GROUNDWATER MONITORING PLAN
FORMER TEXTRON, INC.
WHEATFIELD, NEW YORK FACILITY

Prepared for

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Acronyms and Abbreviations

BAT	Bell Aerospace Textron Facility
DNAPL	dense non-aqueous phase liquid
ELAP	Environmental Laboratory Accreditation Program
GWMP	Groundwater Monitoring Plan
H_2S	hydrogen sulfide
HASP	Health and Safety Plan
IP	Interface Probe
LEL	lower explosive limit
MS/MSD	matrix spike/matrix spike duplicates
NCSD	Niagara County Sewer District
NYSDEC	New York State Department of Environmental Conservation
Off-Site System	Off-Site Groundwater Extraction System
On-Site System	On-Site Groundwater Treatment System
PID	photoionization detector
POTW	Publicly Owned Treatment Works
PPE	personal protective equipment
ppm	parts per million
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
Shaw	Shaw Environmental and Infrastructure, Inc.
SOP	Standard Operating Procedure
SPDES	State Pollutant Discharge Elimination System
Textron	Textron Inc.
USEPA	United States Environmental Protection Agency
VOC	volatile organic compounds

1.0 Introduction

1.1 General

This work plan serves as the Groundwater Monitoring Plan (GWMP) for the former Textron Inc. (Textron) facility located in Wheatfield, New York. This plan is a revision to the GWMP dated October 1998, (Golder Associates, Inc.) previously used by Textron and approved by the New York State Department of Environmental Conservation (NYSDEC). Textron has performed over 19 years of groundwater monitoring to evaluate the performance of the Off-Site Groundwater Extraction System (Off-Site System) and over 17 years of groundwater monitoring for the On-Site Groundwater Treatment System (On-Site System). This monitoring includes both groundwater quality monitoring, through annual collection and analysis of samples for volatile organic compounds (VOC), and hydraulic monitoring, through quarterly groundwater gauging events.

The current requirement for groundwater quality monitoring, which includes monitoring points for both the On-Site and Off-Site systems, is an annual event conducted every October. This plan involves collecting groundwater samples from a combination of 31 monitoring and extraction wells on even numbered years and a combination of 23 monitoring and extraction wells on odd numbered years. All groundwater samples are analyzed for VOCs in accordance with United States Environmental Protection Agency (USEPA) SW 846 Method 8260. Field parameters (pH, specific conductance and temperature) are collected as part of the sampling process as detailed in **Section 4.0**.

The requirements for hydraulic monitoring of both the On-Site and Off-Site systems are the completion of semi-annual groundwater gauging events (April and October) in 52 monitoring and extraction wells. The data is then utilized to evaluate the hydraulic response from the extraction of groundwater by the On-Site and Off-Site systems.

1.2 Background

1.1.1 Site Geology

The site is underlain by approximately 15 feet to 30 feet of silty and clayey overburden. Beneath the overburden, the bedrock stratigraphy consists of four zones. The zones are based on lithology and permeability characteristics as follows:

- Zone 1 comprises approximately the upper 10 feet to 20 feet of Dolostone bedrock and occurs to depths of 25 feet to 50 feet below ground surface. It is thinly bedded to laminated Dolostone of moderate to high permeability and constitutes the upper bedrock aquifer;
- Zone 2 is a massive Dolostone layer that averages approximately 8 feet in thickness. It directly underlies Zone 1 and considered a bedrock aquitard that restricts the vertical movement of groundwater;
- Zone 3 is a porous, vuggy Dolostone of moderate permeability that varies in thickness from 18 feet to 28 feet. It constitutes an aquifer beneath Zone 2; and
- Zone 4 is a massive low permeability Dolostone underlying Zone 3.

1.1.2 Off-Site and On-Site Groundwater Extraction Systems

Textron is currently operating two groundwater extraction systems, designated as the Off-Site and On-Site Groundwater Extraction Systems. The Off-Site System is located south of the former Textron, Inc. Wheatfield Facility and the On-Site System is located on the former Facility. **Figure 1** is a site layout showing the locations of the groundwater extraction systems and groundwater monitoring wells for both the Off-Site and On-Site Systems.

The Off-Site System consists of six Zone 1 bedrock groundwater extraction wells (EW-1 through EW-6, connected by a subsurface double containment pipeline that discharges the extracted groundwater to the Niagara County Sewer District (NCSD) Publicly Owned Treatment Works (POTW). The Off-Site System has been operating since March 1993. Extraction well EW-1 was taken out of service during system star-up in March 1993 based upon the hydraulic response. Extraction well EW-6 was taken off-line April 11, 1996 in an attempt to reduce the constituent concentration at the southern boundary of the dissolved phase plume. The cessation of pumping at EW-6 has allowed EW-5 to draw the dissolved phase plume boundary to the north.

The On-Site System consists of seven Zone 1 bedrock extraction wells (EW-7, EW-8, DW-9, DW-10, DW-11, DW-12 and EW-13) connected by a subsurface double-containment pipeline that delivers the extracted groundwater to the On-Site Treatment Plant. At the Treatment Plant, the groundwater is stripped of VOCs and the water is discharged to the Walmore Road storm sewer, in accordance with the State Pollutant Discharge Elimination System (SPDES) permit NY 0000469. The On-Site System has been in operation since February 1995. Extraction well DW-9 was taken out of service on May 26, 1998, in order to concentrate remedial efforts on the down-gradient side of the dense non-aqueous phase liquid (DNAPL) plume located near DW-12. In September 1998 extraction well EW-13 was installed between extraction wells EW-7 and EW-8 to create a more robust hydraulic barrier along the southern property boundary.

2.0 Monitoring Program Objectives

The objectives of the GWMP are to collect representative field readings and groundwater quality samples to:

- Assess changes in the groundwater chemistry over time;
- Demonstrate that the Off-Site and On-Site remedial systems are performing as intended (reduction in contaminate concentration over time);
- Obtain analytical results that are precise, accurate, representative, comparable, and complete;
- Monitor groundwater elevations and drawdown patterns during operation of the extraction systems; and
- Provide a measure of protection of human health and the environment through continuing groundwater monitoring.

3.0 Groundwater Monitoring Requirements

3.1 Sample Location and Frequency

The monitoring and extraction wells to be sampled annually are listed on **Table 1**; the locations of these points are shown on **Figures 2** and **3**. The groundwater samples will be analyzed for VOCs using USEPA SW-846 Method 8260. The Site Specific Health and Safety Plan (HASP) designed for the Former Textron Wheatfield Site is included as **Appendix A**. If entry into the extraction well vaults is deemed necessary, the procedures for confined space entry is detailed in Section 3.1.12 of the HASP apply.

3.2 Laboratory Requirements

The analytical laboratory contracted to analyze the groundwater and Quality Assurance/Quality Control (QA/QC) samples, in accordance with this plan, has submitted the following, which are included as **Appendix B**:

- Documentation that the laboratory is certified by New York State Department of Health under the Environmental Laboratory Accreditation Program (ELAP);
- A laboratory Quality Assurance Project Plan (QAPP); and
- Any planned modifications of USEPA SW-846 Method 8260.

The parameters to be analyzed for using USEPA SW-846 Method 8260 are listed on **Table 2**. The minimum QA/QC data and information to be included with the analytical laboratory results are outline in **Appendix B**. The analytical laboratory must be approved by Textron prior to award of the monitoring contract.

3.3 Hydraulic Monitoring Requirements

Hydraulic monitoring will be performed to evaluate the hydraulic response of the overburden, Zone 1 and Zone 3 aquifers to the extraction of groundwater by the On-Site and Off-Site Systems. Hydraulic monitoring points are listed on **Table 3** and shown on **Figure 1**. Semi-annual hydraulic monitoring events (April and October) will be performed throughout the operation of the extraction systems.

Groundwater elevations will be measured from each of the listed monitoring points. The procedure for manually measuring a water level in a monitoring well using and electric water level meter is detailed in the Standard Operating Procedures (SOPs) located in **Appendix C**.

4.0 Sampling Equipment and Procedures

4.1 Sampling Protocols

These protocols have been developed to minimize potential contamination of groundwater samples during collection and to minimize potential sample degradation prior to analytical testing. The following is a step-by-step procedure listing for the collection of groundwater samples from the monitoring and extraction wells. The SOP procedures are also listed in **Appendix C**. Sampling of the extraction wells will be accessed through the sampling port of the well head (or the stilling well for EW-13). The following are the protocols and procedures to be followed for sampling the monitoring and extraction wells:

- Inspect the well casing or vault entranceway for damage or inadvertent entry, note any evidence on the Well Inspection Forms, the field notebook and on the Field Sampling Data Sheet; and
- Wear appropriate personal protective equipment (PPE) as specified in the Site-Specific HASP.

MONITORING WELLS

- Unlock and remove the well cap.
- Obtain air quality readings at the well head using a photoionization detector (PID) instrument (Mini RAE or similar) and record readings on the Field Sampling Data Sheets.
- Measure the static water level in the well with an Interface Probe (IP). The IP must be washed with Alconox detergent and water, then triple rinsed with deionized water between individual wells to prevent cross-examination.
- Calculate the volume of water in the well (well volume) using the measurements shown on Field Sampling Data Sheets. Well volume must be documented on the same forms.
- Place polyethylene sheeting near the well casing (but out of walk ways to avoid slip, trip and fall hazards) to prevent contact of sampling equipment with the ground in the event sampling equipment is dropped.
- Purge each well by removing a minimum of three well volumes, or if the well yield is low, by removing water to within 6-inches from the bottom of the well (i.e., purged 'dry'). All purge water must be containerized.
  - If the well goes "dry" (within 6-inches of the well bottom) before the required volumes are removed, the well may be sampled when it recovers 80 percent of the initial static volume

- Purge the well using one of the methods described below. Purged water must be containerized and delivered to the On-Site Treatment Facility for proper disposal along with the decontamination fluids unless otherwise directed by the NYSDEC.
  - Peristaltic, whale or Grundfos pump method will consist of a polyethylene tube connected to the pump discharging into containers. Each well will have a dedicated length of tubing to prevent cross-contamination between wells. The lower end of the tube will be positioned just below the water surface and lowered, as necessary, during pumping. This process will allow stagnant water to be removed from the well and allow representative water from the formation flow into the well;
  - Bailer method will consist of a dedicated stainless steel or Teflon bailer attached to a new polypropylene or nylon rope. The bailer will be lowered slowly into the well to minimize the disturbance of the water.
- Groundwater quality meters will be washed with Alconox detergent and water, then triple rinsed with deionized water between individual wells to prevent cross-examination. Field parameters (i.e., pH, specific conductivity, and temperature) will be collected during purging. These parameters should be recorded after a well volume has been purged for a minimum of two measurements during purging. Field parameter measurements and observations will be recorded on the Field Sampling Data Sheet. Purging will be considered "complete" if the following conditions are met:
  - Consecutive pH readings are ±0.2 pH units of each other
  - Consecutive water temperatures are ±0.5°C of each other
  - Consecutive measured specific conductance is ±10 percent of each other.

If these parameters are not met after purging a volume equal to 3 to 5 times standing water volume in the well, the NYSDEC and Shaw Environmental and Infrastructure, Inc. (Shaw) Project Manager will be contacted to determine the appropriate action(s).

- Obtain sample from well with a bailer suspended on new, clean nylon twine or using low flow sampling techniques using care to not agitate the sample. Dedicated bailers or polyethylene tubing must be used in each well.
- When sampling, the bailer must be lowered slowly into the well to minimize the disturbance of the water. The initial sample/bailer volume will not be used for VOC analysis due to possible degassing. This volume will be used for the measurement of final field parameters (pH, Specific Conductivity and temperature). Record field parameters on the Field Sampling Data Sheet.
- Collect VOC sample. Carefully pour directly into the appropriate sample bottles. Sample bottles must be obtained from the laboratory.

- Place analytical samples in cooler and chill to at least 4°C. Samples must be shipped or delivered to the analytical laboratories within 24 hours of collection.
- Decontaminate any sample pumps between each well following the procedures listed in the SOPS (**Appendix C**); the polyethylene tubing and twine must be properly discarded.
- Re-lock well cap.
- Wrap dedicated sampling equipment (bailers and hoses) with suitable material (e.g., aluminum foil or plastic bags). Discard cord, gloves, etc, according to HASP procedures.
- Complete field logbook, sample sheet, custody seals, and pertinent chain-of-custody forms.

EXTRACTION WELLS

- Open the hatch and lower a multi-gas meter and a PID into the vault to check for the presence of hydrogen sulfide (H_2S), oxygen deficiency, percent lower than the lower explosive limit (percent LEL) and organic vapors. If the level of H_2S is greater than 10 parts per million (ppm), the oxygen is less than 19.5 percent, the percent LEL is greater than 20, or the concentration of organic vapors detected is greater than 5 ppm above background for a minute, withdraw from the area and follow HASP requirements.
- If entry into the vault is necessary, as the vaults are considered to be a confined space, all personnel entering a vault must adhere to confined space entry procedures as defined by Occupational Safety and Health Administration for confined space entry;
- The extraction wells will be sampled using dedicated polypropylene tubing attached to the top of the sampling port (except DW-9, EW-6 and EW-13 which must be sampled with a bailer in the manner of the monitoring wells as described above). Slowly open the sampling port valve by turning the control lever to the 'on' position. Purge the system for at least 1 minute prior to sampling. Extend tubing to the sample container(s) and collect the sample(s). (NOTE: Pump for the extraction well must be operating for at least five minutes immediately prior to sampling). Record volume of water purged prior to sampling;
- Immediately prior to purging and after purging, record pH, specific conductivity, temperature and physical appearance (e.g., color, turbidity, odor, etc) on the Field Sampling Data Sheets. The water quality meters will be triple rinsed with deionized water before and after use. A minimum of two measurements will be made and recorded for each parameter.
- After obtaining the field parameter measurements, collect the sample for VOC analysis from the sampling port. Carefully pour directly into the appropriate sample bottles. Sample bottles must be obtained from the laboratory.

- Place analytical samples in cooler and chill to at least 4°C. Samples must be shipped or delivered to the analytical laboratories within 24 hours of collection.
- Slowly close the sampling port valve by turning the control lever to the 'off' position. Close hatch on the vault.
- Wrap dedicated sampling equipment (bailers and hoses) with suitable material (e.g., aluminum foil or plastic bags). Discard cord, gloves, etc, according to HASP procedures.
- Complete field logbook, sample sheet, custody seals, and pertinent chain-of-custody forms.

Extraction well DW-9 and EW-6 currently have no pump (inactive as approved by the NYSDEC) and will be sampled with a bailer in the same manner as the monitoring wells. These locations will not be purged prior to sampling, per NYSDEC approval, due to the large purge volume that would be required.

4.2 Sample Custody

A Field Sampling Data Sheet will be filled out by the sampler for each sampling point. These sheets will be provided as an appendix within the monitoring report. The following information is documented on these forms:

- Site name (BAT), Sample ID and other identifiers
- Date and time
- Information regarding purging the well prior to sampling
- Field parameter results including pH, specific conductivity and temperature
- Purge and sampling methods used, such as bailer, peristaltic pump, etc, Note the material of the equipment (polyethylene, polypropylene, Teflon, etc)
- Field observations/sampling conditions (e.g., weather)
- Appearance of sample (color, turbidity, sediment, LNAPL, DNAPL, etc)
- Sampler's identity and signature.

In order to maintain the legal integrity of the groundwater samples, strict chain of custody procedures will be followed. To ensure that the samples have not been tampered with between the time of collection until the sample is in the custody of the contracted analytical laboratory, the samples will be:

1. In the sampler's possession;
2. In the sampler's view;
3. Locked in a secure area to prevent tampering
4. In a shuttle or cooler sealed with a tamper proof chain of custody seal.

A written chain of custody record of the transference of samples will be maintained. These documents will be presented as an Appendix in the monitoring report.

All sample bottles will be properly labeled. When transferring the possession of samples, the person making the transference will sign and record the date and time on the chain of custody record. The number of custodians of the samples will be limited to the fewest possible. The chain of custody record for will be sealed in the sample cooler/shuttle and transported to the laboratory. Upon receipt, the seal will be broken by the analytical laboratory and the condition of the samples, temperature of the cooler/shuttle and the date and time received will be recorded on the chain of custody record form by the person checking in the samples. The chain of custody record will be included in the laboratory's analytical report.

4.3 Sample Designation

The samples collected from the former Textron site are identified by the site code, well designation and sampling date. The site code is 'BAT', which stands for the (former) Bell Aerospace Textron facility. The well designation will be used as shown on **Table 1**. The sampling date is a six digit numeric code with the following structure YYMMDD (YY=year, MM=month, DD=day). For example, the date code for October 20, 2012 would be 121020. The sample name for a groundwater sample collected from monitoring well 87-20(1) on October 20, 2012 would be BAT-87-20(1)-121020.

5.0 Quality Assurance/Quality Control

QA can briefly be defined as the process for ensuring that all data and the decisions based on that data are technically sound, statistically valid and properly documented. The complete QA plan is detailed in Shaw's *Quality Assurance Project Plan* dated February 2012. QC procedures are the tools employed to measure the degree to which the QA objectives are met. QA/QC procedures for field activities and laboratory procedures will be consistent with protocols specified below. Field activity protocols are addressed in the preceding section and in Shaw's SOPS (**Appendix C**). Field duplicates, field blanks, equipment blanks, trip blanks and matrix spike/matrix spike duplicates (MS/MSDs) will be obtained as discussed below.

- Trip Blank

  Trip blanks are used to monitor potential aqueous sample volatile organic contamination during shipment to and from the laboratory. It also provides information on laboratory water quality since the laboratory provides the trip blank water. One trip blank will be submitted for analysis for each day aqueous matrix volatile organic samples are collected. A trip blank will be included in each cooler that contains aqueous matrix volatile organic samples, therefore all volatile organic samples and containers will be shipped to and from the laboratory in the smallest number of coolers possible in order to minimize the number of trip blanks required. The Trip Blank identification will contain the date coding as described in **Section 4.3**.

  Example: Trip Blank-121020 or TB-121020

- Equipment Blank

  Equipment blanks are not required when dedicated sampling equipment is used. If non-dedicated sampling equipment is used in the soil sampling program, equipment blanks will be analyzed at a frequency of not less than 5 percent (one equipment blank per every 20 samples collected). The Trip Blank identification will contain the date coding as described in **Section 4.3**. They receive the following code:

  Example: BAT-Equipment Blank-121020 or BAT-EB-121020

- Field Blank

  Field blanks are used to determine if contamination is being introduced by the sampling environment during sample collection. Field blanks will be prepared when equipment blanks are not necessary (i.e., dedicated equipment is used for sample collection). The field blank will be prepared at one of the sampling points by exposing deionized water to the air and transferring the water to a set of sampling bottles. Field blanks will be obtained each day of sampling or every 20 samples, whichever is more frequent.

Examples: BAT-Field Blank-121020 or BAT-FB-121020

- Duplicate Samples

  Duplicate samples are sent "blind" to the laboratory. They will receive the following appropriate designation with the date code:

  Example: BAT-Dup 1-121020

  The sample location where a blind duplicate is collected will be marked both on the field sampling data sheet and on the copy of the chain-of-custody record retained by Shaw. A blind duplicate sample will be collected at a frequency of one per every 20 samples.

- Matrix Spike/Matrix Spike Duplicate (MS/MSD)

  QA/QC samples will include MS and MSD samples at a frequency of not less than 5 percent (one MS/MSD pair per every 20 samples collected). They will receive the following code:

  Examples: BAT-87-20(1)-121020 MS and BAT-87-20(1)-121020 MSD

- Split Samples

  Split samples are used in a sampling program to assess the replication of results from the same analysis between two laboratories. In this case, the NYSDEC and the USEPA have the right to split samples with Textron and have all or a portion of the analytical parameters tested by their laboratory of choice. A split sample will be identified by inserting an 'S' after the sample designation, as described in **Section 4.3**.

  Example: BAT-87-20(1)-121020 S

  If split samples are to be collected, the following procedure is to be used:

  - Groundwater will be poured from the same bailer into four 40 milliliter vials for VOC analysis, two vials will be kept by the sampling subcontractor and two will be relinquished to agency personnel.

Table 4 provides a summary of the estimated QA/QC samples to be obtained during implementation of this GWMP.

6.0 Health and Safety

Personnel performing the sampling will adhere to all safety requirements for contractors and/or visitors of the former Textron facility. Personnel visiting the site or performing sampling will at minimum wear Level D protection (suitable field boots, protective gloves, safety glasses/goggles and hard hat). Other safety equipment which is deemed necessary when activities require, is detailed in the HASP included as **Appendix A**.

Tables

Table 1
Groundwater Monitoring Points
Former Textron, Inc.
Wheatfield, New York

WELL NUMBER	FREQUENCY		ANALYTICAL METHOD
	ANNUAL (A)	ANNUAL (B)	
OVERBURDEN MONITORING WELLS			
87-10(0)	X		8260
87-14(0)	X	X	8260
87-20(0)	X	X	8260
B-8	X		8260
TOTAL OVERBURDEN SAMPLES PER EVENT	**4**	**2**	
ZONE 1 MONITORING WELLS			
87-01(1)	X		8260
87-02(1)	X		8260
87-08(1)	X		8260
87-17(1)	X	X	8260
87-19(1)	X	X	8260
87-20(1)	X	X	8260
87-21(1)	X	X	8260
87-22(1)	X	X	8260
89-04(1)	X		8260
89-14(1)	X	X	8260
89-15(1)	X	X	8260
93-03(1)	X	X	8260
	X	X	8260
TOTAL ZONE 1 SAMPLES PER EVENT	**13**	**9**	
ZONE 3 MONITORING WELLS			
87-02(3)	X		8260
87-13(3)	X		8260
TOTAL ZONE 3 SAMPLES PER EVENT	**2**	**0**	
OFF-SITE EXTRACTION WELLS			
EW-2	X	X	8260
EW-3	X	X	8260
EW-4	X	X	8260
EW-5	X	X	8260
EW-6	X	X	8260
TOTAL OFF-SITE EXTRACTION WELL SAMPLES PER EVENT	**5**	**5**	
ON-SITE EXTRACTION WELLS			
EW-7	X	X	8260
EW-8	X	X	8260
DW-9	X	X	8260
DW-10	X	X	8260
DW-11	X	X	8260
DW-12	X	X	8260
EW-13	X	X	8260
TOTAL ON-SITE EXTRACTION WELL SAMPLES PER EVENT	**7**	**7**	
GRAND TOTAL SAMPLES PER EVENT	**31**	**23**	

(A) Annual sampling to be conducted in October of even-numbered years.
(B) Annual sampling to be conducted in October of odd-numbered years.
A water level reading will be taken from each well shown during each monitoring event.

Table 2
Parameter List for US EPA SW-846 Method 8260
Former Textron, Inc.
Wheatfield, NY

VOCs by EPA Method 8260
Chloromethane
Vinyl chloride
Chloroethane
Bromomethane
1,1-Dichloroethene
Acetone
Carbon Disulfide
Methylene chloride
trans-1,2-Dichloroethene
1,1-Dichloroethane
cis-1,2-Dichloroethene
2-Butanone
Chloroform
1,1,1-Trichloroethane
Carbon Tetrachloride
Benzene
1,2-Dichloroethane
Trichloroethene
1,2-Dichloropropane
Bromodichloromethane
cis-1,3-Dichloropropene
4-Methyl-2-pentanone
Toluene
trans-1,3-Dichloropropene
1,1,2-Trichloroethane
Tetrachloroethene
2-Hexanone
Dibromochloromethane
Chlorobenzene
Ethylbenzene
m/p-Xylenes
o-Xylene
Styrene
Bromoform
1,1,2,2-Tetrachloroethane

Table 3
Hydraulic Monitoring Points
Former Textron, Inc.
Wheatfield, New York

Well Name	Top of Riser Elevation (Feet MSL)
87-01(0)	588.10
87-01(1)	587.99
87-02(1)	589.21
87-02(3)	588.63
87-04(0)	589.32
87-04(1)	589.08
87-04(3)	589.49
87-05(1)	589.37
87-05(3)	589.46
87-08(1)	589.48
87-10(0)	587.30
87-10(1)	587.52
87-12(1)	583.84
87-13(0)	589.77
87-13(1)	590.06
87-13(3)	589.91
87-14(0)	589.56
87-14(1)	589.06
87-14(3)	590.35
87-15(0)	590.70
87-15(1)	590.27
87-15(3)	589.87
87-16(3B)	590.51
87-17(0)	589.50
87-17(1)	589.62
87-18(0)	585.95
87-18(1)	586.02
87-19(1)	581.47
87-20(0)	578.77
87-20(1)	579.01
87-21(1)	577.33
87-22(1)	583.97

NOTES:

MSL = Mean sea level.

(**) = Water level elevation measured fror top of vault grate.

Table 3
Hydraulic Monitoring Points
Former Textron, Inc.
Wheatfield, New York

Well Name	Top of Riser Elevation (Feet MSL)
89-04(1)	NA
89-12(1)	586.60
89-14(1)	587.59
89-15(1)	588.76
93-03(1)	572.30
96-01(1)	585.18
B-8(0)	590.26
EW-2	568.15
EW-3	569.56
EW-4	570.07
EW-5	569.47
EW-6	568.17
EW-7 (**)	580.96
EW-8 (**)	578.44
DW-9 (**)	581.30
DW-10 (**)	583.95
DW-11 (**)	583.05
DW-12 (**)	580.48
EW-13	579.84

NOTES:

MSL = Mean sea level.

(**) = Water level elevation measured fror top of vault grate.

Table 4
Summary of QA/QC Sampling Program
Former Textron, Inc.
Wheatfield, New York

Summary of QA/QC Sampling Program (even numbered years)				
Sampling Event	**QA/QC Sample**	**Number of Samples**	**Frequency**	**Remarks**
October even numbered year	Blind Duplicate	2	1 per 20 samples	Collected from two Zone 1 wells
	Field Blank	2	1 per 20 samples	Collected near two Zone 1 wells
	MS/MSD	2	1 per 20 samples	Collected from two Zone 1 wells
	Trip Blank	2	1 per cooler	Assumption that sampling will take 2 days

** MS/MSD samples will not be collected from the same wells as the Blind Duplicates**

Summary of QA/QC Sampling Program (odd numbered years)				
Sampling Event	**QA/QC Sample**	**Number of Samples**	**Frequency**	**Remarks**
October odd numbered year	Blind Duplicate	2	1 per 20 samples	Collected from two Zone 1 wells
	Field Blank	2	1 per 20 samples	Collected near two Zone 1 wells
	MS/MSD	2	1 per 20 samples	Collected from two Zone 1 wells
	Trip Blank	2	1 per cooler	Assumption that sampling will take 2 days

** MS/MSD samples will not be collected from the same wells as the Blind Duplicates**

Figures

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68,000 m E

69,000 m E

70,000 m E

74,000 m N

73,000 m N

WALMORE ROAD

APPROXIMATE LIMIT OF DISSOLVED PHASE PLUME (1 ppb TVO OCTOBER 2011 SAMPLING EVENT – SEE NOTE 4.)

CLOSED NEUTRALIZATION POND

FORMER TEXTRON INC. (WHEATFIELD PLANT)

NIAGARA ROAD

STATE RTE. 62 (NIAGARA FALLS BLVD.)

OLD FALLS BLVD.

CAYUGA DR. EXT.

NIAGARA FALLS BLVD.

BERGHOLTZ CREEK

SAWYER CREEK

DRAINAGE DITCH

RAILROAD

CONRAIL

SY ROAD

JAGOW ROAD

87-15(0) 87-15(1) 87-15(3) DW-9 B-8(0) 89-14(1) 87-08(1) DW-10 87-16(38) 87-17(0) 87-17(1) 87-14(0) 87-14(1) 87-14(3) 87-04(0) 87-04(1) 87-04(3) 87-05(1) 87-05(3) B-14(1) 89-15(1) DW-11 87-13(0) 87-13(1) 87-13(3) 87-10(0) 87-10(1) 87-02(1) 87-02(3) 89-12(1) DW-12 87-01(0) 87-01(1) 87-18(0) 87-18(1) EW-13 EW-8 87-22(1) EW-7 96-01(1) 87-12(1) 89-04(1) 87-20(0) 87-20(1) 87-19(1) 87-21(1) EW-2 EW-3 EW-4 EW-5 EW-6 93-03(1)

LEGEND

- EXTRACTION WELL OR DNAPL WELL
- MONITORING WELL OR PIEZOMETER
- APPROXIMATE LIMIT OF DISSOLVED PHASE PLUME (1 ppb TVO)

NOTES

1.) GRID SYSTEM SHOWN IS 1000-METER UNIVERSAL TRANSVERSE MERCATOR GRID, ZONE 17, 1927 NORTH AMERICAN DATUM.

2.) REFERENCE: U.S. GEOLOGICAL SURVEY, TONAWANDA WEST NEW YORK 7.5' QUADRANGLE, DATED 1980.

3.) WELL LOCATIONS SHOWN ARE APPROXIMATE.

4.) TOTAL VOLATILE ORGANIC (TVO) DETECTIONS/MINUS CARBON DISULFIDE.

SCALE
0 300 600 900 FEET

REFERENCE:

BASE MAP SOURCE: GOLDER ASSOCIATES
BUFFALO, NY

Shaw Environmental, Inc.

TEXTRON
NIAGARA FALLS, NEW YORK

FIGURE 1
GAUGING LOCATIONS SEMI-ANNUAL
2221 NIAGARA FALLS BOULEVARD
NIAGARA FALLS, NEW YORK

DRAWING NUMBER 135428D17

APPROVED BY

CHECKED BY

DRAWN BY B.S./B.B.F. 2/22/12

OFFICE PITTSBURGH, PA

Xref:

Image:

File: Q:\Shaw Offices - CAD Files\Latham, NY\135428\135428D17.dwg
Plot Date/Time: Feb 22, 2012 - 1:04pm
Plotted By: bernadette.oconnor

68,000 m E

69,000 m E

70,000 m E

74,000 m N

73,000 m N

WALMORE ROAD

APPROXIMATE LIMIT OF DISSOLVED PHASE PLUME (1 ppb TVO OCTOBER 2011 SAMPLING EVENT – SEE NOTE 4.)

CLOSED NEUTRALIZATION POND

FORMER TEXTRON INC. (WHEATFIELD PLANT)

STATE RTE. 62 (NIAGARA FALLS BLVD.)

NIAGARA ROAD

OLD FALLS BLVD.

CAYUGA DR. EXT.

NIAGARA FALLS BLVD.

BERGHOLTZ CREEK

SAWYER CREEK

DRAINAGE DITCH

RAILROAD

CONRAIL

SY ROAD

JAGOW ROAD

89-14(1)
DW-9
B-8(0)
87-08(1)
87-17(1)
87-14(0)
DW-10
87-13(3)
89-15(1)
B-14(1)
DW-11
87-10(0)
87-02(1)
87-02(3)
DW-12
87-01(1)
87-22(1)
89-04(1)
EW-7
EW-13
EW-8
87-20(0)
87-20(1)
87-19(1)
87-21(1)
EW-2
EW-3
EW-4
EW-5
EW-6
93-03(1)

LEGEND

- EXTRACTION WELL OR DNAPL WELL
- MONITORING WELL OR PIEZOMETER
- APPROXIMATE LIMIT OF DISSOLVED PHASE PLUME (1 ppb TVO)

NOTES

1.) GRID SYSTEM SHOWN IS 1000-METER UNIVERSAL TRANSVERSE MERCATOR GRID, ZONE 17, 1927 NORTH AMERICAN DATUM.

2.) REFERENCE: U.S. GEOLOGICAL SURVEY, TONAWANDA WEST NEW YORK 7.5' QUADRANGLE, DATED 1980.

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4.) TOTAL VOLATILE ORGANIC (TVO) DETECTIONS/MINUS CARBON DISULFIDE.

SCALE
0 300 600 900 FEET

REFERENCE:

BASE MAP SOURCE: GOLDER ASSOCIATES
BUFFALO, NY

Shaw Environmental, Inc.

TEXTRON
NIAGARA FALLS, NEW YORK

FIGURE 2
ANNUAL SAMPLING LOCATIONS EVEN NUMBERED YEARS
2221 NIAGARA FALLS BOULEVARD
NIAGARA FALLS, NEW YORK

DRAWING NUMBER 135428D18

APPROVED BY

CHECKED BY

DRAWN BY B.S./B.B.F. 2/22/12

OFFICE PITTSBURGH, PA

Xref :

Image :

File: O:\Shaw Offices - CAD Files\Latham, NY\135428\135428D18.dwg
Plot Date/Time: Feb 22, 2012 - 1:18pm
Plotted By: bernadette.oconnor

68,000 m E

69,000 m E

70,000 m E

74,000 m N

73,000 m N

WALMORE ROAD

APPROXIMATE LIMIT OF DISSOLVED PHASE PLUME (1 ppb TVO OCTOBER 2011 SAMPLING EVENT – SEE NOTE 4.)

CLOSED NEUTRALIZATION POND

FORMER TEXTRON INC. (WHEATFIELD PLANT)

STATE RTE. 62 (NIAGARA FALLS BLVD.)

NIAGARA ROAD

OLD FALLS BLVD.

CAYUGA DR. EXT.

NIAGARA FALLS BLVD.

BERGHOLTZ CREEK

SAWYER CREEK

DRAINAGE DITCH

RAILROAD

CONRAIL

SY ROAD

JAGOW ROAD

89-14(1)
87-17(1)
DW-9
87-14(0)
DW-10
B-14(1)
89-15(1)
DW-11
DW-12
89-12(1)
87-22(1)
EW-7
EW-13
EW-8
87-20(0)
87-20(1)
87-19(1)
87-21(1)
EW-2
EW-3
EW-4
EW-5
EW-6
93-03(1)

LEGEND

- EXTRACTION WELL OR DNAPL WELL
- MONITORING WELL OR PIEZOMETER
- APPROXIMATE LIMIT OF DISSOLVED PHASE PLUME (1 ppb TVO)

NOTES

1.) GRID SYSTEM SHOWN IS 1000-METER UNIVERSAL TRANSVERSE MERCATOR GRID, ZONE 17, 1927 NORTH AMERICAN DATUM.

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4.) TOTAL VOLATILE ORGANIC (TVO) DETECTIONS/MINUS CARBON DISULFIDE.

SCALE
0 300 600 900 FEET

REFERENCE:

BASE MAP SOURCE: GOLDER ASSOCIATES
BUFFALO, NY

Shaw Environmental, Inc.

TEXTRON
NIAGARA FALLS, NEW YORK

FIGURE 3
ANNUAL SAMPLING LOCATIONS ODD NUMBERED YEARS
2221 NIAGARA FALLS BOULEVARD
NIAGARA FALLS, NEW YORK

Appendix A

Site Specific Health and Safety Plan

HEALTH AND SAFETY PLAN
Former Textron, Inc.
Wheatfield, New York Facility

Shaw Environmental, Inc. Project

March 16, 2012

Prepared for:

Textron, Inc.
40 Westminster Street
Providence, Rhode Island 02903

Prepared by:

Shaw® Shaw Environmental, Inc.

Shaw Environmental, Inc.
13 British American Blvd.
Latham, NY 12210

Project Manager

_____

Health and Safety Manager

The information in this HASP has been designed for the methods presently contemplated by Shaw Environmental and Infrastructure (Shaw) for execution of the proposed work. Therefore, this HASP may not be appropriate if the work is not performed by or using the methods presently contemplated by Shaw. In addition, as the work is performed, conditions different from those anticipated may be encountered and the HASP may have to be modified. Therefore, Shaw only makes representations or warranties as to the adequacy of the HASP for currently anticipated activities and conditions.

Table of Contents

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Acronyms and Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
COC	Contaminants of Concern
CRZ	Contamination Reduction Zone
DOT	Department of Transportation
ERCP	Emergency Response and Contingency Plan
EZ	Exclusion Zone
FID	Flame Ionization Detector
GFCI	Ground Fault Circuit Interrupter
HASP	Health and Safety Plan
HSM	Health and Safety Manager
HSR	Health and Safety Representative
IDLH	Immediately Dangerous to Life or Health
JSA	Job Safety Analysis
LO/TO	Lockout/Tagout
MHR	Maximum Heart Rate
MSDS	Material Safety Data Sheet
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PE	Professional Engineer
PEL	Permissible Exposure Limit
PEL	Permissible Exposure Limit
PID	Photoionization Detector
PM	Project Manager
PPE	Personal Protective Equipment
REL	Recommended Exposure Limits
SHSO	Site Health and Safety Officer
SM	Site Manager
SS	Site Supervisor
SSO	Site Safety Officer
SZ	Support Zone
TLV	Threshold Limit Values
WBGT	Wet Bulb Globe Temperature

Table 1
Site Emergency Form

Category	Information
Possible Contaminants of Concern	Vinyl Chloride, Carbon Disulfide, Methylene Chloride, 1,2 Dichloroethene, 1,2 Dichloroethane, Chloroform, 1,1,1 trichloroethane, Carbon Tetrachloride, Trichloroethylene
Minimum Level of Protection	Level D
Hazard Determination*	
Office Telephone	518-783-1996
Site Location Address	2221 Niagara Falls Blvd., Niagara Falls, NY

**See Section 7.0of the Master HASP for site emergency contingency procedures. Do not endanger your own life. Survey the situation before taking any action.*

Table 2
Emergency Phone Numbers*

Contact	Phone Number
Ambulance	911
Fire	911
Police	911
Poison Control	1-800-222-1212
Local Shaw Corp. Medical Provider	See Occupational Health Clinic
Shaw, Medical Case Manager	Dr. Nassetta, MD, MPH, Consulting Medical Director, CORE (877) 347-7429 Fax: (225) 295-4846
Hospital Name	Niagara Falls Memorial Medical Center 621 10th Street Niagara Falls, NY 14301 (716) 278-4000
Occupational Clinic Name	Niagara Falls Memorial Medical Center (Occupational Health) 621 10th Street Niagara Falls, NY 14301 (716) 278-4000
Project Manager (PM)	Cecelia Campbell (412) 858-3977
Site Safety & Health Officer (SSHO)	Kevin Cronin (716) 871-2060
Health & Safety Rep (HSR)	Greg McElroy (412) 858-1542
Client Contact	Greg Simpson (401) 457-2635

National Response Center	800-424-8802
State Agency	New York State Department of Environmental Conservation
Shaw Transportation Spill Emergency Information (CHEM-TREC)	(800) 424-9300
Shaw (Hot Line)	(866) 299-3445

**In the event of any emergency contact Project Manager (PM) or the Health and Safety Representatives*

Table 3
Utility Marker Emergency Telephone Numbers

Utility	Color Code	Telephone Number
Water	Blue	(716) 283-9770 x 221 (City of Niagara Falls)
Gas	Yellow	(716) 857-7076 / (800) 444-3130 Emergency (National Grid)
Electric	Red	(716) 857-7076 National Grid
Telephone/Cable	Orange	(716) 686-4458 (Time Warner), (585) 687-5117 (Fibertech), (800) 252-1133 (AT&T)
Sewer	Green	(716) 283-9770 x 221 (City of Niagara Falls)

Figure 1
Site Location

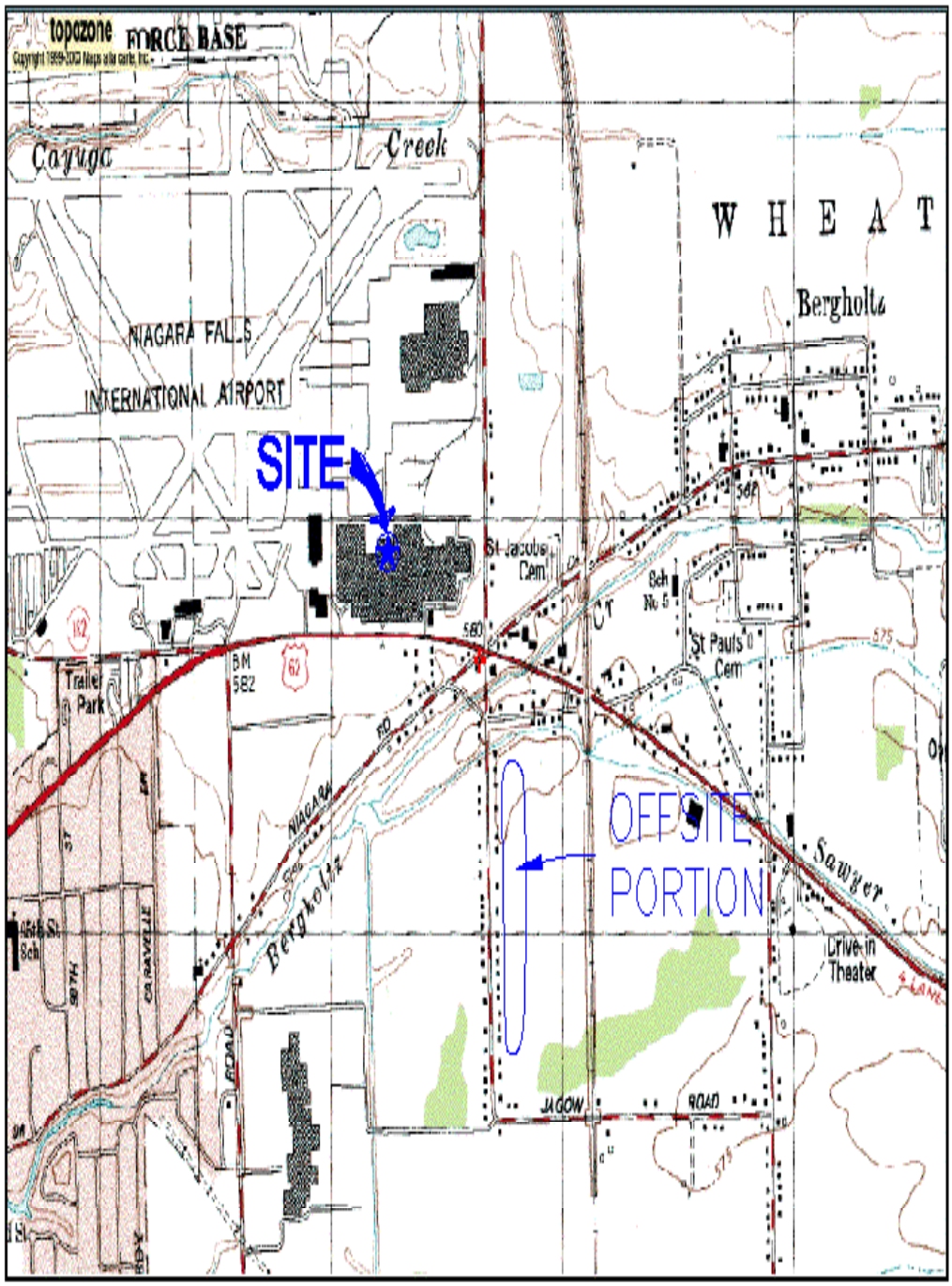


Figure 2
Hospital Map

Hospital Directions:

1.	Start out going WEST on NIAGARA FALLS BLVD / US-62 toward NY-182 W / PORTER RD.	0.4 mi
2.	Turn SLIGHT RIGHT onto NY-182 W / PORTER RD.	2.3 mi
3.	Turn LEFT onto PACKARD RD / NY-182 / PORTER-PACKARD RD / CR-82. Continue to follow PACKARD RD / CR-82.	1.7 mi
4.	Turn RIGHT onto US-62 BR N / NIAGARA FALLS BLVD.	0.2 mi
5.	US-62 BR N / NIAGARA FALLS BLVD becomes US-62 N / WALNUT AVE	1.8 mi
6	Turn RIGHT onto 10TH ST.	0.0 mi
7.	621 10TH ST is on the RIGHT.	0.0 mi

Hospital Information:

Category	Information
Name:	Niagara Falls Memorial Medical Center
Address:	621 10th Street
City, State:	Niagara Falls, NY
Phone:	716-278-4000
Emergency Phone:	911 Tri-County Ambulance

Note: The Occupational Health Center and Hospital are at the same location.

Emergency First Aid Procedures

Observe the following steps in the event of an emergency. See Table 2 for a list of emergency phone numbers.

Site Location

See Figure 2 for a map to the nearest hospital. See Table 3 for utility marker emergency phone numbers.

1. Survey the situation. Do not endanger your own life. Do not enter a confined space to rescue someone who has been overcome unless properly equipped and trained. Ensure all protocols are followed including that a standby person is pre-sent. If applicable, review MSDS to evaluate response actions for chemical exposures.
2. Call 911 (if available) or the fire department immediately. Explain the physical injury, chemical exposure, fire, or release.
3. Decontaminate the victim without delaying life-saving procedures.
4. If the victim's condition appears to be non-critical, but seems to be more severe than minor cuts, he/she should be transported to the nearest hospital by trained Emergency Medical Services (EMS) personnel: let the doctor assume the responsibility for determining the severity of the injury. If the condition is obviously serious, EMS must transport the victim.
5. Notify the PM, SS, SM, and the SHSO. Complete the appropriate incident investigation reports.

Stop Bleeding and CPR Guidelines

To Stop Bleeding

Perform the following steps to stop bleeding. Responder must have a current certificate to administer first aid.

1) Give medical statement.
2) Assure airway, breathing, and circulation.
3) Use direct pressure over the wound with clean dressing or your hand (use non-permeable gloves). Direct pressure will control most bleeding.
4) Bleeding from an artery or several injury sites may require direct pressure on a pressure point. Use pressure points for 30 to 60 seconds to help control severe bleeding.
5) Continue primary care and seek medical aid as needed.

CPR

Perform the following steps to administer CPR. Responder must have a current certificate to administer CPR.

1) Give medical statement.
2) Arousal: Check for consciousness.
3) Open airway with chin-lift.
4) Look, listen, and feel for breathing.

5) If breathing is absent, give 2 slow, full rescue breaths.

6) Check the pulse for 5 to 10 seconds.

7) If pulse is present, continue rescue breathing: 1 breath every 5 seconds.

8) If pulse is absent, initiate CPR; 30 compressions for each two breaths.

Injury Management/Incident Notification

Observe the following injury management/incident notification procedures and practices:

Injury Management

Observe the following injury management procedures and practices:

- Once a personal injury incident is discovered the first action will be to ensure the injured party received appropriate medical attention.
- If it is safe to do so, the nearest workers will immediately assist a person who shows signs of medical distress or who is involved in an accident.
- The work crew supervisor will be summoned. The work crew supervisor will immediately make contact with the PM or other designated individual to alert them of the medical emergency. The work crew supervisor will advise and perform the following "Care of the Employee":
  - Location of the victim at the work site.
  - Nature of the emergency.
  - Whether the victim is conscious.
  - Specific conditions contributing to the injury, if known.
  - Escort the injured person to the occupational clinic or hospital or arrange for ambulance.
  - Contact CORE ((877-347-7429) to inform them of the clinic or hospital the employee is going to be treated and to arrange for a drug and alcohol test

Notification Requirements

Directly After "Care of the Employee," make the following notifications, in order:

- Contact the PM and H&S Manager (or Project CIH) immediately
- Contact CORE 877-347-7429) prior to or during treatment
- Contact the Shaw Help Desk within 1 hour at (866) 299-3445
- PM will contact upper line management
- The H&S Manager will facilitate the incident investigation

All client requirements will also be adhered to pertinent to personal injury incident reporting.

Incident Other Than Personal Injury

All incidents including fire, explosion, property damage, environmental release etc. will be responded in accordance with the site specific Health and Safety Plan. In general this includes securing the site appropriate to the incident, turning control over the emergency responders, or securing the site and summoning appropriate remedial personnel or equipment. Shaw will immediately notify the client of any major incident, fire, equipment/ property damage, and environmental incident with a preliminary report. A full report will be provided within 72 hours.

Motor Vehicle Incidents

All motor vehicle accidents will be reported to the Help Desk, Project Management, and H&S. H&S will determine whether the motor vehicle incident requires the driver of the vehicle to obtain a drug and alcohol test. In general all chargeable, at fault accidents will require the operator to submit to a drug and alcohol screening. Special note regarding any incident: Should you become involved in any incident always contact the Regional H&S Manager (or Project CIH) for guidance.

1.0 Introduction

The policy of Shaw Environmental, Inc. (Shaw) is to provide a safe and healthful work environment for all employees. Shaw considers no phase of operations or administration to be of greater importance than injury and illness prevention. Safety takes precedence over expediency and shortcuts. Shaw believes that all accidents and injuries are preventable. Shaw will take every reasonable step to reduce the possibility of injury, illness, or accident.

This Health and Safety Plan's (HASP) objective is to help establish safe working conditions at the site. Safety procedures and protective equipment are chosen according to potential hazards. Specific hazard control methods have been evaluated and selected to minimize the potential of accident or injury.

This HASP prescribes the procedures that must be followed during specific site activities. Operational changes that could affect the health and safety of personnel, the community, or the environment will not be made without the prior approval of the Project Manager (PM) and the Health and Safety Manager (HSM).

The provisions of this plan are mandatory for all personnel and subcontractors assigned to the project. All visitors to the work site must abide by the requirements of this plan. All project participants will attend a pre-job briefing where the contents of this HASP will be discussed. Project staff assigned to this project must sign the Agreement and Acknowledgement Sheet (see Appendix A) to confirm that they understand and agree to abide by the provisions of this plan.

All work will comply with the Occupational Safety and Health Act (OSHA) standard, "Hazardous Waste Operations and Emergency Response" (29 CFR 1910.120), Shaw Health and Safety Procedures, and other federal, state, and local procedures that require the development and implementation of a HASP. Generation of this document certifies that the workplace has been evaluated for hazards. A hazard assessment has been performed and the adequacy of the personal protective equipment (PPE) selected was evaluated as required by 29 CFR 1910.132(d), 1910.134, 1926.25, and 1926.55, and is duly noted by the signature(s) and date appearing on the cover page of this document.

1.1 Site Description/Background Information

The Off-Site System consists of six (6) Zone 1 bedrock groundwater extraction wells (EW-1 through EW-6), connected by a subsurface double-containment pipeline that discharges the extracted groundwater to the Niagara County Sewer District (NCSD) Publicly Owned Treatment Works (POTW). The Off-Site System has been operating since March 1993. Extraction well EW-1 was taken out of service during system start-up in March 1993, based on the hydraulic response observed during system start-up. EW-6 was taken off-line on April 11, 1996 in an attempt to reduce the constituent concentration at the southern boundary of the dissolved phase plume in the area of EW-6. The cessation of pumping at EW-6 has allowed EW-5 to draw the dissolved phase plume boundary (just south of EW-6) to the north toward EW-5.

The On-Site System consists of seven (7) Zone 1 bedrock groundwater extraction wells (EW-7, EW-8, EW-13 and DW-9 through DW-12) connected by a subsurface double containment pipeline that delivers the extracted groundwater to the On-Site Treatment Plant. At the Treatment Plant, the water is stripped of volatile organic compounds (VOCs), which are discharged to the atmosphere under a NYSDEC approved permit. The water ultimately is discharged to the Walmore Road storm sewer under a National Pollution Discharge Elimination System permit. Construction of the system was initiated on September 20, 1993 and was substantially completed in late 1994. Start-up of the system began in April 1995. DW-9 was taken off-line on May 26, 1998 in order to focus remedial efforts on the southern facility property line

near wells EW-7 and EW-8. In order to form a more robust hydraulic barrier between EW-7 and EW-8, extraction well EW-13 was added to the system approximately midway between these wells and was activated on September 25, 1998.

1.2 Scope of Work

The principal tasks to be conducted are listed below:

- Mobilization
- System Operations and Maintenance
- System Service and Repairs
- Gauging of wells
- Annual groundwater sampling
- Semi-annual discharge monitoring
- Monthly discharge monitoring

1.3 Key Safety Personnel

Shaw will oversee and act accordingly during all phases of the project. The following management structure will be instituted to successfully and safely completing this project.

Health and Safety Advisor
Greg McElroy
Shaw Monroeville, PA
(412)-858-1542

The specific duties of the technical advisors include:

- Providing technical input into the design and implementation of the site HASP
- Advising on potential for worker exposure to project hazards along with appropriate methods and/or controls to eliminate site hazards.

The following people share responsibility for health and safety at the site. See Section 1.3.1 for a description of the role and responsibility of each.

Program Manager	(office) 518-785-2362
David Stoll, P.G.	(cellular) 518-526-2322
Project Manager	(office) (412) 858-3977
Cecelia Campbell	(cellular) (518) 281-2034
Site Supervisor	(office) (412) 858-3977
Cecelia Campbell	(cellular) (518) 281-2034
Site Health and Safety Officer	(office) (716) 871-2060
Kevin Cronin	(cellular) (716) 472-0434
Client Representative	(office) (401)-457-2635
Greg Simpson	(cellular) N/A
Health and Safety Manager	(office) (412)-858-1542
Greg McElroy	(cellular) (412)-759-5302
Director, Health & Safety	(office) 312-499-3503
Clifford Florczak	

1.3.1 Responsibilities of Key Personnel

1.3.1.1 Project Manager

The PM has authority to direct response operations; the PM assumes total control over site activities. In addition, the PM:

- Prepares and organizes background review of the project, the work plan, and the field team.
- Obtains permission for site access and coordinates activities with appropriate officials.
- Sees that the work plan is properly carried out and on schedule.
- Briefs the Site Supervisor (SS), Site Health and Safety Officer (SHSO), and field personnel on specific assignments.
- Together with the SS and SHSO, sees that health and safety requirements are met.
- Consults with the Health Safety Representative (HSR) regarding unsafe conditions, incidents, or changes in site conditions or the scope of work.
- Ensures Company Accident/Incident report procedures are followed (see Appendix B).

1.3.1.2 Site Supervisor

The SS Reports to the PM, has authority to direct response operations, and assumes control over on-site activities. In addition the SS:

- Conducts daily safety meetings.
- Executes the work plan and schedule.
- Manages the construction operations.
- In conjunction with the SHSO, conducts periodic field health and safety inspections to ensure compliance with this HASP.
- Enforces safety procedures.
- Coordinates with the SHSO in enforcing worker protection levels.
- Enforces site control.
- Notifies, when necessary, local public emergency officials.
- In conjunction with the SHSO, responsible for following-up on incident reports to the PM.

1.3.1.3 Site Health and Safety Officer

The SHSO advises the PM on all aspects of health and safety on site. The SHSO stops work if site operations threaten worker or public health and safety; also informs the HSR of any changes in site conditions or project status. In addition, the SHSO:

- Conducts periodic inspections to assess whether the HASP is being followed.
- Periodically inspects protective clothing and equipment.

- Sees that protective clothing and equipment are properly stored and maintained.
- Controls entry and exit at the access control points.
- Performs air monitoring in accordance with this HASP. Maintains and oversees operation of monitoring equipment and interpretation of data from the monitoring equipment.
- Monitors workers for signs of stress, including heat stress, cold exposure, and fatigue.
- Enforces the "buddy" system.
- Is informed of emergency procedures, evacuation routes, and telephone numbers of the local hospital, poison control center, fire department, and police department.
- Notifies, when necessary, local public emergency officials.
- Communicates incidents promptly to SS and PM.
- Maintains communication with HSR on site activities.
- If applicable, ensures decontamination and disposal procedures are followed.
- Maintains the availability of required equipment.
- Advises appropriate health services and medical personnel of potential exposures.
- Notifies emergency response personnel in the event of an emergency. Coordinates emergency medical care.

1.3.1.4 Work Team

The Work Team reports to the SS for on-site activities. Work parties must comprise at least two people for trench entry. In addition, the Work Team:

- Safely completes on-site tasks required to fulfill the work plan.
- Complies with the HASP.
- Attends and participates in daily safety meetings.
- Notifies the SS and SHSO of suspected unsafe conditions.
- Reports all incidents to the SS and SHSO.

1.4 Health and Safety Training Programs

This Section describes the health and safety training programs that site personnel must comply with.

1.4.1 Medical Surveillance

This program tracks the physical condition of the company's employees in compliance with Department of Transportation (DOT) regulations and Occupational Safety and Health Administration (OSHA) standards, and other customer requirements. In addition, medical surveillance will consist of the following:

- Medical examinations and consultations must be completed for all employees prior to assignment, annually, upon termination, and in the event of injury and/or illness resulting from exposure at the work site.

- Dr. William Nassetta (MD, MPH), of CORE will review all medical examinations and will be available for medical consultation on an as needed.

1.4.2 Training

Training requirements and programs will comply with the OSHA Hazardous Waste Operations and Emergency Response regulation, 29 CFR 1910.120. Training requirements will consist of the following:

- Field personnel must complete a minimum of 40 hours of hazardous waste activity instruction.
- Field personnel must complete a minimum of three days of supervised field instruction.
- Field personnel performing drilling/drilling oversight must complete CPDO in-house training.
- Field personnel assigned to the site will also receive 8 hours of refresher training each year.
- On-site managers and supervisors directly responsible for employees engaged in hazardous waste operations will receive an additional 8 hours of supervisory training.
- Field personnel assigned to site will also receive first aid/CPR and blood borne pathogen training.
- Other training may be required depending on the task to be performed (e.g., con-fined space, excavation/trenching, underground storage tank removal, fall protection, respiratory protection, and hazard communication). See the Job Safety Analyses (JSA) in Appendix C.

1.4.3 Initial Orientation

Hazardous Waste Operations Initial Health and Safety Orientation will consist of the following:

- All project participants engaged in site operations will attend an initial site orientation where this HASP will be discussed and followed. Personnel will acknowledge having been given the orientation by signing the agreement and acknowledgement form in Appendix A.

2.0 Hazard Analysis

See Section 2.1 for the chemical hazards caused by groundwater contamination. See Section 2.2 for chemical handling procedures to be followed when handling corrosive materials. JSAs for specific work tasks will be developed in the field. They will be appropriate for site conditions and will be reviewed during daily tailgate safety meetings. Any JSAs developed for ongoing operations will be included in Appendix C. See Section 3.1 for general guide-lines that are common to most projects.

Any change in the scope of work will require an amendment to this HASP. Any task con-ducted beyond the scope of work identified in this HASP must be evaluated using the JSA process. The PM and Site Manager (SM) will be responsible for identifying conditions that are beyond the scope of work and communicating to the HSR. The HSRs will work with the PM and SM to develop JSAs or provide guidance in the development of JSAs. JSAs will be reviewed and approved by the HSR and PM by the HASP amendment prior to initiating the task. See Appendix B for the JSA format. The completed JSAs must accompany the HASP.

A JSA, according to Shaw policy and procedure HS045, will be completed daily of each tasks by the site supervisor or foreman responsible for the task(s). The SSO will facilitate the process and help guide the supervisor in correctly assessing each task for the proper hazards and controls. JSAs are completed in-depth at the beginning of each task identified herein, and for new tasks that develop. However, as the work progresses, the JSAs are modified each day to address changes in work practices, site conditions, process changes, or unusual occurrences. If no modifications are necessary, the JSAs must still be completed, noting such. As work changes can happen at any time, these JSAs may be necessary to be modified more than once a day per task.

The supervisor, foreman, and SSO share the responsibility to review these JSAs with the work crew each day and when JSAs are modified on such days. The JSA 045 procedure allows for signature of work crews, who must sign the bottom form of the JSA for the task that they are working on, acknowledging that they have been briefed. The JSA process is actually the same as a “safe work permit,” where the supervisor or foreman grants permission to work only after the initial assessment of hazards has been made and proper work controls or injury minimization measures have been communicated and understood by affected workers.

Although daily JSAs capture the changes that may occur throughout the project, the changes that are made shall be used to update the initial JSA (045) weekly or bi-weekly. This is important, especially for long-term projects, in that it serves to maintain an up-to-date JSA for reference and/or training/orientation purposes.

Although this HASP contains the safety requirements for the identified work tasks, this process is critical to identifying changes in the hazard scenario or identifying new hazards that need to be addressed. If there are any questions regarding this process or assistance is required, contact the local health and safety manager or Project CIH.

2.1 Contaminants of Concern Profile

See Table 4 for a summary profile of the hazards and control measures to follow for the contaminants of concern (COC). This profile is based on recent site history and site characterization. For more detailed and specific information, always refer to the Material Safety Data Sheet (MSDS) or equivalent information for the compound (see Appendix D).

Table 4 Contaminants of Concern Profile

Contaminant	Physical/Chemical Characteristics (Target Organs/ Route of Entry)	OSHA PELs TWA (STEL)	ACGIH TLVs TWA (STEL)	NIOSH REL TWA (STEL)
Vinyl Chloride	Colorless gas or liquid (below 7°F) with a pleasant odor at high concentration. MW:62.5 VP: 3.3 atm BP: 7°F FRZ: -265°F Sol: 0.1% UEL: 33.0% FL.P Not listed LEL: 3.6% IP: 9.99 eV Target organs – liver, CNS, blood, resp sys, lymphatic system Route of Entry – Inhalation and contact	NA	NA	NA
Carbon Disulfide	Colorless to faint-yellow liquid with a sweet ether-like odor. [Note: Reagent grades are foul smelling.] MW:76.1 VP: 297 mm Hg BP: 116°F FRZ: -169°F Sol: 0.3% UEL: 50.0% FL.P -22°F LEL: 1.3% IP: 10.08eV Target Organs - central nervous system, peripheral nervous system, cardiovascular system, eyes, kidneys, liver, skin, reproductive system. *Route of Entry – Inhalation, skin absorption, ingestion skin and/or eye contact*	20 ppm code: M	10 ppm	1 ppm (3mg/m3) ST 10 ppm
Methylene Chloride	Colorless liquid with a chloroform-like odor. MW:84.9 VP: .0000002 mm Hg BP: 104°F FRZ: 198°F Sol: 2% UEL: NA FL.P 374°F LEL: NA IP: 10.70eV Target organs – Eyes, liver, spleen, CVS *Route of Entry – Inhalation, ingestion, contact*	25 ppm ST 125 ppm	50 ppm	Ca

1,2 Dichloroethene	Colorless liquid with a mild chloroform-like odor. MW:97.0 VP: 180-265 mm Hg BP: 118 to 140°F FRZ: -57 to -115°F Sol: 0.4% UEL: 12.8% FL.P 36 to 39°F LEL: 5.6% IP: 9.65 eV Target organs – Eyes, respiratory system, CNS *Route of Entry – Inhalation, ingestion and contact*	200 ppm	200 ppm	200 ppm
1,2 Dichloroethane	Colorless liquid with a pleasant, chloroform-like odor. [Note: Decomposes slowly, becomes acidic & darkens in color.] MW:99.0 VP: 64 mm Hg BP: 182°F FRZ: -32°F Sol: 0.9% UEL: 16% FL.P 36 to 39°F LEL: 6.2% IP: 11.05 eV Target organs – Eyes, skin, kidneys, liver, central nervous system, cardiovascular system *Route of Entry – inhalation, ingestion, skin absorption, skin and/or eye contact*	TWA 50 ppm,	5 ppm	Ca TWA 1 ppm
Chloroform	Colorless liquid with a pleasant odor. MW:119.4 VP: 160 mm Hg BP: 143°F FRZ: -82°F Sol: 0.5% (77°F) UEL: NA FL.P 36 to 39°F LEL: NA IP: 11.42 eV Target organs – Liver, kidneys, heart, eyes, skin, central nervous system *Route of Entry – inhalation, skin absorption, ingestion, skin and/or eye contact*	50 ppm	10 ppm	Ca ST 2 ppm
1,1,1-Trichloroethane	Colorless liquid with a mild chloroform-like odor. MW:133.40 VP: 100 mm Hg BP: 165°F FRZ: -26°F Sol: Not Listed UEL: 16.0%	350 ppm	350 ppm	350 ppm

	FL.P Not listed LEL: 7.0% IP: Not Listed Target organs – CNS, kidneys, liver and cardiovascular system *Route of Entry – Inhalation, ingestion and contact*			
Carbon Tetrachloride	Colorless to water-white liquid with an odor like carbon tetrachloride at high concentrations MW:153.8 VP: 91 mm Hg BP: 170°F FRZ: -9°F Sol: 0.05% UEL: Not listed FL.P Not listed LEL: Not listed IP: 11.47 eV Target organs – central nervous system, eyes, lungs, liver, kidneys, skin *Route of Entry – inhalation, skin absorption, ingestion, skin and/or eye contact*	TWA 10 ppm	S, 5 ppm / 10 STEL	Ca ST 2 ppm
Trichloroethylene	Colorless to water-white liquid with an odor like carbon tetrachloride at high concentrations MW:187.4 VP: 285 mm Hg BP: 118°F FRZ: -31°F Sol: 0.02%(77°F) UEL: Not listed FL.P Not listed LEL: Not listed IP: 11.99 eV Target organs – CNS *Route of Entry – Inhalation and contact*	100 ppm	50 ppm	25 ppm (10 Hour TWA)

Ca – Substances that NIOSH considers to be potential occupational carcinogens
C – Ceiling
NIOSH – National Institute for Occupational Safety and Health
OSHA – Occupational Safety and Health Administration
PEL – Permissible exposure limit
REL – Recommended exposure limit
STEL – Short-term exposure limit
TWA – Time-weighted average
TLV – Threshold limit values

2.2 Hazard Communication Procedures

The purpose of hazard communication (Employee Right-to-Know) is to ensure that the hazards of all chemicals located at this field project site are communicated according to 29 CFR 1926.59 to all Shaw personnel and Shaw subcontractors. Personnel must follow the hazard communication procedures listed in Sections 2.2.1 and 2.2.2 when handling corrosive materials.

2.2.1 Corrosive Material Handling Procedures

Corrosive materials include acids and bases. They are extremely corrosive materials with a variety of uses. Acids include hydrochloric, nitric, and sulfuric acids. Bases include sodium hydroxide. Observe the following procedures when working with corrosive materials:

- Wear gloves and eye-splash protection while using acid dispensed from a small dropper bottle during water sampling.
- Wear a full-face, air-purifying respirator equipped with combination cartridges (organic vapor/acid gas) as well as Tyvek coveralls and nitrile gloves for large volume applications.
- Have an eyewash bottle and/or portable eyewash station on site.
- Cap all drums after dispensing chemicals.
- Do not add anything into a virgin chemical drum, including unused product.
- Avoid mixing strong acids and bases. Consult HSR for task-specific evaluation. If mixing is absolutely necessary, do it slowly. Avoid vapors or fumes that are generated.
- When diluting acids, add the acid to water in small quantities and mix cautiously.
- When diluting bases, add water to the base in small quantities and mix cautiously.

2.2.2 Hazard Communication Program

2.2.2.1 Container Labeling

Shaw personnel will ensure that all drums and containers are labeled according to contents. These drums and containers will include those from manufacturers and those produced on site by operations. All incoming and outgoing labels shall be checked for identity, hazard warning, and name and address of responsible party.

2.2.2.2 Employee Information and Training

An ongoing corporate training program will train employees on chemical hazards. In addition, chemical hazards will be communicated to employees through daily safety meetings and by an initial site orientation program. At a minimum, Shaw and related subcontractor employees will be instructed on the following:

- Chemicals and their hazards in the work area.
- How to prevent exposure to these hazardous chemicals.
- What the company has done to prevent workers' exposure to these chemicals.
- Procedures to follow if they are exposed to these chemicals.

- How to read and interpret labels and MSDS for hazardous substances found on Shaw sites.
- Emergency spill procedures.
- Proper storage and labeling.

3.0 Hazard Identification and Control

In addition to the Task-Specific JSAs, Section 3.1 lists the general procedures and practices common to most projects. For additional information, refer to Shaw required health and safety procedures or consult with your health and safety professional. A copy of all required Shaw Health and Safety Procedures are maintained in each Shaw vehicle or can be obtained from the Shaw office managing this project. Shaw Health and Safety Procedures shall be followed at all times.

3.1 General Hazards and Controls

3.1.1 General

- Observe the following general procedures and practices:
- Legible and understandable precautionary labels shall be affixed prominently to containers of potentially contaminated soil, water, and clothing.
- No food or beverages shall be present or consumed in a Contamination Reduction Zone (CRZ) or Exclusion Zone (EZ). These are only allowed in designated areas of the support zone.
- No tobacco products shall be present or used, and cosmetics shall not be applied in a CRZ or EZ. These are only allowed in designated areas of the support zone, if areas have been designated.
- Beards, facial hair, or other facial obstructions that interfere with respirator fit will preclude admission to the EZ when respirators are required.
- An emergency eyewash unit shall be located immediately adjacent to employees who handle hazardous or corrosive materials, including decontamination fluids. All operations involving the potential for eye injury, splash, etc., must have approved eyewash units locally available capable of delivering at least 0.4 gallons per minute for at least 15 minutes.
- All on-site activities will be conducted during daylight hours. If work after dusk becomes necessary due to an emergency, adequate lighting must be provided and notification of such activity made to the location contact.
- Hazardous work, such as handling hazardous materials and heavy loads, and equipment operation, etc., should not be conducted during severe storms.
- All temporary electrical power must have a ground fault circuit interrupter (GFCI) as part of its circuit if the circuit is not part of permanent wiring. All equipment must be suitable and approved for the class of hazard present.

3.1.2 Incident Reporting

Observe the following incident reporting procedures and practices:

- All occupational injuries/illnesses, vehicle accidents, and near miss incidents must be reported promptly to the PM and HSR and investigated (See Appendix B for incident forms).
- Immediately notify the PM and HSR when an incident occurs.
- All OSHA recordable injuries/illnesses and chargeable vehicle accidents must be reviewed by an Accident Review Board report.

3.1.3 Daily Safety Meetings

Daily safety meetings make accident prevention a top priority for everyone and make them aware of important accident prevention techniques. Observe the following daily safety meetings procedures and practices:

- Daily safety meetings will be held each morning prior to site activities
- Direct Shaw subcontractors are required to attend all tailgate meetings.
- The tailgate meeting form in Appendix B will be used to document the meeting.

3.1.4 Safety Inspections

Observe the following safety inspection procedures and practices:

- The SS, with assistance from the SHSO, will inspect the site as appropriate and interview one or two site workers regarding areas of safety concerns or ideas for safety improvement.
- Any personnel who identify safety and occupational health deficiencies and will bring them to the attention of the SS and SHSO and will suggest corrective measures.
- Formal safety review inspections will be conducted as needed and recorded and filed for reference by project management (see Appendix B for Inspection Check-list). These inspections will be shared by the PM, SS, and SHSO. Subcontractor supervisory personnel will be asked to participate in inspections.
- Any deficiencies in the effectiveness of this HASP will be immediately brought to the attention to the PM and HSR and corrected.

3.1.5 Slip/Trip/Fall

Observe the following procedures and practices to prevent slips/trips/fall:

- Inspect each work area for slip/trip/fall potential prior to each work task.
- Slip/trip/fall hazards identified must be communicated to all personnel. Hazards identified shall be corrected or labeled with warning signs to be avoided.
- All personnel must be aware of their surroundings and maintain constant communication with each other at all times.

3.1.6 Underground/Utility Line Contact

See Appendix B for Underground Utility Contact Prevention Management Plan. See **Table 3** for utility marker emergency phone numbers. Observe the following underground/utility line contact procedures and practices:

- Review HS308 regarding training requirements, completion of utility mark-out documentation and pre-drilling/boring/direct push check list and variance request.
- Contact client or facility owner to have utility lines marked prior to excavation/trenching or drilling.
- Refer to site drawings or customer interviews if on private property for utility locations.
- Hand dig, probe, post hole dig or air knife to 5 feet down and 5 feet to each side of utility marker to avoid breaking utility lines.

3.1.7 Sites Containing Fiber Optic Cables

Because of the sensitivity of fiber optic cables and the cost costs of damaging them, the following process, effective immediately, will be adopted as mandatory and as a minimum effort.

1) When a Shaw PM or staff person becomes aware that a site requiring subsurface work contains a fiber optic cable within 50 feet of the outside working boundary, he/she will immediately notify the PM/BLM. The BLM—or if no BLM is in place the PM—will immediately notify the Area Manager and the HSR. The PM and the HSR will develop a work plan capable of accomplishing site activities while guaranteeing that fiber optic cables will not be affected.
2) Any subsurface activities conducted at a site as described in item 1, will require the on-site presence of the HSR or a designee as affirmed in writing by the HSR.
3) No subsurface work will occur at a site as referred to in item 1, without the owner of the fiber optic cable being present.
4) The fiber optic cable will not be considered located unless a representative of the owner of the fiber optic cable has visited the site, confirmed the location of the cable, and signed the work plan which shall contain a site plan indicating the locations(s) of the subsurface work and location of the fiber optic cable.
5) Deviation from any of the above points, items 1 through 4, must be approved by the Area Manager.

3.1.8 Overhead Utility Line Contact

Observe the following overhead utility line contact procedures and practices:

- Maintain appropriate distance from overhead utilities:
  - Maintain at least 10 feet from overhead power lines, up to 50 kV
  - For voltages over 50 kV, add 0.4 inches per kV to obtain the safe distance between equipment and power lines.
  - If voltage is unknown, remain at least 20 feet from overhead power lines.
- Conduct a daily site inspection to determine where activities will take place and the location of overhead utilities and overhead obstructions. Once identified place-warning tape on poles and/or guy wires and attempt to plan the work so that no contact will be made with the overhead utilities or obstructions. Share the in-formation with the all site personnel.
- As a precaution, a spotter will be used at all times during the construction phase when near overhead utilities or overhead obstructions. If contact is deemed un-avoidable, consult with the plant manager and HSR to evaluate the area to deter-mine if the particular overhead utility or obstruction can be removed prior to engaging in the activity.

3.1.9 General Falls/Ladders

Observe Shaw Procedure HS302. In addition, observe the following general falls/ladders procedures and practices:

- Assess work areas for fall hazards. A fall protection system is required if work is conducted six feet or over.
- Use Type 1A rated ladders.

- Make sure ladder rungs are sturdy and free of cracks.
- Use ladders with secure safety feet.
- Pitch ladders at a 4:1 ratio.
- Secure ladders at the top or have another person at the bottom to help stabilize it.
- Ladders used to access an upper landing surface shall extend at least three feet above the upper landing surface.
- Do not use ladders for access to air stripper towers above six feet. Instead, use aerial lift.
- Use non-conductive ladders near electrical wires.
- The top step of a stepladder should not be used as a step.
- Do not carry any object or load that could cause a loss of balance or a fall.

3.1.10 Heavy Equipment Operations

Observe the following heavy equipment operations procedures and practices:

- Wear leather gloves while attaching support members to protect against pinching injuries.
- While working from elevated levels greater than six feet, ensure that all employees have 100% fall protection with full body harnesses and guardrails.
- Do not stand under loads that are being raised or lowered with cranes or aerial lifts.
- The subcontractor or Shaw Operator must conduct pre-operational inspections of all equipment. In addition, daily inspections will be conducted on the equipment prior to site activities.
- Maintain appropriate distance from overhead utilities:
  - Maintain at least 10 feet from overhead power lines, up to 50 kV
  - For voltages over 50 kV, add 0.4 inches per kV to obtain the safe distance between equipment and power lines.
  - If voltage is unknown, remain at least 20 feet from overhead power lines.
- Always stay out of the swing radius of all heavy equipment. Always use a spotter during movement of equipment. The spotter and others, as appropriate, shall maintain constant communication with the operator.
- All operators must have adequate training and be qualified to operate the particular heavy equipment unit.
- Conduct site evaluation to determine proper positioning for the unit. Make sure surface is level. Cordon off holes, drop-offs, bumps or weak ground surfaces.
- When using a crane, do not use hands when the load is being lifted or lowered. Use non-conductive tag line to help direct and position the load.
- Never climb a raised platform or stand on the mid-rail or top-rail.
- Tools should always be hung or put into a belt whenever possible.

3.1.11 Excavation and Trenching

Observe Shaw Procedure HS307. In addition, observe the following Excavation and Trenching practices and procedures:

- Ensure a competent person is assigned.
- A competent person shall inspect excavations and documents at least daily and when needed (Follow Shaw Procedure HS307).
- Check for utilities (see Underground Utility Line Contact, Appendix B).
- Have a Professional Engineer (PE) evaluate all excavations deeper than 20 feet.
- Use protective systems (sloping, shoring, shielding) for entry in trenches over five feet deep.
- Provide for rescue for cave-ins.
- Place spoils a minimum of two feet from edge.
- Monitor excavations over four feet deep for hazardous atmospheres and LEL/oxygen.
- Place ladders within 25 feet of lateral travel if the excavation is over four feet deep.
- Place barriers around excavations near pedestrian access.
- Follow work zone security procedures of Section 6.1.

3.1.12 Confined Spaces

Observe Shaw Procedure HS300. In addition, observe the following confined spaces procedures and practices:

- Ensure employees are trained in the hazards of confined spaces.
- Post Confined Space Entry Permits at the entrance to the space.
- Have a copy of the confined space entry procedure available.
- Establish a rescue plan. Evaluate to ensure rescuers are qualified.
- Ensure an entry supervisor is present at each permit-required entry.
- Ensure the required extraction/fall protection devices are being used properly.

3.1.13 Electric Shock

Observe Shaw Procedure HS315. In addition, observe the following procedures and practices to prevent electric shock:

- Maintain appropriate distance from overhead utilities:
  - Maintain at least 10 feet from overhead power lines, up to 50 kV.
  - For voltages over 50 kV, add 0.4 inches per kV to obtain the safe distance between equipment and power lines.
  - If voltage is unknown, remain at least 20 feet from overhead power lines.
- Use ground-fault circuit interrupters as required.
- Perform lockout/tagout LO/TO procedures in accordance with Shaw Procedure HS315.

- Use three-pronged plugs and extension cords.
- Contact your local underground utility-locating service.
- Follow code requirements for electrical installations in hazardous locations.
- Always use qualified electricians to install electrical equipment and when con-ducting troubleshooting activities within 10 feet of exposed live wires.

3.1.14 Hand and Power Tools

Observe the following procedures and practices when working with hand and power tools:

- Keep hand tools sharp, clean, oiled, dressed, and not abused.
- Worn tools are dangerous: e.g., the “teeth” in a pipe wrench can slip if worn smooth; an adjustable wrench will slip if the jaws are sprung; hammerheads can fly off loose handles.
- Tools subject to impact (chisels, star drills, and caulking irons) tend to “mush-room.” Keep them dressed to avoid flying spalls. Use tool holders.
- Don't force tools beyond their capacity. No “homemade” handles or extensions (cheaters) are permitted! Don't use tools for pry bars.
- Flying objects can result from operating almost any power tool, so always warn people in the vicinity and use proper eye protection.
- Each power tool should be examined before use for damaged parts, loose fittings, and frayed or cut electric cords. Tag and return defective tools for repairs. Inspect also for adequate lighting, proper lubrication, and abandoned tools or material that could “vibrate into trouble.”
- Air must be shut off or the electric cord unplugged before making tool adjustments. Air must be “bled down” before replacement or disconnection.
- Proper guards or shields must be installed on all power tools before issue. Do not use improper tools or tools without guards in place.
- Replace all guards before start-up. Remove cranks, key, or wrenches used in ser-vice work.

3.1.15 Physical Injury

Observe the following procedures and practices to prevent physical injuries:

- Wear hard hats and safety glasses when on site.
- Maintain visual contact with the equipment operator and wear an orange safety vest when heavy equipment is used on-site or when adjacent to or in roadways.
- Avoid loose-fitting clothing.
- Prevent slips, trips and falls—keep work area uncluttered.
- Keep your hands away from moving parts (i.e., augers).
- Test the emergency shutoff switch on the drill rig daily.

3.1.16 Vehicular Traffic

Observe the following procedures and practices regarding vehicular traffic:

- Wear traffic safety vest when vehicle hazard exists.
- Use cones, flags, barricades, and caution tape to define work area.
- Use vehicle to block work area.
- Engage police detail for high-traffic situations.
- Always use a spotter in tight or congested areas for material deliveries.
- Review Shaw Procedure HS800, Motor Vehicle Operation.

3.1.17 Noise

Observe Shaw Procedure HS402. In addition, observe the following procedures and practices regarding noise:

- Wear hearing protection when equipment such as a drill rig, jackhammer, cut saw, air compressor, blower or other heavy equipment is operating on the site.
- Wear hearing protection whenever it is necessary to speak above normal conversational speech due to loud noise—this much noise indicates the need for protection.
- Conduct noise monitoring of suspected high noise operations at the beginning of the workday or start up of new operations to verify noise control/hearing protection requirements.

3.1.18 Lifting and Material Handling

Observe the lifting and material handling procedures and practices:

- Use leather gloves when handling metal, wire rope, sharp debris, or transporting materials (wood, piping, drums, etc.).
- The size, shape, and weight of the object to be lifted must first be considered. No individual employee is permitted to lift any object that weights over 60 pounds. Multiple employees or mechanical lifting devices are required for objects over the 60-pound limit.
- Plan a lift before doing it. Bend at the knees and lift with the legs; keep the natural curves of the back; do not use back muscles.
- Check route for clearance.
- Use the buddy system when lifting heavy or awkward objects.
- Do not twist body while lifting.
- Know the capacity of any handling device (crane, forklift, chainfall, come-along) that you intend to use.
- Use tag lines to control loads.
- Ensure that your body, material, tools, and equipment are safe from such unexpected movement as falling, slipping, rolling, tripping, bowing, or any other un-controlled motion.
- Trucks (i.e., flat beds) hauling equipment or materials must not be moved once rigging has been released.

- Chock all material and equipment (such as pipe, drums, tanks, reels, trailers, and wagons) as necessary to prevent rolling.
- Tie down all light, large-surface-area material that might be moved by the wind.
- When working at heights, secure tools, equipment, and wrenches against falling.
- Do not store materials or tools on ducts, lighting fixtures, beam flanges, hung ceilings, or similar elevated locations.
- Fuel-powered tools used inside buildings or enclosures shall be vented and checked for excessive noise

3.1.19 Fire Control

Observe the following fire control procedures and practices:

- Smoke only in designated areas.
- Keep flammable liquids in closed containers.
- Keep site clean; avoid accumulating combustible debris such as paper.
- Follow Hot Work Safety Procedures when welding or performing other activities requiring an open flame.
- Isolate flammable and combustible materials from ignition sources.
- Ensure fire safety integrity of equipment installations according to NEC specifications.

3.1.20 Static Electricity/Transfer of Flammable Liquids

Observe the following procedures and practices regarding static electricity when transferring flammable liquids:

- Do not create static discharge in flammable atmosphere.
- Electrically bond and ground pumps, transfer vessels, tanks, drums, bailers, and probes when moving flammable liquids.
- Electrically bond and ground vacuum trucks and the tanks they are emptying.
- Do not splash fill containers with flammable liquids.
- Pour flammable liquids slowly and carefully.
- Two Fire extinguishers (2A20: BC) must be available, charged, inspected, and readily accessible.

3.1.21 Wells

Observe the following procedures and practices for well installation, well development, well abandonment, well gauging, well bailing, and soil/groundwater sampling:

- Wear appropriate PPE to avoid skin, eye, and inhalation contact with contaminated groundwater and/or soil.
- Stand upwind when conducting tasks and minimize possible inhalation exposure, especially when first opening monitoring wells.
- Conduct air monitoring to determine level of respiratory protection.

- Use engineering controls such as portable air movers to draw away or blow away chemical vapors.

3.1.22 Insects/Spiders

Observe the following procedures and practices regarding insects/spiders:

- Tuck pants into socks.
- Wear long sleeves.
- Use insect repellent.
- Avoid contact by always looking ahead to where walking, standing, sitting, leaning, grabbing, lifting, or reaching into.
- Check for signs of insect/spider bites, such as redness, swelling, and flu-like symptoms.

3.1.23 Ticks

Observe the following procedures and practices regarding ticks:

- Do not detach a tick with bare fingers—bacteria from a crushed tick may be able to penetrate even unbroken skin. Use fine-tipped tweezers.
- Grip the tick as close to skin as possible and gently pull it straight away from until it releases its hold.
- Do not twist the tick as when pulling; do not squeeze its bloated body. Doing so may inject bacteria into your skin.
- Thoroughly wash hands and the bite area with soap and water. Then apply an antiseptic to the bite area.
- Save the tick in a small container with the date, the location of the bite on your body, and the probable location of initial contact with the tick.
- Notify the SSHO of any tick bites as soon as possible.

3.1.24 Poisonous Snakes

Observe the following procedures and practices regarding poisonous snakes:

- Avoid walking in areas where snakes may nest or hide. When walking, always look ahead for signs of snakes.
- Use extreme caution when moving or lifting objects that could be used by snakes as cover.
- Never reach under or behind objects or into other areas where snakes may hide.
- Poisonous snakebites are medical emergencies—seek immediate medical treatment.
- Wear sturdy leather boots.

3.1.25 Poisonous Plants

Poisonous plants include poison ivy, poison oak, and poison sumac. Observe the following procedures and practices regarding poisonous plants.

- Avoid entering areas infested with poisonous plants.
- Immediately wash any areas that come into contact with poisonous plants.
- Use PPE when there is possibility of contact with poisonous plants.

3.1.26 Heat Stress

Observe Shaw Procedure HS400. In addition, observe the following general procedures and practices regarding heat stress:

- Increase number of rest breaks and/or rotate workers in shorter work shifts.
- Watch for signs and symptoms of heat exhaustion and fatigue.
- During hot months, plan work for early morning or evening.
- Use ice vests when necessary.
- Rest in cool, dry areas.

3.1.26.1 Signs, Symptoms, and Treatment

Adverse climatic conditions are important considerations in planning and conducting site operations. High ambient temperature can result in health effects ranging from transient heat fatigue, physical discomfort, reduced efficiency, personal illness, increased accident probability, etc., to serious illness or death. Heat stress is of particular concern when chemical protective garments are worn since they prevent evaporative body cooling. Wearing personal protective equipment places employees at considerable risk of developing heat stress.

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses, regular monitoring and other preventive precautions are vital.

Heat Rash. Heat rash can be caused by continuous exposure to hot and humid air and skin abrasion from sweat soaked clothing. The condition is characterized by a localized red skin rash and reduced sweating. Aside from being a nuisance, the ability to tolerate heat is reduced. To treat, Keep skin hygienically clean and allow it to dry thoroughly after using chemical protective clothing.

Heat Cramps. Heat cramps are caused by profuse perspiration with inadequate electrolytic fluid replacement. This often robs the larger muscle groups (stomach and quadriceps) of blood which can cause painful muscle spasms and pain in the extremities and abdomen. To treat, remove employee to a cool place and give sips of water or an electrolytic drink. Watch for signs of heat exhaustion or stroke.

Heat Exhaustion. Heat exhaustion is a mild form of shock caused by increased stress on various organs to meet increased demand to cool the body. Onset is gradual and symptoms should subside within one hour. It symptoms include weak pulse; shallow breathing; pale, cool, moist skin; profuse sweating; dizziness; fatigue. To treat, remove employee to a cool place and remove as much clothing as possible. Give sips of water or electrolytic solution and fan the person continuously to remove heat by convection. Do not allow the affected per-son to become chilled—treat for shock if necessary.

Heat Stroke. Heat stroke is the most severe form of heat stress; the body must be cooled immediately to prevent severe injury and/or death. *This is a medical emergency!* Symptoms include red, hot, dry skin; body temperature of 105◦ Fahrenheit or higher; no perspiration; nausea; dizziness and confusion; strong, rapid pulse. Since heat stroke is a true medical emergency, transport the victim to a medical facility immediately. Prior to transport, remove as much clothing as possible and wrap the victim in a sheet

soaked with water. Fan vigorously while transporting to help reduce body temperature. Apply cold packs, if available; place under the arms, around the neck, or any other place where they can cool large surface blood vessels. If transportation to a medical facility is delayed, reduce body temperature by immersing victim in a cool water bath (however, be careful not to over-chill the victim once body temperature is reduced below 102o F). If this is not possible, keep victim wrapped in a sheet and continuously douse with water and fan.

3.1.26.2 Prevention

The implementation of preventative measures is the most effective way to limit the effects of heat-related illnesses. During periods of high heat, adequate liquids must be provided to re-place lost body fluids. Replacement fluids can be a 0.1 percent salt-water solution, a commercial mix such as Gatorade, or a combination of these with fresh water. The replacement fluid temperature should be kept cool, 50o F to 60o F, and should be placed close to the work area. Employees must be encouraged to drink more than the amount required to satisfy thirst. Employees should also be encouraged to salt their foods more heavily during hot times of the year.

Cooling devices such as vortex tubes or cooling vests can be worn beneath impermeable clothing. If cooling devices are worn, only physiological monitoring will be used to deter-mine work activity.

All workers are to rest when any symptoms of heat stress are noticed. Rest breaks are to be taken in a cool, shaded rest area. Employees shall remove chemical protective garments during rest periods and will not be assigned other tasks.

All employees shall be informed of the importance of adequate rest and proper diet including the harmful effects of excessive alcohol and caffeine consumption.

3.1.26.3 Monitoring

Heat stress monitoring will be required when employees are working in environments exceeding 90ºF ambient air temperature. If employees are wearing impermeable clothing, this monitoring will begin at 78ºF. There are two general types of monitoring that the health and safety representative can designate to be used: wet bulb globe temperature (WBGT) and physiological. Attachment 2 (see Appendix B) will be used to record the results of heat stress monitoring.

Wet Bulb Globe Temperature (WBGT). The WBGT index is the simplest and most suitable technique to measure the environmental factors which most nearly correlate with core body temperature and other physiological responses to heat. When WBGT exceeds 25.9oC (78oF), the work regiment in Table 1 and Figure 1 of the section Heat Stress in the latest edition of the "American Conference of Governmental Industrial Hygiene (ACGIH) Threshold Limit Value (TLV) Booklet" should be followed.

Physiological. Physiological monitoring can be used in lieu of, or in addition to, WBGT. This monitoring can be self-performed once the health and safety representative demonstrates appropriate techniques to affected employees. Since individuals vary in their susceptibility to heat, this type of monitoring has its advantages. The two parameters that are to be monitored at the beginning of each rest period are:

- **Heart Rate** – The maximum heart rate (MHR) is the amount of work (beats) per minute a healthy person's heart can be expected to safely deliver. Each individual will count his/her radial (wrist) pulse as early as possible during each rest period. If the heart rate of any individual exceeds 75 percent of their calculated maximum heart rate (MHR = 200 - age) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work until his/her sustained heart rate is be-low 75 percent of their calculated maximum heart rate.

- **Temperature** – Each individual will measure his/her temperature with a thermometer for one minute as early as possible in the first rest period. If the temperature exceeds 99.6°F at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work if his/her temperature exceeds 100.4°F

3.1.26.4 Training

Employees potentially exposed to heat stress conditions will be instructed on the contents of this procedure. This training can be conducted during daily tailgate safety meetings.

3.1.27 Cold Stress

Observe Shaw Procedure HS401. In addition, observe the following procedures and practices regarding cold stress:

- Take breaks in heated shelters when working in extremely cold temperatures.
- Upon entering the shelter, remove the outer layer of clothing and loosen other layers to promote evaporation of perspiration.
- Drink warm liquids to reduce the susceptibility to cold stress.
- Be aware of cold stress symptoms, including shivering, numbness in the extremities, and sluggishness.
- Follow cold stress procedures in Appendix B, per Shaw Procedure HS400.

3.1.28 Inclement Weather

Observe the following procedures and practices regarding inclement weather:

- Stop outdoor work during electrical storms, hailstorms, and other extreme weather conditions such as extreme heat or cold.
- Take cover indoors or in vehicle.
- Listen to local forecasts for warning about specific weather hazards such as tornadoes, hurricanes, and flash floods.

3.1.29 Welding, Cutting, Brazing

Observe Shaw Procedure HS314. In addition, observe the following procedures and practices when welding, cutting, or brazing:

- Conduct fire safety evaluation.
- Complete Hot Work Permit using form from Appendix B.
- Follow JSA guidelines for hot work (see Appendix C) if applicable.
- Ensure flammable materials are protected from hot work, sources of ignition.
- Ensure fire watch/fire extinguisher is on standby by hot work location.
- Follow Shaw Procedure HS304, Compressed Gas Cylinders.

3.1.30 Heavy Equipment Decontamination

Observe Shaw Procedure HS303. In addition observe the following heavy equipment decontamination procedures and practices:

- Wear modified Level D protection, including a face shield and safety goggles.
- Ensure that other personnel are out of the area prior to decontamination.
- Secure the area around the decontamination pad with cones, caution tape, or barricades.
- Ensure that safe work practices and precautions are taken to minimize the potential for physical injury from high-pressure water spray.
- The pressure washer wand must be equipped with a safety release handle.
- Follow Shaw Procedure HS303 for pressure washing.
- Ensure that the area is clean after equipment is decontaminated. Barricades, cones, or caution tape must be left in place and secured at all times.

3.1.31 Cleaning Equipment

Observe Shaw Procedure HS303. In addition, observe the following procedures and practices when cleaning equipment:

- Wear appropriate PPE to avoid skin and eye contact with isopropyl alcohol, Alconox, or other cleaning materials.
- Stand upwind to minimize any potential inhalation exposure.
- Dispose of spent cleaning solutions and rinses accordingly.
- Follow Shaw Procedure HS303 for pressure washing.

4.0 Air Monitoring/PPE

4.1 Air Monitoring

Air monitoring must be performed on all sites in accordance with Shaw Environmental & Infrastructure, Inc. practices. Organic vapor and/or concentrations are monitored in the field with either a photoionization detector (PID) or flame ionization detector (FID). Flammable vapors and/or gasses are monitored with an oxygen/combustimeter (O2/LEL) real-time instrument. Airborne dust/particulate concentrations are measured with a real-time aerosol monitor (using a scattered light photometric sensing cell) when there are visible signs of air-borne dust. Both area and personal air monitoring readings are to be taken to characterize site activities. Air monitoring results must be documented on the Air Monitoring Forms (see Appendix B) or in the field logbook.

Calibration and maintenance of air monitoring equipment must follow manufacture specifications and must be documented. Re-calibration and adjustment of air monitoring equipment must be completed as site conditions and equipment operation warrant. Record all air monitoring equipment calibration and adjustment information on forms in (see Appendix B) or in the field logbook.

Air monitoring action levels (see Table 5) have been developed that stipulate the chemical concentrations in the breathing zone that require an upgrade in level of PPE. Action levels are typically set at one-half of the OSHA Permissible Exposure Limit (PEL), National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limits (REL), or the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV). The rationale for establishing action levels is based on the available data that characterizes COCs in soil or water.

All on-site workers must be properly fitted with PPE (i.e., respirators) and have been trained in their use (i.e., donning and doffing). Air monitoring measurements will be taken in the breathing zone of the worker most likely to have the highest exposure. Transient peaks will not automatically trigger action. Action will be taken when levels are consistently exceeded in a 5-minute period. Similarly, if chemical odors are detected that are a nuisance, bother-some, or irritating, an upgrade in respiratory protection can provide an extra level of comfort or protection when conducting site activities. See Section 4.1.1 for guidelines for frequency of air monitoring. See Table 7 for a description of PPE levels. See Table 8 for task-specific protection level and task-specific air monitoring requirements.

Conduct air monitoring when the possibility of volatilization exists (e.g., new monitoring well, well containing known product).

Air movers or other engineering controls that exhaust or dilute solvent vapors emanating from monitoring wells or present when conducting intrusive activities can be used to down-grade PPE requirements.

Table 5
Air Monitoring Action Levels

Instrument*	Function	Measurement	Action
PID (11.7*eV lamp) - Measures Total Organic Vapors	Conduct air monitoring for volatile organic compounds during activities where contaminated media are present. Make sure that a background reading is taken before the start up of activities and periodically thereafter.	0 - 5 ppm above background	Modified Level D
		>5 - 25 ppm above background	Modified Level D
		>25 ppm above background	Upgrade to Level C. Coordinate with PM and HSR for guidance
		>250 ppm	Stop work required. Leave work area, contact PM and HSR for guidance
Oxygen/Combustimeter (O2/LEL) Measures oxygen level (O2) and lower explosive limit (LEL)	Conduct air monitoring for O2/LEL when conditions exist where flammable vapors/gases and/or oxygen deficiency or enrichment can occur. A decreased O2 reading of 0.1% (e.g., 20.9% to 20.8%) actually represents a change in the total air envelope of approximately 0.5% or 5,000 ppm. This represents little hazard if the displacing gas is inert; if the displacing gas is toxic/flammable/reactive, such a concentration represents a real hazard. Verify reasons for O2 depletion by conducting air monitoring with instruments that can measure suspected contaminants (PID/FID) or that can confirm presence of contaminants (detector tubes or chemical specific real-time air monitors).	O2 = 20.9 %	Acceptable
		O2 >19.5 - 20.8%	Verify reasons for O2 depletion with appropriate air monitoring instrumentation before work continues. Utilize appropriate engineering controls/PPE once atmospheric contaminants have been verified.
		O2 >20.9 % - 22 %	Verify reasons for O2 enrichment before entering area. Utilize appropriate engineering controls/PPE to control O2 enriched atmosphere.
		O2 >22 %	Leave area immediately; this atmosphere is extremely flammable. Notify PM or HSR for guidance.
		O2 <19.5%	Leave area immediately; this atmosphere is oxygen deficient. Verify reasons for O2 depletion with appropriate air monitoring instrumentation before work continues. Utilize appropriate engineering controls/PPE once atmospheric contaminants have been verified.
		LEL <10%	Acceptable conditions. Continue normal activity.
		LEL >10%	Leave area immediately. Contact PM or HSR for guidance on venting and other safety measures.

**Note: Instruments must be calibrated according to manufacturer's recommendations.*

4.1.1 Air Monitoring Frequency Guidelines

Conduct periodic monitoring when:

- It is possible that an immediately dangerous to life or health (IDLH) condition or a flammable atmosphere has developed, or
- There is an indication that exposures may have risen over established action levels, permissible exposure limits, or published exposure levels since the last monitoring. Look for a possible rise in exposures associated with these situations:
  - *Change in site area* - work begins on a different section of the site.
  - *Change in contaminants* – handling contaminants other than those first identified.
  - Visible signs of particulate exposure from intrusive activities such as drilling/boring and excavation.
  - Perceptible chemical odors or symptoms of exposure.
  - *Change in on-site activity* – one operation ends and another begins.
  - Handling leaking drums or containers.
  - Working with obvious liquid contamination (e.g., a spill or lagoon).
  - Conduct air monitoring when the possibility of volatilization exists (such as with new monitoring well or a well containing known product).

4.2 Personal Protective Equipment (PPE)

The minimum level of PPE should be selected according to the hazards that may be encountered during site activities. Only PPE that meets the following American National Standards Institute (ANSI) standards are to be worn. At a minimum, all workers will wear the following protection while working on the site:

- Eye protection - ANSI Z87.1-1989.
- Head protection - ANSI Z89.1-1986.
- Foot protection - ANSI Z41-1991.
- Traffic vest in high traffic areas and around heavy equipment.

4.2.1 Respiratory Protection

Air purifying respiratory protection may be used for protection against dust and organic vapors during the course of the project. The need for respiratory protection will be determined by air monitoring results and site conditions. However, engineering controls and administrative controls must first be evaluated for use as the primary controls for protection against site respiratory hazards. In the event engineering controls and administrative controls are deemed to not be feasible, respiratory protection will be required.

Site personnel must also understand the limitations of air purifying respirators and the End-of-Service Life cartridge change-out schedule for the particular type of respirator that will be used. Manufacturer's data has been evaluated for three types of respirators (Scott, MSA, and Survivair).

See Table 6 for a cartridge change-out schedule for Total Hydrocarbons and Benzene.

Any site personnel requiring respiratory protection must also adhere to the site-specific respiratory protection program. Personnel using a respirator that is not listed above should contact their HSR to determine the change-out schedule for the particular respirator used. Any questions regarding the site-specific respiratory protection program must be directed to the HSR or PM.

Table 6
Respirator Cartridge Change-out Schedule

Total Hydrocarbons (Toluene, Ethylbenzene, Xylenes) Air Concentration(ppm)	Change-out Schedule			
	SCOTT642 OV/Acid Gas642 OV642 MPC Cartridges	MSA Ultra Twin GME Cartridge	Survivair Organic Vapor Cartridge 100100	Survivair OV/Acid Gas Cartridge 100300/1053 (includes P-100)
< 150	8 hours	8 hours	8 hours	8 hours
> 150 – 200	8 hours	8 hours	8 hours	8 hours
> 200 – 250	8 hours	8 hours	8 hours	8 hours
> 250	Stop Work	Stop Work	Stop Work	Stop Work

** Based on data from the manufacturer, and represents the worst case conditions*

*** 10 ppm exceeds the recommended use level of 5 ppm for qualitatively fit-tested APRs.*

4.2.2 Project Specific Equipment

See Table 7 for PPE requirements for sites; see Table 8 for task-specific level requirements. Level D is the minimum acceptable level for sites where petroleum hydrocarbons are the COC. Upgrade to Modified Level D occurs when there is a possibility that contaminated media can contact the skin or work uniform. Upgrade to Level C occurs when the results of air monitoring reveals that action levels have been exceeded. Upgrade to Level B occurs when the results of air monitoring reveals action levels have been exceeded (site personnel must have met training requirements). Wear hearing protection when there are high noise levels. Workers must maintain proficiency in the use and care of PPE that is to be worn.

Table 7
Personal Protection Equipment

Level	Requirements
Level D	Work uniform Steel-toed boots Approved safety glasses or goggles Hard hat
Modified Level D-1	Level D Nitrile gloves.
Modified Level D-2	Level D Tyvek suit. Nitrile outer and inner liner gloves. Latex booties or rubber overboots. Hearing protection (muffs and/or plugs). Fluorescent vest is required.
Modified Level D-3	Modified Level D-2 PE-coated Tyvek suit. Nitrile outer and inner liner gloves. Latex booties or rubber over boots. Face shield Face shield, goggles, metatarsal/leg guards for high pressure washing
Level C	Level D and Modified Level D-2. NIOSH/MSHA-approved full-face respirator with organic vapor/acid gas oil proof high efficiency (P100) cartridges.
Level B	Level D and Modified Level D NIOSH/MSHA approved full-face positive pressure demand supplied air respirator, either airline or self-contained.

Prior to using, all equipment must be inspected to ensure proper working condition.

Table 8
Task Specific Air Monitoring/PPE Summary

Job Task	PPE Level	Instrument	Frequency
Soil and Groundwater sample collection	Modified Level D-3	PID	Start up of work at each task location, then every 30 – 60 minutes based upon air monitoring results. Monitor 15 minutes to continuously if action levels have been reached.
Monitoring Well Installation.	Level D-2	PID and LEL	Start up of work at each task location, then every 30 – 60 minutes based upon air monitoring results. Monitor 15 minutes to continuously if action levels have been reached.
Remediation system installation	Level D or modified Level D-1	PID and LEL	Air monitoring required during any digging or drilling at start up of work at each task location, then every 30 – 60 minutes based upon air monitoring results. Monitor 15 minutes to continuously if action levels have been reached.
General site duties, system O&M, operation of equipment, etc.	Level D	N/A	N/A

Note 1: "Start up of work at each new task location" means to monitor the air quality at each new operation on the site. The breathing zone is the area inside a 1-foot radius around the head.

Note 2: A downgrade in the air monitoring program must be approved by the SHSO and HSR.

5.0 Decontamination

5.1 Decontamination Procedures

Operations conducted at this site have the potential to contaminate field equipment and PPE. See Section 5.1.1 for the procedures that must be followed to prevent the transfer of contamination to vehicles, administrative offices, and personnel.

5.1.1 Decontamination Procedures

The Sections below describe decontamination procedures for field equipment, and disposable and non-disposable PPE.

5.1.1.1 Field Equipment

Field equipment can include bailers, interface probes, hand tools, drill augers, and miscellaneous sampling equipment. Observe the following practices and procedures when decontaminating field equipment:

- Decontaminate with a solution of detergent and water; rinse with water prior to leaving the site.
- Protect from exposure by covering with disposable covers such as plastic to minimize required decontamination activities.

5.1.1.2 Disposable PPE

Disposable PPE can include Tyvek suits, inner latex gloves, respirator cartridges. Observe the following practices and procedures when decontaminating disposable PPE:

- Dispose of according to the requirements of the client and state and federal agencies.
- Change out respirator cartridges daily and dispose accordingly.

5.1.1.3 Non-disposable PPE

Non-disposable PPE can include respirators and boots and gloves. When decontaminating respirators, observe the following practices and procedures:

- Wipe out respirator with disinfecting pad prior to donning.
- Decontaminate on site at the close of each day with a solution of an approved sanitizing solution.

When decontaminating boots and gloves, observe the following practices and procedures:

- Decontaminate outside with a solution of detergent and water; rinse with water prior to leaving the site.
- Protect from exposure by covering with disposable covers such as plastic to minimize required decontamination activities.

5.2 Example Decontamination Diagram

If Level C or Level B PPE is required, a contamination reduction zone (CRZ) will be constructed in a centralized common area with a travel path from the exclusion zone (EZ) demarcated with 4-foot-high

cones. The decontamination procedure for this project site is a two-stage process. See Figure 2 for a depiction of the CRZ.

Stage 1:

1. Remove gross contamination with a brush.
2. Remove outer boots and dispose of in a drum.
3. Remove Tyvek suit and dispose in a drum.
4. Removes outer gloves and dispose of in a drum.
5. Walk to Stage 2.

Stage 2:

1. Remove respirator.
2. Remove cartridge and dispose in a drum.
3. Clean respirator and insert into a bag.
4. Remove inner gloves and dispose.
5. Wipe hands with a toilette and dispose.
6. Walk out of decontamination area.

All water used in decontamination procedures should be stored in portable storage tanks until a sufficient amount is stockpiled for disposal treatment. Disposable sampling and PPE will be placed in plastic bags and temporarily stored in designated drums. These drums shall be disposed of according to regulatory guidelines, if necessary.

6.0 Site Control/Communications

6.1 Site Control

To prevent contamination from migrating from personnel and equipment, work areas will be clearly specified as either an EZ, CRZ, or Support Zone (SZ) prior to beginning operations. Each work area will be clearly identified using signs or physical barriers.

A log of all personnel visiting, entering, or working on the site shall be maintained by the SS or Site Safety Officer (SSO). No visitor will be allowed in the EZ without showing proof of training and medical certification, per 29 CFR 1910.120(e), (f). Visitors will attend a site orientation given by the SS/SSO and sign the HASP.

The following are standard safe work practices that apply to all site personnel; they will be discussed in the safety briefing prior to initiating work on the site:

- Eating, drinking, chewing gum or tobacco, and smoking is prohibited in the EZ/CRZs.
- Hands and face must be washed upon leaving the EZ and before eating, drinking, chewing gum or tobacco, and smoking.
- A buddy system will be used. Hand signals will be established to maintain communication.
- During site operations, each worker will consider himself as a safety backup to his partner. Off-site personnel will provide emergency assistance.
- Visual contact will be maintained between buddies on-site when performing hazardous duties.
- No personnel will be admitted to the site without the proper safety equipment, training, and medical surveillance certification.
- All personnel must comply with established safety procedures. Any staff member who does not comply with safety policy, as established by the SS/SSO, will be immediately dismissed from the site.
- Proper decontamination procedures must be followed before leaving the EZ.

6.1.1 Site Security and Work Zone Definition

This Section contains general guidelines for developing site security measures for working in a street or roadway and excavations.

6.1.1.1 Working In Street or Roadway

Observe the following site control practices and procedures when working in streets or road-ways:

- Wear traffic vest and hardhat when vehicle hazard exists.
- Use cones, flag-mounted cones, caution tape, and/or barricades.
- Use vehicle strobe light and block area with truck.
- Develop traffic flow plan for high traffic situations (as appropriate):
  - use flag person
  - use flashing arrow sign

- use “MEN WORKING” signs liberally
- obtain lane closing permits
- engage police details

6.1.1.2 Working at Excavation/Trenching Sites

Observe the following site control practices and procedures when working in streets or road-ways:

- “Competent person” is required per OSHA 29 CFR 1926 Subpart P.
- Safeguard open excavations by restricting unauthorized access.
- Highlight work area using prominent warning signs (cones, saw horses/barricades, and signage) placed a minimum of 10 feet back from excavation opening.
- Maintain zone definition along perimeter with a continuous string of yellow orange caution tape.

6.1.1.3 Excavations Left Unattended or Overnight

Use one of the following methods for excavations left unattended or overnight:

- Surround entire perimeter with plastic or cloth construction net fencing. Anchor fence to ground using steel posts driven into ground. Space out posts no greater than 8 feet apart. Fence height minimum 4 feet high. Fence material must be of a quality capable of withstanding a pressure of 200 pounds. Place fence a minimum of 10 feet back from excavation opening.
- Place 8-foot-long barricades affixed with flashing lights end to end with 4-foot high construction net fence attached to barricades.
- Use temporary curbing or concrete “jersey” barriers affixed with flashing signal lights or other effective warning signs.

6.2 Field Communications

Communications between all Shaw employees and subcontractors at the work site can be verbal and/or non-verbal. Verbal communication can be affected by the on-site background noise and various PPE. See Table 9 for a list of the type of communication methods and equipment to use, depending on site conditions. Communication equipment must be checked daily to ensure proper operation. All project personnel must be initially briefed on the communication methods prior to starting work; communication methods should be reviewed in Daily Tailgate Safety Meetings.

Table 9
Field Communication Methods

Communication Device	Type of Communications	Signal
Telephone On-Site Or Cellular Telephone	Emergency notification	Initiate phone call using applicable emergency numbers
Two-way Radio	Emergency notification among site personnel	Initiate radio communication with Code Red message
Compressed Air Horn	Hailing site personnel for non-emergency	One long blast, one short blast
Compressed Air Horn	Hailing site personnel for emergency evacuation	Three long continuous blasts
Visual	Hailing site personnel for distress, need help	Arms waved in circle overhead
Visual	Hailing site personnel for emergency evacuation	Arms waved in criss-cross over head
Visual	Contaminated air/strong odor	Hands clutching throat
Visual	Break, lunch, end of day	Two hands together, break apart

7.0 Emergency Response and Contingency Plan

See Section 7.1 for pre-emergency situations that warrant implementing the Emergency Response and Contingency Plan (ERCP). In the event of an emergency, immediate action must be taken by the first person to recognize the event.

When required, notify the National Response Center. The following information should be provided to the National Response Center:

- Name and telephone number.
- Name and address of facility.
- Time and type of incident.
- Name and quantity of materials involved, if known.
- Extent of injuries.
- Possible hazards to human health or the environment outside of the facility.

The emergency telephone number for the National Response Center is 800-424-8802. If hazardous waste has been released or produced through control of the incident, ensure that:

- Waste is collected and contained.
- Containers of waste are removed or isolated from the immediate site of the emergency.
- Treatment or storage of the recovered waste, contaminated soil or surface water, or any other material that results from the incident or its control is provided.
- Ensure that no waste that is incompatible with released material is treated or stored in the facility until cleanup procedures are completed.
- Ensure that all emergency equipment used is decontaminated, recharged, and fit for its intended use before operations are resumed.

7.1 Pre-emergency Plan for Site Emergencies

The following subsections provide information for a pre-emergency plan for site emergencies.

7.1.1 Evacuation/Natural Disaster

A contingency plan for evacuation from the works site should exist for the following natural disasters:

- Any situation which can potentially cause serious injury or death.
- Notification of a facility or plant evacuation.
- A rainstorm exceeds the flash flood level.
- The facility is in a projected tornado path or a tornado has damaged facility property.
- Severe wind gusts are forecasted or have occurred and have caused damage to the facility.

7.1.2 Medical Emergency

A contingency plan should exist in the event of the following medial emergencies:

- Overexposure to hazardous materials.
- Trauma injuries (broken bones, severe lacerations/bleeding, burns).
- Eye/skin contact with hazardous materials.
- Loss of consciousness.
- Heat stress (heat stroke).
- Heart attack.
- Respiratory failure.
- Allergic reaction.

7.1.3 Fire Emergency

A contingency plan should exist for the following situations related to fire emergencies.

- The potential for human injury exists.
- Toxic fumes or vapors are released.
- The fire could spread on site or off site and possibly ignite other flammable materials or cause heat-induced explosions.
- The use of water and/or chemical fire suppressants could result in contaminated run-off.
- An imminent danger of explosion exists.

7.1.4 Spill or Release of Hazardous Materials

A contingency plan should exist for the following situations related to a spill of release of hazardous materials:

- The spill could result in the release of flammable liquids or vapors, thus causing a fire or gas explosion hazard.
- The spill could cause the release of toxic liquids or fumes in sufficient quantities or in a manner that is hazardous to or could endanger human health.

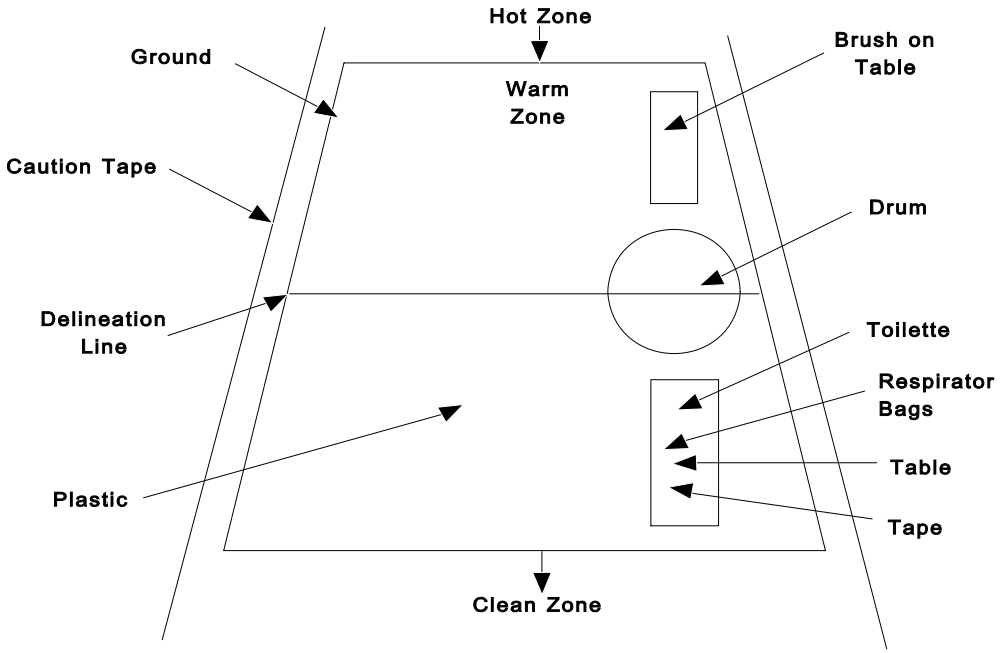
7.1.5 Spill or Release of High Temperature Liquid or Vapor

A contingency plan should exist for the following situations related to a spill or release of high temperature liquid or vapor:

- The spill can be contained on site, but the potential exists for groundwater contamination.
- The spill cannot be contained on site, resulting in off-site soil contamination and/or ground water or surface water pollution.
- The spill quantity is greater than the reportable quantity limit for the material.

FIGURES

Figure 3
Contamination Reduction Zone



APPENDICES

Appendix A
Safety Plan Acknowledgement Form

I have read the site-safety plan for this site and fully understand its contents.

Date	Name	Company

Appendix B
H&S Site Logs And Forms

SITE ENTRY LOG

Date: _____ Client: _____

Location: _____ Job No.: _____

Name	Representing	Time In	Time Out

TAILGATE SAFETY MEETING FORM

Project Name/Number:_____ Date:_____ Time: _____
Client:_____
Work Activities:_____
Hospital Name/Address:_____
Hospital Phone No.:_____ Ambulance Phone No.:_____

Safety Topics Presented

Chemical Hazards:_____
_____
Physical Hazards:_____
_____
Personal Protective Equipment:
Activity:_____ PPE Level:_____
Activity:_____ PPE Level:_____
Activity:_____ PPE Level:_____
Activity:_____ PPE Level:_____
Activity:_____ PPE Level:_____
New Equipment:_____
Other Safety Topic(s):_____

Attendees

PRINTED NAME	SIGNATURE
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
Meeting conducted by:	
_____	_____

REAL TIME AIR MONITORING LOG
(PID/FID/LEL/O2)

Project Name _____Project Location_____Project No._____

Date	Analyst	Time	Manufacturer Model/Serial No.	Concentration (Units)	Location/Activity

PID/FID DETECTOR
CALIBRATION LOG

Project Name_____ Project No._____ Date_____
Calibrated by_____ Instrument: Mfg/Model/Serial No._____

Time	Probe Type	Battery Charged (Y/N)	Calibration Standard	Calibration Standard Concentration (ppm)	Span Setting	Meter Scale Setting	Zeroed (Y/N)	Expected Meter Reading (ppm)	Actual Meter Reading (ppm)

COMBUSTIBLE GAS/OXYGEN METER CALIBRATION LOG

Project Name_____ Project No._____ Date_____
Calibrated by_____ Instrument: Mfg/Model/Serial No._____

Time	Battery Charged (Y/N)	Audible Alarm Check (Y/N)		Zero Checked (Y/N)		Calibration Standard	Calibration Standard (%)		Actual Meter Reading (%)		Ambient Air Rezero Check	
		LEL	O_2	LEL (0%)	O_2 (20.8%)		LEL	O_2	LEL	O_2	LEL (0%)	O_2 (20.8%)

COLORIMETRIC DETECTOR TUBE LOG

Project Name_____ Project No._____ Date_____
Pump Type, Mfg/Model/Serial No._____ Sampled by_____

Time	Detector Tube Type/ (Expiration Date)	Measurable Range	Pump Leak Test (Y/N)	Pump Strokes	Measured Concentration	Comments

REAL TIME AEROSOL MONITORING LOG

Project Name_____ Project No._____ Date_____

Sampled By	Instrument Type (Mfg/Model/ Serial No.)	Battery Charged (Y/N)	Zeroed (Y/N)	Sample Time		Sample Readings (mg/m^3)			Comments
				Start	Finish	TWA	Shift Average	Direct	

General Weather Conditions:_____

Supervisor's Employee Injury Report

EMPLOYEE INFORMATION

Employee's Social Security Number:			Claim Number:
Employee's Full Name:			Case Number from Log:
Home Address:			Home Phone Number:
Male: Female		Date of Birth:	Hire Date:
Dependents:		Dependents Under 18:	Marital Status:
Occupation:			Department Name:
State Hired:	Currently Weekly Wage:		Hourly Wage:
Hours/Days Worked Per Week:	Days Per Week		Hours Worked Per Day:
Employment Stats:			Employee ID No.: N/A
Salaried Continued:		Paid For Date of Injury:	
Ever Injured on the Job:		Supervisor Name & Phone:	

EMPLOYER INFORMATION

Employer Name: The Shaw Group, Inc.	
Work Location:	Project Number:
Contact Name:	Telephone Number: (800) 747-3322, Ext.572
Employer SIC:	Employer Location Code:
Employer FED ID:	Employer Code: N/A
Nature of Business:	
Policy Number:	

ACCIDENT INFORMATION

Date and Time of Injury:	Time Employee Began Work:
Person Accident Reported to:	Date and Time Reported to Employer:
Did the Accident Occur at the Work Location:	If no, where did the accident occur?
Accident Address:	
What was the Employee doing just before the Incident Occurred?	
Give a Full Description of the Accident: (Be as Complete As Possible)	
What object or substance directly harmed the employee?	

Are Other WC Claims Involved?

INJURY INFORMATION

Which Part of the Body Was Injured? (E.g. Head, Neck, Arm Leg)?

What Was the Nature of Injury? (E.g. Fracture, Sprain, Laceration)?

Part of Body Location: (e.g. Left, Right, Upper, Lower)?

Injury Description:

Source of Injury:	Is Employee Hospitalized?
Lost Time:	If Yes, What was First Full Day Out:
Date Last Day Worked:	Date Disability Began: N/A
Date Returned to Work:	Estimated Return Date: N/A

If the Employee Died, When did Death Occur? (Date)

MEDICAL INFORMATION

Initial Medical Treatment:	ER Treated & Released: Y or N	Hospitalized Overnight as In Patient: Y or N

Hospital - Name, Address, Phone Number:

Clinic - Name, Address, Phone Number:

Name of Physician or Health Care Professional?

WITNESS INFORMATION

Were There Any Witnesses?

If Yes, List Names and How to Contact Them:

ADDITIONAL COMMENTS & INFORMATION

REPORT PREPARED BY

Name:		Title:
Signature:	Date:	Phone:

REPORT ALL WORKER'S COMPENSATION INJURIES TO SHAW CLAIMS DEPARTMENT

FAX REPORT WITHIN 24 HOURS OF INCIDENT TO 225-932-2636.

INCIDENT INVESTIGATION REPORT

*** MUST BE COMPLETED WITHIN 72 HOURS ***

Investigation Date _____ Date of Incident _____

Employee Name _____

Supervisor Name _____

Project Number/Name _____/_____

Location of Incident _____

Incident Classification

Injury:	☐ First Aid	Vehicle:	☐ Chargeable	DOT	☐ DOT Vehicle
	☐ OSHA Recordable		☐ Non-Chargeable		☐ DOT Reportable
	☐ Lost Workday				
	☐ Restricted Workday	Near Miss: ☐		General Liability ☐	

Description (Provide facts, describe how incident occurred, provide diagram [on back] or photos)

Analysis 1 (What unsafe acts or conditions contributed to the incident?)

Analysis 2 (What systematic or management deficiencies contributed to incident?)

Corrective Action(s) (List corrective action items, responsible person, scheduled completion date)

Witnesses (Attach statements or indicate why unavailable)

Investigated By _____ _____ _____
Print Name Signature

Project/Location Mgr. _____ _____ _____
Print Name Signature

(Attach Additional Pages if Needed)

VEHICLE ACCIDENT REPORT
Commercial Vehicles

SHAW LOCATION

SHAW SUBSIDIARY NAME | **LOCATION CODE** | **PHONE**

BUSINESS ADDRESS | **CITY** | **STATE** | **ZIP**

SHAW VEHICLE

VEHICLE YEAR, MAKE, MODEL | **VEHICLE VIN** | **LICENSE PLATE NUMBER/STATE**

TRAILER YEAR, MAKE, MODEL | **TRAILER VIN** | **LICENSE PLATE NUMBER/STATE**

DESCRIPTION OF DAMAGE TO VEHICLE

DATE, TIME, AND PLACE

DATE OF ACCIDENT

TIME ☐ **AM** ☐ **PM**

EXACT LOCATION OF ACCIDENT OR LOSS (include cross-streets, mile-markers, etc.)

DRIVER OF SHAW VEHICLE

DRIVER'S NAME AND ADDRESS | **PHONE NUMBER**

DRIVER'S LICENSE NUMBER/STATE | **SEX** | **DATE OF BIRTH** | **SOCIAL SECURITY** | **WORK PHONE**

ACCIDENT INFORMATION

DRIVER'S DESCRIPTION OF ACCIDENT

ILLUSTRATE HOW ACCIDENT OCCURRED (LABEL VEHICLES AND STREET NAMES)

WERE POLICE INVOLVED? ☐ **YES** ☐ **NO**

DEPARTMENT NAME:

CITATIONS ISSUED: ☐ **YES** ☐ **NO**

TO WHOM:

WITNESS NAME

WITNESS ADDRESS | **PHONE:**

ADDITIONAL COMMENTS

VEHICLE ACCIDENT REPORT
Commercial Vehicles
Page 2

OTHER (NON-SHAW) VEHICLES INVOLVED

VEHICLE 1	VEHICLE 2
OWNER NAME SEX	OWNER NAME SEX
OWNER ADDRESS, CITY, STATE, ZIP	OWNER ADDRESS, CITY, STATE, ZIP
HOME PHONE BUSINESS PHONE	HOME PHONE BUSINESS PHONE
DOB AGE SOCIAL SECURITY NUMBER	DOB AGE SOCIAL SECURITY NUMBER
VEHICLE YEAR, MAKE, MODEL LICENSE PLATE/STATE	VEHICLE YEAR, MAKE, MODEL LICENSE PLATE/STATE
TRAILER YEAR, MAKE MODEL LICENSE PLATE/STATE	TRAILER YEAR, MAKE MODEL LICENSE PLATE/STATE
VEHICLE VIN	VEHICLE VIN
INSURANCE COMPANY POLICY NUMBER	INSURANCE COMPANY POLICY NUMBER
OPERATOR NAME SEX	OPERATOR NAME SEX
OPERATOR ADDRESS, CITY, STATE, ZIP	OPERATOR ADDRESS, CITY, STATE, ZIP
HOME PHONE BUSINESS PHONE	HOME PHONE BUSINESS PHONE
DRIVER'S LICENSE NO./STATE	DRIVER'S LICENSE NO./STATE
DOB AGE SOCIAL SECURITY NO.	DOB AGE SOCIAL SECURITY NO.
PASSENGER NAME INJURED? ☐ YES ☐ NO	PASSENGER NAME INJURED? ☐ YES ☐ NO
PASSENGER NAME INJURED? ☐ YES ☐ NO	PASSENGER NAME INJURED? ☐ YES ☐ NO
WAS VEHICLE PARKED?	WAS VEHICLE PARKED?
DESCRIPTION OF DAMAGE TO VEHICLE:	DESCRIPTION OF DAMAGE TO VEHICLE:
ANY DAMAGE TO PROPERTY OTHER THAN VEHICLES (building, fence, sign, etc.)?	ANY DAMAGE TO PROPERTY OTHER THAN VEHICLES (building, fence, sign, etc.)?
PROPERTY OWNER NAME	PROPERTY OWNER NAME
PROPERTY OWNER ADDRESS, CITY, STATE, ZIP	PROPERTY OWNER ADDRESS, CITY , STATE, ZIP
HOME PHONE: BUSINESS PHONE:	HOME PHONE: BUSINESS PHONE:
DESCRIPTION OF DAMAGE TO PROPERTY	DESCRIPTION OF DAMAGE TO PROPERTY

GENERAL LIABILITY, PROPERTY DAMAGE, AND LOSS REPORT

PROJECT/LOCATION _____ PROJECT NO. _____ DATE _____

ADDRESS _____

HOW DID DAMAGE OR LOSS OCCUR? _____

_____

_____

DESCRIPTION AND VALUE ($) OF DAMAGED/LOST/STOLEN PROPERTY: _____

_____

LOCATION OF DAMAGED/LOST/STOLEN PROPERTY (Before Loss): _____

_____

DATE AND TIME OF DAMAGE, LOSS, OR THEFT: Date: _____ Time: _____ a.m. / p.m.

OWNER OR DAMAGED/LOST/STOLEN PROPERTY:

Name _____ Phone No. (_____) _____

Address _____ City _____

Employer and Address _____

INJURED PARTIES (Also complete a Supervisor's Employee Injury Report if a Company Employee):

1. Name _____ Phone No. (_____) _____

Address _____ City _____

Employer and Address _____

Description of Injury _____

WITNESSES:

1. Name _____ Phone No. (_____) _____

Address _____ City _____

Employer and Address _____

2. Name _____ Phone No. (_____) _____

Address _____ City _____

Employer and Address _____

WERE PICTURES TAKEN? ~ YES ~ NO

WERE POLICE NOTIFIED? ~ YES ~ NO DEPT. _____ REPORT NO. _____

COMPLETED BY:

_____ _____ _____

(Print name) (Signature) (Date)

PROJECT/LOCATION MANAGER:

_____ _____ _____

(Print name) (Signature) (Date)

REPORT MUST BE CALLED IN OR FAXED TO:
CORPORATE CLAIMS DEPARTMENT (PHONE: 225.932.2527, FAX: 225.932.2636)
WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY

ACCIDENT REVIEW BOARD

DATE:	LOCATION:
BOARD MEMBERS:	
ACCIDENT DATE:	EMPLOYEE(S) INVOLVED IN INCIDENT:
INVESTIGATION COMPLETE: YES ☐ NO ☐	ACCIDENT CLASSIFICATION:

THE FOLLOWING INFORMATION <u>MUST</u> BE PROVIDED BY THE REVIEW BOARD FOR THIS INCIDENT (PRINT):

SUPERVISOR:_____ **PROJECT/LOCATION MGR.:** _____

CAUSE OF ACCIDENT:

ACTION BY BOARD*:

* ALL ACTIONS BY THE ACCIDENT REVIEW BOARD ARE SUBJECT TO FINAL REVIEW BY THE HUMAN RESOURCES AND LEGAL DEPARTMENTS.

ACCEPTED:

_____ _____
(Employee Signature) (Supervisor Signature)

APPROVED: REJECTED FOR:

_____ _____
(Project/Location Manager) _____

APPROVED: REJECTED FOR:

_____ _____
(Business Line Health and Safety Manager or Designee) _____

APPROVED: REJECTED FOR:

_____ _____
(Business Line Vice President) _____

Employee Witness Statement

MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by every employee working in the crew of the injured employee and by every other employee with knowledge of events or circumstances involved in the incident.

This information is being solicited from you so that the company can accurately assess the reported incident to avoid similar occurrences in the future. Describe only the facts for which you have personal knowledge. If you have no knowledge of the incident, write "no knowledge".

Company _____

Exact Location of Incident/Accident _____

Name of Injured Employee _____

Date of Incident/Accident _____ Time _____ am pm

Date of this Statement _____ Time _____ am pm

Time your shift begins? Time _____ am pm Ends _____ am pm

Witness Information:

- Name _____
- Home Phone No. _____
- Home Address _____
- County _____ Zip _____

Witness' Supervisor Name _____

If not employed by Shaw, enter name of company _____

Company Phone Number _____

Did You See the Incident/Accident? _____

How Far From You (approx., in feet) Did the Incident/Accident Occur? _____

Stating Only Factual Information, Describe in Detail What Happened and Include Any Applicable Events Leading to the Incident/Accident.

_____

_____

_____

_____

_____

_____

_____

_____

I certify that, to the best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

_____ _____

Witness Signature/Date Print Name

Injured Employee Statement

MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by the injured employee involved in the incident. Describe only the facts for which you have personal knowledge. If you have no knowledge of a particular question, write "no knowledge".

Company _____

Exact Location of Incident/Accident _____

Name of Injured Employee _____

Date of Incident/Accident _____ Time _____ am pm

Date of this Statement _____ Time _____ am pm

Time your shift begins? Time _____ am pm Time your shift ends? Time _____ am pm

Name of Known Witnesses:

Name _____

Name _____

Name _____

Name _____

Your Immediate Supervisors Name _____

If not employed by Shaw, enter name of company and phone number _____

Have you had a prior injury similar to this injury? _____

Was it while you were at work? _____

What date did the prior injury occur? _____

Stating Only Factual Information, Describe in Detail What Happened and Include Any Applicable Events Leading to the Incident/Accident.

_____

_____

_____

_____

_____

_____

_____

_____

I certify that, to the best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

_____ _____

Signature/Date Print Name

Incident Reporting and Management Procedure – Commercial & State/Local Programs

Action	Who? *When*?	Under what circumstances?	How?	Notes:
1. Notify Supervisor for all incidents (no matter how minor)	Injured person, first person recognizing incident, driver/passenger, or employee causing damage Immediately	All incidents no matter how minor	In person or by telephone	
2. For *life-threatening injuries/illnesses* - contact local emergency personnel For *non life-threatening injuries/illnesses* - transport injured person to doctor at an occupational medical facility For *vehicle accidents* – make scene safe, notify police, aid injured parties For *equipment/property damage* - make scene safe, prevent further damage or injuries	Site Supervisor Immediately (concurrently with next step if injury or illness) Site Supervisor Immediately (concurrently with next step if injury or illness) Driver/passenger Immediately Employee causing damage Immediately	– In case of serious injury or illness requiring off-site medical care	– Via ambulance – – – Via vehicle	– Site Supervisor or Site Safety Officer must immediately go to emergency care facility. – – – Site Supervisor or Site Safety Officer must transport and stay with injured person until released from care
3. Notify CORE (for injuries/illnesses to Shaw employees only)	Site Supervisor *Immediately, prior to transporting the injured employee, unless injuries are life threatening*	♦ Serious injury requiring off-site medical care ♦ If employee states that he/she has been exposed to any chemical or biological substance	877-347-7429	♦ Not required for temporary agency and contract labor ♦ Provide name of injured employee, name and phone # of treating medical facility, description of the incident ♦ CORE will help with medical facility coordination and follow-up care
4. Notify Regional EHS Manager	Site Supervisor *Immediately (concurrently with providing transportation to occupational medical facility or EMS transport to hospital)*	All incidents	– See C&S/L Incident Notification and Communication Contact List (attached)	♦ Contact should be made prior to sending the individual for medical care ♦ Regional EHS Manager will notify Clifford Florczak as appropriate

Incident Reporting and Management Procedure – Commercial & State/Local (continued)

Action	Who? *When*?	Under what circumstances?	How?	Notes:
5. Contact Shaw Notification Hotline/Help Desk	Site Supervisor *As soon as possible. Prior to sending an individual for medical treatment*	♦ Illness and/or injury (doctors cases and above) ♦ Property damage (damage > $2,500.00) ♦ Vehicle accidents (All) ♦ Criminal activity (i.e. bomb threat, theft) ♦ Natural disaster (all) ♦ Explosion and/or fires (damage > $2,500.00 or result in injury) ♦ Environmental spills/releases (incidents that requires regulatory notification or have an offsite impact) ♦ Regulatory agency visit ♦ Fatalities	Shaw Notification Hotline/Help Desk Phone Number 866-299-3445 Note: Outside the Continental US call 225-215-5056	
6. Complete forms: I*njuries and illnesses* ♦ Authorization for Release of Protected Medical Information ♦ Authorization for Treatment of Occupational Injury/Illness ♦ Return-To-Work Examination Form ***and*** fax to CORE ***and*** fax to Loss Prevention Manager (Casey Parker)	Injured employee and medical facility personnel (Site Supervisor is responsible for verifying forms are completed) *Prior to leaving medical facility*	♦ Serious injury requiring off-site medical care ♦ If employee states that he/she has been exposed to any chemical or biological substance	Fax to CORE at 877-347-7429 Fax to Loss Prevention Manager (Casey Parker at 225-987-3080)	Site Supervisor or Site Safety Officer must take these forms with him/her to occupational medical facility or hospital (Contained in HS 020)
7. Call Project Manager and notify of incident	Site Supervisor *As soon as reasonably possible*		–	Project Manager will report incident to upper levels of Operations/Business Line Management

Incident Reporting and Management Procedure – Commercial & State/Local (continued)

	Action	Who? *When*?	Under what circumstances?	How?	Notes:
8.	Call back Regional EHS Manager to report on status of ***injured/ill employee***	Site Supervisor *Prior to employee leaving medical facility*	All injuries and illnesses requiring off-site medical care	– See C&S/L Incident Notification and Communication Contact List (attached)	
9.	Complete forms: *OSHA Recordable Cases* Supervisor's Employee Injury/Illness Report Form Injured Employee Statement Witness Statement Form(s) *First Aid Cases* Supervisor's Employee Injury/Illness Report Injured Employee Statement Witness Statement Form(s) Fax completed forms to Shaw Corporate Claims and Regional EHS Manager and CORE.	♦ Site Supervisor ♦ Witnesses *As soon as possible – no later than 24 hours*	All injuries, illnesses, and first aide cases	Shaw Corporate Claims Department Fax (225-932-2636) CORE Fax 225-295-4846 See C&S/L Incident Notification and Communication Contact List (attached)	Site Supervisor should have these forms with him/her at all times (Contained in HS 020)
10.	Complete forms: *Chargeable Vehicle Accidents* Vehicle Accident Report Witness Statement Form(s) Driving Record Certification (Procedure HS800) *Non-Chargeable Vehicle Accidents* Vehicle Accident Report Witness Statement Form(s) *Equipment, Property Damage and General Liability Incidents* Equipment, Property Damage and General Liability Loss Report Witness Statement Form(s) Fax completed forms to Shaw Corporate Claims and Regional EHS Manager.	♦ Site Lead / Supervisor ♦ Witnesses *As soon as possible – no later than 24 hours*	All vehicle accidents and /or all property damage	Shaw Corporate Claims Department (225-932-2636) See C&S/L Incident Notification and Communication Contact List (attached)	Supervisor should have these forms with him/her at all times (Contained in HS 020)

Incident Reporting and Management Procedure – Commercial & State/Local (continued)

Action	Who? *When*?	Under what circumstances?	How?	Notes:
11. Complete forms: *OSHA Recordable Cases* Incident Investigation Report *First Aid Cases* Incident Investigation Report *Chargeable Vehicle Accidents* Incident Investigation Report *Non-Chargeable Vehicle Accidents* Incident Investigation Report *Equipment, Property Damage and General Liability Incidents* Incident Investigation Report *Near Miss* Incident Investigation Report Fax completed forms to Regional EHS Manager	Site Supervisor *As soon as possible – no later than 72 hours of incident*		Shaw Corporate Claims Department (225-932-2636) See C&S/L Incident Notification and Communication Contact List (attached)	Supervisor should have these forms with him/her at all times (Contained in HS 020)
12. Perform "Accident Review Board" (ARB) and fax to Regional EHS Manager.	Site Supervisor/Project Manager *Within 10 days of incident*	OSHA Recordable Cases Chargeable Vehicle Accidents		ARB must include: Regional Vice President, Project Manager, Employee's Direct Supervisor, Regional EHS Manager, and Employee(s) involved in the incident.

C&S/L INCIDENT NOTIFICATION AND COMMUNICATION CONTACT LIST

Project Number: _____ Project / Office / Facility Location: _____

Name	Phone Number(s)	Fax Number	E-mail
Shaw Notification Hotline / Helpdesk	866-299-3445 225-215-5056 (Outside Continental US)	N/A	N/A
CORE	877-347-7429	225-292-8986	
Shaw Corporate Claims Department		225-932-2636	
EHS Manager – Greg McElroy	412-858-1542 (office) / 412-759-5302 (cell)	419-425-6039	greg.mcelroy@shawgrp.com
CSL EHS Director, Central & NE– Clifford Florczak	312-499-3503 (office-Chicago) 708-260-1266 (office) 708-308-6200 (cell)	312-499-3505	clifford.florczak@shawgrp.com.
Loss Prevention Manager - Casey Parker	225-932-2763 (office) / 225-405-1246 (cell)	225-987-3080	casey.parker@shawgrp.com
Project/Office Manager – Cecelia Campbell	412-858-3977 (office)	212-290-6001	cecelia.campbell@shawgrp.com
District/Business Line Manager – David Stoll	518-785-2362 (office) / 518-526-2322 (cell)	518-783-8397	david.stoll@shawgrp.com
Vice President, Commercial Construction - John Wilpert	609-588-6302 (office)	609-588-6399	john.wilpert@shawgrp.com
Central /NE Regional Vice President – Harry Dravecky	412-858-3324 (office)	412-858-3979	harry.dravecky@shawgrp.com

Note: Notifications to operations chain will be verbal and as soon as reasonably possible, but no later than 24-hours following the incident

Appendix C
Job Safety Analyses (JSAs)

JOB SAFETY ANALYSIS

SUPERVISION/FOREMAN
Consider the following and check the items which apply to the job, then review with the work crew.

PERMITS
- ☐ Required
- ☐ Cold Work
- ☐ Hot Work
- ☐ Entry Permit
- ☐ All Conditions Met
- ☐ Signed Off When Complete
- ☐ Other

PERSONAL PROTECTIVE EQUIP. (PPE)
- ☐ Type of Gloves
- ☐ Composition of Gloves
- ☐ Special Purpose Gloves
- ☐ Tyvek Suit
- ☐ Acid Suit /Slicker Suit
- ☐ Rubber Boots
- ☐ Mono Goggles (vented/non-vented)
- ☐ Face Shield
- ☐ Respirator
- ☐ Fresh Air
- ☐ Ear Protection
- ☐ Safety Harness
- ☐ Burning Goggles
- ☐ Other

TOOLS
- ☐ Current Inspection
- ☐ Proper Tools for the Job
- ☐ Good Tool Condition
- ☐ Qualifications
- ☐ Other

EMERGENCY EQUIPMENT
- ☐ Fire Extinguishers
- ☐ Safety Shower
- ☐ Evacuation Route
- ☐ Other

WELDING
- ☐ Flashburns
- ☐ Combustibles
- ☐ Spark Containment
- ☐ Shields
- ☐ Grounding
- ☐ Water Hose
- ☐ Fire Extinguisher
- ☐ Fire Blanket
- ☐ Fire Watch
- ☐ Sewer Covers
- ☐ Other

OVERHEAD WORK
- ☐ Barricades
- ☐ Signs
- ☐ Hole Cover
- ☐ Handrail
- ☐ Other

ELECTRICAL
- ☐ Locked & Tagged out
- ☐ Try Start/Stop Switch
- ☐ GFCI Test
- ☐ Assured Grounding
- ☐ Extension Cord Inspection
- ☐

LIFTING
- ☐ Forklift
- ☐ Cherry Picker
- ☐ Load Chart
- ☐ Angle
- ☐ Crane
- ☐ Chainfall
- ☐ Proper Rigging Practices
- ☐ Manual Lifting
- ☐ Condition of Equipment
- ☐ Operator Certificate

HAZARDS (ENVIRONMENTAL)
- ☐ Electrical Shock
- ☐ Heat Stress
- ☐ Heavy Objects
- ☐ Hot/Cold Surf. Or Mat.
- ☐ Inadequate Lighting
- ☐ Line Breaking
- ☐ Noise
- ☐ Poor Access/Egress
- ☐ Sharp Objects
- ☐ Other

HAZARDS/CHEMICALS
- ☐ Chemical Burn Shin/Eyes
- ☐ Flammable
- ☐ Ingestion
- ☐ Inhalation
- ☐ Skin Contamination

HAZARDS/BODY
- ☐ Fall Potential
- ☐ Pinch Points
- ☐ Slip-Trip Potential
- ☐ Other

OTHER WORK IN AREA
- ☐ Others Working Overhead
- ☐ Type Work Others Doing
- ☐ PPE Due to Other Work
- ☐ Other

ACCESS
- ☐ Scaffold (properly inspected)
- ☐ Ladder (Tied off)
- ☐ Manlift
- ☐ Personnel Basket (inspected & approved)
- ☐ Operator Training
- ☐ Special Provisions
- ☐ Other

Confined Space
Know the Following:

1) Possible hazards within the confined space
2) First signs of exposure
3) How to summons help
4) How to track personnel
5) Entering and exiting the confined space
6) Maintain contact with all entrants by voice or visual
7) Do not attempt to rescue unless you are a part of a coordinated effort
8) Remain at entry point assume no duties with take you from there.

JOB SAFETY ANALYSIS

Location of Job (Unit/Location on Project):				
Required PPE:	**Safety Access/ Location**	Supervisor of Work:		
	Safe Haven:	JSA Prepared By:		
	Wind Direction:	Are other crews in area?		
Pre-Job Preparation Fill out JSA Review JSA (EVERYONE) Sign JSA (EVERYONE)	Evacuation Route: Assembly Point:	New:		
		Revised:		

Job Task (What are You Doing)	**Audit the Job** Audit Time:
Potential Hazards	**Supervisors Comments**
Recommended Action or Procedure	**Supervisor's Initials:**

Crew Name Signatures:		

Appendix D
MSDS Definitions, Material Safety Data Sheets (MSDS)

CORNELL

Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

VINYL CHLORIDE

Section 1 - Product and Company Identification
VINYL CHLORIDE

Product Identification: VINYL CHLORIDE
Date of MSDS: 10/01/1985 **Technical Review Date:** 10/09/1992
FSC: 6810 **NIIN: LIIN:** 00N034925
Submitter: N EN
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: MATHESON GAS PRODUCTS
Manufacturer's Address1: 932 PATTERSON PLANK RD
Manufacturer's Address2: EAST RUTHERFORD, NJ 07073
Manufacturer's Couutry: US
General Information Telephone: 201-933-2400
Emergency Telephone: 201-933-2400
Emergency Telephone: 201-933-2400
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: N
Published: Y
CAGE: 0FB11
Special Project Code: N

Contractor Information

Contractor's Name: MATHESON GAS PRODUCTS
Contractor's Address1: 30 SEAFIEW DRIVE
Contractor's Address2: SEACAUCUS, NJ 07096
Contractor's Telephone: 201-867-4100, CHEMTREC 800-424-9300
Contractor's CAGE: 0FB11

Section 2 - Compositon/Information on Ingredients
VINYL CHLORIDE

Ingredient Name: ETHYLENEM, CHLORO-; (VINYL CHLORIDE) (SARA III)
Ingredient CAS Number: 75-01-4 **Ingredient CAS Code:** M
RTECS Number: KU9625000 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: SEE 1910.1017 **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: 5 PPM, A1; 9293 **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity: 1 LB
DOT Reporting Quantity: 1 LB
Ozone Depleting Chemical: N

Section 3 - Hazards Identification, Including Emergency Overview
VINYL CHLORIDE

Health Hazards Acute & Chronic: ACUTE:INHAL MAY CAUSE DROWS, BLURRED VISION, STAG GAIT, & TINGLING & NUMBNESS IN THE FEET & HANDS. IN HIGH CONC VINYL CHLORIDE ACTS AS AN ANESTHETIC. CONTACT WITH LIQ VINYL CHLORIDE MAY CAUSE SEVERE I RRITATION & BURNS. CHRONIC: VINYL CHLORIDE IS A RECOGNIZED CARCINOGEN & HAS CAUSED CANCER IN MAN.(EFTS OF OVEREXP)

Signs & Symptoms of Overexposure:
SEE HEALTH HAZARDS.

Medical Conditions Aggravated by Exposure:
NONE SPECIFIED BY MANUFACTURER.

LD50 LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.

Route of Entry Indicators:
Inhalation: YES
Skin: NO
Ingestion: YES

Carcenogenicity Indicators
NTP: YES
IARC: YES
OSHA: YES

Carcinogenicity Explanation: VINYL CHLORIDE: KNOWN CARCINOGEN (NTP), GROUP 1 (IARC); OSHA REGULATED

Section 4 - First Aid Measures
VINYL CHLORIDE

First Aid:
INHAL: MOVE VICTIM TO FRESH AIR. IF NOT BRTHG, GIVE ARTF RESP. IF BRTHG IS DIFFICULT, GIVE OXYGEN. CALL A PHYSICIAN. EYE/SKIN: IMMED FLUSH EYE/SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MIN. REMOVE CON TAMINATED CLOTHING AND SHOES. CALL A PHYSICIAN. INGEST: GET MD IMMEDIATELY (FP N). NOTE: SKIN BURNS CAN BE TREATED BY THE APPLICATION OF MAGNESIUM PASTE (MAGNESIUM OXIDE AND GLYCERINE).

Section 5 - Fire Fighting Measures
VINYL CHLORIDE

Fire Fighting Procedures:
FIRE FIGHTERS MUST WEAR NIOSH/MSHA APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT (FP N). FIREIGHTERS TURNOUT GEAR IS INADEQUATE.
Unusual Fire or Explosion Hazard:
CYLINDERS THAT ARE EXPOSED TO FIRE MAY RUPTURE WITH VIOLENT FORCE. EXTING SURROUNDING FIRE & KEEP CYLINDERS COOL USING A WATER SPRAY

APPLIED FROM THE(SUPP DATA)
Extinguishing Media:
TO EXTING A VINYL CHLORIDE FIRE STOP THE FLOW OF GAS. IF THE FLOW CANNOT BE STOPPED, LET THE FIRE BURN ITSELF(SUPP DATA)
Flash Poiut: Flash Point Text: N/K

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): 4%
Upper Limit(s): 22%

Section 6 - Accidental Release Measures
VINYL CHLORIDE

Spill Release Procedures:
EVACUATE AREA. PERSONNEL EQUIPPED W/SPECIAL PERSONAL PROTECTIVE SUITS FOR FIRE/CHEMICALS AND POSITIVE PRESSURE NIOSH/MSHA APPROVED SCBA CAN RE-ENTER THE AREA AND ATTEMPT TO STOP LEAK.

Section 7 - Handling and Storage
VINYL CHLORIDE

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
VINYL CHLORIDE

Repiratory Protection:
NIOSH/MSHA APPROVED POSITIVE PRESSURE SCBA SHOULD BE WORN IF IT IS SUSPECTED THAT VINYL CHLORIDE IS IN THE AIR.
Ventilation:
NONE SPECIFIED BY MANUFACTURER.
Protective Gloves:
IMPERVIOUS GLOVES.
Eye Protection: CHEM WORK GOGG/FULL LENGTH FSHLD (FP N).
Other Protective Equipment: EYE WASH STATIONS & SAFETY SHOWERS READILY AVAILABE.
Work Hygenic Practices: NONE SPECIFIED BY MANUFACTURER.
Supplemental Health & Safety Information: EXTING MEDIA:OUT WHILE COOLING -- CYLINDER & SURROUNDINGS USING A H*2O SPRAY. EXPLO HAZ:MAX POSS DISTANCE. FLAMM & TOX GASES MAY SPREAD FROM A SPILL AFTER FIRE IS EXTING & BE SUBJECT TO REIGNIT. THERMAL DECOMP PRODS MAY INCL HCL & PHOSGENE (FP N). OTHER PREC: PLAN COVERING STEPS TO BE TAKEN IN CASE OF ACCIDENTAL RELEASE.

Section 9 - Physical & Chemical Properties
VINYL CHLORIDE

HCC: G2

NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: 7.2F,-13.8C
Melting/Freezing Point: Melting/Freezing Text: -245F,-154C
Decomposition Point: Decomposition Text: N/K
Vapor Pressure: 234KPA@21C **Vapor Density:** N/K
Percent Volatile Organic Content:
Specific Gravity: 2.21
Volatile Organic Content Pounds per Gallon:
pH: N/K
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: N/K
Solubility in Water: 1.07 CM3/1 ML H*2O
Appearance and Odor: COLORLESS, HIGHLY FLAMM GAS WITH A PLEASANT, SWEET ODOR AT HIGH CONC.
Percent Volatiles by Volume: N/K
Corrosiou Rate: N/K

Section 10 - Stability & Reactivity Data
VINYL CHLORIDE

Stability Indicator: YES
Materials to Avoid:
OXIDIZING MATLS, ACTIVE METALS, ALUMINUM ALLOYS AND ORGANOMETALLICS.
Stability Condition to Avoid:
AVOID EXPOSURE TO SUNLIGHT, HEAT, AIR, OXYGEN PEROXIDES AND OTHER STRONG OXIDIZING AGENTS.
Hazardous Decomposition Products:
HYDROGEN CHLORIDE, PHOSGENE, CARBON MONOXIDE.
Hazardous Polymerization Indicator: YES
Conditions to Avoid Polymerization:
OXYGEN (AIR), HEAT, SUNLIGHT, MOISTURE AND FREE RADICAL INITIATORS OR OTHER CATALYTIC MATERIALS.

Section 11 - Toxicological Information
VINYL CHLORIDE

Toxicological Information:
N/P

Section 12 - Ecological Information
VINYL CHLORIDE

Ecological Information:
N/P

Section 13 - Disposal Considerations
VINYL CHLORIDE

Waste Disposal Methods:
DISPOSAL MUST BE IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL

REGULATIONS (FP N).

Section 14 - MSDS Transport Information
VINYL CHLORIDE

Transport Information:
N/P

Section 15 - Regulatory Information
VINYL CHLORIDE

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
VINYL CHLORIDE

Other Information:
N/P

HMIS Transportation Information

Product Identification: VINYL CHLORIDE
Transporation ID Number: 39375
Responsible Party CAGE: 0FB11
Date MSDS Prepared: 10/01/1985
Date MSDS Reviewed: 03/24/1993
MFN: 03/24/1993
Submitter: N TN
Status Code: C

Container Information
Unit of Issue: NK
Container Quantity: NK
Type of Container:
Net Unit Weight:

Article without MSDS: N
Technical Entry NOS Shipping Number:
Radioactivity:
Form:
Net Explosive Weight:
Coast Guard Ammunition Code:
Magnetism: N/P
AF MMAC Code:
DOD Exemption Number:
Limited Quantity Indicator:
Multiple Kit Number: 0
Kit Indicator: N

Kit Part Indicator: N
Review Indicator: Y
Additional Data:

Department of Transportation Information

DOT Proper Shipping Name: VINYL CHLORIDE, INHIBITED OR VINYL CHLORIDE, STABILIZED
DOT PSN Code: PRS
Symbols:
DOT PSN Modifier:
Hazard Class: 2.1
UN ID Number: UN1086
DOT Packaging Group:
Label: FLAMMABLE GAS
Special Provision(s): 21,B44
Packaging Exception: 306
Non Bulk Packaging: 304
Bulk Packaging: 314,315
Maximimum Quanity in Passenger Area: FORBIDDEN
Maximimum Quanity in Cargo Area: 150 KG
Stow in Vessel Requirements: B
Requirements Water/Sp/Other: 40

IMO Detail Information

IMO Proper Shipping Name: VINYL CHLORIDE, INHIBITED
IMO PSN Code: PJJ
IMO PSN Modifier:
IMDG Page Number: 2186
UN Number: 1086
UN Hazard Class: 2(2.1)
IMO Packaging Group: -
Subsidiary Risk Label: -
EMS Number: 2-07
Medical First Aid Guide Number: 340

IATA Detail Information

IATA Proper Shipping Name: VINYL CHLORIDE, INHIBITED
IATA PSN Code: ZHW
IATA PSN Modifier:
IATA UN Id Number: 1086
IATA UN Class: 2.1
Subsidiary Risk Class:
UN Packaging Group:
IATA Label: FLAMMABLE GAS
Packaging Note for Passengers: FORB
Maximum Quantity for Passengers: FORB
Packaging Note for Cargo: 200
Maximum Quantity for Cargo: 150KG
Exceptions: A1

AFI Detail Information

AFI Proper Shipping Name: VINYL CHLORIDE, INHIBITED
AFI Symbols:

AFI PSN Code: ZHW
AFI PSN Modifier:
AFI UN Id Number: UN1086
AFI Hazard Class: 2.1
AFI Packing Group: N/A
AFI Label:
Special Provisions: P4
Back Pack Reference: A6.3, A6.5

HAZCOM Label Information

Product Identification: VINYL CHLORIDE
CAGE: 0FB11
Assigned Individual: N
Company Name: MATHESON GAS PRODUCTS
Company PO Box:
Company Street Address1: 30 SEAFIEW DRIVE
Company Street Address2: SEACAUCUS, NJ 07096 US
Health Emergency Telephone: 201-933-2400
Label Required Indicator: Y
Date Label Reviewed: 10/08/1992
Status Code: C
Manufacturer's Label Number:
Date of Label: 10/08/1992
Year Procured: N/K
Organization Code: G
Chronic Hazard Indicator: Y
Eye Protection Indicator: YES
Skin Protection Indicator: YES
Respiratory Protection Indicator: YES
Signal Word: DANGER
Health Hazard: Moderate
Contact Hazard: Moderate
Fire Hazard: Severe
Reactivity Hazard: Slight

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Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

CARBON DISULFIDE

Section 1 - Product and Company Identification
CARBON DISULFIDE

Product Identification: CARBON DISULFIDE
Date of MSDS: 01/01/1987 **Technical Review Date:** 03/01/2001
FSC: 6810 **NIIN:** 00-112-6000
Submitter: D DG
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: SPECTRUM CHEMICAL MANUFACTURING CORP.
Manufacturer's Address1: 14422 SOUTH SAN PEDRO STREET
Manufacturer's Address2: GARDENA, CA 90248-2027
Manufacturer's Country: US
General Information Telephone: 213-516-8000
Emergency Telephone: 213-516-8000
Emergency Telephone: 213-516-8000
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: N
Published: Y
CAGE: 63415
Special Project Code: N

Item Description

Item Name: CARBON DISULFIDE,ACS
Item Manager: S9G
Specification Number: 0-C-265
Type/Grade/Class: N/R
Unit of Issue: BT **Quantitative Expression:** 00000000500ML
Unit of Issue Quantity: B
Type of Container: BOTTLE

Contractor Information

Contractor's Name: SHAPE PRODUCTS
Contractor's Address1: 1127 57TH AVE.
Contractor's Address2: OAKLAND, CA 94621-4427
Contractor's Telephone: 510-534-1186 OR 800-444-0015
Contractor's CAGE: 3D869

Contractor Information

Contractor's Name: SPECTRUM CHEMICAL MFG. CORP.
Contractor's Address1: 14422 SOUTH SAN PEDRO STREET
Contractor's Address2: GARDENA, CA 90248-2027
Contractor's Telephone: 310-516-8000
Contractor's CAGE: 63415

Section 2 - Compositon/Information on Ingredients
CARBON DISULFIDE

Ingredient Name: CARBON DISULFIDE (SARA III)
Ingredient CAS Number: 75-15-0 **Ingredient CAS Code:** M
RTECS Number: FF6650000 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:

>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: 100
% Enviromental Weight:
Other REC Limits: NONE SPECIFIED
OSHA PEL: 20 PPM **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: S, 10 PPM; 9293 **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity: 100 LBS
DOT Reporting Quantity: 100 LBS
Ozone Depleting Chemical: N

Section 3 - Hazards Identification, Including Emergency Overview
CARBON DISULFIDE

Health Hazards Acute & Chronic: CARBON DISULFIDE IS ABSORBED VERY RAPIDLY THROUGH THE SKIN.

Signs & Symptoms of Overexposure:
VOMITING, DIARRHEA, DEPRESSION, LOSS OF CONSCIOUSNESS,CONVULSIONS, RESPIRATORY PARALYSIS AND POSSIBLE DEATH. ACTS ON CENTRAL NERVOUS SYSTEM.

Medical Conditions Aggravated by Exposure:
NONE GIVEN BY MANUFACTURER (SUPPLIER).

LD50 LC50 Mixture: LD50 (ORAL RAT) IS UNKNOWN

Route of Entry Indicators:
Inhalation: YES
Skin: YES
Ingestion: YES

Carcenogenicity Indicators
NTP: NO
IARC: NO
OSHA: NO

Carcinogenicity Explanation: NONE OF THE COMPOUNDS IN THIS PRODUCT IS LISTED BY IARC, NTP, OR OSHA AS A CARCINOGEN.

Section 4 - First Aid Measures
CARBON DISULFIDE

First Aid:
EYE:FLUSH W/WATER 15 MIN, HOLD LIDS OPEN. SKIN:WASH WITH SOAP & WATER. REMOVE CONTAMINATED CLOTHING AND LAUNDER BEFORE REUSE. INHALED:REMOVE TO FRESH AIR. RESTORE BREATHING IF NECESSARY. GET MEDICAL CARE. INGESTED:GET IMMEDIATE MEDICAL CARE. GIVE NOTHING BY MOUTH IF UNCONSCIOUS. IF SYMPTOMS PERSIST OR ARE SEVERE,SEE A DOCTOR.

Section 5 - Fire Fighting Measures
CARBON DISULFIDE

Fire Fighting Procedures:
WEAR FIRE FIGHTING PROTECTIVE EQUIPMENT AND A FULL FACED SELF CONTAINED BREATHING APPARATUS. EVACUATE AREA. COOL FIRE EXPOSED CONTAINERS WITH WATER SPRAY.
Unusual Fire or Explosion Hazard:
COMBUSTION OR HEAT OF FIRE MAY PRODUCE HAZARDOUS DECOMPOSITION PRODUCTS AND VAPORS.
Extinguishing Media:
USE WATER FOG OR SPRAY, CARBON DIOXIDE, OR DRY CHEMICAL.
Flash Point: =-30.C, -22.F **Flash Point Text:**

Autoignition Temperature:
Autoignition Temperature Text: UNKNON
Lower Limit(s): 1.0
Upper Limit(s): 50.0

Seetion 6 - Accidental Release Measures
CARBON DISULFIDE

Spill Release Procedures:
ALLOW TO EVAPORATE OR WIPE/SOAK UP WITH CLOTH OR PAPER TOWEL OR INERT ABSORBENT. PUT IN DISPOSAL CONTAINER. REMOVE RESIDUE WITH WATER.

Section 7 - Handling and Storage
CARBON DISULFIDE

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
CARBON DISULFIDE

Repiratory Protection:
USE NIOSH/MSHA APPROVED AIR SUPPLIED RESPIRATOR OR RESPIRATOR FOR ORGANIC VAPOR/MIST IF EXPOSURE IS ABOVE THE TLV/PEL. SEE 29 CFR 1910.134 FOR REGULATIONS PERTAINING TO RESPIRATOR USE.
Ventilation:
USE LOCAL EXHAUST AS NEEDED TO CONTROL EXPOSURE BELOW PEL/TLV.
Protective Gloves:

NEOPRENE, OR OTHER IMPERVIOUS
Eye Protection: SPLASH GOGGLES AND/OR FACE SHIELD
Other Protective Equipment: EYE WASH STATION AND SAFETY SHOWER. IMPERVIOUS CLOTHING AND APRON AS REQUIRED.
Work Hygenic Practices: CARBON DISULFIDE IS ABSORBED RAPIDLY THROUGH THE SKIN. USE STRICT CHEMICAL HYGIENE PRACTICE. AVOID SKIN CONTACT.
Supplemental Health & Safety Information: NONE

Section 9 - Physical & Chemical Properties
CARBON DISULFIDE

HCC: F5
NRC/State License Number: NOT RELEVANT
Net Property Weight for Ammo: N/R
Boiling Point: =46.1C, 115.F **Boiling Point Text:**
Melting/Freezing Point: Melting/Freezing Text: UNKNOWN
Decomposition Point: Decomposition Text: UNKNOWN
Vapor Pressure: 400 MM **Vapor Density:** 2.67
Percent Volatile Organic Content:
Specific Gravity: 1.26
Volatile Organic Content Pounds per Gallon:
pH: N/K
Volatile Organic Content Grams per Liter:
Viscosity: UNKNOWN
Evaporation Weight and Reference: UNKNOWN
Solubility in Water: 0.22%
Appearance and Odor: CLEAR LIQUID, UNPLEASANT ODOR
Percent Volatiles by Volume: 100
Corrosion Rate: UNKNOWN

Section 10 - Stability & Reactivity Data
CARBON DISULFIDE

Stability Indicator: YES
Materials to Avoid:
AZIDES
Stability Condition to Avoid:
HIGH HEAT, OPEN FLAMES AND OTHER SOURCES OF IGNITION
Hazardous Decomposition Products:
CARBON MONOXIDE, CARBON DIOXIDE, SULFUR OXIDES
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
NOT RELEVANT

Section 11 - Toxicological Information
CARBON DISULFIDE

Toxicological Information:
N/P

Section 12 - Ecological Information
CARBON DISULFIDE

Ecological Information:
N/P

Section 13 - Disposal Considerations
CARBON DISULFIDE

Waste Disposal Methods:
DISPOSE I/A/W ALL FEDERAL, STATE AND LOCAL REGULATIONS. MANUFACTURER MAKES NO SUGGESTIONS AS TO DISPOSAL PROCEDURE.

Section 14 - MSDS Transport Information
CARBON DISULFIDE

Transport Information:
N/P

Section 15 - Regulatory Information
CARBON DISULFIDE

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
CARBON DISULFIDE

Other Information:
N/P

HMIS Transportation Information

Product Identification: CARBON DISULFIDE
Transporation ID Number: 48200
Responsible Party CAGE: 63415
Date MSDS Prepared: 01/01/1987
Date MSDS Reviewed: 03/01/2001
MFN: 03/01/2001
Submitter: D DG
Status Code: C

Container Information
- **Unit of Issue:** BT
- **Container Quantity:** B
- **Type of Container:** BOTTLE
- **Net Unit Weight:** 1.386 LBS

Article without MSDS: N
Technical Entry NOS Shipping Number:
Radioactivity:
Form:

Net Explosive Weight: N/R
Coast Guard Ammunition Code: N/R
Magnetism: N/R
AF MMAC Code:
DOD Exemption Number: N/R
Limited Quantity Indicator:
Multiple Kit Number: 0
Kit Indicator: N
Kit Part Indicator: N
Review Indicator: Y
Additional Data:
NOT ACCEPTABLE BY AIR. DOT RQ: 100 LBS.

Department of Transportation Information

DOT Proper Shipping Name: CARBON DISULFIDE
DOT PSN Code: CVR
Symbols:
DOT PSN Modifier:
Hazard Class: 3
UN ID Number: UN1131
DOT Packaging Group: I
Label: FLAMMABLE LIQUID, POISON
Special Provision(s): B16,T18,T26,T29
Packaging Exception:
Non Bulk Packaging: 201
Bulk Packaging: 243
Maximimum Quanity in Passenger Area: FORBIDDEN
Maximimum Quanity in Cargo Area: FORBIDDEN
Stow in Vessel Requirements: D
Requirements Water/Sp/Other: 18,40,115

IMO Detail Information

IMO Proper Shipping Name: CARBON DISULPHIDE
IMO PSN Code: DOT
IMO PSN Modifier:
IMDG Page Number: 3109
UN Number: 1131
UN Hazard Class: 3.1
IMO Packaging Group: I
Subsidiary Risk Label: TOXIC
EMS Number: 3-01
Medical First Aid Guide Number: 210

IATA Detail Information

IATA Proper Shipping Name: FORBIDDEN BY THIS MODE OF TRANSPORTATION
IATA PSN Code: ZZY
IATA PSN Modifier:
IATA UN Id Number: N/R
IATA UN Class: N/R
Subsidiary Risk Class: N/R
UN Packaging Group: N/R
IATA Label: N/R
Packaging Note for Passengers: N/R

Maximum Quantity for Passengers: N/R
Packaging Note for Cargo: N/R
Maximum Quantity for Cargo: N/R
Exceptions: N/R

AFI Detail Information

AFI Proper Shipping Name: FORBIDDEN BY THIS MODE OF TRANSPORTATION
AFI Symbols:
AFI PSN Code: ZZY
AFI PSN Modifier:
AFI UN Id Number: N/R
AFI Hazard Class: N/R
AFI Packing Group: N/R
AFI Label: N/R
Special Provisions: N/A
Back Pack Reference: N/A

HAZCOM Label Information

Product Identification: CARBON DISULFIDE
CAGE: 63415
Assigned Individual: N
Company Name: SPECTRUM CHEMICAL MFG. CORP.
Company PO Box:
Company Street Address1: 14422 SOUTH SAN PEDRO STREET
Company Street Address2: GARDENA, CA 90248-2027 US
Health Emergency Telephone: 213-516-8000
Label Required Indicator: Y
Date Label Reviewed: 11/07/1991
Status Code: C
Manufacturer's Label Number: NONE
Date of Label: 11/07/1991
Year Procured: N/K
Organization Code: F
Chronic Hazard Indicator: N/P
Eye Protection Indicator: YES
Skin Protection Indicator: YES
Respiratory Protection Indicator: YES
Signal Word: DANGER
Health Hazard: Moderate
Contact Hazard: Moderate
Fire Hazard: Severe
Reactivity Hazard: None

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Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format) For Cornell University Convenience Only

METHYLENE CHLORIDE

Section 1 - Product and Company Identification
METHYLENE CHLORIDE

Product Identification: METHYLENE CHLORIDE
Date of MSDS: 01/01/1985 **Technical Review Date:** 12/26/1984
FSC: 6810 **NIIN:** 00-616-9188
Submitter: D DG
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: YANCY MINERALS INCORPORATED
Manufacturer's Address1:
Manufacturer's Address2: N/P, NK 00000
Manufacturer's Country: NK
General Information Telephone:
Emergency Telephone: (203)624-8067
Emergency Telephone: (203)624-8067
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: Y
Published: Y
CAGE: 95652
Special Project Code: N

Item Description

Item Name: DICHLOROMETHANE,TECHNICAL
Item Manager: S9G
Specification Number: MIL-D-6998
Type/Grade/Class: NONE
Unit of Issue: DR **Quantitative Expression:** 00000000055GL
Unit of Issue Quantity: 1
Type of Container: DRUM

Contractor Information

Contractor's Name: YANCY MINERALS INCORPORATED
Contractor's Address1: UNKNOWN
Contractor's Address2: UNKNOWN, NK 00000
Contractor's Telephone: UNKNOWN
Contractor's CAGE: 95652

Section 2 - Compositon/Information on Ingredients
METHYLENE CHLORIDE

Ingredient Name: METHYLENE CHLORIDE (SARA III)
Ingredient CAS Number: 75-09-2 **Ingredient CAS Code:** M
RTECS Number: PA8050000 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: 100

% Enviromental Weight:
Other REC Limits: N/P
OSHA PEL: 500 PPM/C,1000; Z2 **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: 50 PPM, A2; 9192 **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity: 1000 LBS
DOT Reporting Quantity: 1000 LBS
Ozone Depleting Chemical: N

Section 3 - Hazards Identification, Including Emergency Overview
METHYLENE CHLORIDE

Health Hazards Acute & Chronic: N/P

Signs & Symptoms of Overexposure:
LIGHT HEADEDNESS,MENTAL CONFUSTION,NAUSEA,HEADACHE.TINGLING OR CREEPING SKIN FEELING ON INHALATION.

Medical Conditions Aggravated by Exposure:
N/P

LD50 LC50 Mixture: N/P

Route of Entry Indicators:
Inhalation: N/P
Skin: N/P
Ingestion: N/P

Carcenogenicity Indicators
NTP: N/P
IARC: N/P
OSHA: N/P

Carcinogenicity Explanation: N/P

Section 4 - First Aid Measures
METHYLENE CHLORIDE

First Aid:
REMOVE TO FRESH AIR,IF UNCONSCIOUS,USE ARTIFICIAL RESPIRATION & CALL A PHYSICIAN,KEEP WARM & COMFORTABLE. FOR EYE CONTACT.WASH WITH WATER FOR 15 MIN. IN CASE OF SKIN CONTACT, WASH WITH SOAP & WATER

Section 5 - Fire Fighting Measures
METHYLENE CHLORIDE

Fire Fighting Procedures:
WEAR SELF-CNTD BRTHG,APP H*20 SPRAY TO COOL CONTR.
Unusual Fire or Explosion Hazard:

MAY DECOMPOSE & GIVE PHOSGENE GAS.
Extinguishing Media:
CO*2, FOAM, DRY CHEM & H*2O FOG.
Flash Point: Flash Point Text: NON-FLAMMABLE

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): 15.5
Upper Limit(s): 66.0

Section 6 - Accidental Release Measures
METHYLENE CHLORIDE

Spill Release Procedures:
ALLOW MATERIAL TO VAPORIZE.KEEP UNPROTECTED EMPLOYEES AWAY.REMOVE IGNITION SOURCES.CLOSE VALVE IF PERTINENT & WITHOUT RISK.

Section 7 - Handling and Storage
METHYLENE CHLORIDE

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
METHYLENE CHLORIDE

Repiratory Protection:
SELF-CONTAINEE BREATHING APPARATUS;POSITIVE PRESSUR HOSE MASKS
Ventilation:
PROVIDE MECHAN(GEN/LOCAL EXHAUST)VENT TO MAINTN **Protective Gloves:**
IMPERVIOUS
Eye Protection: GOGGLES/FACE SHIELD
Other Protective Equipment: EYE WASH STATION. APRONS. SPECIAL IMPERVIOUS CLOTHING.
Work Hygenic Practices: N/P
Supplemental Health & Safety Information: MSDS NOT DATED & SIGNED

Section 9 - Physical & Chemical Properties
METHYLENE CHLORIDE

HCC: T4
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: 104F
Melting/Freezing Point: Melting/Freezing Text: N/A
Decomposition Point: Decomposition Text: N/A
Vapor Pressure: 350 **Vapor Density:** 2.93
Percent Volatile Organic Content:
Specific Gravity: 1.326

Volatile Organic Content Pounds per Gallon:
pH: N/P
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: 1.8
Solubility in Water: MODERATE
Appearance and Odor: CLEAR,COLORLESS LIQUID WITH PLEASANT,AROMATIC ODOR
Percent Volatiles by Volume: 100
Corrosion Rate: N/P

Section 10 - Stability & Reactivity Data
METHYLENE CHLORIDE

Stability Indicator: YES
Materials to Avoid:
ALUMINUM,POTASSIUM,SODIUM
Stability Condition to Avoid:
EXCESSIVE HEAT,AUTOIGNITION TEMPERATURE 1180-1220F
Hazardous Decomposition Products:
PHOSGENE GAS
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
HIGH TEMPERATURE

Section 11 - Toxicological Information
METHYLENE CHLORIDE

Toxicological Information:
N/P

Section 12 - Ecological Information
METHYLENE CHLORIDE

Ecological Information:
N/P

Section 13 - Disposal Considerations
METHYLENE CHLORIDE

Waste Disposal Methods:
RESIDUE MAY BE POURED ON SAND,EARTH OR ASHES AT A SAFE DISTANCE FROM OCCUPIED AREAS & ALLOWED TO EVAPORATE INTO THE ATMOSPHERE,ACCORDLY IN CONSULTATION WITH LOCAL,STATE & FEDERAL AUTHORITIES.

Section 14 - MSDS Transport Information
METHYLENE CHLORIDE

Transport Information:
N/P

Section 15 - Regulatory Information
METHYLENE CHLORIDE

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
METHYLENE CHLORIDE

Other Information:
N/P

HMIS Transportation Information

Product Identification: METHYLENE CHLORIDE
Transporation ID Number: 79915
Responsible Party CAGE: 95652
Date MSDS Prepared: 01/01/1985
Date MSDS Reviewed: 12/26/1984
MFN: 12/26/1984
Submitter: D DG
Status Code: C

Container Information
Unit of Issue: DR
Container Quantity: 1
Type of Container: DRUM
Net Unit Weight:

Article without MSDS: N
Technical Entry NOS Shipping Number:
Radioactivity:
Form:
Net Explosive Weight:
Coast Guard Ammunition Code:
Magnetism: N/P
AF MMAC Code:
DOD Exemption Number:
Limited Quantity Indicator:
Multiple Kit Number: 0
Kit Indicator: N
Kit Part Indicator: N
Review Indicator: Y
Additional Data:
HANDLE WITH CARE AVOID INHALATION OF VAPORS & SKIN OR EYE CONTACT.PROVIDE ADEQUATE VENTILATION. TARG ET ORGANS:SKIN,CVS,EYES & CNS.

Department of Transportation Information

DOT Proper Shipping Name: DICHLOROMETHANE
DOT PSN Code: EUP

Symbols:
DOT PSN Modifier:
Hazard Class: 6.1
UN ID Number: UN1593
DOT Packaging Group: III
Label: KEEP AWAY FROM FOOD
Special Provision(s): N36,T13
Packaging Exception: 153
Non Bulk Packaging: 203
Bulk Packaging: 241
Maximimum Quanity in Passenger Area: 60 L
Maximimum Quanity in Cargo Area: 220 L
Stow in Vessel Requirements: A
Requirements Water/Sp/Other:

IMO Detail Information

IMO Proper Shipping Name: DICHLOROMETHANE
IMO PSN Code: FLF
IMO PSN Modifier:
IMDG Page Number: 6127
UN Number: 1593
UN Hazard Class: 6.1
IMO Packaging Group: III
Subsidiary Risk Label: -
EMS Number: 6.1-02
Medical First Aid Guide Number: 340

IATA Detail Information

IATA Proper Shipping Name: DICHLOROMETHANE
IATA PSN Code: IYW
IATA PSN Modifier:
IATA UN Id Number: 1593
IATA UN Class: 6.1
Subsidiary Risk Class:
UN Packaging Group: III
IATA Label: TOXIC
Packaging Note for Passengers: 605
Maximum Quantity for Passengers: 60L
Packaging Note for Cargo: 612
Maximum Quantity for Cargo: 220L
Exceptions:

AFI Detail Information

AFI Proper Shipping Name: DICHLOROMETHANE
AFI Symbols:
AFI PSN Code: IYW
AFI PSN Modifier:
AFI UN Id Number: UN1593
AFI Hazard Class: 6.1
AFI Packing Group: III
AFI Label:
Special Provisions: P5, N36
Back Pack Reference: A10.5

HAZCOM Label Information

Product Identification: METHYLENE CHLORIDE
CAGE: 95652
Assigned Individual: N
Company Name: YANCY MINERALS INCORPORATED
Company PO Box:
Company Street Address1: UNKNOWN
Company Street Address2: UNKNOWN, NK 00000 NK
Health Emergency Telephone: 203-624-8067
Label Required Indicator: Y
Date Label Reviewed: 09/12/1990
Status Code: C
Manufacturer's Label Number: N/R
Date of Label: 09/12/1990
Year Procured: N/K
Organization Code: F
Chronic Hazard Indicator: Y
Eye Protection Indicator: YES
Skin Protection Indicator: YES
Respiratory Protection Indicator: YES
Signal Word: WARNING
Health Hazard: Moderate
Contact Hazard: Slight
Fire Hazard: None
Reactivity Hazard: None

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Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

TRANS-1,2-DICHLOROETHENE, O-660

Section 1 - Product and Company Identification
TRANS-1,2-DICHLOROETHENE, O-660

Product Identification: TRANS-1,2-DICHLOROETHENE, O-660
Date of MSDS: 09/01/1988 **Technical Review Date:** 12/27/1995
FSC: 6810 **NIIN: LIIN:** 00N067797
Submitter: N EN
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: CHEM SERVICE INC
Post Office Box: 3108
Manufacturer's Address1:
Manufacturer's Address2: WEST CHESTER, PA 19381
Manufacturer's Country: US
General Information Telephone: 215-692-3026
Emergency Telephone: 215-692-3026
Emergency Telephone: 215-692-3026
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: N
Published: Y
CAGE: 84898
Special Project Code: N

Contractor Information

Contractor's Name: CHEM SERVICE INC
Post Office Box: 3108
Contractor's Address1: N/K
Contractor's Address2: WEST CHESTER, PA 19381
Contractor's Telephone: 215-692-3026
Contractor's CAGE: 84898

Contractor Information

Contractor's Name: CHEM SERVICE, INC
Post Office Box: 599
Contractor's Address1: 660 TOWER LN
Contractor's Address2: WEST CHESTER, PA 19301-9650
Contractor's Telephone: 610-692-3026
Contractor's CAGE: 8Y898

Section 2 - Compositon/Information on Ingredients
TRANS-1,2-DICHLOROETHENE, O-660

Ingredient Name: ETHYLENE, 1,2-DICHLORO-, (E)-; (TRANS-1,2-DICHLOROETHYLENE) (SARA 313) (CERCLA)
Ingredient CAS Number: 156-60-5 **Ingredient CAS Code:** M
RTECS Number: KV9400000 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:

% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: 200 PPM (MFR) **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: 200 PPM (MFR) **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity: 1000 LBS
DOT Reporting Quantity: 1000 LBS
Ozone Depleting Chemical: N

Section 3 - Hazards Identification, Including Emergency Overview
TRANS-1,2-DICHLOROETHENE, O-660

Health Hazards Acute & Chronic: ACUTE: CAN BE HARMFUL IF ABSORBED THRU SKIN, INHALED/SWALLOWED. CAN CAUSE SKIN AND EYE IRRITATION. CAN BE IRRITATING TO MUCOUS MEMBRANES. VAPORS AND/OR DIRECT EYE CONTACT CAN CAUSE SEVERE EYE BURNS. C HRONIC: PROLONGED EXPOSURE MAY CAUSE NAUSEA, HEADACHE, DIZZINESS AND/OR EYE DAMAGE. CAN CAUSE LIVER & KIDNEY INJURY.

Signs & Symptoms of Overexposure:
SEE HEALTH HAZARDS.

Mcdical Conditions Aggravated by Exposure:
NONE SPECIFIED BY MANUFACTURER.

LD50 LC50 Mixture: LD50 (ORAL RAT): 7536 MG/KG.

Route of Entry Indicators:
Inhalation: YES
Skin: YES
Ingestion: YES

Carcenogenicity Indicators
NTP: NO
IARC: NO
OSHA: NO

Carcinogenicity Explanation: NOT RELEVANT.

Section 4 - First Aid Measures
TRANS-1,2-DICHLOROETHENE, O-660

First Aid:
AN ANTIDOTE IS A SUBSTANCE INTENDED TO COUNTERACT EFT OF POIS. IT SHOULD BE ADMIN ONLY BY MD/TRAINED EMER PERS. MED ADVICE CAN BE OBTAINED FROM POIS CTL CTR. EYES: FLUSH CONTINUOUSLY W/WATER FOR AT LE AST 15 MIN. SKIN: FLUSH W/WATER FOR 15-20 MIN. IF NO BURNS HAVE OCCURRED, USE SOAP & WATER TO CLEANSE SKIN. INHAL: REMOVE TO FRESH AIR. ADMIN OXYGEN IF DFCLT BRTHG. IF

BRTHG HAS STOPPED, (SUP DAT)

Section 5 - Fire Fighting Measures
TRANS-1,2-DICHLOROETHENE, O-660

Fire Fighting Procedures:
WEAR NIOSH/MSHA APPROVED SCBA & FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire or Explosion Hazard:
NONE SPECIFIED BY MANUFACTURER.
Extinguishing Media:
USE CARBON DIOXIDE, DRY CHEMICAL POWDER OR WATER SPRAY.
Flash Point: Flash Point Text: 42.8F,6.0C

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): N/K
Upper Limit(s): N/K

Section 6 - Accidental Release Measures
TRANS-1,2-DICHLOROETHENE, O-660

Spill Release Procedures:
EVACUATE AREA. WEAR APPROPRIATE OSHA-REGULATED EQUIPMENT. VENTILATE AREA. ABSORB ON VERMICULITE OR SIMILAR MATERIAL. SWEEP UP AND PLACE IN AN APPROPRIATE CONTAINER. HOLD FOR DISPOSAL. WASH CONTAMINATE D SURFACES TO REMOVE ANY RESIDUES.

Section 7 - Handling and Storage
TRANS-1,2-DICHLOROETHENE, O-660

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
TRANS-1,2-DICHLOROETHENE, O-660

Repiratory Protection:
USE NIOSH/MSHA APPROVED RESPIRATOR APPROPRIATE FOR EXPOSURE OF CONCERN (FP N).
Ventilation:
THIS CHEMICAL SHOULD BE HANDLED ONLY IN A HOOD.
Protective Gloves:
IMPERVIOUS GLOVES (FP N).
Eye Protection: ANSI APPRVD CHEM WORKERS GOGGS (FP N).
Other Protective Equipment: EMERGENCY EYEWASH & DELUGE SHOWER MEETING ANSI DESIGN CRITERIA (FP N).
Work Hygenic Practices: CONTACT LENSES SHOULD NOT BE WORN IN THE LABORATORY.
Supplemental Health & Safety Information: FIRST AID PROC: ADMIN ARTF RESP. IF PATIENT IN CARD ARREST, ADMIN CPR. CONTINUE LIFE SUPPORTING MEASURES UNTIL MED

ASSIST HAS ARRIVED. INGEST: CALL MD IMMED (FP N). OTHER PREC: THIS PROD MAY NOT BE US ED AS DRUGS, COSMETICS, AGRICULTURAL/PESTICIDAL PRODS, FOOD ADDITIVES/AS HOUSEHOLD CHEMICALS.

Section 9 - Physical & Chemical Properties
TRANS-1,2-DICHLOROETHENE, O-660

HCC:
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: 118F,48C
Melting/Freezing Point: Melting/Freezing Text: -58F,-50C
Decomposition Point: Decomposition Text: N/K
Vapor Pressure: N/K **Vapor Density:** N/K
Percent Volatile Organic Content:
Specific Gravity: 1.257
Volatile Organic Content Pounds per Gallon:
pH: N/K
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: N/K
Solubility in Water: INSOLUBLE
Appearance and Odor: COLORLESS LIQUID
Percent Volatiles by Volume: N/K
Corrosion Rate: N/K

Section 10 - Stability & Reactivity Data
TRANS-1,2-DICHLOROETHENE, O-660

Stability Indicator: YES
Materials to Avoid:
INCOMPATIBLE WITH STRONG OXIDIZING AGENTS, STRONG BASES. REACTS WITH WATER AND MOST REACTIVE HYDROGEN COMPOUNDS.
Stability Condition to Avoid:
FLAMMABLE.
Hazardous Decomposition Products:
DECOMPOSITION LIBERATES TOXIC FUMES. DECOMPOSITION PRODUCTS ARE CORROSIVE.
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
NOT RELEVANT.

Section 11 - Toxicological Information
TRANS-1,2-DICHLOROETHENE, O-660

Toxicological Information:
N/P

Section 12 - Ecological Information
TRANS-1,2-DICHLOROETHENE, O-660

Ecological Information:

N/P

Section 13 - Disposal Considerations
TRANS-1,2-DICHLOROETHENE, O-660

Waste Disposal Methods:
BURN IN A CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER AND SCRUBBER. DISPOSE OF IN ACCORDANCE W/LOCAL, STATE & FEDERAL REGULATIONS (FP N).

Section 14 - MSDS Transport Information
TRANS-1,2-DICHLOROETHENE, O-660

Transport Information:
N/P

Section 15 - Regulatory Information
TRANS-1,2-DICHLOROETHENE, O-660

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
TRANS-1,2-DICHLOROETHENE, O-660

Other Information:
N/P

HAZCOM Label Information

Product Identification: TRANS-1,2-DICHLOROETHENE, O-660
CAGE: 84898
Assigned Individual: N
Company Name: CHEM SERVICE INC
Company PO Box: 3108
Company Street Address1: N/K
Company Street Address2: WEST CHESTER, PA 19381 US
Health Emergency Telephone: 215-692-3026
Label Required Indicator: Y
Date Label Reviewed: 12/27/1995
Status Code: C
Manufacturer's Label Number:
Date of Label: 12/27/1995
Year Procured: N/K
Organization Code: G
Chronic Hazard Indicator: Y
Eye Protection Indicator: YES
Skin Protection Indicator: YES
Respiratory Protection Indicator: YES
Signal Word: DANGER

Health Hazard: Moderate
Contact Hazard: Slight
Fire Hazard: Severe
Reactivity Hazard: Slight

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Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

F29 1,1-DICHLOROETHENE

Section 1 - Product and Company Identification
F29 1,1-DICHLOROETHENE

Product Identification: F29 1,1-DICHLOROETHENE
Date of MSDS: 01/26/1995 **Technical Review Date:** 04/10/1996
FSC: 6550 **NIIN: LIIN:** 00F037520
Submitter: F BT
Status Code: C
MFN: 02
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: CHEM SERVICE INC
Post Office Box: 3108
Manufacturer's Address1: 660 TOWER LN
Manufacturer's Address2: WEST CHESTER, PA 19381-3108
Manufacturer's Country: US
General Information Telephone: 215-692-3026/800-452-9994
Emergency Telephone: 215-386-2100/215-692-3026
Emergency Telephone: 215-386-2100/215-692-3026
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: Y
Published: Y
CAGE: 84898
Special Project Code: N

Preparer Information

Preparer's Name: CHEM SERVICE INC
Post Office Box: 3108
Preparer's Address1: N/K
Preparer's Address2: WEST CHESTER, PA 19381
Preparer's CAGE: 84898
Assigned Individual: N

Contractor Information

Contractor's Name: CHEM SERVICE INC
Post Office Box: 3108
Contractor's Address1: N/K
Contractor's Address2: WEST CHESTER, PA 19381
Contractor's Telephone: 215-692-3026
Contractor's CAGE: 84898

Contractor Information

Contractor's Name: CHEM SERVICE, INC
Post Office Box: 599
Contractor's Address1: 660 TOWER LN
Contractor's Address2: WEST CHESTER, PA 19301-9650
Contractor's Telephone: 610-692-3026
Contractor's CAGE: 8Y898

Section 2 - Compositon/Information on Ingredients F29 1,1-DICHLOROETHENE

Ingredient Name: VINYLIDENE CHLORIDE, 1,1-DICHLOROETHENE, 1,1-DICHLOROETHYLENE, VDC
Ingredient CAS Number: 75-35-4 **Ingredient CAS Code:** M
RTECS Number: KV9275000 **RTECS Code:** M

=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: 5 PPM
OSHA PEL: N/K **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: 20 MG/CUM **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity: 100 LBS
DOT Reporting Quantity: 100 LBS
Ozone Depleting Chemical: N

Section 3 - Hazards Identification, Including Emergency Overview
F29 1,1-DICHLOROETHENE

Health Hazards Acute & Chronic: SKIN: IRRITATION & SENSITIZATION, CAN CAUSE AN ALLERGIC SKIN REACTION. INHALATION: CAN BE IRRITATING TO MUCOUS MEMBRANES. NARCOTIC AT HIGH CONCENTRATIONS, EXPOSURE CAN CAUSE LIVER & KIDNEY DAMAGE, NER VOUS SYSTEM INJURY & CARDIOVASCULAR SYSTEM INJURY. CAN CAUSE DELAYED ADVERSE HEALTH EFFECTS.

Signs & Symptoms of Overexposure:
IRRITATION.

Medical Conditions Aggravated by Exposure:
N/K

LD50 LC50 Mixture: ORAL LD50(RAT/MOUSE): 200 MG/KG

Route of Entry Indicators:
Inhalation: YES
Skin: NO
Ingestion: NO

Carcenogenicity Indicators
NTP: NO
IARC: NO
OSHA: NO

Carcinogenicity Explanation: NONE

Section 4 - First Aid Measures
F29 1,1-DICHLOROETHENE

First Aid:
EYES: FLUSH CONTINUOUSLY W/WATER FOR 15-20 MINS. SKIN: FLUSH W/WATER FOR 15-20 MINS. IF NO BURNS HAVE OCCURED-USE SOAP & WATER TO CLEANSE. INHALATION: REMOVE TO FRESH AIR. GIVE OXYGEN/MOUTH TO MOUTH I F NEEDED. CONTINUE LIFE SUPPORTING MEASURES UNTIL MEDICAL ASSISTANCE HAS ARRIVED. KEEP WARM & QUIET. INGESTION: DON'T GIVE LIQUIDS/INDUCE VOMITING TO AN UNCONSCIOUS/CONVULSING PERSON. (SEE SUPP)

Section 5 - Fire Fighting Measures
F29 1,1-DICHLOROETHENE

Fire Fighting Procedures:
N/K
Unusual Fire or Explosion Hazard:
FLAMMABLE CHEMICAL.
Extinguishing Media:
CO2, DRY CHEMICAL POWDER. DON'T USE WATER!
Flash Point: Flash Point Text: 5F

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): 6.5
Upper Limit(s): 15.5

Section 6 - Accidental Release Measures
F29 1,1-DICHLOROETHENE

Spill Release Procedures:
EVACUATE AREA. WEAR APPROPRIATE OSHA REGULATED EQUIPMENT. VENTILATE AREA. ABSORB ON VERMICULITE/SIMILAR MATERIAL. SWEEP UP & PLACE IN AN APPROPRIATE CONTAINER. HOLD FOR DISPOSAL. WASH CONTAMINATED SUR FACES TO REMOVE ANY RESIDUES.

Section 7 - Handling and Storage
F29 1,1-DICHLOROETHENE

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
F29 1,1-DICHLOROETHENE

Repiratory Protection:
USE APPROPRIATE OSHA/MSHA APPROVED SAFETY EQUIPMENT.
Ventilation:
CHEMICAL HOOD.

Protective Gloves:
N/K
Eye Protection: GLASS SHIELDS
Other Protective Equipment: N/K
Work Hygenic Practices: REMOVE/LAUNDER CONTAMINATED CLOTHING BEFORE REUSE.
Supplemental Health & Safety Information: IF PATIENT IS VOMITING-WATCH CLOSELY TO MAKE SURE AIRWAY DOESN'T BECOME OBSTRUCTED BY VOMIT. OBTAIN MEDICAL ATTENTION IN ALL CASES. AN ANTIDOTE IS A SUBSTANCE INTENDED TO COUNTERACT THE EFFECT OF A PO ISON. IT SHOULD BE GIVEN ONLY BY A PHYSICIAN/TRAINED EMERGENCY PERSONNEL. GET MEDICAL ADVICE FROM POISON CONTROL CENTER.

Section 9 - Physical & Chemical Properties
F29 1,1-DICHLOROETHENE

HCC:
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: 89.06F
Melting/Freezing Point: Melting/Freezing Text: -188.5F
Decomposition Point: Decomposition Text: N/K
Vapor Pressure: 500 **Vapor Density:** N/K
Percent Volatile Organic Content:
Specific Gravity: N/K
Volatile Organic Content Pounds per Gallon:
pH: N/K
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: N/K
Solubility in Water: SLIGHT
Appearance and Odor: COLORLESS LIQUID W/FRUITY/PLEASANT ODOR
Percent Volatiles by Volume: N/K
Corrosion Rate: N/K

Section 10 - Stability & Reactivity Data
F29 1,1-DICHLOROETHENE

Stability Indicator: YES
Materials to Avoid:
INCOMPATIBLE MATERIALS
Stability Condition to Avoid:
HEAT, AIR, PRESSURE.
Hazardous Decomposition Products:
N/K
Hazardous Polymerization Indicator: YES
Conditions to Avoid Polymerization:
MAY POLYMERIZE UPON STANDING.

Section 11 - Toxicological Information
F29 1,1-DICHLOROETHENE

Toxicological Information:
N/P

Section 12 - Ecological Information
F29 1,1-DICHLOROETHENE

Ecological Information:
N/P

Section 13 - Disposal Considerations
F29 1,1-DICHLOROETHENE

Waste Disposal Methods:
BURN IN A CHEMICAL INCINERATOR EQUIPPED W/AN AFTERBURNER & SCRUBBER IAW/FEDERAL, STATE & LOCAL REGULATIONS.

Section 14 - MSDS Transport Information
F29 1,1-DICHLOROETHENE

Transport Information:
N/P

Section 15 - Regulatory Information
F29 1,1-DICHLOROETHENE

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
F29 1,1-DICHLOROETHENE

Other Information:
N/P

HAZCOM Label Information

Product Identification: F29 1,1-DICHLOROETHENE
CAGE: 84898
Assigned Individual: N
Company Name: CHEM SERVICE INC
Company PO Box: 3108
Company Street Address1: N/K
Company Street Address2: WEST CHESTER, PA 19381 US
Health Emergency Telephone: 215-386-2100/215-692-3026
Label Required Indicator: Y
Date Label Reviewed: 12/16/1998
Status Code: C
Manufacturer's Label Number:
Date of Label: 12/16/1998
Year Procured: N/K
Organization Code: G
Chronic Hazard Indicator: N/P

Eye Protection Indicator: N/P
Skin Protection Indicator: N/P
Respiratory Protection Indicator: N/P
Signal Word: N/P
Health Hazard:
Contact Hazard:
Fire Hazard:
Reactivity Hazard:

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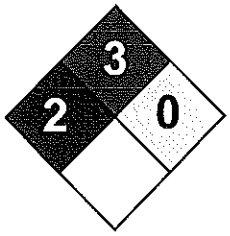

Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
1,2-Dichloroethane MSDS

Section 1: Chemical Product and Company Identification

Product Name: 1,2-Dichloroethane

Catalog Codes: SLD2521, SLD3721

CAS#: 107-06-2

RTECS: KH9800000

TSCA: TSCA 8(b) inventory: 1,2-Dichloroethane

CI#: Not available.

Synonym: Ethylene dichloride

Chemical Formula: C2H4CL2

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
{1,2-}Dichloroethane	107-06-2	100

Toxicological Data on Ingredients: 1,2-Dichloroethane: ORAL (LD50): Acute: 670 mg/kg [Rat]. 413 mg/kg [Mouse]. DERMAL (LD50): Acute: 2800 mg/kg [Rabbit]. VAPOR (LC50): Acute: 1414.2 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Extremely hazardous in case of ingestion. Very hazardous in case of eye contact (irritant), of inhalation. Hazardous in case of skin contact (irritant). Corrosive to skin and eyes on contact. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:
Very hazardous in case of ingestion, of inhalation. CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified 2B (Possible for human.) by IARC. Classified 2 (Reasonably anticipated.) by NTP. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, the nervous system, liver, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical got on the victim's exposed skin, such as the hands : Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 413°C (775.4°F)

Flash Points: CLOSED CUP: 13°C (55.4°F). OPEN CUP: 18°C (64.4°F).

Flammable Limits: LOWER: 6.2% UPPER: 15.6%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Flammable in presence of open flames and sparks. Slightly flammable to flammable in presence of oxidizing materials.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive to explosive in presence of oxidizing materials.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid. Corrosive liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep container dry. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. Never add water to this product In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 10 CEIL: 75 (ppm) from ACGIH (TLV) TWA: 40 CEIL: 300 (mg/m3) from ACGIHConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 98.96 g/mole

Color: Not available.

pH (1% soln/water): Not available.

Boiling Point: 83.5°C (182.3°F)

Melting Point: -35.3°C (-31.5°F)

Critical Temperature: Not available.

Specific Gravity: 1.2351 (Water = 1)

Vapor Pressure: 61 mm of Hg (@ 20°C)

Vapor Density: 3.42 (Air = 1)

Volatility: Not available.

Odor Threshold: 26 ppm

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water; log(oil/water) = 0

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether, n-octanol, acetone.

Solubility:
Easily soluble in methanol, diethyl ether, n-octanol, acetone. Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 413 mg/kg [Mouse]. Acute dermal toxicity (LD50): 2800 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 1414.2 ppm 4 hour(s) [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified 2B (Possible for human.) by IARC. Classified 2 (Reasonably anticipated.) by NTP. The substance is toxic to lungs, the nervous system, liver, mucous membranes.

Other Toxic Effects on Humans:
Extremely hazardous in case of ingestion. Very hazardous in case of inhalation. Hazardous in case of skin contact (irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Passes through the placental barrier in animal. Excreted in maternal milk in human.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : Ethylene dichloride : UN1184 PG: II

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: 1,2-Dichloroethane California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: 1,2-Dichloroethane Pennsylvania RTK: 1,2-Dichloroethane Massachusetts RTK: 1,2-Dichloroethane TSCA 8(b) inventory: 1,2-Dichloroethane CERCLA: Hazardous substances.: 1,2-Dichloroethane

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R11- Highly flammable. R20/22- Harmful by inhalation and if swallowed. R38- Irritating to skin. R41- Risk of serious damage to eyes. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:17 PM

Last Updated: 11/01/2010 12:00 PM

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CORNELL

Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

CHLOROFORM

Section 1 - Product and Company Identification
CHLOROFORM

Product Identification: CHLOROFORM
Date of MSDS: 11/14/1985 **Technical Review Date:** 04/03/1989
FSC: 6810 **NIIN:** 00-982-0733
Submitter: D DG
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: MALLINCKRODT INC.,SCIENCE PRODUCTS DIVISION
Post Office Box: M
Manufacturer's Address1: PARIS BYPASS
Manufacturer's Address2: PARIS, KY 40361
Manufacturer's Country: NK
General Information Telephone: 314-982-5000
Emergency Telephone: 314-982-5000
Emergency Telephone: 314-982-5000
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: Y
Published: Y
CAGE: 62910
Special Project Code: N

Item Description

Item Name: CHLOROFORM,ACS
Item Manager:
Specification Number: N/R
Type/Grade/Class: N/R
Unit of Issue:
Unit of Issue Quantity:
Type of Container: BOTTLE

Contractor Information

Contractor's Name: MALLINCKRODT SPECIALTY CHEMICALS CO
Contractor's Address1: 222 RED SCHOOL LANE
Contractor's Address2: PHILLIPSBURG, NJ 08865
Contractor's Telephone: 908-859-2151
Contractor's CAGE: 62910

Section 2 - Compositon/Information on Ingredients
CHLOROFORM

Ingredient Name: CHLOROFORM (SARA III)
Ingredient CAS Number: 67-66-3 **Ingredient CAS Code:** M
RTECS Number: FS9100000 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:

% Text: >99
% Enviromental Weight:
Other REC Limits: NONE
OSHA PEL: (C) 50 PPM **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: 10 PPM; A2; 9293 **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity: 10 LBS
DOT Reporting Quantity: 10 LBS
Ozone Depleting Chemical: N

Section 3 - Hazards Identification, Including Emergency Overview
CHLOROFORM

Health Hazards Acute & Chronic: ACUTE:SEE SIGNS & SYMPTOMS OF OVEREXPOSURE. CHRONIC:PROLONGED OR REPEATED EXPOSURE TO VAPORS MAY CAUSE DAMAGE TO LIVER AND KIDNEYS.CONTACT WITH LIQUID MAY HAVE DEFATTING EFFECT AND CHRONIC SKIN IRRITA TION WITH CRACKING & DRYING AND CORRESPONDING DERMATITIS.MAY CAUSE TUMOR FORMATION.

Signs & Symptoms of Overexposure:
EYES:PAIN AND IRRITATION OF CONJUNCTIVA;
SKIN:IRRITATION,REDNESS,PAIN.REMOVES NATURAL OILS;INHALATION:POTENT ANESTHETIC,IRRITATES RESPIRATORY TRACT AND MAY CAUSE HEADACHE,DROWSINESS, VOMITING,DIZZINES S,AND UNCONSCIOUSNESS.HEART ARRYTHMIA,KIDNEY & LIVER DISORDER,DEATH;INGESTION:SEVERE BURNING,CHEST PAIN,VOMIT,UNCONSCIOU

Medical Conditions Aggravated by Exposure:
PERSONS WITH PRE-EXISTING SKIN DISORDERS OR EYE PROBLEMS,OR IMPAIRED LIVER,KIDNEY OR RESPIRATORY FUNCTION.

LD50 LC50 Mixture: LD50 ORAL RAT=908MG/KG

Route of Entry Indicators:
Inhalation: YES
Skin: YES
Ingestion: YES

Carcenogenicity Indicators
NTP: YES
IARC: YES
OSHA: NO

Carcinogenicity Explanation: CHLOROFORM IS SUSPECTED BY NTP AND IARC TO BE CARCINOGENIC.

Section 4 - First Aid Measures
CHLOROFORM

First Aid:
INHAL:REMOVE TO FRESH AIR.GIVE CPR/OXYGEN IF NEEDED;INGEST:IF SWALLOWED,GIVE TWO GLASSES OF WATER & INDUCE VOMIT.NOTHING BY MOUTH IF UNCON;SKIN/EYE EXPOSURE:RMV CONTMNTD CLOTHG.WASH SKIN W/SOAP & H2O. FLUSH SKIN/EYES W/LG H2O;GET MED HELP IMMEDIATLY

Section 5 - Fire Fighting Measures
CHLOROFORM

Fire Fighting Procedures:
WEAR SELF-CNTD BRTHG,APP H20 SPRAY TO COOL CONTR.
Unusual Fire or Explosion Hazard:
NOT CONSIDERED TO BE AN EXPLOSION HAZARD; SLIGHT FIRE HAZARD WHEN EXPOSED TO HIGH HEAT.
Extinguishing Media:
EXTINQUISH W. AGENT SUITABLE FOR SURROUNDING FIRE.
Flash Point: Flash Point Text: NONE

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): N/R
Upper Limit(s): N/R

Section 6 - Accidental Release Measures
CHLOROFORM

Spill Release Procedures:
ELIM IGN SOURCES,VENTL & EVAC AREA.USE PROTCV CLOTHG/RESP PROTCTION FM VAP.CONTAIN & RECOVR LIQ IF POSS.ABSORB W/ VRMCULITE,EARTH,ETC.SCOOP UP W/NON-SPARKG TOOLS & PLACE IN CLOSD CONTNRS. USE H2O SPRA Y TO DISPERSE VAP/COOL CNTNR.DO NOT FLUSH TO SEWR

Section 7 - Handling and Storage
CHLOROFORM

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
CHLOROFORM

Repiratory Protection:
SUPPLIED AIR RESPIR/SCBA; ESCAPE: GAS MASK
Ventilation:
LOCAL EXHAUST TO MAINTN BELOW TLV.
Protective Gloves:
IMPERVIOUS
Eye Protection: GOGGLES/FACE SHIELD
Other Protective Equipment: FULL PROTECTIVE CLOTHING,SAFETY SHOWER,EYE WASH

STATION
Work Hygenic Practices: WASH THOROUGHLY AFTER HANDLING.REMOVE AND LAUNDER CONTAMINATED CLOTHING.
Supplemental Health & Safety Information: N/P

Section 9 - Physical & Chemical Properties
CHLOROFORM

HCC: T3
NRC/State License Number: N/R
Net Property Weight for Ammo: N/R
Boiling Point: Boiling Point Text: 142F,61C
Melting/Freezing Point: Melting/Freezing Text: -82F,-63C
Decomposition Point: Decomposition Text: N/A
Vapor Pressure: 100 **Vapor Density:** 4.1
Percent Volatile Organic Content:
Specific Gravity: 1.49
Volatile Organic Content Pounds per Gallon:
pH: N/P
Volatile Organic Content Grams per Liter:
Viscosity: N/R
Evaporation Weight and Reference: 11.6(BU-AC=1)
Solubility in Water: 0.8%
Appearance and Odor: CLEAR COLORLESS LIQ.HEAVY ETHEREAL ODOR
Percent Volatiles by Volume: 100
Corrosion Rate: N/P

Section 10 - Stability & Reactivity Data
CHLOROFORM

Stability Indicator: YES
Materials to Avoid:
STRONG CAUSTICS,CHEM.ACTIVE METALS,AL,K,MG,NA;ACETONE, FLUORINE,METHANOL,NA METHOXIDE,DINITROGEN TETROXIDE,TERT-BUTOXIDE
Stability Condition to Avoid:
PREVENT EXPOSURE TO AIR AND LIGHT(FORM PHOSGENE & HCL GASES)
Hazardous Decomposition Products:
HCL,CL2,PHOSGENE,& CO GASES WHEN HEATED TO DECOMPOSITION.
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
N/K

Section 11 - Toxicological Information
CHLOROFORM

Toxicological Information:
N/P

Section 12 - Ecological Information
CHLOROFORM

Ecological Information:

N/P

Section 13 - Disposal Considerations
CHLOROFORM

Waste Disposal Methods:
SPILLS & LOT SIZES MAY BE COLLECTD & ATOMIZED IN RCRA APPRVD COMBUSTN CHMBR EQUIPPD W/EFFLUENT GASE CLEANG DIVEICE,OR ABSORBED IN ABSORBNT & DISPOSED IN RCRA APPRVD FACILITY.ENSURE COMPLIANCE W/LOCAL, STATE & FEDERAL REGS; RCRA/CWA RQ:5000 LBS.

Section 14 - MSDS Transport Information
CHLOROFORM

Transport Information:
N/P

Section 15 - Regulatory Information
CHLOROFORM

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
CHLOROFORM

Other Information:
N/P

HMIS Transportation Information

Product Identification: CHLOROFORM
Transporation ID Number: 96253
Responsible Party CAGE: 62910
Date MSDS Prepared: 11/14/1985
Date MSDS Reviewed: 04/03/1989
MFN: 04/03/1989
Submitter: D DG
Status Code: C

Container Information
- **Unit of Issue:**
- **Container Quantity:**
- **Type of Container:** BOTTLE
- **Net Unit Weight:** 0.3 POUNDS

Article without MSDS: N
Technical Entry NOS Shipping Number:
Radioactivity: N/R
Form:

Net Explosive Weight: N/R
Coast Guard Ammunition Code:
Magnetism: N/P
AF MMAC Code:
DOD Exemption Number:
Limited Quantity Indicator:
Multiple Kit Number: 0
Kit Indicator: N
Kit Part Indicator: N
Review Indicator: Y
Additional Data:
DOT RQ:5000 LBS.

Department of Transportation Information

DOT Proper Shipping Name: CHLOROFORM
DOT PSN Code: DHF
Symbols:
DOT PSN Modifier:
Hazard Class: 6.1
UN ID Number: UN1888
DOT Packaging Group: III
Label: 6.1
Special Provision(s): N36,T14
Packaging Exception: 153
Non Bulk Packaging: 203
Bulk Packaging: 241
Maximimum Quanity in Passenger Area: 5 L
Maximimum Quanity in Cargo Area: 60 L
Stow in Vessel Requirements: A
Requirements Water/Sp/Other: 40

IMO Detail Information

IMO Proper Shipping Name: CHLOROFORM
IMO PSN Code: EEH
IMO PSN Modifier:
IMDG Page Number: 6103
UN Number: 1888
UN Hazard Class: 6.1
IMO Packaging Group: III
Subsidiary Risk Label: -
EMS Number: 6.1-02
Medical First Aid Guide Number: 340

IATA Detail Information

IATA Proper Shipping Name: CHLOROFORM
IATA PSN Code: GJO
IATA PSN Modifier:
IATA UN Id Number: 1888
IATA UN Class: 6.1
Subsidiary Risk Class:
UN Packaging Group: III
IATA Label: TOXIC
Packaging Note for Passengers: 610

Maximum Quantity for Passengers: 60L
Packaging Note for Cargo: 612
Maximum Quantity for Cargo: 220L
Exceptions:

AFI Detail Information

AFI Proper Shipping Name: CHLOROFORM
AFI Symbols:
AFI PSN Code: GJO
AFI PSN Modifier:
AFI UN Id Number: UN1888
AFI Hazard Class: 6.1
AFI Packing Group: III
AFI Label:
Special Provisions: P5, N36
Back Pack Reference: A10.5

HAZCOM Label Information

Product Identification: CHLOROFORM
CAGE: 62910
Assigned Individual: N
Company Name: MALLINCKRODT SPECIALTY CHEMICALS CO
Company PO Box:
Company Street Address1: 222 RED SCHOOL LANE
Company Street Address2: PHILLIPSBURG, NJ 08865 US
Health Emergency Telephone: 314-982-5000
Label Required Indicator: Y
Date Label Reviewed: 12/16/1998
Status Code: C
Manufacturer's Label Number:
Date of Label: 12/16/1998
Year Procured: N/K
Organization Code: F
Chronic Hazard Indicator: N/P
Eye Protection Indicator: N/P
Skin Protection Indicator: N/P
Respiratory Protection Indicator: N/P
Signal Word: N/P
Health Hazard:
Contact Hazard:
Fire Hazard:
Reactivity Hazard:

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CORNELL

Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

1,1,1-TRICHLOROETHANE, 21547

Section 1 - Product and Company Identification
1,1,1-TRICHLOROETHANE, 21547

Product Identification: 1,1,1-TRICHLOROETHANE, 21547
Date of MSDS: 11/01/1993 **Technical Review Date:** 11/27/1995
FSC: 6810 **NIIN:** **LIIN:** 00N055317
Submitter: N EN
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: HACH CO
Post Office Box: 907
Manufacturer's Address1:
Manufacturer's Address2: AMES, IA 50010
Manufacturer's Country: US
General Information Telephone: 800-227-4224
Emergency Telephone: 303-623-5716
Emergency Telephone: 303-623-5716
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: N
Published: Y
CAGE: 4T252
Special Project Code: N

Contractor Information

Contractor's Name: HACH COMPANY
Post Office Box: 907
Contractor's Address1: 100 DAYTON RD.
Contractor's Address2: AMES, IA 50010
Contractor's Telephone: 800-227-4224
Contractor's CAGE: 4T252

Section 2 - Compositon/Information on Ingredients 1,1,1-TRICHLOROETHANE, 21547

Ingredient Name: ETHANE,1,1,1-TRICHLORO-; (1,1,1-TRICHLOROETHANE) (SARA III)
Ingredient CAS Number: 71-55-6 **Ingredient CAS Code:** M
RTECS Number: KJ2975000 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: 100
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: 350 PPM **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: 350 PPM/450 STEL **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity: 1000 LBS
DOT Reporting Quantity: 1000 LBS

Ozone Depleting Chemical: 1

Section 3 - Hazards Identification, Including Emergency Overview
1,1,1-TRICHLOROETHANE, 21547

Health Hazards Acute & Chronic: CHLOROCARBON MATLS HAVE PRDCED SENSIT OF MYOCARDIUM TO EPINEPHRINE IN LAB ANIMALS & COULD HAVE A SIMILAR EFT IN HUMANS. ADRENOMIMETICS (E.G. EPINEPHRINE) MAY BE CONTRAINDICATED EXCEPT FOR LIFE-SUSTAIN ING USES IN HUMANS ACUTELY OR CHRONICALLY EXPOSED TO CHLOROCARBONS (FP N). ACUTE:IRRITATION, NARCOTIC (EFTS OF OVEREXP)

Signs & Symptoms of Overexposure:
HLTH HAZ:EFTS; SENSITIZES HEART TO EPINEPHRINE. VAP MAY CAUSE HDCH, DIZZ, DROWS, UNCON, IRREGULAR HEARTBEAT, LIVER DAMAGE, KIDNEY DMG, DEPRESSED RESPIRATIONS, DEATH. MAY CAUSE REPRODUCTIVE ABNORMALITI ES.

Medical Conditions Aggravated by Exposure:
PRE-EXISTING SKIN DISORDERS MAY INCREASE SUSCEPTIBILITY TO THE EFFECTS OF THE SUBSTANCE.

LD50 LC50 Mixture: LD50:(ORAL,RAT) 10300 MG/KG

Route of Entry Indicators:
Inhalation: YES
Skin: NO
Ingestion: NO

Carcenogenicity Indicators
NTP: NO
IARC: NO
OSHA: NO

Carcinogenicity Explanation: NOT RELEVANT.

Section 4 - First Aid Measures
1,1,1-TRICHLOROETHANE, 21547

First Aid:
EYES:FLUSH W/WATER FOR @ LEAST 15 MINUTES. CALL PHYS. SKIN:FLUSH W/PLENTY OF WATER. INGEST:GIVE LARGE QTYS OF WATER. CALL PHYS IMMED. INHAL:REMOVE TO FRESH AIR. GIVE ARTIFICIAL RESPIRATION IF NECESSAR Y. CALL PHYS.

Section 5 - Fire Fighting Measures
1,1,1-TRICHLOROETHANE, 21547

Fire Fighting Procedures:
WEAR NIOSH/MSHA APPROVED PRESSURE DEMAND SCBA & FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire or Explosion Hazard:
MAY EVOLVE TOXIC FUMES IN FIRE. THERMAL DECOMPOSITION PRODUCTS MAY

INCLUDE HCL & PHOSGENE (FP N).
Extinguishing Media:
WATER MIST OR SPRAY.
Flash Point: Flash Point Text: NONE

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): 8.0%
Upper Limit(s): 10.5%

Section 6 - Accidental Release Measures
1,1,1-TRICHLOROETHANE, 21547

Spill Release Procedures:
ABSORB ON PAPER. BURN IN A CHEMICAL INCINERATOR EQUIPPED WITH AFTERBURNER AND SCRUBBER.

Section 7 - Handling and Storage
1,1,1-TRICHLOROETHANE, 21547

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
1,1,1-TRICHLOROETHANE, 21547

Repiratory Protection:
NIOSH/MSHA APPROVED RESPIRATOR APPROPRIATE FOR EXPOSURE OF CONCERN (FP N).
Ventilation:
FUME HOOD.
Protective Gloves:
NITRILE GLOVES.
Eye Protection: ANSI APPRVD CHEM WORKER GOGGLES (FP N).
Other Protective Equipment: LAB COAT.
Work Hygenic Practices: WASH THOROUGHLY AFTER HANDLING.
Supplemental Health & Safety Information: CNDTNS TO AVOID:SODIUM METAL, SODIUM-POTASSIUM ALLOY, N*2O*4.

Section 9 - Physical & Chemical Properties
1,1,1-TRICHLOROETHANE, 21547

HCC: T4
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: 165F,74C
Melting/Freezing Point: Melting/Freezing Text: -36F,-38C
Decomposition Point: Decomposition Text: N/K
Vapor Pressure: 100 @20C **Vapor Density:** 4.6

Percent Volatile Organic Content:
Specific Gravity: 1.345
Volatile Organic Content Pounds per Gallon:
pH: N/A
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: 12.8
Solubility in Water: INSOLUBLE
Appearance and Odor: CLEAR, COLORLESS LIQUID, SWEET ODOR
Percent Volatiles by Volume: N/K
Corrosion Rate: N/K

Section 10 - Stability & Reactivity Data
1,1,1-TRICHLOROETHANE, 21547

Stability Indicator: YES
Materials to Avoid:
NONE SPECIFIED BY MANUFACTURER.
Stability Condition to Avoid:
HEAT CONTRIBUTES TO INSTABILITY. VIOLENT REACTION W/OXYG GAS/LIQ, SODIUM HYDROXIDE & OTHER STRONG CAUSTICS, (SUPDAT)
Hazardous Decomposition Products:
HCL & PHOSGENE (FP N). MAY EMIT TOXIC FUMES IN FIRE.
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
NOT RELEVANT.

Section 11 - Toxicological Information
1,1,1-TRICHLOROETHANE, 21547

Toxicological Information:
N/P

Section 12 - Ecological Information
1,1,1-TRICHLOROETHANE, 21547

Ecological Information:
N/P

Section 13 - Disposal Considerations
1,1,1-TRICHLOROETHANE, 21547

Waste Disposal Methods:
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

Section 14 - MSDS Transport Information
1,1,1-TRICHLOROETHANE, 21547

Transport Information:
N/P

Section 15 - Regulatory Information

1,1,1-TRICHLOROETHANE, 21547

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
1,1,1-TRICHLOROETHANE, 21547

Other Information:
N/P

HAZCOM Label Information

Product Identification: 1,1,1-TRICHLOROETHANE, 21547
CAGE: 4T252
Assigned Individual: N
Company Name: HACH COMPANY
Company PO Box: 907
Company Street Address1: 100 DAYTON RD.
Company Street Address2: AMES, IA 50010 US
Health Emergency Telephone: 303-623-5716
Label Required Indicator: Y
Date Label Reviewed: 11/15/1994
Status Code: C
Manufacturer's Label Number:
Date of Label: 11/15/1994
Year Procured: N/K
Organization Code: G
Chronic Hazard Indicator: Y
Eye Protection Indicator: YES
Skin Protection Indicator: YES
Respiratory Protection Indicator: YES
Signal Word: WARNING
Health Hazard: Moderate
Contact Hazard: Slight
Fire Hazard: None
Reactivity Hazard: None

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CORNELL

Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

CARBON TETRACHLORIDE

Section 1 - Product and Company Identification
CARBON TETRACHLORIDE

Product Identification: CARBON TETRACHLORIDE
Date of MSDS: 01/01/1987 **Technical Review Date:** 06/16/1986
FSC: 6810 **NIIN:** 00-975-2409
Submitter: D DG
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: MALLINCKRODT INC.,SCIENCE PRODUCTS DIVISION
Post Office Box: M
Manufacturer's Address1: PARIS BYPASS
Manufacturer's Address2: PARIS, KY 40361
Manufacturer's Country: US
General Information Telephone: 314-982-5000
Emergency Telephone: 314-982-5000
Emergency Telephone: 314-982-5000
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: Y
Published: Y
CAGE: 62910
Special Project Code: N

Item Description

Item Name:
Item Manager:
Specification Number: O-C-265
Type/Grade/Class: NK
Unit of Issue:
Unit of Issue Quantity:
Type of Container: BOTTLE

Contractor Information

Contractor's Name: MALLINCKRODT SPECIALTY CHEMICALS CO
Contractor's Address1: 222 RED SCHOOL LANE
Contractor's Address2: PHILLIPSBURG, NJ 08865
Contractor's Telephone: 908-859-2151
Contractor's CAGE: 62910

Section 2 - Compositon/Information on Ingredients
CARBON TETRACHLORIDE

Ingredient Name: CARBON TETRACHLORIDE (SARA III)
Ingredient CAS Number: 56-23-5 **Ingredient CAS Code:** M
RTECS Number: FG4900000 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:

% Text: >99
% Enviromental Weight:
Other REC Limits: N/P
OSHA PEL: 10 PPM **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: S,5PPM/10 STEL,A3 93 **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity: 10 LBS
DOT Reporting Quantity: 10 LBS
Ozone Depleting Chemical: 1

Section 3 - Hazards Identification, Including Emergency Overview
CARBON TETRACHLORIDE

Health Hazards Acute & Chronic: N/P

Signs & Symptoms of Overexposure:
INH:NARCOTIC EFFECTS.HEAD,DIZZ,NAUSEA.MAY CAUSE DEATH;ING:SEV GI PROBLM;SKIN:DERMATITIS;EYES:IRRIT.

Medical Conditions Aggravated by Exposure:
N/P

LD50 LC50 Mixture: N/P

Route of Entry Indicators:
- **Inhalation:** N/P
- **Skin:** N/P
- **Ingestion:** N/P

Carcenogenicity Indicators
- **NTP:** N/P
- **IARC:** N/P
- **OSHA:** N/P

Carcinogenicity Explanation: N/P

Section 4 - First Aid Measures
CARBON TETRACHLORIDE

First Aid:
INHAL:REMOVE TO FRESH AIR.GIVE CPR/OXYGEN IF NEEDED;INGEST:IF SWALLOWED,GIVE TWO GLASSES OF WATER & INDUCE VOMIT.NOTHING BY MOUTH IF UNCON;SKIN/EYE EXPOSURE:RMV CONTMNTD CLOTHG.WASH SKIN W/SOAP & H*2O .FLUSH SKIN/EYES W/LG H*2O;GET MED HELPIMMEDIATLY

Section 5 - Fire Fighting Measures
CARBON TETRACHLORIDE

Fire Fighting Procedures:

WEAR SELF-CNTD BRTHG,APP H*20 SPRAY TO COOL CONTR.
Unusual Fire or Explosion Hazard:
NON EXPLOSIVE
Extinguishing Media:
EXTINQUISH W. AGENT SUITABLE FOR SURROUNDING FIRE.
Flash Point: Flash Point Text: NONE

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): N/R
Upper Limit(s): N/R

Section 6 - Accidental Release Measures
CARBON TETRACHLORIDE

Spill Release Procedures:
ELIM IGN SOURCES,VENTLT & EVAC AREA.USE PROTCTV CLOTHG/RESP PROTCTION FM VAP.CONTAIN & RECOVR LIQ IF POSS.ABSORB W/VRMCULITE,EARTH,ETC.SCOOP UP W/NON-SPARKG TOOLS & PLACE IN CLOSD CONTNRS.USE H*2O SPR AY TO DISPERSE VAP/COOL CNTNR.DO NOT FLUSH TO SEWR

Section 7 - Handling and Storage
CARBON TETRACHLORIDE

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
CARBON TETRACHLORIDE

Repiratory Protection:
SUPPLIED AIR RESPIR/SCBA; ESCAPE: GAS MASK
Ventilation:
LOCAL EXHAUST TO MAINTN BELOW TLV.
Protective Gloves:
IMPERVIOUS
Eye Protection: GOGGLES/FACE SHIELD
Other Protective Equipment: FULL PROTECTIVE CLOTHING,SAFETY SHOWER,EYE WASH STATION
Work Hygenic Practices: N/P
Supplemental Health & Safety Information: MSDS FROM MFR DATED:JAN 85,CONFORMS TO OSHA HAZ COMM STD;POSSIBLE CANCER HAZARD BASED ON TESTS W/LAB ANIMALS.AS DEFINED BY IARC, MAK, NIOSH, NTP, TLV.

Section 9 - Physical & Chemical Properties
CARBON TETRACHLORIDE

HCC: T4
NRC/State License Number:

Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: 76.8C(170F)
Melting/Freezing Point: Melting/Freezing Text: N/A
Decomposition Point: Decomposition Text: N/A
Vapor Pressure: 91 **Vapor Density:** 5.3
Percent Volatile Organic Content:
Specific Gravity: 1.59
Volatile Organic Content Pounds per Gallon:
pH: N/P
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: N/K
Solubility in Water: NEGLIGIBLE
Appearance and Odor: COLORLESS LIQUID.ETHER-LIKE ODOR.
Percent Volatiles by Volume: N/K
Corrosion Rate: N/P

Section 10 - Stability & Reactivity Data
CARBON TETRACHLORIDE

Stability Indicator: YES
Materials to Avoid:
CHEMICALLY ACTIVE METALS E.G. NA,K & MG;SOME PLASTICS.
Stability Condition to Avoid:
NOT KNOWN
Hazardous Decomposition Products:
CO,CO*2,HCL GAS,CL*2 & PHOSGENE UPON THERMAL DECOMPOSITION.
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
N/K

Section 11 - Toxicological Information
CARBON TETRACHLORIDE

Toxicological Information:
N/P

Section 12 - Ecological Information
CARBON TETRACHLORIDE

Ecological Information:
N/P

Section 13 - Disposal Considerations
CARBON TETRACHLORIDE

Waste Disposal Methods:
SPILLS & LOT SIZES CAN BE COLLECTED FOR RECLAMATION OR ABSORBED IN SUITABLE ABSORBENT FOR DISPOSAL AS A HAZARDOUS SUBSTANCE IN A RCRA APPROVED LAND FILL.ENSURE COMPLIANCE W/LOCAL,STATE & FEDERAL REGUL ATIONS; CWA RQ:5000LBS.

Section 14 - MSDS Transport Information
CARBON TETRACHLORIDE

Transport Information:
N/P

Section 15 - Regulatory Information
CARBON TETRACHLORIDE

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
CARBON TETRACHLORIDE

Other Information:
N/P

HMIS Transportation Information

Product Identification: CARBON TETRACHLORIDE
Transporation ID Number: 96114
Responsible Party CAGE: 62910
Date MSDS Prepared: 01/01/1987
Date MSDS Reviewed: 09/05/1986
MFN: 09/05/1986
Submitter: D DG
Status Code: C

Container Information
- **Unit of Issue:**
- **Container Quantity:**
- **Type of Container:** BOTTLE
- **Net Unit Weight:** N/K

Article without MSDS: N
Technical Entry NOS Shipping Number:
Radloactivity:
Form:
Net Explosive Weight:
Coast Guard Ammunition Code:
Magnetism: N/P
AF MMAC Code:
DOD Exemption Number:
Limited Quantity Indicator:
Multiple Kit Number: 0
Kit Indicator: N
Kit Part Indicator: N
Review Indicator: Y

Additional Data:
DOT RQ:5000LBS.

Department of Transportation Information

DOT Proper Shipping Name: CARBON TETRACHLORIDE
DOT PSN Code: CVY
Symbols:
DOT PSN Modifier:
Hazard Class: 6.1
UN ID Number: UN1846
DOT Packaging Group: II
Label: POISON
Special Provision(s): N36,T8
Packaging Exception: NONE
Non Bulk Packaging: 202
Bulk Packaging: 243
Maximimum Quanity in Passenger Area: 5 L
Maximimum Quanity in Cargo Area: 60 L
Stow in Vessel Requirements: A
Requirements Water/Sp/Other: 40

IMO Detail Information

IMO Proper Shipping Name: CARBON TETRACHLORIDE
IMO PSN Code: DPR
IMO PSN Modifier: P
IMDG Page Number: 6096
UN Number: 1846
UN Hazard Class: 6.1
IMO Packaging Group: II
Subsidiary Risk Label: -
EMS Number: 6.1-02
Medical First Aid Guide Number: 340

IATA Detail Information

IATA Proper Shipping Name: CARBON TETRACHLORIDE
IATA PSN Code: FKO
IATA PSN Modifier:
IATA UN Id Number: 1846
IATA UN Class: 6.1
Subsidiary Risk Class:
UN Packaging Group: II
IATA Label: TOXIC
Packaging Note for Passengers: 610
Maximum Quantity for Passengers: 5L
Packaging Note for Cargo: 612
Maximum Quantity for Cargo: 60L
Exceptions:

AFI Detail Information

AFI Proper Shipping Name: CARBON TETRACHLORIDE
AFI Symbols:
AFI PSN Code: FKO
AFI PSN Modifier:
AFI UN Id Number: UN1846

AFI Hazard Class: 6.1
AFI Packing Group: II
AFI Label:
Special Provisions: P5, N36
Back Pack Reference: A10.5

HAZCOM Label Information

Product Identification: CARBON TETRACHLORIDE
CAGE: 62910
Assigned Individual: N
Company Name: MALLINCKRODT SPECIALTY CHEMICALS CO
Company PO Box:
Company Street Address1: 222 RED SCHOOL LANE
Company Street Address2: PHILLIPSBURG, NJ 08865 US
Health Emergency Telephone: 314-982-5000
Label Required Indicator: Y
Date Label Reviewed: 12/16/1998
Status Code: C
Manufacturer's Label Number:
Date of Label: 12/16/1998
Year Procured: N/K
Organization Code: F
Chronic Hazard Indicator: N/P
Eye Protection Indicator: N/P
Skin Protection Indicator: N/P
Respiratory Protection Indicator: N/P
Signal Word: N/P
Health Hazard:
Contact Hazard:
Fire Hazard:
Reactivity Hazard:

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Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format) For Cornell University Convenience Only

TRICHLOROETHENE, 0-664

Section 1 - Product and Company Identification
TRICHLOROETHENE, 0-664

Product Identification: TRICHLOROETHENE, 0-664
Date of MSDS: 01/07/1993 **Technical Review Date:** 10/26/1994
FSC: 6810 **NIIN: LIIN:** 00N054683
Submitter: N EN
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: CHEM SERVICE INC
Post Office Box: 3108
Manufacturer's Address1:
Manufacturer's Address2: WEST CHESTER, PA 19381
Manufacturer's Country: US
General Information Telephone: 215-692-3026
Emergency Telephone: 215-692-3026
Emergency Telephone: 215-692-3026
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: N
Published: Y
CAGE: 84898
Special Project Code: N

Contractor Information

Contractor's Name: CHEM SERVICE INC
Post Office Box: 3108
Contractor's Address1: N/K
Contractor's Address2: WEST CHESTER, PA 19381
Contractor's Telephone: 215-692-3026
Contractor's CAGE: 84898

Contractor Information

Contractor's Name: CHEM SERVICE, INC
Post Office Box: 599
Contractor's Address1: 660 TOWER LN
Contractor's Address2: WEST CHESTER, PA 19301-9650
Contractor's Telephone: 610-692-3026
Contractor's CAGE: 8Y898

Section 2 - Compositon/Information on Ingredients TRICHLOROETHENE, 0-664

Ingredient Name: ETHYLENE, TRICHLORO-; (TRICHLOROETHYLENE) (SARA III). LD50: (ORAL,RAT) 4920 MG/KG.
Ingredient CAS Number: 79-01-6 **Ingredient CAS Code:** M
RTECS Number: KX4550000 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:

% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: 100 PPM **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: 50 PPM;100 STEL **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity: 100 LBS
DOT Reporting Quantity: 100 LBS
Ozone Depleting Chemical: N

Ingredient Name: OTHER PREC:CAUSE THE FORMATION OF HCL &/OR PHOSGENE (FP N).
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: SUPDAT:BY MD/TRAINED EMERGENCY PERSONNEL. MEDICAL ADVICE CAN BE OBTAINED FROM A POISON CONTROL CENTER.
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K

% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Section 3 - Hazards Identification, Including Emergency Overview
TRICHLOROETHENE, 0-664

Health Hazards Acute & Chronic: ALL CHEMS SHOULD BE CONSIDERED HAZ - AVOID DIRECT PHYSICAL CONT! SUSPECTED CARCIN - MAY PRDCE CANCER. MAY BE HARMFUL IF ABSORBED THRU SKIN, INHALED/SWALLOWED. LACHRYMATOR - CAUSES SEV EYE IRRIT. VAPS &/OR DIRECT EYE CONT CAN CAUSE SEV EYE BURNS. CAN CAUSE SKIN/EYE IRRIT. CAUSE CAUSE SKIN BURNS. CAN (EFTS OF OVEREXP)

Signs & Symptoms of Overexposure:
HLTH HAZ:CAUSE SEV SKIN BURNS. EXPOS CAN CAUSE LIVER/KIDNEY DMG. CAN CAUSE GI DISTURBS. CAN BE IRRIT TO MUC MEMBS. PRLNG EXPOS MAY CAUSE NAUS, HDCH, DIZZ &/OR EYE DMG. CAN CAUSE SENSIT BY SKIN CONT. C HLOROCARBON MATLS HAVE PRDCD SENSIT OF MYOCARDIUM TO EPINEPHRINE IN LAB ANIMALS & COULD HAVE SIMILAR EFT IN (SUPP DATA)

Medical Conditions Aggravated by Exposure:
NONE SPECIFIED BY MANUFACTURER.

LD50 LC50 Mixture: SEE INGREDIENT.

Route of Entry Indicators:
Inhalation: YES
Skin: YES
Ingestion: YES

Carcenogenicity Indicators
NTP: NO
IARC: NO
OSHA: NO

Carcinogenicity Explanation: NOT RELEVANT

Section 4 - First Aid Measures
TRICHLOROETHENE, 0-664

First Aid:
INGEST:CALL MD IMMED (FP N). EYES:FLUSH CONTINUOUSLY W/WATER FOR AT LST 15-20 MINS. SKIN:FLUSH W/WATER FOR 15-20 MINS. IF NO BURNS HAVE OCCURRED - USE SOAP & WATER TO CLEANSE SKIN. INHAL:REMOVE PATIEN T TO FRESH AIR. ADMIN

OXYGEN IF PATIENTIS HAVING DFCLTY BRTHG. IF PATIENT HAS STOPPED BRTHG ADMIN ARTF RESP. IF PATIENT IS IN CARDIAC ARREST ADMIN CPR. CONTINUE LIFE SUPPORTING MEASURES UNTIL(SUPDAT)

Section 5 - Fire Fighting Measures
TRICHLOROETHENE, 0-664

Fire Fighting Procedures:
USE NIOSH/MSHA APPROVED PRESSURE DEMAND SCBA & FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire or Explosion Hazard:
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE HCL & PHOSGENE (FP N).
Extinguishing Media:
CARBON DIOXIDE, DRY CHEMICAL POWDER OR SPRAY.
Flash Point: Flash Point Text: NON-FLAMMABLE

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): 11%
Upper Limit(s): 41%

Section 6 - Accidental Release Measures
TRICHLOROETHENE, 0-664

Spill Release Procedures:
EVACUATE AREA. WEAR APPROPRIATE OSHA REGULATED EQUIPMENT. VENTILATE AREA. ABSORB ON VERMICULITE OR SIMILAR MATERIAL. SWEEP UP & PLACE IN AN APPROPRIATE CONTAINER. HOLD FOR DISPOSAL. WASH CONTAMINATED SURFACES TO REMOVE ANY RESIDUES.

Section 7 - Handling and Storage
TRICHLOROETHENE, 0-664

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
TRICHLOROETHENE, 0-664

Repiratory Protection:
NIOSH/MSHA APPROVED RESPIRATOR APPROPRIATE FOR EXPOSURE OF CONCERN (FP N).
Ventilation:
THIS CHEMICAL SHOULD ONLY BE HANDLED IN A HOOD.
Protective Gloves:
IMPERVIOUS GLOVES (FP N).
Eye Protection: ANSI APPROVED CHEM WORKERS GOGGS (FP N).
Other Protective Equipment: USE APPROPRIATE NIOSH/MSHA APPROVED SAFETY EQUIPMENT.

Work Hygenic Practices: CONTACT LENSES SHOULD NOT BE WORN IN THE LABORATORY. ANSI APPRVD EYE WASH & DELUGE SHOWER (FP N).
Supplemental Health & Safcty Information: EFTS OF OVEREXP:HUMANS. ADRENOMIMETICS (E.G., EPINEPRHINE) MAY BE CONTRAINDICATED EXCEPT FOR LIFE-SUSTAINING USES IN HUMANS ACUTELY/CHRONICALLY EXPOS TO CHLOROCARBONS (FP N). FIRST AID PROC:MED ASSIST ANCE HAS ARRIVED. NOTE:AN ANTIDOTE IS ASUBSTANCE INTENDED TO COUNTERACT EFT OF A POIS. IT SHOULD BE ADMIN ONLY (ING 2)

Section 9 - Physical & Chemical Properties
TRICHLOROETHENE, 0-664

HCC:
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: 189F,87C
Melting/Freezing Point: Melting/Freezing Text: -125F,-87C
Decomposition Point: Decomposition Text: N/K
Vapor Pressure: 58 @ 20C **Vapor Density:** N/K
Percent Volatile Organic Content:
Specifie Gravity: 1.462
Volatile Organic Content Pounds per Gallon:
pH: N/K
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: N/K
Solubility in Water: INSOL (IMMISCIBLE)
Appearance and Odor: COLORLESS LIQUID.
Percent Volatiles by Volume: N/K
Corrosion Rate: N/K

Section 10 - Stability & Reactivity Data
TRICHLOROETHENE, 0-664

Stability Indicator: YES
Materials to Avoid:
INCOMPATIBLE W/STRONG BASES, STRONG OXIDIZING AGENTS.
Stability Condition to Avoid:
NONE SPECIFIED BY MANUFACTURER.
Hazardous Decomposition Products:
DECOMPOSITION LIBERATES TOXIC FUMES. DECOMPOSTION PRODUCTS ARE CORROSIVE. VOLATILE. HCL, PHOSGENE (FP N).
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerizatiou:
NOT RELEVANT

Section 11 - Toxicological Information
TRICHLOROETHENE, 0-664

Toxicological Information:
N/P

Section 12 - Ecological Information

TRICHLOROETHENE, 0-664

Ecological Information:
N/P

Section 13 - Disposal Considerations
TRICHLOROETHENE, 0-664

Waste Disposal Methods:
DISPOSAL MUST BE I/A/W FEDERAL, STATE & LOCAL REGULATIONS (FP N). BURN IN A CHEMICAL INCINERATOR EQUIPPED W/AFTERBURNER & SCRUBBER.

Section 14 - MSDS Transport Information
TRICHLOROETHENE, 0-664

Transport Information:
N/P

Section 15 - Regulatory Information
TRICHLOROETHENE, 0-664

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
TRICHLOROETHENE, 0-664

Other Information:
N/P

HAZCOM Label Information

Product Identification: TRICHLOROETHENE, 0-664
CAGE: 84898
Assigned Individual: N
Company Name: CHEM SERVICE INC
Company PO Box: 3108
Company Street Address1: N/K
Company Street Address2: WEST CHESTER, PA 19381 US
Health Emergency Telephone: 215-692-3026
Label Required Indicator: Y
Date Label Reviewed: 10/26/1994
Status Code: C
Manufacturer's Label Number:
Date of Label: 10/26/1994
Year Procured: N/K
Organization Code: G
Chronic Hazard Indicator: Y
Eye Protection Indicator: YES
Skin Protection Indicator: YES

Respiratory Protection Indicator: YES
Signal Word: DANGER
Health Hazard: Moderate
Contact Hazard: Severe
Fire Hazard: None
Reactivity Hazard: None

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Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

ACTIVATED CARBON

Section 1 - Product and Company Identification
ACTIVATED CARBON

Product Identification: ACTIVATED CARBON
Date of MSDS: 10/06/1986 **Technical Review Date:** 10/17/1992
FSC: 6810 **NIIN:** 00-726-7944
Submitter: D DG
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: NORTHWESTERN CARBON
Manufacturer's Address1: 85 SALE LN. SUITE E
Manufacturer's Address2: RED BLUFF, CA 96080
Manufacturer's Country: US
General Information Telephone: 916-527-2664
Emergency Telephone: N/P
Emergency Telephone: N/P
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: Y
Published: Y
CAGE: 0K886
Special Project Code: N

Item Description

Item Name: CHARCOAL,ACTIVATED,TECHNICAL
Item Manager: S9G
Specification Number: MIL-C-17605
Type/Grade/Class: NONE
Unit of Issue: BG **Quantitative Expression:** 10000000052LB
Unit of Issue Quantity: 0
Type of Container: BAG

Contractor Information

Contractor's Name: NORTHWESTERN CARBON
Contractor's Address1: 85 SALE LN. SUITE E
Contractor's Address2: RED BLUFF, CA 96080
Contractor's Telephone: UNKNOWN
Contractor's CAGE: 0K886

Section 2 - Compositon/Information on Ingredients
ACTIVATED CARBON

Ingredient Name: CARBON BLACK
Ingredient CAS Number: 1333-86-4 **Ingredient CAS Code:** M
RTECS Number: FF5800000 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/R

% Enviromental Weight:
Other REC Limits: NONE RECOMMENDED
OSHA PEL: 3.5 MG/M3 **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: 3.5 MG/M3; 9293 **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical: N

Section 3 - Hazards Identification, Including Emergency Overview
ACTIVATED CARBON

Health Hazards Acute & Chronic: POSSIBLE SKIN IRRITATION OF THE DUST OR CONTACT OF DUST WITH THE SKIN.

Signs & Symptoms of Overexposure:
SKIN IRRITATION

Medical Conditions Aggravated by Exposure:
ALLERGIES

LD50 LC50 Mixture: ORAL LD50 (RAT) NOT ESTABLISHED

Route of Entry Indicators:
Inhalation: YES
Skin: NO
Ingestion: NO

Carcinogenicity Indicators
NTP: NO
IARC: NO
OSHA: NO

Carcinogenicity Explanation: THIS PRODUCT AND ITS COMPONENTS ARE NOT LISTED ON THE IARC, NTP OR OSHA CARCINOGENS LISTS.

Section 4 - First Aid Measures
ACTIVATED CARBON

First Aid:
IN EVENT OF CONTACT, FLUSH WITH WATER FOR 15 MINUTES. IF IRRITATION OCCURS, CALL A PHYSICIAN.

Section 5 - Fire Fighting Measures
ACTIVATED CARBON

Fire Fighting Procedures:
WEAR FIRE FIGHTING PROTECTIVE EQUIPMENT AND A FULL FACED SELF CONTAINED BREATHING APPARATUS. USE CAUTION WHEN FIGHTING ANY CHEMICAL FIRE.

Unusual Fire or Explosion Hazard:
CONTACT WITH STRONG OXIDIZERS OR LIQUID OXYGEN MAY CAUSE EXPLOSION.
Extinguishing Media:
USE CARBON DIOXIDE, FOAM, OR DRY CHEMICAL.
Flash Point: Flash Point Text: NOT FLAMMABLE

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): N/R
Upper Limit(s): N/R

Section 6 - Accidental Release Measures
ACTIVATED CARBON

Spill Release Procedures:
SWEEP UP SPILL AND DISCARD IN REFUSE CONTAINER OR BURY IN A LANDFILL.

Section 7 - Handling and Storage
ACTIVATED CARBON

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
ACTIVATED CARBON

Repiratory Protection:
NONE IF PROPERLY VENTILATED
Ventilation:
MECHANICAL(GENERAL) VENTILATION IS ESSENTIAL
Protective Gloves:
SHOULD BE USED
Eye Protection: GOGGLES FOR DUSTY CONDITIONS
Other Protective Equipment: LONG SLEEVED WORK CLOTHING.
Work Hygenic Practices: WASH THOROUGHLY AFTER USE AND BEFORE EATING, DRINKING OR SMOKING. VACUUM UP ANY DUST. LAUNDER CLOTHING BEFORE REUSE.
Supplemental Health & Safety Information: N/P

Section 9 - Physical & Chemical Properties
ACTIVATED CARBON

HCC: N1
NRC/State License Number: N/R
Net Property Weight for Ammo: N/R
Boiling Point: Boiling Point Text: N/R
Melting/Freezing Point: Melting/Freezing Text: N/R
Decomposition Point: Decomposition Text: UNKNOWN
Vapor Pressure: N/R **Vapor Density:** N/R
Percent Volatile Organic Content:

Specific Gravity: 1.8-2.1
Volatile Organic Content Pounds per Gallon:
pH: N/P
Volatile Organic Content Grams per Liter:
Viscosity: N/R
Evaporation Weight and Reference: 0
Solubility in Water: INSOLUBLE
Appearance and Odor: BLACK GRANULES
Percent Volatiles by Volume: N/P
Corrosion Rate: UNKNOWN

Section 10 - Stability & Reactivity Data
ACTIVATED CARBON

Stability Indicator: YES
Materials to Avoid:
STRONG OXIDIZERS OR LIQUID OXYGEN.
Stability Condition to Avoid:
NONE STATED BY THE MANUFACTURER.
Hazardous Decomposition Products:
UNKNOWN
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
NOT APPLICABLE

Section 11 - Toxicological Information
ACTIVATED CARBON

Toxicological Information:
N/P

Section 12 - Ecological Information
ACTIVATED CARBON

Ecological Information:
N/P

Section 13 - Disposal Considerations
ACTIVATED CARBON

Waste Disposal Methods:
CONSULT YOUR LOCAL ENVIRONMENTAL OFFICER. SHIP PRODUCT WASTE TO NORTHWESTERN CARBON FOR REACTIVATION OR BURY IN A LANDFILL AREA ACCORDING TO LOCAL, STATE, AND FEDERAL REGULATIONS.

Section 14 - MSDS Transport Information
ACTIVATED CARBON

Transport Information:
N/P

Section 15 - Regulatory Information

ACTIVATED CARBON

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
ACTIVATED CARBON

Other Information:
N/P

HMIS Transportation Information

Product Identification: ACTIVATED CARBON
Transporation ID Number: 83428
Responsible Party CAGE: 0K886
Date MSDS Prepared: 10/06/1986
Date MSDS Reviewed: 10/17/1992
MFN: 10/17/1992
Submitter: D DG
Status Code: C

Container Information
Unit of Issue: BG
Container Quantity: 0
Type of Container: BAG
Net Unit Weight:

Article without MSDS: N
Technical Entry NOS Shipping Number:
Radioactivity: N/R
Form:
Net Explosive Weight: N/R
Coast Guard Ammunition Code: N/R
Magnetism: N/P
AF MMAC Code:
DOD Exemption Number: N/R
Limited Quantity Indicator:
Multiple Kit Number: 0
Kit Indicator: N
Kit Part Indicator: N
Review Indicator: Y
Additional Data:

Department of Transportation Information

DOT Proper Shipping Name: CARBON, ACTIVATED
DOT PSN Code: CUR
Symbols: I

DOT PSN Modifier:
Hazard Class: 4.2
UN ID Number: UN1362
DOT Packaging Group: III
Label: SPONTANEOUSLY COMBUSTIBLE
Special Provision(s):
Packaging Exception: NONE
Non Bulk Packaging: 213
Bulk Packaging: 241
Maximimum Quanity in Passenger Area: 0.5 KG
Maximimum Quanity in Cargo Area: 0.5 KG
Stow in Vessel Requirements: A
Requirements Water/Sp/Other: 12

IMO Detail Information

IMO Proper Shipping Name: CHARCOAL, ACTIVATED
IMO PSN Code: DVZ
IMO PSN Modifier:
IMDG Page Number: SEE 4224
UN Number: 1362
UN Hazard Class: 4.2
IMO Packaging Group: III
Subsidiary Risk Label: -
EMS Number: 4.2-05
Medical First Aid Guide Number: NON

IATA Detail Information

IATA Proper Shipping Name: CARBON, ACTIVATED
IATA PSN Code: FGN
IATA PSN Modifier:
IATA UN Id Number: 1362
IATA UN Class: 4.2
Subsidiary Risk Class:
UN Packaging Group: III
IATA Label: SPONTANEOUSLY COMBUSTIBLE
Packaging Note for Passengers: 426
Maximum Quantity for Passengers: 0.5 KG
Packaging Note for Cargo: 426
Maximum Quantity for Cargo: 0.5 KG
Exceptions: A3

AFI Detail Information

AFI Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
AFI Symbols:
AFI PSN Code: ZZZ
AFI PSN Modifier:
AFI UN Id Number: N/R
AFI Hazard Class: N/R
AFI Packing Group: N/R
AFI Label: N/R
Special Provisions: N/A
Back Pack Reference: N/A

HAZCOM Label Information

Product Identification: ACTIVATED CARBON

CAGE: 0K886
Assigned Individual: N
Company Name: NORTHWESTERN CARBON
Company PO Box:
Company Street Address1: 85 SALE LN. SUITE E
Company Street Address2: RED BLUFF, CA 96080 US
Health Emergency Telephone:
Label Required Indicator: Y
Date Label Reviewed: 10/17/1992
Status Code: C
Manufacturer's Label Number:
Date of Label: 10/17/1992
Year Procured: N/K
Organization Code: F
Chronic Hazard Indicator: N
Eye Protection Indicator: YES
Skin Protection Indicator: YES
Respiratory Protection Indicator: YES
Signal Word: CAUTION
Health Hazard: Slight
Contact Hazard: Slight
Fire Hazard: None
Reactivity Hazard: Slight

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CORNELL

Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format) For Cornell University Convenience Only

ALCONOX

Section 1 - Product and Company Identification
ALCONOX

Product Identification: ALCONOX
Date of MSDS: 01/01/1987 **Technical Review Date:** 03/09/1987
FSC: 7930 **NIIN:** 01-153-7111
Submitter: D DG
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: ALCONOX, INC.
Manufacturer's Address1:
Manufacturer's Address2: N/P, NK 00000
Manufacturer's Country: NK
General Information Telephone:
Emergency Telephone: (212) 473-1300
Emergency Telephone: (212) 473-1300
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: Y
Published: Y
CAGE: NO073
Special Project Code: N

Item Description

Item Name:
Item Manager: S9M
Specification Number: N/K
Type/Grade/Class: NK
Unit of Issue: DR
Unit of Issue Quantity: 1
Type of Container: DRUM

Contractor Information

Contractor's Name: ALCONOX INC
Contractor's Address1: 9 EAST 40TH STREET, SUITE 200
Contractor's Address2: NEW YORK, NY 10016
Contractor's Telephone: 212-532-4040
Contractor's CAGE: 17534

Contractor Information

Contractor's Name: ALCONOX, INC.
Post Office Box: N/K
Contractor's Address1: UNKNOWN
Contractor's Address2: UNKNOWN, NK 00000
Contractor's Telephone: UNKNOWN
Contractor's CAGE: NO073

Section 2 - Compositon/Information on Ingredients
ALCONOX

Ingredient Name: DETERGENTS,ANIONIC
Ingredient CAS Number: **Ingredient CAS Code:** X
RTECS Number: **RTECS Code:** X
=WT: **=WT Code:**
=Volume: **=Volume Code:**

>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/P
OSHA PEL: N/P **OSHA PEL Code:**
OSHA STEL: OSHA STEL Code:
ACGIH TLV: N/K **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Section 3 - Hazards Identifieation, Including Emergency Overview
ALCONOX

Health Hazards Acute & Chronic: N/P

Signs & Symptoms of Overexposure:
NO DATA AVAILABLE-TREAT AS NUISANCE DUST.PROLONGED EXPOSURE TO DUST MAY IRRITATE MUCOUS MEMBRANES.

Medical Conditions Aggravated by Exposure:
N/P

LD50 LC50 Mixture: N/P

Route of Entry Indicators:
Inhalation: N/P
Skin: N/P
Ingestion: N/P

Carcenogenicity Indicators
NTP: N/P
IARC: N/P
OSHA: N/P

Carcinogenicity Explanation: N/P

Section 4 - First Aid Measures
ALCONOX

First Aid:
INHALE:REMOVE TO FRESH AIR, GIVE CPR/O*2 IF NEED;EYES/SKIN:FLUSH W LG AMTS

H*2O FOR 15 MIN;INGEST:RINSE MOUTH; GET MEDICAL ATTENTION FOR EYES, BREATHING DIFFICULTY, OR OTHER SYMPTOMS OF OVEREXPOSURE.

Section 5 - Fire Fighting Measures
ALCONOX

Fire Fighting Procedures:
WEAR SELF-CNTD BRTHG,APP H*20 SPRAY TO COOL CONTR.
Unusual Fire or Explosion Hazard:
NONE NOTED BY MANUFACTURER.
Extinguishing Media:
WATER, CO*2, DRY CHEMICAL, FOAM, SAND/EARTH.
Flash Point: Flash Point Text: NONE

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): N/R
Upper Limit(s): N/R

Section 6 - Accidental Release Measures
ALCONOX

Spill Release Procedures:
USD DUST RESPIRATOR & EYE PROTECTION; MATERIAL FOAM PROFUSELY, SHOVEL & RECOVER AS MUCH AS POSSIBLE. RINSE REMAINDER TO SEWER.MATERIAL IS COMPLETELY BIODEGRADABLE.

Section 7 - Handling and Storage
ALCONOX

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
ALCONOX

Repiratory Protection:
DUST MASK
Ventilation:
NORMAL ROOM VENTILATION.
Protective Gloves:
AS REQUIRED
Eye Protection: SAFETY GLASSES
Other Protective Equipment: NONE REQUIRED
Work Hygenic Practices: N/P
Supplemental Health & Safety Information: MSDS FROM ALCONOX INC EFFECTIVE:1/10/86.

Section 9 - Physical & Chemical Properties
ALCONOX

HCC: N1
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: N/R
Melting/Freezing Point: Melting/Freezing Text: N/A
Decomposition Point: Decomposition Text: N/A
Vapor Pressure: N/R **Vapor Density:** N/R
Percent Volatile Organic Content:
Specific Gravity: N/K
Volatile Organic Content Pounds per Gallon:
pH: N/P
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: N/R
Solubility in Water: APPRECIABLE
Appearance and Odor: WHITE POWDER INTERSPERED W/CREAM COLORED FLKS.ODRL
Percent Volatiles by Volume: N/R
Corrosion Rate: N/P

Section 10 - Stability & Reactivity Data
ALCONOX

Stability Indicator: YES
Materials to Avoid:
AVOID STRONG ACIDS
Stability Condition to Avoid:
NONE
Hazardous Decomposition Products:
MAY RELEAS CO*2 ON BURNING.
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
NOT KNOWN

Section 11 - Toxicological Information
ALCONOX

Toxicological Information:
N/P

Section 12 - Ecological Information
ALCONOX

Ecological Information:
N/P

Section 13 - Disposal Considerations
ALCONOX

Waste Disposal Methods:
SMALL QUANTITIES MAY BE DISPOSED OF IN SEWER.LARGE QTY SHOULD BE DISPOSED OF 1/A/W APPLICABLE-RECS FOR NON-HAZARDOUS DETERGENTS.

Section 14 - MSDS Transport Information
ALCONOX

Transport Information:
N/P

Section 15 - Regulatory Information
ALCONOX

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
ALCONOX

Other Information:
N/P

HMIS Transportation Information

Product Identification: ALCONOX
Transporation ID Number: 111562
Responsible Party CAGE: NO073
Date MSDS Prepared: 01/01/1987
Date MSDS Reviewed: 03/09/1987
MFN: 03/09/1987
Submitter: D DG
Status Code: C

Container Information
- **Unit of Issue:** DR
- **Container Quantity:** 1
- **Type of Container:** DRUM
- **Net Unit Weight:** 25LBS

Article without MSDS: N
Technical Entry NOS Shipping Number:
Radioactivity:
Form:
Net Explosive Weight:
Coast Guard Ammunition Code:
Magnetism: N/P
AF MMAC Code:
DOD Exemption Number:
Limited Quantity Indicator:
Multiple Kit Number: 0
Kit Indicator: N
Kit Part Indicator: N

Review Indicator: Y
Additional Data:

Department of Transportation Information

DOT Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
DOT PSN Code: ZZZ
Symbols: N/R
DOT PSN Modifier:
Hazard Class: N/R
UN ID Number: N/R
DOT Packaging Group: N/R
Label: N/R
Special Provision(s): N/R
Packaging Exception: N/R
Non Bulk Packaging: N/R
Bulk Packaging: N/R
Maximimum Quanity in Passenger Area: N/R
Maximimum Quanity in Cargo Area: N/R
Stow in Vessel Requirements: N/R
Requirements Water/Sp/Other: N/R

IMO Detail Information

IMO Proper Shipping Name: NOT REGULATED FOR THIS MODE OF TRANSPORTATION
IMO PSN Code: ZZZ
IMO PSN Modifier:
IMDG Page Number: N/R
UN Number: N/R
UN Hazard Class: N/R
IMO Packaging Group: N/R
Subsidiary Risk Label: N/R
EMS Number: N/R
Medical First Aid Guide Number: N/R

IATA Detail Information

IATA Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
IATA PSN Code: ZZZ
IATA PSN Modifier:
IATA UN Id Number: N/R
IATA UN Class: N/R
Subsidiary Risk Class: N/R
UN Packaging Group: N/R
IATA Label: N/R
Packaging Note for Passengers: N/R
Maximum Quantity for Passengers: N/R
Packaging Note for Cargo: N/R
Maximum Quantity for Cargo: N/R
Exceptions: N/R

AFI Detail Information

AFI Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
AFI Symbols:
AFI PSN Code: ZZZ
AFI PSN Modifier:

AFI UN Id Number: N/R
AFI Hazard Class: N/R
AFI Packing Group: N/R
AFI Label: N/R
Special Provisions: N/A
Back Pack Reference: N/A

HAZCOM Label Information

Product Identification: ALCONOX
CAGE: NO073
Assigned Individual: Y
Company Name: ALCONOX, INC.
Company PO Box: N/K
Company Street Address1: UNKNOWN
Company Street Address2: UNKNOWN, NK 00000 NK
Health Emergency Telephone: (212) 473-1300
Label Required Indicator: Y
Date Label Reviewed: 12/16/1998
Status Code: C
Manufacturer's Label Number:
Date of Label: 12/16/1998
Year Procured: N/K
Organization Code: G
Chronic Hazard Indicator: N/P
Eye Protection Indicator: N/P
Skin Protection Indicator: N/P
Respiratory Protection Indicator: N/P
Signal Word: N/P
Health Hazard:
Contact Hazard:
Fire Hazard:
Reactivity Hazard:

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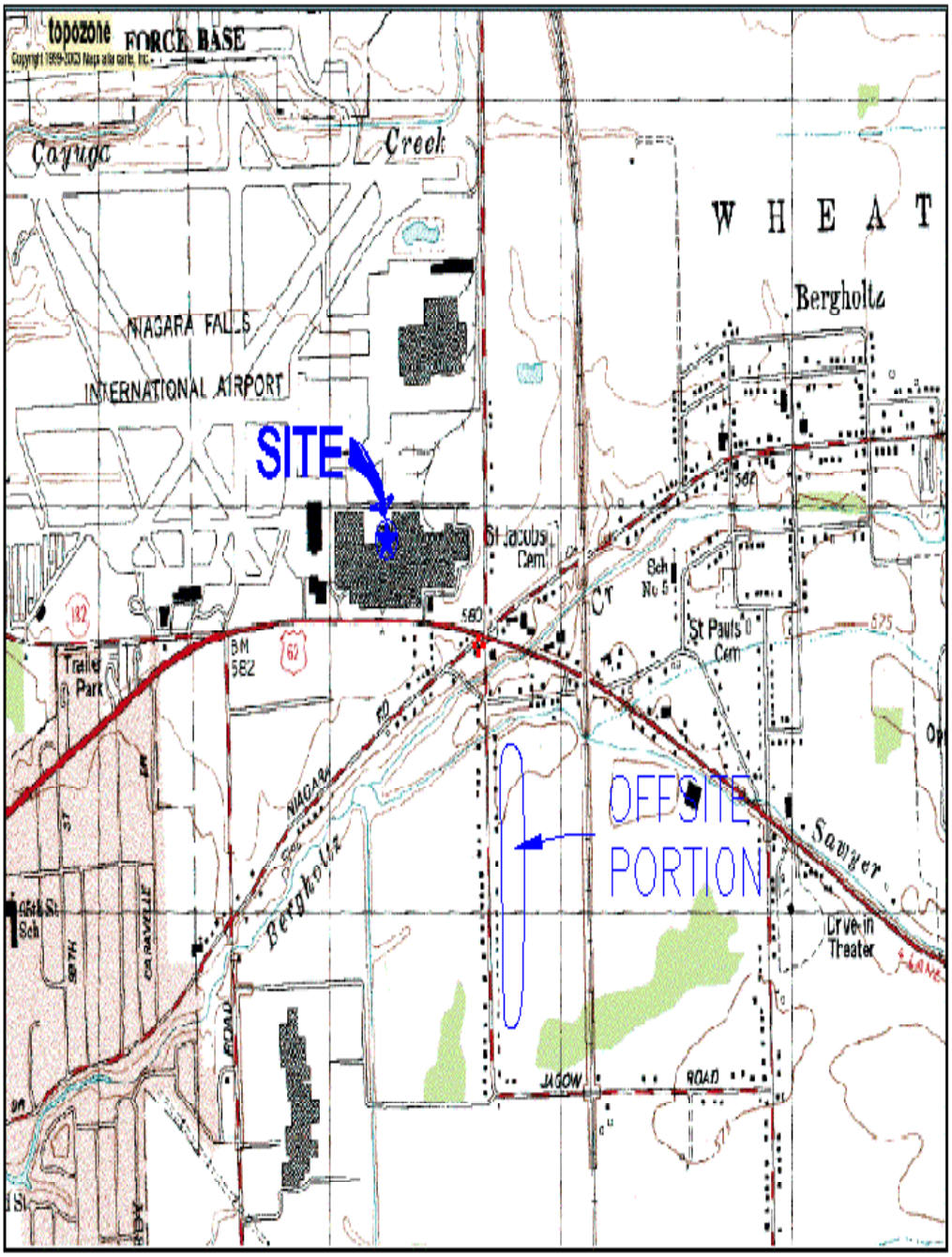
Appendix E
Site Maps

Figure 1
Site Location



Appendix F
Shaw H&S Procedures Required to be Onsite

NOTE: SEI health and safety procedures along with required forms that will be utilized during the project are listed below. A copy the Health and Safety Procedures will be included with this HASP or available electronically.

P-EI-HS001	**Environmental Health and Safety Policy**	**8/27/2009**
HS003	**Philosophy for Corporate Procedures**	**7/09/2009**
HS009	**New Employee Orientation Health and Safety Checklist**	**6/11/2009**
HS010	**Employee Safety and Health Work Rules**	**6/04/2009**
HS011	**Health & Safety Rules for Contractors**	**3/30/2006**
HS012	**Chemical Hygiene Plan**	**4/24/2002**
HS013	**Health and Safety Procedure Variance**	**8/03/2009**
HS014	**Severe Weather Policies and Procedures**	**3/17/2009**
HS018	**Safety Councils**	**6/04/2009**
HS019	**Injury and Illness Prevention Program**	**6/04/2009**
HS020	**Accident Prevention Program: Reporting, Investigation and Review**	**7/16/2003**
HS021a	**Accident Prevention Program: Tier 1, Sr. Management, Leadership Safety Assessments**	**11/01/2007**
HS021b	**Accident Prevention Program: Tier 2 Management Safety Inspections**	**11/01/2007**
HS021c	**Accident Prevention Program: Management Safety Inspections**	**11/01/2007**
HS022	**Accident Prevention Program: Review of New Proposals, Projects, Operations, Construction, and Jobs by Health and Safety**	**5/06/2009**
HS023	**Accident Prevention Program: Employee Safety Incentives and Team Safety Award Program**	**9/01/2007**
HS024	**Prevention of Repetitive Motion Injuries (Applies to California Only)**	**1/05/2010**
HS025	**Workplace Anti-Violence Policy**	**4/11/2006**
HS026	**Safety Observation Program**	**3/12/2009**
HS040	**Stop Work Authority**	**3/29/2004**
HS041	**Embryo-Fetus Protection Program**	**4/24/2002**
HS045	**Job Safety Analysis (JSA)**	**1/07/2003**
HS050	**Employee and Subcontractor Training Requirements**	**2/19/2007**
HS051	**Tailgate Safety Meetings**	**3/17/2009**
HS052	**Health and Safety Plans**	**3/23/2009**
HS060	**Hazard Communication Program**	**10/27/2003**
HS061	**Hazardous Waste Operations and Emergency Response**	**2/06/2004**
HS062	**Hazardous Waste Operations (RCRA)**	**5/22/2008**
HS090	**OSHA Regulatory Inspections**	**4/24/2002**
HS091	**Reporting of Fatality or Multiple Hospitalization Incidents**	**4/24/2002**
HS100	**Medical Policies and Procedures**	**3/21/2008**
HS101	**Drug and Alcohol Testing**	**12/19/2008**
HS102	**Management of Associate Exposure and Medical Records**	**4/24/2002**

HS104	**Employee Notification of Industrial Hygiene Monitoring Results**	**4/24/2002**
HS106	**First Aid Kits**	**9/26/2002**
HS300	**Confined Spaces**	**10/31/2008**
HS301	**Fall Protection**	**9/26/2002**
HS302	**Ladder Safety**	**5/06/2009**
HS303	**Pressurized Water Cleaning and Cutting Equipment**	**5/06/2009**
HS304	**Compressed Gas Cylinders**	**4/25/2002**
HS306	**Handling Compressed Gas Cylinders with Unknown Contents**	**2/13/2004**
HS307	**Excavation and Trenching**	**2/13/2004**
HS308	**Underground/Overhead Utility Contact Prevention**	**2/20/2006**
HS309	**Underground Storage Tank Removal**	**2/13/2004**
HS312	**Electrical Safety**	**2/13/2004**
HS313	**Fire Protection**	**2/13/2004**
HS314	**Hot Work in Hazardous Locations**	**2/13/2004**
HS315	**Control of Hazardous Energy Sources**	**2/13/2004**
HS316	**Drill Rig Operations**	**2/13/2004**
HS317	**Unexploded Ordnance (UXO)**	**3/28/2008**
HS400	**Working in Hot Environments**	**5/06/2009**
HS401	**Cold Stress**	**2/11/2004**
HS402	**Hearing Conservation Program**	**4/25/2002**
HS403	**Fatigue Management**	**8/23/2010**
HS500	**OSHA Regulated Toxic and Hazardous Substances**	**2/13/2004**
HS501	**Cadmium Compliance Plan**	**2/13/2004**
HS502	**Lead Compliance Plan**	**4/25/2002**
HS503	**Benzene Compliance Plan**	**6/04/2008**
HS504	**Asbestos Compliance Plan**	**2/09/2004**
HS505	**Hexavalent Chromium Protection**	**6/09/2008**
HS512	**Handling of Blood or Other Potentially Infectious Material**	**4/25/2002**
HS600	**Personal Protective Equipment**	**3/17/2008**
HS601	**Respiratory Protection Program**	**4/25/2002**
HS700	**Policy & Guidance For Developing Radiation Protection Plans**	**4/22/2008**
HS800	**Motor Vehicle Operation: General Requirements**	**7/27/2010**
HS810	**Commercial Motor Vehicle Operation and Maintenance**	**7/12/2005**
HS811	**Compliance Requirements for DOT's Emergency Response Telephone Number**	**2/19/2007**
HS820	**Forklift Operation**	**2/13/2004**
HS822	**Crane Operations**	**4/25/2002**
HS823	**Rigging & Lifting**	**7/18/2002**

POLICY

Subject: Environmental Health and Safety Policy

1. PURPOSE AND SUMMARY

This document establishes the environmental health and safety (EHS) policy of The Shaw Group Inc.'s Environmental & Infrastructure Group (Shaw E&I), and the mission, vision, values, and operating principles necessary to its fulfillment.

Shaw E&I is firmly committed to operating all of our facilities and projects in a safe, efficient manner and in compliance with all applicable EHS laws, rules, and regulations to which we subscribe. Through the adoption of these sustainable practices we are committed to securing a high quality of life for current and future generations, restoring and sustaining a healthy environment, and increasing value for our customers, shareholders, and business partners.

2. POLICY

Shaw E&I expects all of our employees, clients, and partners to uphold the highest EHS standards, to promote a positive and proactive safety attitude, and to exhibit a heightened awareness of their surroundings both on and off the job. We must identify risks and hazards and implement appropriate controls in order to provide an injury-free work environment where people, equipment, and the environment are not placed at unreasonable threat of injury or damage. We will continually strive to be good citizens in our own community, as well as in every community in which we operate.

The Environmental Health & Safety Program and the components of our Occupational Health & Safety Management System have been developed to guide us in our daily activities. We also commit ourselves to continual improvement in EHS management. Further, I ask that you include our environmental health and safety process in all aspects of your work, assist in the maintenance of our process, and communicate this policy to all persons working for or on behalf of Shaw E&I with the intent that they are made aware of their individual EHS obligations.

Through compliance with this policy, we will all actively participate in this process and advocate this philosophy. Together, we can accomplish our goals and exceed the minimum requirements provided by applicable laws and regulations, thus resulting in all stakeholders being proud to be a part of a team that truly values the importance of health, safety, and respect for the environment. Accordingly, we will maintain the position as a recognized leader in all of our business endeavors through a stewardship-based approach for our fellow employees, the environment, and the communities in which we live and work.

We are committed to the spirit and intent of this EHS policy statement and the laws, rules, and regulations to which we subscribe at its foundation.

George Bevan
President
Shaw Environmental & Infrastructure, Inc.

2.1 Mission

Shaw's E&I Group will achieve its goal of "Targeting Zero" accidents and injuries while working as a team to provide a workplace that is free from recognized hazards.

2.2 Vision

We will be recognized and respected as the leading company in our industry and as the standard by which our competitors are benchmarked by providing the leadership, guidance, and operations excellence necessary to identify and control all recognized hazards in the workplace.

2.3 Values

- **Leadership**—Provide the necessary tools to identify and control all hazards in the workplace.
- **Commitment**—We will never be satisfied that we have done enough.
- **Pride**—All employees will own the safety process.
- **Dedication**—To strive for continual improvement.
- **Appreciation**—To embrace the safety of our employees.

2.4 Operating Principles

- Safety is a core value.
- We plan work to ensure it is done safely.
- We are a safety team.
- We follow good safety practices in all work that we do.
- We will actively demonstrate our commitment to safety.
- All accidents are preventable.
- We will not perform any job that cannot be performed safely.
- We will not compromise safety in the interest of time or comfort.
- We will constantly review our performance to ensure continuous improvement.
- We will encourage employees to commit to safety as a lifestyle and carry the culture of "Targeting Zero" home with them.

3. DEFINITIONS

None.

4. REFERENCES

CEHS-01 Shaw EH&S Policy Statement

5. ATTACHMENTS

None.

6. FORMS

None.

7. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
03 08/27/2009	Changed name to reflect current Shaw Environmental & Infrastructure, Inc. President. Modified procedure to conform to new policy format.	Troy Allen

STANDARD OPERATING PROCEDURE

Subject: Philosophy for Procedures

UNCONTROLLED WHEN PRINTED

1. PURPOSE

The purpose of this procedure is to establish the Shaw Environmental & Infrastructure, Inc. (Shaw E&I) philosophy for developing and maintaining health and safety procedures.

2. SCOPE

This procedure applies to all procedures developed, or considered for development, by Shaw E&I.

3. REFERENCES

None

4. DEFINITIONS

None

5. RESPONSIBILTIES

5.1 Procedure Responsibility

The Senior Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

6. PROCEDURE

Shaw Environmental & Infrastructure, Inc. (Shaw E&I) will maintain policies and procedures to document the methods by which Shaw E&I will meet regulatory and internal safety and health management requirements. Procedures will follow the framework established by the regulations of the United States Department of Labor Occupational Safety and Health Administration, or other applicable federal regulations. In general, Shaw E&I will develop a procedure where regulation requires a "program plan," or where Shaw E&I chooses to impose additional requirements. Shaw E&I views it as unnecessarily burdensome to write procedures that simply duplicate regulatory requirements.

Since the vast majority of our work is project oriented, the key document through which we accomplish hazard assessment and control is the project-specific Health and Safety Plan. Guidelines for content and approval authority are established in Shaw E&I Procedure No. HS052, “Health and Safety Plans.”

Periodically state, local, or client requirements may be more protective than those in procedures based on federal regulations. Where this occurs, the Project Manager and health and safety professional will incorporate these requirements into the project-specific Health and Safety Plan.

Several broadly accepted exposure guidelines exist, and are updated at various frequencies. Shaw E&I will rely upon the most protective value between the current Occupational Safety and Health Administration Permissible Exposure Limits and the current American Conference of Governmental

Industrial Hygienists Threshold Limit Values, since these values are peer reviewed. The National Institute for Occupational Safety and Health Recommended Exposure Limits will be used in the absence of a Permissible Exposure Limits or Threshold Limit Values. For Hazardous Waste Operations only, the Recommended Exposure Limits shall take precedence over the Threshold Limit Values when a Permissible Exposure Limit does not exist.

7. ATTACHMENTS

None

8. FORMS

None

9. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
01 07/9/2009	Description of revisions made to the procedure or, in the case of extensive revisions made, "Extensive Revision." noted. All references to corporate procedures have been removed.	Mike Zustra

STANDARD OPERATING PROCEDURE

Subject: New Employee Health and Safety Orientation Requirements

1. PURPOSE

The purpose of this procedure is to establish the health and safety information that should be communicated on an individual basis to all new employees beginning work for The Shaw Group Inc.'s Environmental & Infrastructure Group (Shaw E&I), and/or all wholly-owned subsidiaries of Shaw E&I. It provides an outline of the health and safety information that should be reviewed with all new hire employees. Additionally, the completion of Form EI-HS009.1, "New Employee Health and Safety Checklist," will ensure that each employee understands the Health and Safety culture of Shaw E&I employees and its facilities and complies with the Shaw E&I drug and alcohol testing, motor vehicle, and background check requirements.

2. SCOPE

This procedure applies to all new employees.

2.1 Exception Provisions

Variances and exceptions may be requested pursuant to the provisions of EI-HS013, "Health and Safety Procedure Variance."

3. REFERENCES

- Procedure No. EI-HS010, Employee Health and Safety Manual
- Procedure No. EI-HS013, Health and Safety Procedure Variance
- Procedure No. EI-HS018, Safety Councils
- Procedure No. EI-HS020, Accident Prevention Program: Reporting, Investigation, and Review
- Procedure EI-No. HS040, Stop Work Authority
- Procedure No. EI-HS050, Employee and Subcontractor Training Requirements
- Procedure No. EI-HS101, Drug and Alcohol Testing
- Procedure No. EI-HS800, Motor Vehicle Operation: General Requirements

4. DEFINITIONS

- **Company**—All wholly-owned subsidiaries of Shaw E&I.

5. RESPONSIBILITY MATRIX

5.1 Procedure Responsibility

The Senior Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

5.2 Action/Approval Responsibilities

The Responsibility Matrix is shown as Attachment 1, "New Employee Health and Safety Checklist, Responsibility Matrix."

6. PROCEDURE

6.1 New Employee Health and Safety Orientation Requirements

New employee health and safety orientations must be completed with all new field employees within the first month of employment by their direct Supervisor or Resource Manager. In the event that this orientation is not completed by the direct Supervisor or Resource Manager, the Human Resource Manager or Health and Safety Representative will be responsible for this training.

The New Employee Health & Safety Checklist (Form EI-HS009.1) provides a form to assist the employee's direct Supervisor or Resource Manager with the completion of the orientation requirements. Completed checklists must be returned to the human resources manager to verify completion of the orientation process.

6.2 Employee Safety Handbook/New Employee Orientation Safety Video Review

Each new employee should be allowed to review the New Employee Orientation (NEO) Safety Video and should be provided with an Employee's Safety Handbook (Pocket Guide) by the Human Resources Representative. The employee shall be offered the opportunity to ask questions concerning the content of the NEO Safety Video and the Employee's Safety Handbook.

In those situations where an employee is hired outside of the traditional office setting and the new employee cannot review the NEO Safety Video at the hiring location, the direct Supervisor or Resource Manager shall provide for the viewing of the video upon the employee's arrival to the project, office, etc. The employee shall be instructed to complete and sign the perforated signature page of the handbook. The perforated page will then be removed from the handbook and forwarded to the Monroeville, Pennsylvania, Human Resource Department to be maintained in the employee's master file.

6.3 Employee Authorization to Stop Work

Every employee beginning work for Shaw E&I shall be issued an Employee Authorization to Stop Work card at the conclusion of the New Employee Orientation. All employees shall be provided with an explanation that the card enables all employees to stop unsafe work activities and that they have that right, without fear of reprimand or retaliation, to report anything they believe to be unsafe to their Supervisor.

6.4 Motor Vehicle Operation Review

Prior to allowing any employee to drive a company vehicle or drive their personal vehicle on behalf of the company, each employee shall be provided with a copy of the Shaw E&I Motor Vehicle Operation policy and procedure (EI-HS800, "Motor Vehicle Operation: General Requirements"). The employee shall be given an opportunity to ask questions about the policy. After the employee has signed Attachments 2 and 3 of EI-HS800, agreeing to the conditions of the policy, the Human Resources Representative or Resource Manager shall forward the attachments to the Baton Rouge Fleet Department via a fax number provided on the New Employee Checklist. The Fleet Department Representative will, based upon the DMV/MVR report results, determine the driving status for each new employee according to the point system established in EI-HS800. The employee shall then be enrolled in the applicable defensive driving course.

6.5 Drug and Alcohol

Every new Shaw E&I employee shall be provided with the company's Drug and Alcohol Testing program procedure (EI-HS101, "Drug and Alcohol Testing") and given the opportunity to ask questions of the requirements set forth in the procedure.

6.6 Health and Safety Manager Contact Information

All newly hired employees shall be provided by his/her Supervisor with the name, location, telephone number, and any other appropriate contact information for his/her Project, Site, Area, or Regional Safety Manager.

6.7 Health and Safety Policy and Procedure Overview

All newly hired employees of Shaw E&I shall be provided with an overview of all applicable Shaw E&I health and safety policies and procedures as well as the Site Safety Plan. It is the responsibility of the new employee's direct Supervisor to provide this overview and/or explanation.

6.8 Health and Safety Team Site

All new employees of Shaw E&I, with access to the ShawNet system, shall be shown how to access the Health and Safety Team Site and offered a chance to examine the content provided by the site. Employees should be encouraged by their Supervisor to access the site on a regular basis or as often as necessary.

6.9 Reporting

Each employee shall be provided with an overview of the Accident Prevention Program: Reporting, Investigation, and Review (EI-HS020, "Accident Prevention Program: Reporting, Investigation, and Review"). Employees shall be introduced to the Safety Hotline and given the proper instructions on how and when to report an accident, incident, and/or illness including all near misses.

6.10 Safety Council

Safety Councils provide a mechanism for management and employees to take a proactive role in providing a safe workplace. Safety Councils are required at the corporate, group, and business line levels throughout the company and actively involves management and employees in the continual enhancement of the safety of our workplace. Each new employee shall be provided with an overview of the company policy concerning Safety Councils (EI-HS018, "Safety Councils").

6.11 Office Safety Procedures

Prior to starting work, each employee shall be provided, by their Supervisor, with training specifically directed toward his/her home facility/office safety and emergency procedures.

6.12 Health and Safety Plan Review

Each new employee shall be informed of the Site Specific Orientation (EI-HS050, "Employee and Subcontractor Training Requirements") and site Health and Safety Plan (HASP) review that are required prior to performing work duties at a new location. It is the responsibility of the new employee's direct Supervisor to ensure that the employee receives this orientation and review of the site HASP.

6.13 Personal Protective Equipment

Every new employee shall be provided with the correct personal protective equipment (PPE) to perform his/her job duties as defined by the HASP for his/her work location. No Shaw E&I employee shall start work without proper PPE.

7. ATTACHMENTS

- Attachment 1, New Employee Health and Safety Checklist, Responsibility Matrix

8. FORMS

- EI-HS009.1_1, New Employee Health and Safety Checklist

9. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
01 06/11/09	• Changed procedure name to "New Employee Health and Safety Orientation Requirements. • Shifted several responsibilities currently assigned to "Recruiter/Human Resources" to Resource Manager and/or Direct Supervisor. • The Responsibility Matrix has undergone significant revisions to reflect the changes referenced above. • Revised the New Employee Health and Safety Checklist (Attachment 2) to eliminate redundant information and make HR responsible for ensuring the checklist has been completed prior to placement in the employee's personnel file.	Mike Zustra

Attachment 1
New Employee Health and Safety Checklist
Responsibility Matrix

Action	Procedure Section	Responsible Party				
		Human Resources Representative	Resource Manager/ Direct Supervisor	Project/ Office Manager	Health and Safety Representative	Senior Director, Health and Safety
Issue, Revise, and Maintain Procedure	5.1					X
Ensure checklist has been completed / processed for all new employees	6.1	X	X		X	
Provide new employees with a copy of the documents required to be completed by checklist	6.2	X	X			
Answer employee questions pertaining to items in New Employee Health and Safety Checklist	6.2	X	X			
Provide for Employee Safety Handbook and NEO Safety Video review	6.2	X	X			
Issue Stop Work Authorization Cards	6.3	X	X		X	
Fax completed motor vehicle operation procedure attachments to Baton Rouge.	6.4	X	X			

Action	Procedure Section	Responsible Party				
		Human Resources Representative	Resource Manager/ Direct Supervisor	Project/ Office Manager	Health and Safety Representative	Senior Director, Health and Safety
Provide Health and Safety Manager contact information	6.6		X			
Provide policy and procedure overview	6.7		X		X	
Review access to health and safety team site	6.8		X		X	
Review accident reporting procedures	6.9		X			
Provide overview of Safety Council procedure	6.10		X			
Review office safety procedures (when applicable)	6.11		X	X		
Provide Health and Safety Plan Review	6.12		X			
Provide required Personal Protective Equipment	6.13		X		X	

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New Employee Health and Safety Checklist

Employee Name: _____ **Employee #**: _____ **Date:** _____

Orientation Provided by: _____ **(Recruiter or Human Resources Representative)**

Orientation Provided by: _____ **(Employee's Direct Supervisor)**

Orientation Provided by: _____ **(Health & Safety Representative, if applicable)**

Please check off the boxes as Complete or N/A as the tasks are completed. Forward completed checklist form to the Shaw E&I Human Resources Office in Monroeville, Pennsylvania, Fax # 412-858-3973, for inclusion in their personnel file. Supervisor shall also maintain a copy of this form in on-site records.

Complete	N/A	
☐	☐	Employee reviewed New Employee Orientation Safety Video
☐	☐	Employee was provided Shaw E&I's Employee Safety Handbook (Pocket Guide).
☐	☐	Employee signed last page and page was sent to Monroeville, Pennsylvania Human Resources Department.
☐	☐	Employee provided "Employee Authorization to Stop Work" card with explanation.
☐	☐	Employee provided a copy of Shaw E&I Procedure No. HS800, "Motor Vehicle Operation: General Requirements. Employee completed, signed, and the recruiter faxed Attachments 2 and 3 to Baton Rouge Health and Safety Department (Fax: 225-987-3575).
☐	☐	Driver DMV/MVR Records Check completed and approval was received from BR Fleet Safety that prospective employee is either (check one): ☐ Drive without restriction ☐ Drive with probationary status ☐ Prohibited to drive Employee should then be enrolled in the applicable defensive driving course.
☐	☐	Employee has been provided information concerning the requirements under Shaw E&I Procedure No. HS101, "Drug and Alcohol Testing," as well as any applicable site, project, etc., requirements.
☐	☐	Employee provided Health and Safety Manager contact information: Name:_____ Location:_____ Phone:_____
☐	☐	Employee provided overview of Shaw E&I Health and Safety Policies and shown how to access through: http://shawnetv2.shawgrp.com/sites/govern/pp/ei/EHS%20Procedures/Forms/AllItems.aspx
☐	☐	Employee provided overview of Shaw E&I Health and Safety Team Site and shown how to access through ShawNet: http://shawnetv2.shawgrp.com/sites/ehs/ei/default.aspx
☐	☐	Requirement for reporting all incidents emphasized to employee (Shaw E&I Procedure No. HS020).
☐	☐	Shaw Safety Council procedure explained to employee (Shaw E&I Procedure No. HS018).
☐	☐	Office based employee trained on home facility/office safety and emergency procedures.
☐	☐	Field employee informed of requirement for Site Specific Safety Orientation (Shaw E&I Procedure No. HS050) and HASP review.
☐	☐	Employee is supplied with PPE equipment (hard hat, safety glasses, gloves, etc.)

STANDARD OPERATING PROCEDURE

Subject: Employee Health and Safety Manual

UNCONTROLLED WHEN PRINTED

1. PURPOSE

This procedure establishes the method of distribution for the employee Health and Safety Manual. This manual is not intended to be an all-inclusive document, but rather an outline of general health and safety guidelines applicable to all employees.

2. SCOPE

This procedure applies to all Shaw Group Inc. Environmental & Infrastructure Group (E&I) employees.

Variances and exceptions may be requested pursuant to the provisions of Procedure No. EI-HS013, "Health and Safety Procedure Variances."

3. REFERENCES

- Procedure No. EI-HS013, Health and Safety Procedure Variances

4. DEFINITIONS

- **Company**—All wholly-owned subsidiaries of Shaw E&I.

5. RESPONSIBILITY MATRIX

5.1 Procedure Responsibility

The Senior Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

5.2 Action/Approval Responsibilities

The Responsibility Matrix is shown as Attachment 1, "Responsibility Matrix."

6. PROCEDURE

Project and office managers are to ensure that each employee at his/her location is provided with a copy of the Health and Safety Manual. All newly hired employees will be provided a copy of this manual as part of their new hire orientation package. Employees are encouraged to read and retain this manual for future reference. Specific questions should be addressed to their manager or health and safety representative.

The employee's manager is responsible for collecting completed copies of the signature card found at the end of the manual, and for forwarding these cards to the Human Resources Department. Additional copies of this manual can be obtained from the various Human Resources Departments located throughout the company.

7. ATTACHMENTS

- Attachment 1, Responsibility Matrix

8. FORMS

None.

9. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
02 / 06/04/2009	No significant changes have been made to the content of this procedure. Numerous sentence structure problems were corrected.	Zustra, Mike

Attachment 1
Employee Health and Safety Manual
Responsibility Matrix

Action	Procedure Section	Responsible Party			
		Human Resources Representative	Project/ Office Manager	Health and Safety Representative	Senior Director of Health and Safety
Issue, Revise, and Maintain Procedure	5.1				X
Ensure Current Employees are Provided a Copy of the Manual	6		X		
Provide New Hires With a Copy of the Manual	6	X			
Answer Employee Questions Pertaining to Manual	6		X	X	
Forward Completed Signature Cards to Human Resources Department	6		X		

PROCEDURE

Subject: **HEALTH AND SAFETY RULES FOR CONTRACTORS**

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to promulgate the General Safety Rules for Contractors and the Contractor Site Safety Rules Checklist. These documents set forth in broad terms the health and safety requirements to which a contractor is expected to conform while working under contract with Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility. The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities. The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Contractor- As used in this procedure, means a party in either the Prime or Subcontractor role or otherwise, providing supplies/services to Shaw E & I and performing some obligations of a particular prime contract.

Contractor prequalification- The process of ensuring that an individual or firm possesses the required capabilities so that both Shaw E & I and the Contractor are protected in the event of a failure to perform, an accident, or a difference of opinion as to the terms and conditions or performance. This prequalification process is governed by Shaw E & I Procedure PR012 Subcontractor Prequalification Requirements.

5.0 DISCUSSION

The attached publications have been created for the express purpose of circulating prescribed safety and health rules for contractors working on Shaw E & I projects, whether in-house or for clients. These publications should be widely distributed to our contractors and the rules contained therein stringently enforced. These rules are supported by years of experience in the field and are considered equally applicable to our own operations as well as our contractors.

6.0 TEXT

6.1 Procurement Department

Shaw E & I procurement specialists will forward copies of the attached documents to prospective contractors as part of the contractor prequalification process prescribed by Shaw E & I Procedure PR012- Subcontractor Prequalification Requirements. They will assure completion of the General Site Safety Rules for Contractors Receipt and maintain copies with the procurement file.

6.2 Document Availability

Stocks of the attachments will be maintained in the procurement system for issuance upon submittal of a request to the Procurement Department. In addition, local health and safety personnel will maintain a small working stock of the publications for ready issue.

6.3 Document Updates

It is desired to make these safety and health documents truly functional publications. To that end, suggestions for improvement are encouraged. Recommended changes should be submitted to local health and safety personnel for transmittal to the Corporate Health and Safety Office for consideration and incorporation.

7.0 CROSS REFERENCES

Shaw E & I Procedure PR012 Subcontractor Prequalification Requirements

8.0 ATTACHMENTS

1. Responsibility Matrix
2. General Safety Rules for Contractors

ATTACHMENT 1
HEALTH AND SAFETY RULES FOR CONTRACTORS

Responsibility Matrix

Action	Procedure Section	Procurement Specialist	Local HS Representative	Director of HS
Issuance, revision and maintenance of this procedure	3.1			X
Distribute General Safety Rules	6.1	X		
Maintain General Safety Rules Receipts	6.1	X		
Submit Recommended Changes	6.3		X	
Update General Safety Rules	6.3			X

ATTACHMENT 2
HEALTH AND SAFETY RULES FOR CONTRACTORS

Shaw Environmental & Infrastructure, Inc.

General Safety Rules for Contractors

Health & Safety Office. 4171 Essen Lane, Baton Rouge, LA 70809. 225-932-2500

Introduction

The rules and requirements contained in this booklet have been written for the guidance of Contractors who are to perform work under contract with any member company of Shaw Environmental & Infrastructure, Inc. (Company). This booklet prescribes minimum requirements only. The Contractor, working in conjunction with the Company representative, will be expected to establish such additional rules and procedures as may be necessary to conduct a safe operation and comply with Company, regulatory and insurance requirements, and those of our clients.

The term Contractor, as used in this booklet, shall be understood to include any and all persons, sole proprietorships, partnerships, corporations, or other business ventures under contract, oral or written, to the Company. Contractor is responsible for informing its subcontractors of these requirements, for directing and supervising work of subcontractors, and for assuring that its subcontractors adhere to the requirements herein. The Company may request Contractor to provide proof of its subcontractor's adherence to all rules and regulations and will prohibit access to Company property or job sites or our client's property for those Contractors not in compliance.

In order to assist Contractor in following these instructions, a Company Representative will be assigned to the Contractor to act as the Company agent in all matters relative to work activities at Company facilities or job sites. Under no circumstances shall any work be started until the Company Representative has been contacted, a job orientation and Tailgate Safety meeting has been conducted, and all permits, insurance, and company, client, and regulatory pre-job requirements have been met.

General Safety Rules and Requirements

Accident Reporting

All incidents (personal and property damage) shall be reported immediately to the Company Representative. A written report shall be prepared documenting the incident and corrective measures taken to prevent recurrence.

Alcohol, Firearms, etc.

Alcoholic beverages, illegal drugs or narcotics, or guns and ammunition are not permitted on Company property or job sites. Personnel under the influence of alcohol or drugs shall not be allowed on Company property or job sites.

Approvals

The Contractor shall be required to obtain pertinent work permits or authorizations and approval from the Company Representative before:

- Working on existing pipelines or equipment.
- Entering tanks or closed vessels.
- Entering any designated high-hazard areas.
- Using torches, electrodes, electric motors, forges, soldering irons, any open flames, or any device which could produce sparks or ignition source.
- Closing walkways, roads, or restricting traffic.
- Starting excavations.
- Removing tanks from excavations.
- Backfilling excavations.
- Using utilities as such steam, water, compressed air, or electricity.
- Sandblasting, spray painting, or guniting.
- Storing flammable materials such as gasoline, oil, paints, compressed gas cylinders, etc.
- Walking or working on roofs of buildings or equipment.
- Drilling, boring, preparing test pits, or using geophysical equipment or any other exploratory equipment requiring penetration of surfaces.
- Operating cranes or similar equipment near overhead power lines, pipelines, or underground utilities.
- Opening or cutting through firewalls or beams.
- Fueling or repairing Contractor operating equipment on Company property or job sites.

Security

For security reasons, entrance to and exit of Company facilities and job sites is restricted to those areas designated as the Contractor's work area.

Speed Limits

All vehicles on Company job sites and facilities must observe a maximum speed limit of 10 mph, unless otherwise posted.

Vehicle Safety

- All vehicles must be parked in authorized areas only.
- There will be no passing of moving vehicles at job sites where there are narrow roads and short-sight distances.
- Company vehicles will only be operated by personnel with valid licenses and good driving records. (ref. Company Procedure HS800).
- Vehicles shall have all required inspection and operating permits.
- Seat belts shall be used for all drivers and passengers.

Other General Requirements

This booklet focuses on Federal and Company standards. Where State and local standards exist and are more stringent, their provisions shall be followed.

The Company has established a lifting limit of 60 pounds. Above this weight, additional personnel and/or materials handling equipment are required.

All bridges intended for vehicular traffic shall be constructed to withstand twice the load of the heaviest vehicle anticipated.

Contractors are expected to brief their employees on these requirements and enforce these rules with their employees.

All Contractor equipment, such as pipe, rebar, etc., shall be kept out of traffic lanes and access ways. Equipment shall be stored in a manner, which ensures the safety of the Company and Contractor employees at all times.

All surfaces which a person could reasonably contact should be free of splinters, nails, or protrusions which may cause injury.

Company management may stop or suspend work at any time the Contractor fails to comply with company rules and regulations.

Safe Work Practices

Confined Space Entry

Confined spaces include storage tanks, bins, sewers, in-ground vaults, degreasers, boilers, vessels, tunnels, manholes, pits, certain excavations, etc. These enclosures, because of inadequate ventilation and/or the introduction of hazardous gases and vapors, may present conditions that could produce asphyxiation or injury.

Before entering a confined space, Contractor must notify the Company Representative of intent to enter. The Company Representative will review with Contractor the safe entry requirements which include:

Permits - All confined space entries are initially considered permit-required until/unless the space meets the requirements of Company Procedure HS300 for non-permit required confined spaces.

Removal of Contents - Confined spaces must be clean; free of hazardous materials/chemicals; and, where necessary, purged by water or other equivalent means, insofar as is feasible or possible.

Isolation - All input lines that discharge into a confined space shall be disconnected, blanked, capped, or isolated. The use of a single in-line valve shut-off as the sole means of isolating the confined space from any input lines is prohibited.

Electrical Lockout - Where electrical devices located within the confined space (motors, switches, etc.) are to be repaired or worked on, the line-disconnect switches supplying the power must be tagged and locked in the "OFF" position. The lock key is to be kept by the person performing the job, and only this person is authorized to unlock the switch and remove the tag upon completion of the job. Where more than one person is working on the line, each must place a lock on the switch and retain their own key.

Where there are multiple sources of power to an electrical device that supplies power to the device through an automatic or manual bus transfer switch, lockout devices must be placed on the breaker nearest to the electrical device that is to be isolated, and an electrician shall test the power supply lines to ensure that power has been secured.

Line-disconnect switches supplying power to any mechanical apparatus in the confined space (mixers, conveyors, etc.) must also be tagged and locked in the "OFF" position. This must be done for any entry, even though work will not be performed on the apparatus itself.

Securing of Covers - All manhole and cleanout covers shall be removed and the openings maintained clear of any obstructions. When hinged doors or lids are provided, they shall be secured so they cannot be closed.

Testing Atmosphere - A qualified person (see Company Procedure HS300 or 29 CFR 1910.146) shall make appropriate tests of the atmosphere in the confined space and place a record of the test results at the entrance to the confined space. Testing shall ensure the following:

- Combustible gas and vapor concentrations do not exceed 10 percent of the lower explosive limit.
- Oxygen content is no less than 19.5 percent and no greater than 23.5 percent.
- Appropriate respiratory protective equipment and other appropriate personal protective devices have been provided for all employees when concentrations of toxic materials exceed established exposure limits.

Continuous Monitoring - If the nature of the work to be performed introduces, or has the potential to introduce, harmful air contaminants, continuous monitoring of the atmosphere is required. If tests indicate evidence of dangerous air contaminants, and/or the oxygen content drops below 19.5 percent, or rises above 23.5 percent, all personnel shall evacuate the confined space immediately.

Personal Protective Equipment - All Contractor employees must be instructed in accordance with OSHA regulations regarding personal protective clothing, hard hats, respirators, lifelines, and harnesses. Such instructions shall be received and documented before entering any confined space.

Contractor shall arrange for confined space rescue services as required by 29 CFR 1910.146, prior to entry.

Compressed Gas Cylinders

- Valve protection caps shall be in place when compressed gas cylinders are transported, moved, or stored.
- Cylinder valves shall be closed when work is finished and when cylinders are empty or are moved.
- Compressed gas cylinders shall be secured (roped or chained), in an upright position at all times, except when cylinders are actually being hoisted or carried.
- Gas regulators shall be in proper working order while in use and shall only be of the type approved for the application.
- If a leak develops in a gas cylinder, after donning appropriate safety equipment, immediately remove it to a safe location. If the leak cannot be corrected, report it to the Company Representative.
- Cylinders shall be permanently marked or stenciled to identify the type of gas in the cylinder.
- All compressed breathing air shall meet ASTM specifications for breathing air quality.
- Oil and oily rags shall be kept away from oxygen equipment

Cranes, Hoists, and Other Heavy Equipment

- Contractor personnel will not be permitted to use hoists and powered apparatus belonging to the Company unless approval is obtained in each instance from the Company Representative.
- Roll over protection shall be used when conditions or regulations call for such use.
- Documentation of operator qualifications shall be on file.
- Subcontractor shall present to the Company site supervisor for review the documentation for permits, testing and inspection on cranes and heavy equipment; and shall make maintenance records available as requested.

Cutting or Welding

- "Hot work" authorization must be obtained from the Company Representative before any welding, cutting, or other "hot work" is done. "Hot work" permits and results of tests are to be submitted to the Company Representative at the completion of the job or at the end of each workday.
- Noncombustible or flameproof shields or screens must be provided to protect welder or others who might be harmed by direct rays of arc.
- Goggles, gloves, aprons, and other personal protective equipment appropriate to the job shall be used.

High Fire-Hazard Areas

- Contractor personnel are responsible to see that a fire watch is maintained and all adjacent combustible materials are protected or removed as designated by the Company Representative.

Safe Work Practices

- Contractor shall provide their own calibrated combustible gas meter or other instruments for checking areas before beginning hot work.
- Documentation of instrument calibration shall be submitted to the Company Representative
- Contractor is responsible for all testing and monitoring required by applicable regulations, assuring work place safety, and providing test results to the Company.
- The Company shall have the right, not the responsibility, to perform additional testing. Company testing shall not be in lieu of Contractor's requirement.

- Contractor shall provide fire extinguisher(s) for welding and cutting, as designated by the Company Representative.
- Contractor shall provide a fire watch for 30 minutes AFTER cutting is completed.

Electrical Safety

- All noncurrent-carrying metal parts of fixed, portable, or plug- connected equipment shall be grounded. Since ground wires can break, they shall be tested with an electrical resistance meter to assure conductivity as often as necessary to assure safety.
- Extension cords shall be the three-wire type for grounded tools and shall be protected from damage; do not fasten with staples or extend across an aisleway or walkway. Worn or frayed cords shall not be used. Cords shall not be run through doorways where the door could cut or damage them.
- Exposed bulbs on temporary lights shall be guarded to prevent accidental contact, except where bulbs are deeply recessed in the reflector. Temporary lights shall not be suspended by their electric cords unless designed for this use. Explosion-proof bulb covers shall be used when contact with flammable vapors or gases are possible and shall meet Class 1, Division 1 requirements.
- Receptacles for attachment plugs shall be of the approved, concealed, contact type. Where different voltages, frequencies, or types of current are supplied, receptacles shall be of such design that attachment plugs are not interchangeable.
- All field/construction shall require ground fault interruptors and watertight connectors.

Emergency Equipment

- The Company's fire equipment is not to be moved, relocated, or otherwise rendered inaccessible unless specific permission is granted in each case by the Company Representative.
- Self-contained breathing apparatus, first aid equipment, fire blankets, stretchers, eyewash fountains, and deluge showers are not to be moved, relocated, blocked, or used without the express permission of the Company Representative.

Excavations and Trenches

- Before any excavation work begins, all required permits shall be obtained.
- All work shall be in accordance with 29 CFR 1926 Subpart P and Company Procedure HS307.
- The Contractor's Competent Person shall be identified to the Company Representative, including documentation of qualifications.
- When subcontractor is responsible for design of excavation, shoring, trenches or barrier walls, full design/approval (i.e., P.E.) documentation shall be presented to the Company Representative.

Fall Protection

- Contractor shall ensure employees on a walking/working surface six feet or higher above a lower level are protected by guardrail systems, personal fall arrest systems, or safety net systems.
- Safety harnesses and lifelines (including extracting devices for top entry spaces) are required on all work performed in permit-required confined spaces.
- All lifelines shall be safely secured to stable and adequate supports.
- Contractor activities shall comply with 29 CFR 1926 Subpart M - Fall Protection.

Fire Prevention

Company Representative, or his designee, is authorized to correct any condition which he may consider a fire hazard. In any emergency, the site personnel are authorized to act directly with Contractor's Supervisor in regard to fire hazards without waiting for the Company Representative.

Floor Openings

- Floor openings shall be guarded by substantial barriers, railings, and/or covering materials strong enough to sustain twice the load of employee's equipment and materials that may be imposed on the cover at any one time. Barriers will be supplied by the Contractor.
- Where a danger of falling exists for personnel, elevated floor areas must be provided with guardrails. In addition, toeboards shall be provided when the possibility of falling objects striking personnel below exists.

High-Hazard Areas

Although this list is not all inclusive, there are certain areas and operations at Company facilities and job sites where extra precautions must be taken because of the nature of the hazards. When starting up any operation, Contractor is required to check with the Company Representative for a review of the safety and health rules which apply before entering any of the following areas:

- Confined spaces (tanks, manholes, vaults, pits, etc.)
- Building roof areas
- Laboratories
- Excavations
- Chemical storage and disposal areas

Contractor is also required to check with the Company Representative before any work is done on a flammable gas or solvent line; a tank or vessel that presently contains, or has contained, a flammable material; and before making an excavation anyplace on the site.

Housekeeping

- Material shall be carefully stacked and located so that it does not block aisles, doors, self-contained breathing apparatus, fire extinguishers, fire blankets, stretchers, emergency eyewash fountains, emergency safety showers, fixed ladders, stairways, or electrical breaker panels.
- Nails protruding from boards must be removed or bent over.

Safe Work Practices

- All work areas shall be kept clear of scrap lumber and all other debris.
- Combustible scrap, waste materials, and debris shall be removed at regular and frequent intervals.
- Containers shall be provided for the collection and separation, by type, of refuse. Covers shall be provided on containers used for flammable, combustible, or harmful substances.
- Overhead storage of debris, tools, equipment, pipes, etc., is prohibited.
- At the end of each workday, Contractor shall provide for pick-up of all debris such as paper, rags, empty cans and bottles, etc.

Ladders

- The use of ladders with broken or missing rungs or steps, broken or split handrails, or with other faulty or defective construction is prohibited.
- Ladders must not be placed adjacent to a door unless the door is locked or guarded.
- Metal ladders shall not be used for electrical work.
- Tie off top of ladder to structure.

Medical Service and First Aid

- Preplanned emergency medical service shall be provided as designated by Contractor and approved by the Company Representative.
- Contractor shall provide a first aid kit for Contractor employees, which meets or exceeds minimum OSHA requirements.
- Compliance with Bloodborne Pathogens Standard (29 CFR 1910.1030) and Company Procedure HS512 is required.

Overhead Work

No overhead work shall be performed when, as a result of that work, the possibility of a falling object striking any person exists. Do not work above any person at any time.

Personal Protective Clothing and Equipment

In certain construction and maintenance operations, personal protective equipment such as safety glasses, chemical goggles, respirators, hard hats, and protective clothing is required. The type of protective equipment to be worn will be determined by the degree of exposure to the potential hazard. There will be very few occasions when hard hats and eye protection will not be required at Company job sites. When in doubt of the safety measures to be observed, Contractor shall contact the Company Representative. This shall not, however, relieve Contractor of the responsibilities to determine appropriate protection.

Eye protection is required when engaging in such operations as the following:

- Drilling, chipping, grinding, wire brushing
- Handling caustics and acids
- Breaking bricks or concrete
- Hammering chisels, drift pins, etc.
- Burning or welding
- Other situations which create a possible eye hazard (e.g., chemical environments)

Photographs

Only Company photographers are permitted to carry cameras or take pictures. If progress or finished construction photographs are desired, request for same should be made through the Company Representative.

Power/Air-Actuated Tools

- Power/air-actuated tools are not to be used on Company property or job sites without prior approval of the Company Representative.
- Explosive-actuated fastening tools shall meet ANSI design requirements. A tool which does not meet these design standards cannot be used.
- A tool shall never be left unattended in a place where it would be available to unauthorized persons.
- The tools shall not be used in explosive or flammable atmospheres.

Safety

Company Representative and designees are authorized to stop any work which they may consider hazardous to Company personnel or equipment or Contractor personnel.

Scaffolds

- All scaffolds, whether fabricated on site, purchased, or rented, shall conform to the specifications found in Safety Requirements for Scaffolding (ANSI A10.8) and 29 CFR 1910.28 or 1926.451, as appropriate. Rolling scaffolds shall maintain a four-to-one height-to-base ratio.
- The footing or anchorage for a scaffold shall be sound, rigid, and capable of carrying the maximum intended load without settling or displacement.
- Unstable objects, such as barrels, boxes, loose bricks, or concrete blocks, shall not be used to support scaffolds or planks.
- No scaffold shall be erected, moved, dismantled, or altered except under the supervision of competent persons.
- Scaffolds and their components shall be capable of supporting, without failure, at least four times the maximum intended load.
- Guardrails and toeboards shall be installed on all open sides and ends of platforms more than 10 feet above the ground or floor.
- Scaffolds measuring four to ten feet in height, and having a horizontal dimension of less than 45 inches, shall have standard guardrails installed on all open sides and ends of the platform.
- Wire, synthetic, or fiber rope used for suspended scaffolds shall be capable of supporting at least six times the rated load.
- No riveting, welding, burning, or open flame work shall be performed on any staging suspended by means of fiber or synthetic rope.
- Tested fiber or approved synthetic ropes shall be used for or near any work involving the use of corrosive substances.

Smoking and Open Flames

Smoking and the use of open flames are strictly prohibited in areas where flammable liquids, gases, or highly combustible materials are stored, handled, or processed. Obey "No Smoking" signs. Smoke only in designated areas.

Solvents and Paints

- Adequate ventilation must be maintained at all times when paints or solvents are used.
- Personnel should use proper respiratory protection and protective clothing when toxicity of the material requires such protection.

Safe Work Practices

- Flammable solvents and materials shall not be used when possible sources of ignition exist.
- Flammable paints and solvents must be stored in an approved (Factory Mutual or Underwriters Laboratories) flammable liquids storage cabinet when storage is required inside buildings. If an approved cabinet is not available, paints and solvents must be removed from the building when not in use.
- Flammable liquids must be dispensed in safety cans with flash arresters bearing a Factory Mutual or Underwriters Laboratories approval. These containers must be clearly identified as to their contents.
- Material Safety Data Sheets, for materials used by the contractor, shall be maintained by the Contractor, and a copy provided to the Company Representative.

Tarpaulins
When tarpaulins are required for the deflection of hot slag, dust, paint drippings, etc., or as security barriers, they shall be flame-resistant and in good condition.

Tools

- Hand and power tools shall be kept in safe operating condition. Mushroomed heads on cold chisels, star drills, etc., are unsafe and shall not be used. Hammers shall have handles which are not cracked, split, or broken.
- Nonsparking tools may be necessary in certain areas where flammable materials are handled or where sparks could create an explosion.

Transporting Material and Equipment

- Extreme care must be taken while carrying sections of pipe, conduit, and other materials to assure safety to the Company and client personnel and property. This includes, but is not limited to, flagging and use of two people to carry pipe of lengths greater than ten feet.
- Tools, material, and equipment must not be left unattended in accessways.
- Tools, material, and equipment shall not be removed from the job site without permission of the Company Representative.

Walking and Working Surfaces

- Workroom floors shall be clean and, to the extent possible, dry.
- Drainage mats, platforms, or false floors should be used where wet processes are performed.
- Floors shall be free from protruding nails, splinters, holes, and loose boards or tiles.
- Permanent aisles or passageways shall be marked.
- Floor holes shall be protected by covers that leave no openings more than one inch wide.
- Floor openings into which persons can accidentally walk shall be guarded by a standard railing and toeboards.
- Open-sided floors, platforms, and runways higher than four feet shall be guarded by standard railings.
- Toeboards shall be used wherever people can pass below, or where hazardous equipment or materials are located below.

Warning Signs
All posted warning, safety, and security signs and barriers shall be observed. Additionally, Contractor shall provide warning signs, barriers, barricades, etc., wherever such protection is needed. Where signs and barricades do not provide adequate protection, particularly along a road, flagmen shall be used.

PROCEDURE

Subject: CHEMICAL HYGIENE PLAN

1.0 PURPOSE AND SUMMARY

This chemical hygiene plan (CHP) documents the program that protects associate health and the steps taken to ensure that associate exposures are below the lower of the Permissible Exposure Limits (PELs) established by Occupational Safety and Health Administration (OSHA) and the Threshold Limit Values® (TLVs®) published by the American Conference of Governmental Industrial Hygienists (ACGIH). The plan is consistent with the regulatory requirements of the federal and state Occupational Safety and Health Administrations and is supplemented by standard operating procedures (SOPs) that document safe work practices for the variety of hazards commonly found in a Shaw Environmental & Infrastructure, Inc. (Shaw E & I) laboratory. The plan specifically addresses:

- Designation of personnel responsible for implementation of the CHP, including the assignment of a Chemical Hygiene Officer (CHO);
- SOPs to be followed when laboratory work involves the use of hazardous chemicals;
- Control measures to reduce associate exposure to hazardous chemicals to as low as reasonably achievable (ALARA), including engineering controls, the use of personal protective equipment (PPE), and personal hygiene practices;
- Provisions for additional associate protection when working with regulated chemicals including carcinogens;
- Circumstances under which a particular laboratory operation, procedure, or activity shall require approval from the CHO before implementation;
- Measures to ensure the proper functioning and adequate performance of laboratory hoods and other protective equipment; and
- Procedures to be followed in the event of an emergency, including the location and proper use of available emergency equipment.

This **document defines the minimum requirements** for any Shaw E & I laboratory and provides consistent directions for each Laboratory Director. Each facility incorporates their own procedures as applicable in order to make the document specific to that facility.

This Chemical Hygiene Plan applies to any Shaw E & I associate involved in the laboratory use of hazardous chemicals. Visitors and contractors must comply with specific elements as defined. Mobile and field laboratories will meet all of the requirements of this document in the absence of a facility-specific document.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility - The Director of Health & Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities - The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Action Level
The action level is the airborne concentration of a chemical designated in 29 CFR 1910 calculated as an 8-hour time-weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance. For chemicals listed in 29 CFR 1910.1000 Table Z-2, the action level is defined as 50 percent of the PEL.

Acute Health Effect
An acute health effect is defined as an adverse effect on a human or animal body with symptoms that develop rapidly.

Acute Toxicity
Acute toxicity is the adverse effects resulting from a single dose of or exposure to a material and is ordinarily used to denote effects observed in experimental animals.

Authorized Personnel
These are associates who have been advised of the potential hazards of the chemicals being used in, and have the approval of the department supervisor to enter and work in, a designated area.

Carcinogen
A carcinogen is a substance that:

(a) OSHA regulates as a carcinogen;
(b) the National Toxicity Program (NTP) lists as "Known to be [a] carcinogen;"
(c) the International Agency for Research on Cancer (IARC) lists as Group 1, "carcinogenic to humans;" (d) the IARC lists as Group 2A or 2B, or NTP lists as "reasonably anticipated to be [a] carcinogen," and causes statistically significant tumor incidence in animals.

Chronic Health Effect
A chronic health effect is an adverse effect on a human or animal body with symptoms that develop slowly over a long period of time or that recur frequently.

Chronic Toxicity
Chronic toxicity is an adverse effect(s) resulting from repeated doses of, or exposures to, a material over a relatively prolonged period of time and is ordinarily used to denote effects observed in experimental animals.

Designated Area
A designated area is an area which may be used for work with “select carcinogens,” reproductive hazards, or substances which have a high degree of acute toxicity. The area may be an entire laboratory, or even a laboratory fume hood.

Energized Equipment
Energized equipment is equipment that is connected to an energy source, or contains residual or stored energy. The energy may be electrical, thermal, chemical, hydraulic, or pneumatic in nature.

Hazardous Chemical
A hazardous chemical is one for which there is statistically significant evidence, based on at least one study conducted in accordance with established scientific principles, that acute or chronic health effects may occur in exposed associates. The term "health hazard" includes chemicals that are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents that act on the hematopoietic systems, and agents that damage the lungs, skin, eyes, or mucous membranes.

Laboratory
A facility where the "laboratory use of hazardous chemicals" occurs constitutes a laboratory. It is a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

Laboratory Fume Hood
A laboratory fume hood is a device enclosed on five sides with a moveable sash, or fixed partial enclosure, on the remaining side. The hood is constructed and maintained to draw air from the laboratory and to prevent or minimize the escape of air contaminants into the laboratory. The

hood allows chemical manipulations to be conducted in the enclosure without any portion of the associate's body other than the hands and arms having to be placed inside the hood.

Mobile Laboratory
A mobile laboratory is a temporary laboratory facility moved to a site and subject to the requirements defined in Section 5.19, Mobile and Field Laboratories.

Mutagen
A mutagen is a chemical that causes changes in the gene structure which results in altered cell reproduction.

Regulated Chemical
A regulated chemical is one that is considered to be particularly hazardous such that protective measures in addition to the provisions of the safe work practices are required. These chemicals include carcinogens, reproductive toxins, and others that exhibit a high degree of acute or chronic toxicity.

Reproductive Toxin
A reproductive toxin is any agent that has a harmful effect on the adult male or female reproductive system or on the developing fetus or child. Such hazards may affect people in several ways, including loss of sexual drive, mental disorders, impotence, infertility, sterility, teratogenic effects on the fetus, and transplacental carcinogenesis.

Temporary Associate
A temporary associate is any person working for, or contracted by, Shaw E & I, to perform a task in the laboratory for a limited time, and who may handle hazardous chemicals as part of the assignment.

Teratogen
A teratogen is a chemical that has a toxic effect on an embryo.

5.0 TEXT

5.1 Responsibilities

5.1.1 Chief Executive Officer. The Chief Executive Officer for Shaw E & I is ultimately responsible for the health and safety of all Shaw E & I associates and shall hold appropriate subordinate managers responsible for implementing the Chemical Hygiene Plan within Shaw E & I. The Chief Executive Officer must also provide, with other corporate staff, ongoing support of the Chemical Hygiene Plan. He shall hold the Vice Presidents for Operations accountable for implementing the Chemical Hygiene Plan on an operational basis.

5.1.2 Vice Presidents for Operations. The Vice Presidents for Operations are responsible for the health and safety of all associates under their control and are

the primary managers for overseeing implementation of the Chemical Hygiene Plan and assuring compliance with the Shaw E & I Health & Safety Program.

5.1.3 Director of Health & Safety (or Designee). The Director of Health & Safety shall:

- Provide leadership and technical assistance to Shaw E & I operations in environmental, health and safety areas;
- Monitor regulatory developments in HS, distribute relevant information to the operations and establish guidelines for regulatory compliance;
- Review and update the Chemical Hygiene Plan at least annually;
- Assist management with implementation of the CHP;
- Conduct or cause audits and review of records at each of the laboratories to verify implementation of the CHP;
- Maintain and publish the list of Regulated Chemicals;
- Act as a resource to the Shaw E & I operations for environmental, safety and industrial hygiene and related training;
- Review and approve laboratory-specific attachments to the CHP;
- Audit all labs in area of responsibility, on annual basis, to verify CHP implementation; and
- Act as a resource to the Shaw E & I operations for environmental, safety and industrial hygiene and related training.

5.1.4 Laboratory Director. The Laboratory Director will:

- Ensure that the facility-specific attachments to this Chemical Hygiene Plan are reviewed and updated annually, with assistance from the facility HS professional;
- Enforce the HS program and the requirements of the CHP in the laboratory;
- Ensure that associates are trained in the HS aspects of their jobs;
- Assist in the development of appropriate safety precautions for new projects and procedures;
- Monitor the collection, storage and disposal of hazardous wastes to ensure regulatory compliance;
- Review use of regulated chemicals;
- Monitor proper functioning of engineering controls such as fume hoods, establish scheduled preventative maintenance program, and arrange for prompt repairs as needed;
- Determine when an "Exposure Assessment" is appropriate and arrange to have it performed by a qualified individual(s);
- Ensure that periodic facility inspections are conducted, and participate in the inspection program;
- Ensure that HS deficiencies are corrected; and
- Participate in the investigation of accidents and near misses and report to National HS.

5.1.5 Laboratory Operations Manager. The Laboratory Operations Manager will:

- Ensure that the HS program is enforced and the CHP implemented in the laboratories under his/her control;
- Ensure that new regular and temporary laboratory associates receive specific training on the hazards of the work to be performed;
- Participate in the periodic housekeeping and safety inspection program;
- Initiate corrective actions.

5.1.6 Health & Safety Professional. The Health & Safety professional will:

- Provide assistance to the Laboratory Director for day-to-day implementation of the HS program;
- Maintain controlled copies of the facility attachment to the CHP;
- Act as the facility Chemical Hygiene Officer, with guidance from the National Director, Health & Safety;
- Coordinate the investigation of all accidents and incidents;
- Maintain laboratory statistics on accidents and injuries, including a review of the OSHA Form 200 for correctness, and ensure the reporting requirements of Workers Compensation;
- Approve safety aspects of facility specific standard operating procedures;
- Monitor the use, and disposal of chemicals in the laboratory;
- Ensure a current chemical inventory is maintained, gather and maintain a collection of manufacturer's Material Safety Data Sheets (MSDS);
- Review the chemical inventory to verify which carcinogens are present in the facility; ensure designated areas for their use are set up;
- Conduct reviews of chemical usage in the facility to assess the potential for exposure to chemical, physical and biological hazards, and the need for workplace monitoring;
- Conduct and/or coordinate industrial hygiene monitoring;
- Coordinate the emergency response activities at the facility;
- Coordinate laboratory hazardous waste programs to meet regulatory requirements;
- Develop and implement a waste minimization program;
- Ensure that appropriate personal protective equipment (PPE) is available as needed and that associates are properly trained in its use;
- Participate in discussion of safety matters relating to the design of new or rehabilitated facilities; and
- Oversee installation of safety equipment upgrades or modifications to ensure safe working conditions.

5.1.7 Laboratory Team Leaders and Supervisors. Laboratory Team Leaders and Supervisors will:

- Ensure that associates understand and follow the CHP and the SOPs specific to the analytical procedures;
- Review PPE requirements with associates;

- Ensure that appropriate PPE is available, in working order, and used by all personnel in their area of responsibility;
- Ensure that appropriate HS training has been provided to, and is understood by, the associates; and
- Conduct H & S inspections of their areas and initiate corrective action.

5.1.8 Laboratory Associates. Laboratory Associates will:

- Conduct their activities in a safe and healthful manner by working within established HS guidelines and practices;
- Use the PPE appropriate for the task;
- Incorporate the ongoing training into the performance of their responsibilities;
- Exercise prudent and careful work practices to ensure their own safety as well as that of their coworkers;
- Stop any task that jeopardizes individual health and safety;
- Notify their supervisors of any potential health or safety hazards that they observe in the laboratory;
- Immediately report all accidents and near misses to their supervisors; and
- Ensure that all containers of chemicals are properly labeled with the identity of the chemical and its hazards.

5.2 Permissible Exposure Limits

It is the responsibility of management and associates to maintain laboratory exposures as low as reasonably achievable (ALARA). Exposures will be maintained below the PEL for individual substances or mixtures as defined in 29 CFR 1910.1000 Subpart Z, or the TLV, whichever is lower. In agreement states, the state equivalent will be substituted for the values in 29 CFR 1910.1000, Subpart Z.

For certain chemicals an action level is established at half of the PEL. If the action level is exceeded, exposure monitoring will be performed at least quarterly. The requirements for monitoring are listed in Section 5.13, Associate Exposure Determination.

If a chemical is not listed by either OSHA or ACGIH, the Shaw E & I National Director, Health & Safety will be contacted regarding an exposure limit.

5.3 Implementation of Chemical Hygiene Plan

The health and safety of Shaw E & I associates is paramount in the operating philosophy of Shaw E & I. To this end, the CHP has been written to provide a program for individual facilities to follow. This program represents prudent practices for handling chemicals in the laboratory. These provide guidelines for normal laboratory practice.

5.3.1 Strategy. The strategy to implement the CHP consists of the following elements:

- Provide training on the requirements of the OSHA lab standard and the CHP;
- Implement an effective hazard communication program;
- Evaluate and modify, if necessary, the condition of engineering controls available in the facility;
- Confirm and enforce safe work practices for major tasks performed in the laboratory;
- Implement an effective hazardous waste management program;
- Perform an evaluation of the use of hazardous chemicals in the laboratory. Based on this evaluation workplace monitoring will be conducted as needed;
- Implement an effective medical surveillance program;
- Conduct an annual review of the CHP and the facility attachments, including the hazardous waste procedures and Contingency (Emergency Action) Plan; and
- The National Director, Health & Safety shall review and approve the contents of the facility attachments to the CHP.

The program elements are discussed in the following section of this document.

5.3.2 Self-Assessment. A formal self-assessment will be performed at least annually by the HS Coordinator at each facility to determine the level of compliance with this plan. The results of the assessment will be formally reviewed by the Lab Director. Specific items that need to be changed or implemented will be identified and a schedule to incorporate the changes established. The assessment will be formally reviewed by the National Director, Health & Safety during the annual audit program.

5.4 Training

5.4.1 Training Programs. All full or part-time associates who could be exposed to hazardous chemicals shall be given the following training:

- New associate orientation (including basic lab safety, an introduction to the OSHA lab standard, and facility emergency requirements);
- Laboratory Safety Training (LST); and
- Safe Work Practices and OSHA Lab Standard (CHP).

The complete LST course will be presented by a qualified instructor within 90 days of an associate starting employment. Associates, such as administrative associates, who have a limited potential for exposure shall attend the CHP training only. Associates will be given review training in the Lab Standard and the CHP at least once per year. Documented updates in laboratory safety awareness will be given periodically. Supervisors are responsible for training new and transferred associates to carry out their new tasks.

The following training courses are required:

	LST	CHP	Orientation
· Full-time associates[1]	x	X	x
· Administrative associates		X	x
· Part-time or temporary lab associates	x	X	x

Contractors who perform repairs or routine maintenance (including janitors, instrument repair, or ventilation contractors), and visitors will be given basic information on the hazards they might encounter in the work place. Receipt of this information will be documented.

The training course for the CHP covers the following elements:

- Contents of the OSHA Occupational Exposures to Hazardous Chemicals in Laboratories standard (29 CFR 1910.1450) and its appendices (the standard is made available to associates);
- Location and availability of the CHP in each facility;
- PELs for OSHA-regulated substances and TLVs for other hazardous chemicals where there is no applicable OSHA standard;
- Signs and symptoms associated with exposure to hazardous chemicals used in the laboratory;
- Methods and observations that may be used to detect the presence or release of a hazardous chemical, such as breathing zone air monitoring, continuous monitoring devices, visual appearance, or odor of hazardous chemicals when being released;
- Location and availability of known reference material on the hazards, safe handling, storage, and disposal of hazardous chemicals found in the laboratory including, but not limited to, the MSDS received from the chemical supplier; and
- Methods that associates can use to protect themselves from these hazards, including specific procedures the facility has implemented to protect associates from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and PPE.

The training will include, as appropriate, the Hazard Communication Program presented in accordance with Shaw E & I Health & Safety Procedures. The MSDS provides the associate with the greatest amount of information about each hazardous material used in their work area and a typical MSDS is

[1] Full-time Shaw E & I associates include laboratory and maintenance staff.

discussed. Also, the labeling program which is in place at each laboratory is reviewed.

Laboratory associates will also receive training in the use and selection of PPE (Shaw E & I Procedure HS600).

Respirator training is given to those associates who may be required to wear a respirator. The training will meet the requirements of the OSHA standard 29 CFR 1910.134 and Shaw E & I Procedure HS601, and follows a determination by medical examination and testing that the individual can use a respirator.

New associates to the laboratory or individuals in a new area will be informed of hazards in their workplace before they begin work.

First aid/CPR/Bloodborne Pathogen training shall be provided to a sufficient number of associates to assure at least one associate with current training will be on-site whenever scheduled laboratory operations are being conducted. (NOTE: Consider turnover, travel, vacation, sick time, etc.) All such providers will be "voluntary", with incident response being a collateral, not a primary, duty. Primary reliance shall be on local municipal response capability.

Videotapes that have been approved by Shaw E & I Health & Safety may be used to present key issues in an abbreviated manner. The training should include:

- Elements of the CHP;
- Brief discussion of safe work practices;
- Hazard communication program elements;
- Correct use of PPE; and
- Emergency response.

The key points of the videotape will be explained by a qualified instructor.

5.4.2 **Documentation.** Training sessions will be documented in accordance with Section 5.18, Record keeping, by signed attendance sheets and other signed statements, and will include tests covering selected subjects. This documentation is placed in the facility's Health & Safety files, with copies forwarded to the Shaw E & I Training Department.

5.5 Engineering Controls

Chemical safety is accomplished by developing an awareness of the chemical hazards and by keeping chemical exposure under control through a variety of engineered safeguards. Laboratory personnel should be familiar with the proper use of those safeguards. Laboratory supervisors should be able to detect if those safeguards are malfunctioning. Engineering controls will be properly maintained, inspected regularly, and not overloaded beyond their design limits.

Shaw E & I has selected several different engineered controls that are used to dilute, capture, or contain hazardous chemicals. Specifically, ventilation systems, both general and exhaust hoods, American National Standards Institute (ANSI)-approved storage containers, and storage cabinets for flammable and corrosive chemicals are suitable engineering controls to reduce personnel exposure to volatile hazardous chemicals.

The risk of fire can be reduced by limiting the quantity of chemicals stored in the laboratory and by reducing the use of ignition sources, or open flames. The proper and compatible storage of chemicals minimizes the risk of hazardous chemical reactions.

5.5.1 Ventilation. General ventilation with air intakes and exhausts identified and properly located will reduce the intake of contaminated air into the building. Laboratory ventilation supply air should:

- Ensure that laboratory air is continually being replaced, preventing an increase in the concentration of volatile chemicals in air over the workday. Generally 4 to 12 changes of room air per hour may be considered to provide adequate ventilation.
- Introduce the conditioned, fresh air uniformly throughout the laboratory with minimum turbulence and no stagnant areas.
- Since the air in laboratories can become contaminated with fumes and vapors that have been released during sample preparation, HVAC air must not be recycled from those laboratories where sample preparation is carried out.

General ventilation should not be relied on to provide adequate protection by diluting the vapors of volatile chemicals used within the laboratory. An inadequate ventilation system can prove to be worse than none at all since it could give the lab worker a false sense of security that they are protected from airborne toxic substances.

Laboratory fume hoods protect associates working with hazardous chemicals by removing toxic materials from the workers' breathing zone. They are the primary engineering control for reducing associate exposure to volatile chemicals. As a result, fume hoods shall be used when associates are working with hazardous materials, or substances with unknown toxicity. This includes the initial receipt and processing of samples. Fume hoods:

- Should not be positioned at 90 degrees to each other, in proximity to each other.
- Will have an average face velocity of at least 100 ft/min. with a minimum of 80 ft/min. at any one point. A face velocity of 125 ft/min. with a minimum of 100 ft/min. at any one point, is required if carcinogens and highly toxic materials are being used. Fume hood operation will be evaluated by HS. The sash position shall be marked to show the acceptable position for achieving the desired air flow rate. Walk-in hoods shall be measured at a 50% opening.
- Face velocities will be posted on the face of each hood. Documentation on face velocity measurements will be maintained by HS for at least five years.
- **All hoods will be monitored with a calibrated instrument, such as hot wire anemometer, at least twice per year. The results of the survey will be posted prominently near the opening of the hood.** Periodically, smoke will be used to confirm that eddy currents do not carry contaminants outside of the hood. The hood operation will be rechecked after maintenance has been carried out; whenever there is a change in the system, such as a new motor, or addition or removal of an exhaust hood or local exhaust, or ductwork maintenance affecting multiple hoods.
- Will have a device attached that indicates the hood is working correctly. Such devices include, but are not limited to, a slant manometer or a magnehelic gauge. They should allow the lab worker to determine that the hood is working regardless of the position of the sash.
- If the face velocity is such that the sash must be lowered so that the operator cannot use the hood effectively the hood will be taken out of service. [NOTE: The face opening at which an associate can effectively use the hood will vary from task to task, but can reasonably be expected to be 50% for tasks that **do not** require frequent transfer of large equipment into and out of the hood. Tasks that require continual transfer of equipment into and out of the hood (such as separatory funnel extractions) will require a larger opening.]
- A sign shall be posted on the hood to inform associates when a hood is not working correctly. It is the responsibility of the supervisor/ manager to ensure that repairs are effected promptly. The face velocity will be measured after repairs are complete in order to ensure that the hood is working correctly **before** it is returned to service.
- **Local exhaust systems will be measured at least every six months by smoke capture.** The smoke may be generated by using commercially available smoke sticks, or by the addition of solid carbon dioxide to warm water. Documentation of these tests will be maintained in the laboratory HS for at least five years.

Fume hoods are work areas and are not to be used for storage. Materials in the hoods will be kept to a minimum and placed where they will not block vents or reduce air flow.

Hoods provide the general ventilation for the laboratory. Each facility will identify those hoods that must be operated at all times in order to maintain general ventilation rates; and those which may be turned off when not in use in order to save energy.

Associates can reduce personal exposure to hazardous chemicals by using the following techniques:

- Using hoods for all operations that might result in release of hazardous chemical vapors;
- Confirming adequate hood performance before starting the operation. **Deficiencies in hood operation must be reported to the supervisor as soon as they are detected;**
- Providing local exhaust ventilation for equipment that can release hazardous vapors into the room (i.e., vacuum pumps, GCs, distillation columns, etc.); and
- Keeping hoods free from stored materials.

Local exhausts provide supplemental control by removing small volumes of air directly at the source. To be effective, these exhausts must be placed close to (i.e., within a few inches of) the source.

Canopy hoods provide little, if any, protection when positioned more than a few inches from the source of contamination. The use of canopy hoods can be significantly improved by the installation of tracks and sliding doors (safety glass or plastic depending on the operation), which contain the operation and function similar to an exhaust hood. Unmodified canopy hoods may be used in conjunction with heat-generating equipment, such as ovens. **Canopy hoods must not be used for operations involving hazardous materials.**

Hoods where perchloric acid is used shall be equipped with a water washdown system capable of flushing the duct periodically during the day. A commercially available hood that meets the design requirements established by the National Fire Protection Association (NFPA) Publication 45 must be used for this purpose.

5.5.2 Maintenance. Maintenance of and repairs on engineered controls will be documented.

Good equipment maintenance is important for safe, efficient operations. Equipment failure creates an unacceptable hazard level within the laboratory. If the operation cannot be performed safely, the preparation or analysis of the samples will not continue. **Equipment will be inspected and maintained regularly following the manufacturers' service schedules. Each laboratory**

will establish a written schedule that meets its particular needs and will document compliance.

Fume hoods and ventilation systems will be given preventative maintenance at least every 6 months. The maintenance should be scheduled and performed when the unit can be taken out of production; however, such schedule variances will not vary from the expected date by more than fourteen (14) days. In an emergency situation, such as a hood failure, the facility Contingency Plan defines the steps necessary to reduce exposures and to complete a safe shutdown. Associates must be notified of the failure.

Maintenance plans will include a procedure to ensure that when a device that is out of service cannot be restarted (i.e., remains locked out) until repairs are complete and authorization is granted to proceed.

All energized equipment shall be tagged and shall have in place the appropriate hasps to allow lockout and to prevent the equipment from being operated while it is being repaired or inspected. Associates will be trained per the OSHA standard (29 CFR 1910.147) and the training will be documented. Tagout procedures may only be used with the prior written approval of the HS professional.

Equipment repair and maintenance shall be performed by trained individuals.

5.5.3 Alteration of Facilities or Engineering Controls. The HS professional shall review and approve all facility or operation changes. Major facility changes such as addition or relocation of fume hoods, and other ventilation changes, require the approval of the National or Group Director, Health & Safety. Input from qualified Industrial Ventilation Engineers must be obtained when changes in the laboratory exhaust systems are planned.

The facility HS professional will assist management in the review of health and safety issues concerning proposed operation changes.

5.6 Laboratory Safe Work Practices

The key factor in working safely with chemical, physical and biological hazards is preventing, or minimizing any exposure. The level of exposure to these hazards can be greatly reduced or eliminated through the use of engineering controls, administrative controls, and Personal Protective Equipment (PPE). Laboratory safety requires all associates to accept their responsibilities and to participate collectively.

5.6.1 Laboratory Rules

- The associates should understand, and will implement the requirements of the CHP.
- All accidents, incidents, injuries, work-related illnesses and chemical releases will be reported to the supervisor and to HS immediately following the event, or as soon as it is discovered.
- Management will be notified immediately of an unsafe condition, or safety equipment that is broken, damaged, or missing.
- Good housekeeping is of paramount importance. Associates will keep floors, working surfaces clean, dry and free from clutter. Spills will be cleaned up immediately. Glassware and other equipment will be stored in designated areas when not in use.
- **Eating, drinking, chewing gum or tobacco products, or applying cosmetics or lip balm in the laboratory is not permitted.**
- Hands, arms and other areas of the body that may have been in contact with chemicals will be washed before eating, drinking, or smoking.
- All facility personnel and visitors will wear ANSI-approved eye protection at all times while in laboratory areas unless the area has been so designated by HS.
- Avoid use of contact lenses in the laboratory unless necessary. If they are used, inform the supervisor and HS so precautions, if necessary, can be taken.
- Chemical goggles or face shields over safety glasses will be worn while large quantities of hazardous liquids are being handled, concentrated acids heated, or where there is a potential for chemicals to be splashed during transfer.
- Laboratory coats will be worn by all associates and visitors when working directly with, or in close proximity to, chemicals and samples. Lab coats may not be taken home for laundering. Lab coats must be removed before entering areas where food consumption is permitted.
- Gloves must be worn when chemicals and samples are handled. The gloves will be selected on the basis of the procedure, the temperature conditions, and the dexterity required Care must be taken to select gloves that will adequately overlap the end of the lab coat sleeve.
- Associates will inspect gloves before use and make sure that the gloves provide adequate protection from the hazardous chemicals being used.
- PPE listed in the standard operating procedure for the task will be used.
- Enclosed shoes will be worn in a laboratory. High heeled shoes, opened-toe shoes, sandals, cloth shoes and sneakers will not be worn in the laboratory. Certain operations may require the use of safety shoes.
- Any safety equipment, such as a laboratory coat, that is suspected of being contaminated will be removed immediately. A new laboratory coat or replacement safety equipment will be obtained.

- Clear access will be maintained to all emergency equipment, such as fire extinguishers, eye washes, safety showers, etc., and to electrical panels and other control equipment.
- Associates will know what emergency equipment is be necessary in the event of an accident or spill and will be familiar with its location and operation.
- The use of respiratory equipment is restricted to associates trained in its use.
- A neoprene rubber or polyethylene carrier will be used to transport single bottles of chemicals from stockroom/storeroom and within the laboratory. Bottles shall not be carried unprotected.
- A cart with a leakproof top to provide secondary containment of chemicals will be used to transport multiple containers of chemicals from stock/storeroom and within the laboratory.
- Mouth pipetting is prohibited. Mechanical pipettes will be used.
- Chemicals or samples will not be smelled or tasted.
- Chemicals must be stored in safe locations according to compatibility.

5.6.2 Hygiene Practices to Minimize Ingestion of Chemicals. Hands will be washed before eating, drinking, smoking, or using restrooms.

Food and drink will be stored, handled, or consumed in an area free from hazardous chemicals. Areas where food is permitted shall be prominently posted (for example, EATING AREA - NO CHEMICALS). Laboratory coats will not be brought into eating areas. An office adjacent to a laboratory is not considered to comply with this requirement if there is direct access through the laboratory, and/or if the walls do not go from floor to ceiling.

Glassware or utensils that could be used for laboratory operations must never be used to prepare or contain food or beverages. Laboratory refrigerators, ice chests, cold rooms, and such are for samples and will not be used for storing food and beverages. These refrigerators should be marked that they will not be used for food storage.

5.6.3 Housekeeping. There is a definite relationship between safety performance and orderliness in the laboratory. When housekeeping standards fall, safety performance as well as productivity inevitably deteriorates. Hazardous materials are present in laboratory and storage areas, thus it is of paramount importance that good housekeeping practices be implemented to prevent unnecessary exposure or injury. The following steps are required:

- Chemicals must be labeled clearly and properly.
- Equipment/materials must be stored in their proper location.
- All safety equipment shall be readily accessible.
- Aisles will be clear of items that could cause trips or block someone's exit.

- Floors will be cleaned regularly since accumulated dust, chromatography adsorbents, and other assorted chemicals can pose a respiratory and slipping hazard.
- Trash will be placed in appropriate containers; it must not be left on the floor, on the benches, etc.
- Clean up should occur at the end of the operation, or the end of the day.
- Spilled chemicals will be cleaned up immediately using the appropriate spill control procedures, and the material will be disposed of properly. HS staff should be contacted if additional information is needed.
- Access to exits, emergency equipment, electrical control panels, etc. will be kept clear at all times.
- Electrical cords, cables, etc., must not present a tripping hazard. They should be kept tidy, preferably off the floor in conduit trays.
- Stairs, hallways, open areas under stairs, and cubicles will not be used for storage.
- Unlabeled containers and chemical wastes will be disposed of promptly using appropriate procedures.
- Materials and chemicals that are no longer needed must not be allowed to accumulate in the laboratory; they will be returned to the chemical stockroom.

5.6.4 Equipment Guarding. All mechanical equipment shall be equipped with guards that prevent access to moving parts (such as the belts and pulleys). Each laboratory worker will inspect equipment before using it to ensure that the guards are in place and functioning.

Careful design of guards is vital. Emergency shutoff devices may be needed in addition to mechanical guarding.

5.6.5 Glassware. Accidents involving glassware are a leading cause of all laboratory injuries; therefore, the following guidelines must be adhered to closely:

- Glassware will be inspected carefully before use.
- Careful handling and storage procedures must be used to avoid damaging glassware. Chipped, cracked, or stressed items shall be disposed of, or if appropriate, repaired.
- Adequate hand protection must be used when inserting glass tubing into rubber stoppers or corks, or when placing rubber or plastic tubing on glass hose connections. Glass tubing should be fire polished or rounded and will be lubricated. Hands should be held close together to limit movement of glass if fracture occurs. The use of plastic or metal connectors should be considered.
- Heavy gloves must be used when picking up broken glass. (Small pieces should be swept into a dustpan with a brush.)
- Proper instruction should be provided for first-time users of glass equipment designed for specialized tasks that may represent unusual risks.

For example, separatory funnels containing volatile solvents can develop considerable pressure during use; these must be vented frequently into the hood.

- Glass-blowing operations are not permitted in laboratory areas.

5.6.6 Shielding. In general, safety shielding will be used for any operation that has the potential for explosion such as:

- Whenever a reaction/procedure is attempted for the first time (small quantities of reactants must also be used to minimize hazards), and
- Whenever a familiar reaction is carried out on a larger scale than usual (e.g., 5 to 10 times more material).

Shields must be placed so that all personnel in the area are protected from the hazards whenever operations are performed in a vacuum or pressurized container.

Extreme care must be taken to prevent implosions whenever vacuum-jacketed glass apparatus is being handled. Equipment such as Dewar flasks will be taped or shielded. Only glassware designed for vacuum work will be used for that purpose.

The use of fume hood sashes should not be overlooked as safety shields.

5.6.7 Electrical Hazards. Only qualified persons are permitted to work on electrical equipment and systems.

5.6.7.1 Outlets

- Electrical outlets will have a grounding connection (three-pronged plug).
- Ground-fault interrupters will be used within 6 feet of water supplies or in areas where water may be present.
- Outlets will be located so as to minimize the possibility of water or chemicals being accidentally spilled on them.
- GFIs should be used in cold rooms since outlets and equipment may experience condensation and promote electrical shock.

- Fume hood outlets should be located outside the hood to prevent the production of sparks inside the hood when a device is plugged in. This location also permits the associate to disconnect electrical devices from outside the hood.

5.6.7.2 Wiring

- The condition of wiring and cords attached to equipment will be frequently inspected. All wiring that is worn or frayed will be eliminated.
- **Extension cords should be considered to be a temporary solution for lack of power at a location within a laboratory**. Their use shall be limited and the a permanent solution, such as installation of additional electric circuits, should be implemented as soon as practical. When they are used they must be of sufficient gauge for the anticipated load; must be secured to prevent a tripping hazard; and will not be run through walls, or across ceilings.

5.6.7.3 Electrical Control Panels

- Outlets should be identified by control panel and circuit so they can quickly be turned off from outside the work area.
- Electrical control panels must not be obstructed; a clearance of at least three (3) feet must be maintained in front.
- Electrical control panel circuits must be labeled identifying rated amperage, room, and equipment and/or outlets.

5.6.7.4 Refrigerators and Freezers

- Only aqueous solutions may be stored in domestic (home-type) refrigerators and freezers because the various control switches and defroster heaters can spark and ignite flammable mixtures.
- Explosion-proof, or flammable storage refrigerators and freezers shall be used when flammable or reactive chemicals must be refrigerated. These refrigerators have modified internal wiring eliminating ignition sources and sealed external motors and switches.

5.6.7.5 Portable Heaters

- Use of portable heaters is restricted by location to prevent overheating of combustible materials and overloading electric circuits.
- Laboratory use of portable heaters is not permitted because of the presence of flammable materials.
- Electric portable heaters must be UL listed. An automatic timer must be attached in line to prevent the unit being left on when the

user has left for the day, and the heater must be equipped with an automatic tip switch.
- The use of each portable heater must be approved by the facility HS staff.

5.6.7.6 Static Electricity

- Static electricity is promoted by protective clothing made of plastic or synthetic materials and low absolute humidity, which is likely in cold weather.
- It is also caused during the transfer of flammable solvents.
- Containers of flammable solvents must be properly grounded and bonded because static electricity could cause a spark and a fire or explosion.

5.6.7.7 Fuse and Overload Protection

- Electrical circuits in the laboratories will have overload protection.
- Laboratory equipment shall be fused or have other overload-protection if the unit fails or is overloaded.
- New or existing laboratory equipment will contain overload protection.
- Electric strips equipped with overload protection may be used; "octopus" or similar multiple outlets are prohibited.

5.6.7.8 Motors

- Non-sparking induction motors will be used where volatile flammable materials may be present.
- Induction motors cannot be controlled by variable autotransformers because the motor may overheat and cause a fire.
- Series-wound motors (kitchen appliances including mixers, blenders, vacuums, and drills) shall not be used where flammable materials may be present.

5.6.7.9 Lockout and Tagout of Energized Sources

The primary purpose of this procedure is to protect people when working on equipment; secondly, this procedure prevents operation of dangerous equipment. These procedures must not be violated.

This procedure provides a uniform method for tagging and locking out machinery or equipment that is being worked on or may otherwise be unsafe. It will prevent the possibility of setting moving parts in motion, energizing electrical circuits, or opening valves while work is being

performed. All personnel working on energized systems are required to comply with this procedure.

The requirements of this procedure apply to circuit breakers, switches, or other power source controls; air or hydraulic valves controlling the operations of equipment; and valves controlling the flow of liquids or gases, or any other potential source of stored energy.

5.6.7.9.1 **Procedure.**

When a piece of equipment is to be repaired or serviced, it must be locked out of service before work is performed on the equipment. Each associate who could be affected by the lockout will be informed before the work begins. Each person involved in the work shall attach his/her own tag and personal lock. Any equipment that can be unplugged may be tagged out without a lock being attached, provided the plug remains within sight/control of the person working on the equipment.

The tag will be signed by the person attaching it and will give the reason for its use and the names of additional people, if any, authorized to remove it. Only persons whose names appear on the tag are authorized to remove the tag.

In addition to tags, personal padlocks will be used for the protection of the individual working on the equipment. These padlocks shall be removed by the person installing the lock at the end of the project. Only the installer is authorized to remove his/her own personal padlock or tape. If the personal padlock of an absent person must be removed, this can only be done after receiving specific authorization from the Laboratory Director. The Laboratory Director or HS Coordinator may do this only after a complete examination of the equipment and an attempt to contact all of the individuals named on the tag. Such removal will be immediately documented in writing to HS Coordinator by the person(s) removing the tag.

Affected associates will be notified prior to removal of the lock or tag, and re-energization of the equipment.

Shutting off a circuit breaker without appropriate locking and tagging does not constitute a lockout and is not permitted.

5.6.8 Sand Baths. An extremely hazardous spattering situation can occur when water falls into hot sand baths. Water and chemicals will be placed as far away from the bath as possible.

A sign reading HOT SAND must be posted while bath is in use or cooling.

5.6.9 Cryogenic Hazards. Cryogenic materials (i.e., liquefied gases) are extremely cold and, therefore, extremely hazardous. They and the surfaces they cool can cause severe burns if allowed to contact the skin.

While transfers are being made protective equipment will include laboratory coat, insulated gloves, and face shield when working with liquefied gases or dry ice baths. Safety glasses may be substituted when transfers are not being made. Gloves will be loose enough so that they can easily be cast aside.

Dry ice - Associates shall avoid lowering their heads into a bath or sample cooler containing dry ice. Carbon dioxide is heavier than air and is an asphyxiant.

Refrigerated baths shall be open to the air; closed systems can develop uncontrolled and dangerously high pressures.

Systems containing cold traps shall be vented at the completion of the process.

Cold traps should be used to protect vacuum pumps. The cold trap prevents the materials from getting into the pump oil or out into the atmosphere of the laboratory. Vacuum pump exhausts shall be vented to a hood.

Neither liquid nitrogen nor any other cryogenic liquid may be used to cool a flammable mixture in the presence of air because oxygen can condense from air and cause a fire or explosion.

5.6.10 Containers Under Vacuum. In an evacuated system, the higher pressure is on the outside, rather than on the inside, thus a break causes an implosion that results in flying glass, spattered chemicals, and possibly fire. Glass will be inspected for star cracks, scratches or etching before use. **Repaired glass should not be used for vacuum or pressure work. Apparatus such as desiccators, cold traps, and Dewar flasks will be wrapped in friction tape or contained behind an explosion shield.**

Associates will use a face shield and safety glasses when working with containers under vacuum.

Water aspirators use specially designed glassware (DO NOT SUBSTITUTE). Place a trap and a check valve between the aspirator and the apparatus to

prevent water from being sucked back into the system if the water pressure should fall while filtering.

CAUTION - Water, solvents, or corrosive gases must not be drawn into a facility vacuum system. A water aspirator must be used as the vacuum source.

5.6.11 Pressurized Containers

In a like manner, this system shall be treated as under Section 9.11, except the danger is from explosion not implosion.

The container shall be wrapped sufficiently to contain the debris should the container break under pressure.

An explosion shield must be used to contain the explosion or direct the flying pieces away from the associate. [NOTE: The fume hood sash can be used as a shield if closed.]

The PPE used by the associate will include a face shield and safety glasses.

If the reaction cannot be opened directly to the air, an inert gas purge and bubbler system shall be used in conjunction with a venting system.

Pressurized apparatus shall have an appropriate relief device.

Reactions must never be carried out in, nor heat applied to, an apparatus that is a closed system unless it is designed and tested to withstand pressure.

5.6.12 Compressed Gas Cylinders. Compressed gases pose both physical and chemical hazards. Handling compressed gases exposes the associate both to the weight of the cylinder and to chemical hazards, which are the contents of the cylinder.

Flammable gases under pressure may diffuse throughout a laboratory presenting a fire or explosion threat.

Compressed gases frequently are at 1,500 to 2,000 psi making the cylinder a potential rocket or fragmentation bomb.

Unlabeled cylinders or cylinders with dents, scratches or gouges will not be accepted at time of delivery. Cylinders must be legibly marked, identifying the gas by a chemical or trade name.

5.6.12.1 Storage/Handling

- Persons handling and moving compressed gas cylinders will wear safety glasses, steel-toed shoes or shoe caps, and heavy duty leather or cloth gloves.
- Cylinders of compressed gases should be handled as high energy sources.
- All gas cylinders must be stored in a well ventilated, dry location at least 20 feet away from all hazardous substances. Oxygen, and oxidizing gases will be separated by at least 20 feet from flammable gases, or by a fire barrier meeting NFPA requirements.

- Cylinders of all sizes (empty or full) will be firmly restrained by chains, straps, stands or in racks. No more than three cylinders may be stored in a properly designed rack, otherwise they must be stored separately.
- Empty and full cylinders should not be stored together.
- Valve caps will be securely in place during cylinder storage and transfer. Never lift a cylinder by the valve cap.
- Cylinders will be moved by strapping into a specially designed wheeled cart to ensure stability. Do not allow cylinders to knock together.
- Some rupture devices on cylinders will release at about 65^{o}C. Do not expose cylinders to direct sunlight or to temperatures higher than 50^{o}C. Some small cylinders, such as lecture bottles, are not fitted with rupture devices and may explode if exposed to high temperatures.
- Cylinders must not be used as rollers.
- The Compressed Gas Association (CGA) recommends that all cylinders be protected from direct solar loading.

5.6.12.2 Operation

- Use the appropriate regulator on each gas cylinder. Adapters or homemade modifications can be dangerous and are prohibited.
- Oxygen will not be used in place of air.
- Cylinders must be secured before being put into service.
- Do not put oil or grease on cylinder systems that contain oxygen, chlorine, or other oxidizing agents. An explosion can result.
- Use SNOOP^{TM} or a soap solution to test for leaks. Do NOT use a flame.
- Toxic, flammable, or reactive gases will be used only in fume hoods.
- Never direct high pressure gases at anyone.
- Compressed gas or compressed air should not be used to blow away dust or dirt; the resultant flying particles are dangerous.

- Flash arresters will be used on cylinders containing hydrogen or other flammable gases. These cylinders will also be grounded unless they are used in conjunction with electric welding.
- Be aware that rapid release of a compressed gas will cause an unsecured gas hose to whip dangerously and also may build up a static charge that could ignite a combustible gas.
- Do not extinguish a flame involving a highly combustible gas until the source of gas has been shut off; otherwise, it can reignite causing an explosion.
- Close the main cylinder valves securely when the cylinder is not in use.
- Never bleed cylinders completely empty. Leave a slight pressure to keep contaminants out.
- Cylinders must never be opened, even to determine if they are empty, unless a regulator is firmly attached.
- Promptly remove the regulators from empty cylinders, and replace the protective valve cap at once. Mark the cylinder empty and move it to storage.

5.6.12.3 Acetylene

- Acetylene cylinders are partially filled with acetone; they should be stored and must be used in an upright position.
- Do not use an acetylene cylinder that has been stored or handled in a non-upright position until it has remained upright for at least 30 minutes.
- Ensure that the outlet line of an acetylene cylinder is protected with a flash arrester.
- Never exceed the pressure limit indicated by the warning red line of an acetylene pressure gauge.
- Use the correct kind of tubing to transfer gaseous acetylene. Tubing materials such as copper and some brass alloys form explosive acetylides and must not be used.
- Always close the cylinder valve before closing off the regulator.

5.6.13 Warning Signs and Labels. Laboratory areas that have special or unusual hazards will be posted with warning signs. Standard signs and symbols have been established for a number of special situations, such as radioactivity hazards, biological hazards, fire hazards, and laser operations. Areas designated for use of carcinogens or other high hazard materials will be identified and posted.

Signs providing information will be posted to show the location of safety items such as:

- Eye wash stations

- Safety showers
- Fire extinguishers
- Exits (floor plans with marked routes and "you-are-here" indicators).

Labels on containers of chemicals will contain information on the hazards involved with the chemical. They will not be removed as long as the chemical remains in the container.

Waste containers shall be labeled for the type of waste that can be safely deposited in them.

Chemical/waste storage areas and buildings are to be posted with the appropriate National fire Protection Association (NFPA) hazard warning signs. This may be used for individual labs as well.

5.6.14 Review of New Projects. Special projects will be reviewed and approved by the Laboratory Director or his/her representative; the HS professional; and the Technical Director/Group Leader before the start of any new method. Hazards and potential hazards will be addressed and resolved. If the operation cannot be performed safely, it will not be started.

5.6.15 Unattended Operations. Frequently, laboratory operations are carried out continuously or overnight. It is essential to plan for interruptions in utility services such as electricity, water, and inert gas.

Tubing should be secured to faucets and condensers, or to Coolflow units. Hoses leading to a sink should be secured to prevent them from "snaking" on the bench top as the result of an increase in water pressure.

Operations will be designed to be safe, and plans will be made to avoid hazards in case of failure. Where possible, arrangements for routine inspection of the operation will be made.

In all cases, the laboratory lights in the immediate area must be left on, and an appropriate sign containing telephone numbers listed for emergency contacts be placed on the door.

One particular hazard frequently encountered is failure of cooling water supplies. Devices shall be installed to automatically turn off operations if there is a failure in the water supply or electricity.

In all cases, unattended operations will be designed and constructed to fail in a safe condition. That is, in the event of a failure of coolant, vacuum, pressure, gas, or power, an unsafe condition will not be created.

5.6.16 Working Alone

An associate is said to be working alone when they cannot be seen or heard by another person. If appropriate monitoring systems are being used in the facility, then although the associate is alone, they are not considered inaccessible.

Under normal working conditions, individuals working in separate laboratories after working hours must make arrangements to cross-check each other periodically.

Laboratory work involving sample preparation will not be undertaken by a worker who is alone in a laboratory. This includes any operation involving the manipulation of chemicals, it does not include loading of auto samplers.

Under unusual conditions, special rules may be necessary. The supervisor or manager is responsible for determining whether the work requires special safety precautions, such as having two persons in the same room during a particular operation. This exception does not apply to hazardous or potentially hazardous operations. Good judgment must be used to ensure that no one is working alone when there should be two or more associates present.

5.7 Personal Protective Equipment

Personal protective equipment (PPE) is used in several different ways in the laboratory environment. Certain items are used routinely to prevent, or to minimize contact with, or exposure to, the chemicals being handled. PPE is also used to reduce the chance of skin contact during a spill or splash situation. These include eye protection, gloves, and lab coats. Others, including air purifying respirators may be used to supplement engineering controls, or as a temporary measure pending installation of satisfactory engineering controls. A third use would be in response to an emergency, in which case self-contained breathing apparatus may be required. All applications will be discussed in this section.

It is a requirement of the Shaw E & I HS program that all associates wear PPE appropriate to the procedure being carried out. The Shaw E & I method procedures (SOPs) indicate the hazards that may be encountered and the protective equipment required.

Associates are to be provided with, and required to wear, the specified personal protective equipment (PPE) when handling chemicals.

5.7.1 Minimum PPE within the Laboratory. The following **minimum** equipment will be worn by anyone handling chemicals in the laboratory:

- Safety glasses with side shields that meet American National Standards Institute (ANSI) requirements for eye protection (Z 87.1);
- Laboratory coat with sleeves rolled down;
- Hand protection appropriate for the task being carried out; and

- Enclosed shoes.

Protective equipment is defined in the Shaw E & I Procedure HS600, and respiratory protection is covered in Shaw E & I Procedure HS601.

5.7.2 PPE for Visitors/Contractors

Visitors shall use the same controls and PPE as the Shaw E & I associates with whom they are working. This includes:

- Safety glasses;
- Laboratory coat in laboratories;
- Gloves will be required when hands-on work is done; and
- Additional protective equipment may be needed.

NOTE: Respiratory protection will not be supplied to visitors or contractors.

Administratively, visitors are required to sign in and out; receive and wear a badge; be given information on hazardous materials they may encounter in laboratories they may enter. The host must make sure the visitor is given, and wears PPE, and that the visitor stays with the escort. If contractors bring hazardous chemicals into the workplace, they must supply an MSDS for each chemical/mixture. This information will be shared with Shaw E & I associates in the area.

5.7.3 Additional PPE

The normal hierarchy regarding additional personal protection is:

- Implementation of engineering controls (fume hoods) to reduce a hazard before exposure occurs;
- If the engineering controls are inadequate, then administrative controls can be used to reduce the duration and likelihood of exposure; and
- Additional PPE can be used to reduce exposure after the other methods have been shown to be inadequate.

The use of PPE such as respirators must be approved by HS.

5.7.3.1 Eye Protection

- Chemical goggles are required when working with liquids or dusts that could cause injury to vision.
- Face shield with safety glasses or chemical goggles is required when working with materials that could not only damage vision, but could also cause damage to facial tissue, such as a nitric acid bath, or cryogenic liquids.

5.7.3.2 Body Protection

- Rubber apron and long sleeves are required when working with one gallon or more of strongly acidic or caustic materials.

5.7.3.3 Hand and Arm Protection - Selection should be made on the basis of the chemicals that will be handled, and the task to be carried out. In some instances the need for dexterity may result in the use of thin gloves that will not afford mechanical protection.

Gloves must be worn when handling samples and hazardous materials. Double gloving may be required. Examples of glove types and their applications are:

- Latex surgical gloves do **not** afford protection from solvents; if dexterity is needed, thin nitrile gloves will afford more protection. They should still be removed when contact with solvent occurs.
- Rubber gloves for handling acids, aqueous liquids, and solids;
- Vinyl rubber gloves for laboratory operations with a low possibility of solvent contact;
- Nitrile rubber gloves for handling organic liquids with high likelihood of extensive solvent contact;
- Viton rubber, silver shield, 4H, or other approved gloves for handling organic liquids with high likelihood of extensive solvent contact;
- Kevlar gloves for handling materials and equipment that have very sharp edges;
- Non-asbestos heat resistant gloves for handling hot crucibles or other items subject to high temperatures; and
- Insulated gloves for operations involving cryogenics such as dry ice, liquid nitrogen, etc.

Additional information can be obtained from compatibility tables published by the manufacturers and suppliers. Material selection should be made in conjunction with the HS Coordinator.

Arm covers or gloves with long gauntlets will be worn while working with or around strong acids or bases.

5.7.3.4 Respiratory Protection

Shaw E & I Procedure HS601 applies to all associates who may be required to wear a respirator.

Respiratory protection is not to be worn as a replacement for engineering controls. If associates feel respiratory protection is required in addition to engineering controls, HS must evaluate the process, as well as the efficiency of the engineering controls.

Workplace monitoring must be carried out for operations that require respiratory protection, per 29 CFR 1910.134.

Shaw E & I Procedure HS102 applies for Record keeping.

5.7.3.4.1 Air Purifying Respirator

Air purifying respirators may serve to reduce personal exposures to airborne hazardous chemicals. Respirators may be selected as a temporary measure only after engineering controls and administrative controls have been evaluated and found to be inadequate. **They do not provide adequate protection for a rescue ER team.**

NOTE: Only NIOSH or MSHA certified respirators and cartridges may be used.

Air purifying respirators (those fitted with chemical cartridge, canister or particulate filter) have certain limitations, which must be understood by associates using the equipment. These limitations include:

- As the name implies, they only remove contaminants from the air, they do not supply oxygen.
- They must not be used in oxygen deficient atmospheres with an oxygen content less than 19.5%, nor in environments immediately dangerous to life or health (IDLH).
- Chemical cartridge respirators must not be used for protection against exposures to air contaminants that cannot be easily detected by odor or irritation. For example, there are no cartridges certified by NIOSH for use with methylene chloride, ether, and other common laboratory solvents.
- Respirators must not be used when there is a potential for exposure to high levels of toxic materials.
- They cannot be used for protection against gases which are not effectively captured by the absorbents used, or which have poor warning properties.

- Cartridges will be changed at the end of each shift, or when break through occurs, whichever is earlier.

All users will be given annual medical examinations and must be certified to be medically fit to wear a respirator.

On an annual basis, users will undergo fit testing and will be trained as required by 29 CFR 1910.134.

Training will be documented.

5.7.3.4.2 Self-Contained Breathing Apparatus (SCBA)

SCBA devices must be used in the following emergency situations:

- Conditions where hazardous materials are present in concentrations that pose an immediate threat to life and health.
- For rescue of personnel from an atmosphere with high concentrations of contaminants.
- To shut down equipment, or to clean up a spill, in an area where high concentrations of contaminants may exist.

General considerations and limitations include:

- SCBA units are to be used for emergency purposes **only**.
- Only those individuals trained in the use of the SCBA units may enter an area where high levels of contaminants exist. This entry will be carried out after permission has been received from HS.
- At least two individuals must be present before an attempt is made to enter a highly contaminated atmosphere. One person must remain in a safe environment and be equipped to be able to assist or rescue in an emergency with SCBA.
- Communication must be maintained at all times between all persons present.
- SCBA will be inspected monthly.
- Training and inspections will be documented.

5.7.3.5 Contaminated PPE

Articles of PPE that are contaminated represent a potential for associate exposure.

- A contaminated laboratory coat shall be promptly removed and replaced with a clean garment.
- Contaminated clothing will also be removed promptly.

- Disposable gloves will be removed and disposed of as soon as practical to minimize exposures to personnel and reduce the likelihood of contaminating samples and the work area.
- Gloves that can be reused will be decontaminated as soon as is practical. Those that cannot be decontaminated shall be promptly removed and discarded. Hands will be washed, and new gloves will be obtained and worn.
- Contaminated clothing and other personal protective equipment will be disposed of according to appropriate procedures.
- All waste materials will be disposed of in compliance with local, state and federal regulations in a manner that prevents contamination of non-designated areas.

5.7.4 Safety/Emergency Equipment

- Signs will be posted to mark the location of the emergency equipment.
- The location of safety showers, eye wash stations, exits, and fire extinguishers will be indicated in the contingency plan for the specific facility. Safety showers and eye wash stations should be within 50 feet of the work area and must be reachable within 10 seconds.
- The location of safety equipment will be reviewed during the training program.
- The area around safety equipment will be kept clear at all times.

5.8 Chemical Safety

The following characteristics, amongst others, have been identified as health hazards:

Select carcinogens	Hepatotoxins
Reproductive toxins	Nephrotoxins
Toxic or Highly Toxic Agents	Neurotoxins
Irritants	Corrosives
Sensitizers	

Attachment 2 lists chemical substances that are examples of some of these categories. Each facility will identify:

- Mixtures that contain hazardous chemicals in concentrations greater than 1%;
- Solutions that contain carcinogens in concentrations greater than 0.1%;
- The locations where they are used; and
- Specific precautions that are required to be taken while working with these materials.

Containers of hazardous chemicals, and samples submitted for analysis will be opened inside of an operating fume hood.

Containers that have been opened, but are not emptied, will be covered and sealed before being removed from the hood and transferred to the storage area.

5.8.1 Select Carcinogens and Reproductive Toxins. OSHA has designated that certain chemicals be handled using special precautions designed to limit personnel exposures. This section describes the criteria and protocols that must be satisfied.

All carcinogens in concentrations greater than 0.1% will be identified together with the procedure in which they are used. This may be achieved in part by listing the hazards of the chemicals being used in the safety section of the method SOP.

Examples of regulated chemicals including carcinogens, reproductive toxins, acutely hazardous chemicals, and highly toxic chemicals are found in Attachment 2. These materials must be handled using special precautions.

Associates will participate in training programs to review the consequences of exposure, control measures, and disposal procedures before handling these materials. These associates will be classed as **Authorized Personnel** for purposes of handling these materials.

Select carcinogens, reproductive toxins or substances that are highly toxic will be used only in areas designated by HS. A **designated area** may be as small as fume hood, or may include a whole laboratory. These areas will be posted with signs carrying the appropriate hazard warnings.

Operations where carcinogenic, or suspected carcinogenic, materials are used will be evaluated to determine what exposures can occur. **Air sampling and other monitoring methods will be used to document that exposures are maintained below the action levels specified in the CHP.**

5.8.1.1 Safety Precautions

- All associates are to wear the prescribed gloves and other personal protective equipment while working with these materials.
- Working surfaces in the designated area must be protected from contamination by the use of plastic backed paper liner.
- Medical surveillance will be provided to associates assigned tasks involving the use of OSHA-defined carcinogens.
- All OSHA-defined carcinogens with a concentration greater than 0.1% must be stored in trays in a ventilated storage area or cabinet. Neat materials must be stored in secondary containment.

5.8.1.2 Cleanup/Decontamination

- Designated areas will be cleaned and decontaminated using approved methods when the use of carcinogens or suspect carcinogens is completed, and no less frequently than the end of each shift.
- Associates will remove PPE when leaving the task, and will wash their hands and forearms before using telephones, instrumentation, or leaving the laboratory.
- Decontamination procedures to remove chemicals from work surfaces and equipment will be established and implemented. This can be minimized by using plastic coated paper counter covers.
- Any equipment, material, or other item removed from a designated area shall be removed in such a manner that does not cause contamination of a non-designated area or the external environment; for example, equipment that has not been decontaminated must be contained in impermeable plastic bags, etc. prior to removal.

5.8.1.3 Emergencies

Facilities that are not within five (5) minutes of professional medical aid as specified under 29 CFR 1910.151 are required to designate a minimum of two trained first aid responders per shift.

- Both responders shall have current First Aid and CPR training and shall have completed Bloodborne Pathogen training. They must also be offered Hepatitis B vaccination per Shaw E & I Procedure HS512.
- In any emergency, the safety of the associate will take precedence. Steps must be taken to ensure that injured associates receive adequate and appropriate attention before other actions are taken.
- Steps will then be taken to prevent contamination spreading outside the designated area.
- Designated areas will be decontaminated before the resumption of normal operations.
- Incidents resulting in the release of these materials outside the designated area, or resulting in a real or potential associate exposure shall be reported immediately to facility HS. Written documentation will be supplied to National HS as soon as practical.

5.8.1.4 Spills

Spills must be cleaned up immediately using facility procedures. In order to reduce the effects of spills:

- An absorbent plastic-backed paper should be used on bench surfaces to absorb small spills;
- Laboratory associates will be trained to handle small laboratory spills; and
- Spill kits compatible with lab hazards will be available at various locations throughout the lab.

5.8.1.5 Waste Disposal

- Contaminated clothing will be disposed of according to appropriate procedures.
- All hazardous waste materials must be segregated from other hazardous waste and must be clearly labeled. It will be disposed of in a manner that prevents contamination of nondesignated areas.
- Facility waste disposal procedures will be followed. Containers will be clearly labeled as to contents.

5.8.2 Biological Hazards. Biological hazards causing laboratory-related infections are generally less readily recognized than acute health effects resulting from exposure to chemicals. Each facility that handles, or might handle, a biological agent or pathogen will develop a biological hazard program that is based on Centers for Disease Control Universal Precautions and an Exposure Control Plan. This Control plan will be approved by the National Director, HS.

5.8.3 Chemical Storage. The correct storage of chemicals will minimize the potential for a fire, or a release of hazardous materials resulting from an unplanned chemical reaction. The containment of volatile chemicals also serves to reduce potential personnel exposure.

Storage in the laboratory shall be limited to the smallest practical amount (2- to 3-day supply). Benchtop and hood storage is not permitted. Empty or full bottles of chemicals, especially solvents, acids, and caustics, must not be left on the floor. Chemicals no longer being used in a laboratory should be returned to the stockroom or other central location for appropriate storage, or disposal and removal from chemical inventory.

All chemical containers must be labeled to identify the contents, particular hazards, and handling precautions. Manufacturers' labels must not be defaced, or removed, while any chemical remains in the container.

Peroxide-forming chemicals, such as ethyl ether or tetrahydrofuran, will be dated upon receipt and will be appropriately discarded after 12 months if unopened; or three months after opening.

Highly toxic, carcinogenic, suspected carcinogenic, teratogenic standards greater than 0.1% (1000 ppm) must be double containerized and stored in an approved ventilated storage cabinet.

Refrigerators intended for storing flammable liquids must have spark-free interior construction; refrigerators in a room where large quantities of flammable materials are stored must be explosion-proof.

Stockrooms/storerooms should be secure, with limited access, and provide appropriate storage by class/type of chemical. Chemicals will be stored according to chemical compatibility, not in alphabetical order or by stock number. Fire is the major hazard in chemical storage. Unopened chemical bottles will be kept in chemical storage. Bottle carriers or lab carts should be used when transporting glass bottles containing hazardous chemicals.

NFPA 30, Flammable and Combustible Liquid Code (1990), establishes requirements for the types of storage and maximum quantities of chemicals that can be stored in a storeroom or laboratory. NFPA 45, Fire Protection for Laboratories Using Chemicals, also provides information on chemical storage. A storage room designed to meet the requirements of NFPA 30 Section 4-4 should be used to store the largest quantities of flammable chemicals.

5.8.3.1 Flammable Storage Cabinets

- Flammable solvent storage cabinets shall be installed according to guidelines published in NFPA 30, Flammable and Combustible Liquid Code.
- The cabinets must not be ventilated unless the local fire codes require a vent to the outside. Non-vented cabinets will have the bungs in place.
- If the fire code requires the cabinet to be vented, the bungs will be removed during installation and the **exhaust connected to the low outlet**. Each cabinet must be vented individually to the outside. A manifold system to connect several cabinets to the same exhaust is not permitted.
- Cabinets designed for the safe storage of flammable chemicals must be used and maintained properly.
- Only compatible materials can be stored inside the cabinet.
- Paper or cardboard is not to be stored inside the cabinets with chemicals.
- The cabinet should not be overloaded.

- The quantities of flammable chemicals in a storage cabinet shall not exceed:
- 120 gallons of Class I, II, and IIIA liquids
- Maximum of 60 gallons of Class I and II liquids

No more than three cabinets may be placed in a single room.

5.8.3.2 Approved Storage Cans. Chemicals must be kept in the manufacturers' original container or in safety cans specifically designed for them. The cans should be used according to manufacturer's instructions and common safety practices, including:

- Safety cans used to store volatile liquids must be approved by a recognized agency such as ANSI or UL;
- It must be kept closed except when adding or removing liquid;
- It must be emptied when free liquid is seen in the flame arrester;
- The flame arrester screen must be kept in place at all times and must be replaced if punctured or damaged;
- As with all chemicals, chemicals in safety cans must be stored in storage areas and not in laboratory work areas or hallways; and
- All flammables must be protected against sources of ignition.

5.8.3.3 Cold Rooms. Cold rooms (walk-in freezers) must have provision for rapid escape and emergency lighting in the event of an electrical failure. Escape latches on walk-in cold rooms should be included in a preventive maintenance/ program and should be tested routinely. If temperature in a cold room reaches 70^{o}F, special precautions should be taken to minimize worker exposure to volatile chemicals. Respirators and air monitoring may be necessary.

5.8.4 Flammability Hazards. An open flame will only be used when necessary, and will be extinguished when no longer needed. An open flame will not be used to heat a flammable liquid, or to carry out a distillation under reduced pressure. Before lighting the flame, all flammable substances must be removed from the immediate area and all containers of flammable materials checked to ensure that they are tightly closed. Other occupants in the laboratory should be notified.

Non-sparking electrical equipment will be used when volatile flammable materials are present in quantity.

5.8.5 Sample Receipt. To minimize the potential for exposure to unknown samples, newly received sample shipping containers including ice chests and coolers will be opened inside an exhaust hood or under other form of mechanical ventilation. This is to prevent exposure to unknown hazardous materials that might have leaked during transport. The supervisor will be notified of any samples that are suspected of off-gassing hazardous substances.

Large ice chests and sample shipping containers (exceeding 60 pounds) shall be handled by two associates or mechanical means.

The minimum PPE described in Section 5.7 should be worn with nitrile or vinyl gloves.

5.8.6 Incompatible Chemicals. Many chemicals are incompatible with others. A brief listing of combinations to be avoided is shown below. NOTE: Substances in the left-hand column should be stored and handled so that they **cannot accidentally come in contact** with the corresponding substances in the right-hand column. The facility MSDS file should be consulted to determine whether specific chemicals have incompatibilities.

Reagent	**Incompatible Chemicals**
Acetic acid	Chromic acid, nitric acid, perchloric acid, hydroxyl-containing compounds, ethylene glycol, peroxides, and permanganates.
Acetone	Concentrated nitric, sulfuric, perchloric, and chromic acid mixtures, and certain plastic materials.
Acetylene	Chlorine, bromine, copper, silver, brass (red), fluorine, mercury, and oxygen.
Ammonium nitrate	Acids, metal powders, flammable liquids, chlorates, nitrates, sulfur, finely divided organics, or combustibles.
Ammonium hydroxide	Acids.
Ammonium iodide	Acids and oxidizing agents.
Ammonium sulfide	Acids.
Bromine	Ammonia, acetylene, butadiene, butane, and other petroleum gases; hydrogen; sodium carbide; turpentine; benzene; and finely divided metals.
Sodium carbide, acetylene	Water; also see acetylene, which is liberated from sodium carbide on exposure to moisture.

Reagent	Incompatible Chemicals
Carbon, activated	Calcium hypochlorite and ruthenium tetroxide.
Chlorates	Ammonium salts, acids, metal powders, sulfur, finely divided organics, or combustibles.
Chromic acid	Acetic acid, acetone, naphthalene, camphor, glycerin, turpentine, alcohol, and most flammable organic compounds.
Copper	Acetylene or hydrogen peroxide.
Diethyl ether	Nitric acid (concentrated and fuming) and other strong oxidizing agents (such as dichromate, permanganate), heat, or aluminum.
Hydrochloric acid	Bases or manganese dioxide.
Hydrocyanic acid	Nitric acid or alkalis.
Hydrogen peroxide	Copper, chromium, iron, most metals or their salts, any flammable liquid, combustible materials, aniline, and nitromethane.
Hydrofluoric acid (Anhydrous)	Ammonia (aqueous or anhydrous).
Hydrogen sulfide	Fuming nitric acid, oxidizing gases, heat, and most common metals.
Hydrocarbons (benzene, butane, propane, gasoline turpentine, etc.)	Oxidizing agents (e.g., fluorine, chlorine, romine chromic acid, sodium peroxide and perchlorates, etc.).
Mercury	Acetylene, fulminic acid, ammonia, and concentrated nitric acid.
Methyl isobutyl ketone hexone)	Nitric acid (concentrated and fuming) dichromate, and permanganate.
Nitric acid (conc.)	Acetic acid, aniline, chromic acid, hydrocyanic acid, hydrogen sulfide, flammable liquids, flammable gases, nitratable substances such as organic compounds including diethyl ether and methyl isobutyl ketone (hexone) and bases.
Oxygen	Oils, grease, hydrogen, flammable liquids, solids, or gases.
Oxalic acid	Silver and mercury.

Reagent	Incompatible Chemicals
Perchloric acid	Acetic anhydride, acetone, alcohol, bismuth and its alloys, charcoal, paper, wood, bases, or organic compounds.
Potassium chlorate	Acids and organic compounds.
Potassium perchlorate	Acids and organic compounds.
Potassium permanganate	Glycerin, ethylene glycol, benzaldehyde, and sulfuric acid.
Sodium hydroxide	Acids, organic materials, most common metals, and water.
Sodium nitrite	Ammonium nitrate and other ammonium salts, organic materials.
Sodium peroxide	Any oxidizable substance, such as ethanol, methanol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerin, ethylene glycol, ethyl acetate, methyl acetate, and furfural.
Sulfuric acid	Chlorates, perchlorates, permanganates, water, and bases.
Strong bases	Strong acids, organic materials, water, and most common metals.

5.9 Radioactive Materials

Some of the laboratories work with materials containing, or suspected of containing, radioisotopes, either in samples submitted for analysis by a client or in electron capture detectors used in gas chromatographs. The concentrations and radioisotopes vary with the type of sample and instrumentation. Shaw E & I is responsible for providing a workplace in which associate and visitor are adequately protected from the hazards associated with exposure to radiation and radioactive materials. Those facilities that handle radioactive samples will institute a formal health physics program that has been approved by a state or federal licensing agency.

5.9.1 Approach to Radiation Safety. All radiation exposures regardless of how small are assumed to entail some risk to the associate. Shaw E & I has adopted the following principles to govern all work activities with the potential for exposure to radiation or radioactive materials:

- No activity or operation involving exposure to radiation will be conducted unless its performance is necessary for the completion of the assigned task.

- All radiation exposures will be kept as low as reasonably achievable (ALARA) considering economic and societal considerations.
- No individual will receive radiation doses in excess of federal or administrative limits.

The first principle is self-explanatory: Associates of Shaw E & I will not be exposed to radiological hazards unless there is some benefit to be gained from the activity involving the exposure. The third principal is also self-explanatory: Federal authorities and Shaw E & I management have identified an upper limit on radiation doses to which workers may be exposed. The second principle, ALARA, is the basis for the federal radiation safety program and for much of our radiation protection program, other than demonstrating compliance with regulations and our licenses. ALARA is an operating policy that is integrated into each of the elements of our program. The full program is given in Shaw E & I Procedure HS700 and the ancillary SOPs.

5.9.2 Program Elements. The Shaw E & I Radiation Protection Program can only be effective through the concern and commitment of associates and management and must be integrated into all aspects of operations that involve radiation. Each associate must assume the responsibility to maintain our radiation exposures ALARA. Each supervisor or department manager must also assume additional responsibilities. They shall maintain continual oversight and evaluate means by which radiation exposures to their associates can be minimized. They shall also exercise sound judgment when weighing the costs and benefits of further dose reduction. They shall institute programs of exposure control, and encourage associate participation in ALARA activities.

The radiation protection program at Shaw E & I consists of the following program elements:

- Training;
- Exposure control;
- Surveillance; and
- Radiation Exposure Reduction Program.

5.9.2.1Training. The training provided will be commensurate with the exposure potential, and applicable regulatory requirements. Specific training includes the consequences of exposure to radiation and the methods to reduce one's exposure. The training is provided by a qualified instructor who has demonstrated a clear understanding of the philosophies and procedures of the methods to limit one's exposure. The instructor also presents the federal and/or state regulations that apply to the operation such as the rights of the worker, equivalent to the regulations promulgated by the U.S. Nuclear Regulatory Commission (NRC), 10 CFR 19, the permissible exposure limits equivalent to 10 CFR 20, or the DOE regulations in 10 CFR 835, the specific risks stemming from radiation exposure to the fetus (Regulatory Guide 8.13), and emergency procedures.

The student must show a proficiency at limiting the spread of radioactive contamination and reducing exposures. This proficiency is demonstrated in written examinations during the training classes and safe work practices during actual tasks. This review is documented by a radiation protection professional.

5.9.2.2 Exposure Control

The control of personal exposure to radiation involves limiting the external and internal exposures. Dose limits are established by the regulatory agency such as the NRC. Monitoring is performed by the radiation protection professional to confirm that the exposure limits are not exceeded. Guidelines are established to track exposures that are sufficient to alert management before an overexposure occurs.

Radiation exposures to external sources of radiation are measured by using personnel dosimeters, such as thermoluminescent dosimeters (TLD), to measure whole body exposures. The TLDs are analyzed by an accredited laboratory and the data are reviewed by the radiation protection staff, lab management, and individuals receiving the exposure. Access to specific sources of external radiation is limited when there is a potential for a significant exposure. Caution signs are posted to remind the technicians in the area that radiation exists, as well as listing the requirements for entry into the area.

Handling loose, unsealed sources of radioactive materials represents a risk of internal deposition and internal exposure. A program has been established to limit exposure to internal sources of radioactive materials. Contamination surveys are conducted periodically to assess the level of contamination and identify areas where there is a potential for exposure. Samples are collected and analyzed by the specific laboratory handling the radioactive material. Each laboratory has established acceptable limits for surface contamination recommended

by the NRC and the American National Standards Institute (ANSI). The limits are designed to limit the uptake of the material during routine handling and analysis by radiation workers. Air monitoring is performed for specific tasks to document the concentrations of radioactive material present. Wet methods and containment systems are used to minimize the spread of contamination to surfaces. Fume hoods and other types of local exhaust ventilation are also used by the laboratories to capture dust that is potentially contaminated. High efficiency particulate air (HEPA) filters may be required if large quantities of radioactive material are used. Personal protective equipment is used when engineering and administrative controls are not sufficient. Radiation work permits are used to document the need for personal protective equipment and any other requirements before entering the restricted access area. Respiratory devices are used by trained associates when a potential exists for the concentration of airborne radioactive material to exceed the permissible limits. Respirators are not the desired method to limit exposures but may be used temporarily if engineering controls and administrative controls are found to provide insufficient protection.

5.9.2.3 Surveillance

The radiation protection staff performs periodic surveys to evaluate the potential for exposure to radiation and radioactive materials. Direct reading instruments are used to measure external radiation as well as total contamination that exists on surfaces. Each type of instrument is selected according to the radiation likely to be emitted and the detection limit that is desired. The instruments are calibrated using sources of radiation traceable to standards developed by the National Institute of Standards (NIST). Technicians using the instruments are trained to use the instrument correctly and to respond to the data that are provided.

Surveys are also performed to measure the concentrations of removable surface contamination. These "wipe" surveys serve to distinguish the contamination that is likely to be deposited internally versus the contamination that is fixed on surfaces and less likely to result in a personnel exposure. The control of removable contamination is an important element to limit internal exposures. Wipe surveys are performed for specific areas where loose radioactive materials are used to confirm that the contamination is confined with the boundaries of the restricted area. Wipe surveys are also performed throughout the facilities, including but not limited to the offices and lunchroom, to document that the administrative procedures are adequate to limit the spread of contamination.

5.9.2.4 Radiation Exposure Reduction

Shaw E & I is committed to maintaining personal radiation exposures to ALARA. This philosophy is achieved by many efforts including effective training of radiation workers. During the training session, the associate reviews methods to reduce exposure and limit the spread of contamination. Radiation protection professionals are employed by Shaw E & I to assist the laboratory management in developing specific procedures that limit exposures by adequate planning and safe work practices. Facilities are designed to limit contamination and exposure to radioactive material, as well as to permit efficient decontamination should contamination be detected. Routine surveys are performed to document the condition of the laboratories and the effectiveness of the engineering and administrative controls.

5.10 Spills

Associates will be trained to respond to small spills of hazardous materials. The response procedure is documented in the Contingency Plan that has been approved for the facility. This plan will include an emergency phone list that gives:

- Emergency departments that may be called to respond to an emergency;
- Home phone numbers for senior laboratory staff; and
- Name, address and phone number of organizations that will respond to a spill at the facility.

The approach to respond to a spill of hazardous chemicals should include the following steps:

5.10.1 Solid/Liquid Spills

5.10.1.1 Evaluate the Situation. The associate discovering the spill should evaluate the situation, without compromising his/her own safety. The area supervisor and the HS Coordinator should be contacted immediately and informed of the spill. Outside of normal working hours, the facility Emergency Coordinator is to be contacted for large spills. It is the responsibility of the HS Coordinator or the Emergency Coordinator to determine if outside help will be required for the clean-up.

Medical assistance must be obtained for any person injured in the spill.

The affected area should be isolated and supervised to prevent personnel from unnecessarily entering the area. If evacuation of the building is necessary, follow the "EVACUATION PROCEDURES" found in the facility Contingency Plan.

5.10.1.2 Personal Protective Equipment and Clothing. When attempting to clean up a spilled chemical, the proper PPE must be utilized. The level of protection required depends on the amount of material spilled and the hazards. At a minimum, normal laboratory PPE is needed, with the added protection of gloves that are resistant to the chemicals involved. For larger spills, additional protective equipment may include:

- Chemical-resistant clothing that fits over personal clothing;
- Chemical-resistant footwear and gloves; and
- Air purifying respirator or SCBA depending on the amount of material spilled, its volatility, and its hazards.

The information needed to select the proper PPE is provided in the MSDS associated with the chemical that is to be cleaned up. **The HS Coordinator shall be contacted to confirm the correct protective equipment.**

Minimum PPE shall be appropriate chemical protective suit/gloves/boots and SCBA, unless actual air contaminant exposures have been measured and the HS Coordinator determines that other PPE will provide adequate protection.

5.10.1.3 Containment. Containment is the first priority in dealing with a chemical spill (with the EXCEPTION of FLAMMABLE MATERIALS. See below). Refer to the appropriate section of the MSDS and/or information supplied with the specific spill control materials.

- Solids by their nature tend to be contained easily.
- Liquids should be contained with an absorbent material that is compatible with the chemical. Spill pillows or socks can be used in place of loose materials. Every attempt should be made to prevent liquids from reaching any drains in the area.

5.10.1.4 Flammable Materials. With flammable materials, the first objective is to remove all possible sources of ignition of the material such as flames, heaters, hot plates, electrical motors, etc. Power sources should be deactivated, preferably from outside the laboratory by means of the emergency shutoff switch or the circuit breaker. When the ignition sources have been removed, containment of the material is performed.

5.10.1.5 Inactivation. Many of the spill kits available in the laboratories will react with and "neutralize" the hazardous material. This

changes the properties, reduces the hazards, and may even result in a material that can be disposed of as non-hazardous. Reactive materials must be stabilized. Mercury should be recovered for repurification, and only the last traces picked up using a mercury spill kit.

5.10.1.6 Disposal. Once the spilled materials have been contained and inactivated, the mixture can be prepared for disposal. The mixture should be placed in a sealed container, properly labeled, and then disposed using the established disposal procedures. The shipping container and labels must satisfy the U.S. Department of Transportation requirements.

5.10.2 Gas Release. A release of a hazardous gas from a pressurized cylinder into the laboratory may require the evacuation of laboratory associates. The following steps should be followed:

- Associates in the room must be notified. If the leak occurs outside of the hood, the lab area should be evacuated.
- All ignition sources in the hood and room must be deactivated, preferably at the circuit box.
- The associate attempting to stop the leak must use an SCBA since an air purifying respirator will NOT provide adequate protection. No attempt will be made to enter the area if a SCBA is not available. A backup outside the contaminated area, also wearing an SCBA, must be in visual or oral contact to render assistance in an emergency.
- Only hand pressure should be exerted to close the cylinder valve; excessive force may shear the valve.
- Only the HS Coordinator, or designated alternate, will indicate when reentry into an evacuated area can be made. If an outside agency is used in the clean up, they are responsible for giving permission that the area is safe to re-enter.

5.11 Waste Disposal

The goal of Shaw E & I's policy for hazardous waste management is to ensure that laboratory wastes are disposed of safely and in a manner consistent with applicable regulations. This goal is accomplished by requiring that all laboratories have approved SOPs for the management of hazardous wastes. Guidelines for developing these SOPs are found in Attachment 3.

The disposal of hazardous waste generated at laboratory facilities will be carried out in accordance with applicable hazardous waste regulations.

5.11.1 Requirements. The Laboratory Director, or his designee, is responsible for the development, implementation, and maintenance of site specific procedures that will document all aspects of the disposal program. In

addition, the Laboratory Director or his designee is responsible for ensuring that all applicable personnel receive appropriate training regarding these procedures. The procedure includes the following requirements:

- Wastes designated by the Resource Conservation and Recovery Act (RCRA) as hazardous shall not be discharged to the sewer or to a Publicly Owned Treatment Works (POTW).
- RCRA-regulated hazardous waste shall not be disposed of in a sanitary landfill.
- Evaporation in laboratory fume hoods will not be used as a means for disposal of waste chemicals.
- Disposal by recycling or chemical decontamination will be used when possible.
- Incineration of combustible laboratory wastes will be considered as the most desirable waste disposal option when practical.
- The Best Available Technology will be used for disposal of non-combustible materials, such as inorganic acids and bases, and metal compounds.

5.11.2 Waste Management Program Elements. The waste management program is composed of the following program elements:

- Waste segregation, accumulation, and collection;
- Waste storage;
- Manifest and shipping;
- Methods of disposal;
- Hazardous waste minimization; and
- Training.

5.11.2.1 Waste Segregation and Accumulation. Hazardous waste that is generated during analytical methods will be transferred to a satellite accumulation container in the work area. A container will be provided for each different waste stream according to chemical compatibility.

Each container will be **clearly labeled** to reflect the hazard type (i.e., corrosive, flammable, oxidizer, etc.) and the safety precaution. It is suggested that, in addition, a color code be given to each waste stream, and the container be color coded to match the waste stream.

The satellite container will be made of a material that is compatible with the chemical(s) that will be stored inside, and will be approved for the purpose. Waste containers for flammable solvents must be equipped with a flash arrester. The

container should be sized such that one person can easily pick it up when full.

The satellite containers will sit inside a tray (secondary container) capable of holding the contents of the container. This is a requirement in many states.

The person adding materials to a satellite container shall wear appropriate eye protection, a laboratory coat, and the type of gloves worn during the sample analysis.

The satellite container should be emptied when it is full. It is preferable that the container hold no more than the quantity generated in a week's time. The maximum quantity of waste chemicals that may be stored in any laboratory shall not exceed a total of 55 gallons.

The contents should be transferred to the appropriate storage container in the waste storage area.

Any spill or leaks from the satellite container shall be cleaned promptly. Laboratory personnel will immediately notify their supervisor, or HS, if a container is found to be leaking.

5.11.2.2 Waste Storage. The storage container will be no larger than a 55-gallon drum constructed of materials that are impervious to the chemicals being stored. The container will meet container specifications as defined by the Department of Transportation (DOT) for the specific waste stream.

Each container shall be labeled to reflect the hazard type (i.e., corrosive, flammable, oxidizer, etc.), the safety precautions, and the **date the hazardous waste accumulation started**. LABELS WILL BE ATTACHED WHEN MATERIAL IS FIRST ADDED TO THE DRUM.

The length of time that a drum of waste is accumulated will be tracked to verify that U.S. Environmental Protection Agency (U.S. EPA) established holding times are not exceeded.

Laboratory management will determine the correct category for their facility as defined in the U.S. EPA regulations 40 CFR 262.34.

In general, a large quantity generator is defined as a facility that generates more than 1,000 kilograms of hazardous waste per

month. Large quantity generators may not store waste on site for longer than 90 days.

Small quantity generators must dispose of their waste within 180 days unless they use a treatment, storage, and disposal facility (TSDF) that is more than 200 miles away. In this case, the waste must be shipped within 270 days.

During transfer, each drum containing flammable or combustible solvents shall be grounded and bonded to the smaller container from which the waste is transferred.

At least two persons should be present during the transfer operation from the satellite containers to the larger accumulation drum.

The person emptying the contents of the satellite container will wear the protective clothing required for the type of waste being handled. At a minimum, the associate will wear chemical goggles, impervious gloves and protective apron. Respiratory protection may be required.

Care must be taken to ensure that drums of incompatible materials are not stored such that the contents can interact should the contents mix. The storage area should be diked or bermed to prevent leaked materials from spreading through the area. Drums will be stored in rows no more than two drums wide. There will be a 3-foot aisle between rows. This aisle width allows drums to be removed easily in an emergency. Labels will be attached to the drums such that they are visible from the aisles.

The waste storage area will be inspected weekly for any leaks or spills; deficiencies shall be noted, and the corrective action documented.

Provision will be made to contain spills or leaks from the storage drums. Available emergency equipment will include:

- Spill kits;
- Fire extinguishers;
- Overpack drums; and
- Communication systems.

The person adding materials to a satellite container shall wear appropriate eye protection, a laboratory coat, and the type of gloves worn during the sample analysis.

Procedures will be developed describing the methods used to respond to a spill.

The storage area shall be locked when unoccupied and posted with signs identifying the presence of hazardous chemicals. Areas where PCBs are known to be stored shall be labeled at the entrance.

5.11.2.3 Waste Shipment and Manifesting. Hazardous waste shall profiled by a U.S. EPA-permitted Treatment, Storage and Disposal Facility (TSDF) and shall be shipped to that facility by an EPA-permitted transporter.

The waste manifest shall be completed as described in SOPs listed in Attachment 3. The manifest and other transportation documents must be signed by an associate who has been trained in the requirements of the U.S. DOT regulations.

Each container must be marked and labeled according to the U.S. DOT requirements for the specific hazardous material.

The generator is responsible for ensuring the transport vehicle is placarded as required by U.S. DOT requirements, 49 CFR 172.500, Subpart F.

Safety equipment available during the loading of drums onto the transport vehicle will include, but not be limited to:

- Spill kits;
- Drum dolly; and
- Ten-pound A, B, and C fire extinguisher.

Shaw E & I associates will wear safety footwear while handling waste drums.

5.11.2.4 Disposal Methods. All RCRA hazardous wastes shall be shipped off site for treatment and disposal at a permitted facility. The preferred method of disposal for EPA flammable materials is by burning in an approved incinerator.

Where economical, waste should be recovered by an authorized recycling company.

Disposal to the sanitary sewer may only occur after the bulk solutions have been analyzed to show that the liquid is not a

RCRA hazardous waste or otherwise a regulated substance. The effluent must also satisfy requirements of the local sewer districts. The laboratory must determine if a discharge permit is required from local agencies for these wastes. Effluent will be analyzed to assure compliance with local, state and federal regulations; all analytical data for these effluents will be retained for at least five years.

5.11.2.5 Waste Minimization. Each facility will develop a program to minimize the amount of wastes shipped for disposal. This can be achieved in a number of ways, for example:

Waste solvents should be recycled when feasible.

Orders for chemical reagents shall be minimized to prevent unnecessary disposal of out-of-date materials.

Steps should be taken to ensure that segregation of the wastes is effectively carried out. Inappropriate mixing of wastes generated during sample preparation, or sample disposal, could result in increased costs for disposal, or at worst an inability to dispose of the materials at all (i.e., mixed wastes).

Samples that have been determined to be hazardous (under RCRA) shall be segregated/flagged so they can be disposed of appropriately. Samples that have not been determined to be RCRA hazardous will be discarded as appropriate.

Containers (e.g. glass bottles) should be triple rinsed and crushed prior to disposal. Compaction should be used where possible prior to disposal of contaminated laboratory trash.

Waste streams that can be recycled should be segregated sufficiently to prohibit trace contaminants from being added. The trace contaminants may eliminate the option of recycling. The TSDF should be contacted to identify the contaminants that must be excluded.

5.11.2.6 Training. All laboratory staff will be trained in the waste segregation procedures, the collection procedures, the hazards of the wastes generated in their work areas and the PPE needed when handling waste.

Basic training should be conducted before the laboratory technician begins the work assignment. Annual updates are required. All training will be documented.

5.12 Enforcement

Operations management is responsible for implementing and enforcing the elements of the CHP. This section addresses the associate who does not use, and management that does not provide, engineering controls, administrative controls, or PPE as required and listed in the procedures for the performance of assigned task(s).

5.12.1 Progressive Discipline. Disciplinary action will be carried out by the appropriate manager in conjunction with Human Resources.

Any associate who violates any Company rule, regulation, or standard of associate conduct will be subject to disciplinary action as set forth in Shaw E & I Procedure HR207.

5.12.2 Management. Management shall provide engineering controls, administrative controls, and PPE as required and listed in the procedures for the performance of the tasks.

Implementation and enforcement of the CHP is a key measure of managerial performance.

5.12.3 Guidelines to Stop an Unsafe Operation. The laboratory associate, supervisor, and/or group leader will stop work when either of the following situations occur:

- The associate experiences symptoms that indicate potential exposure to hazardous chemicals; or
- Failure of any equipment used in the procedure, especially an engineering control such as a fume hood.

All associates have the right and duty to stop work when conditions are unsafe, and to assist in correcting these conditions. The condition shall be reported immediately to the department manager/supervisor. Whenever a representative of the Health & Safety staff determines that workplace conditions present an immediate uncontrolled risk of injury or illness to associates, immediate resolution with the appropriate supervisor shall be sought. Should the supervisor be unable or unwilling to correct an unsafe condition, the Health & Safety representative is authorized and required to

issue a Stop Work Order, which is immediately binding on all affected associates and subcontractors.

Upon issuing the Stop Work Order, the Health & Safety representative shall contact the laboratory director and request assistance in implementing corrective action so that operations may be safely resumed.

An appropriate review will be conducted by the supervisor, group leader, laboratory manager and HS professional. Work may not proceed until all parties deem the operation to be safe.

If the parties are unable to agree on the necessary corrective actions, or the appropriateness of the Stop Work Order, the issue shall be referred to the Vice President for Operations and the National Director, Health & Safety who shall review the findings and approve, reject, or offer an alternate solution.

Resumption of **safe** operations is the primary objective; however, operations may not resume until the HS professional has given approval that workplace conditions now meet acceptable safety standards.

The HS professional shall write a report of the concerns of the associate and the findings of the manager and HS. The report shall be distributed to the Laboratory Director, associate, and National Director, Health & Safety within five days of the stop work event.

5.13 Exposure Determination

An evaluation of the potential for personnel to be exposed to volatile hazardous chemicals, dusts, and fumes, involves several elements, including:

- Toxicity of substances involved;
- Likelihood of the release of toxic materials during the procedure;
- Protective equipment or engineering controls available for use;
- Previous experience and accidents involving the operation;
- Complaints, odors, or symptoms of exposure reported by associates performing the operation, or at locations nearby; and
- Any reason to believe that the action level, or the PEL, has been exceeded.

Based on the results of this evaluation, workplace monitoring may be conducted.

5.13.1 Initial Associate Exposure Monitoring. Associate exposure monitoring will be conducted if there is reason to believe that exposure levels exceed the action level, the TLV, or the PEL (as applicable), for any hazardous chemical.

Baseline monitoring will be conducted for selected tasks where there is a potential for personnel exposures in excess of the action level, TLV, or the PEL, to occur.

Monitoring may be carried out if there is an associate concern about exposure to a chemical. Available data will be reviewed by the HS professional to determine if exposures may exceed an action level (of 50% of the exposure limit). If there is reasonable potential for exposures to exceed the action levels, initial monitoring will be conducted.

If the initial monitoring indicates that associate exposures exceed the action level, there will be a complete industrial hygiene evaluation of the task. The evaluation should include the requirements for additional engineering controls or administrative controls to reduce the exposure. Monitoring will be conducted to document the effectiveness of the changes in reducing exposures below the action level.

PPE such as respiratory protection should be used only after it is determined that engineering or administrative controls are inadequate to protect the associate. Associates wearing respirators must meet the requirements of the Shaw E & I Procedure HS601, Respiratory Protection Program; must satisfy the medical requirements; must be fit tested annually and trained to use the equipment.

NOTE: NIOSH Approved air-purifying respirators are <u>not</u> available for many solvents and reagents used in the laboratories, for example, ether, methylene chloride.

5.13.2 Criteria of "Reasonable" Suspicion of Exposure. The following are examples of situations that might be considered evidence of exposure to toxic substances:

- Direct skin or eye contact with a chemical substance.
- Odor was noticed, especially if person was working with any chemical that has a PEL or TLV lower than odor threshold, such as carbon tetrachloride.
- Manifestation of health hazard symptoms such as headache, rash, nausea, coughing, tearing, irritation or redness of eyes, irritation of nose or throat, dizziness, loss of motor dexterity, etc.
- Some or all symptoms disappear when the person leaves the work area and goes into fresh air. The symptoms reappear soon after the person resumes working with the chemicals.
- Complaints are received from more than one person in the same work area.

It is Shaw E & I policy to promptly investigate **all** complaints to determine the risk of associate overexposure to toxic substances in the workplace.

5.13.3 Exposure Evaluations. Complaints of possible hazardous chemical exposure will be documented along with the decision of appropriate action. Formal exposure evaluations will be conducted by a responsible person or persons in Shaw E & I with the assistance of a qualified safety professional or industrial hygienist. **The purpose of the exposure evaluation is to determine if an exposure has taken place, and how to decrease that exposure - not to assign fault.** The evaluation includes, but is not limited to:

- Interviewing the person initiating the complaint, and the victim (if not the same person);
- Comparison of the symptoms with the information on the MSDS;
- Evaluation of the procedure and the chemicals being used;
- Listing essential information about the circumstances of the exposure;
- Air sampling of the area for the suspect chemicals; and
- Review of the present control measures and safety procedures.

Associates will be notified of any monitoring results within 15 working days of their receipt.

Operations that result in exposures above the PELs will be stopped until adequate controls can be implemented.

If initial associate monitoring reveals exposure over the action level, the Health & Safety/Compliance Coordinator will continue monitoring quarterly until engineering controls, work practices, or substitution of chemicals has reduced the exposure below the action level. Corrective actions must be taken to mitigate personnel exposures.

Workplace monitoring for those compounds (such as benzene) that have substance-specific requirements will be conducted using the methods outlined in the standard published in 29 CFR 1910, after an evaluation has been made in compliance with the OSHA Lab Standard.

The assessment documenting the circumstances contributing to the overexposure shall be reviewed by the National Director, Health & Safety.

5.13.4 Fetal Protection. All associates will be given training in Shaw E & I Procedure HS041, Embryo-Fetus Protection Program. Specific chemicals have been identified as being hazardous to the fetus or having an affinity to cross the placenta and bioaccumulate in the fetus. A partial list of representative reproductive toxins is provided in Attachment 2, Regulated Chemicals.

Shaw E & I Procedure HS041 indicates that associates should notify their supervisor when they know that they are pregnant, or if they are contemplating a pregnancy in the near future. Upon such notification, the HS professional will make a preliminary workplace assessment. An evaluation of the potential exposures shall be initiated immediately and include, but not be limited to:

- A review of the chemicals that may be encountered in the workplace, their hazards, the quantities and how they will be used;
- Air sampling to confirm the airborne concentrations of the reproductive toxins and/or hazardous chemicals that may be used by that individual;
- The potential that surface contamination that may be ingested or be absorbed into the body by transcutaneous exposure.

Once the evaluation is complete, the results will be shared with the associate. The associate may request a job accommodation through Human Resources or transfer to alternate duties that do not involve chemical handling or exposure. Such a transfer will be based on medical considerations and would last for the duration of the pregnancy for women, and while attempting pregnancy for men.

5.13.5 Medical Consultation. When it is suspected or known that associates have been overexposed to toxic chemicals, they shall receive prompt medical attention. To ensure that they do receive proper and informed medical attention, Shaw E & I will contract with a local medical professional who is experienced in treating victims of chemical overexposure. The contracted medical professional should also be knowledgeable about which tests or procedures will help determine if there has been an overexposure. The local physicians shall discuss their findings with the Shaw E & I Medical Director. The following procedures will also be implemented:

- Routine non-emergency medical examinations will be scheduled for all laboratory personnel, and
- All documentation related to a complaint of possible exposure to hazardous substances will be maintained in a file for easy retrieval in accordance with Shaw E & I Procedure HS102. For more on reports and recordkeeping, see Section 5.18.

5.13.5.1 Notification. The associate shall be notified of the results of any medical examination with regard to any medical condition that might result from overexposure to a chemical.

5.14 Medical Surveillance Program

The medical surveillance program will provide the following:

- An initial determination of associate's physical ability to perform the assigned task through a replacement medical examination (Shaw E & I Procedure HS100). This ability will consider the need for reasonable accommodations in the workplace.
- On-going surveillance through periodic/update physical examinations (Shaw E & I Procedure HS100).
- Work-related illness and injury: treatment, follow-up visits, return to work, and restrictions (Shaw E & I Procedure HS105).
- Exit physical examinations (Shaw E & I Procedure HS100).

An integral part of the medical program is the maintenance of associate exposure monitoring and medical records (Shaw E & I Procedure HS102). This procedure will be used for these data.

5.14.1 Requirements. Medical surveillance will be performed for all associates and temporary associates who may handle hazardous chemicals as part of their assignment. The surveillance will be performed **before** work in the laboratory begins.

Medical examinations and consultations are performed by or under the direct supervision of a licensed physician without cost to the associate, without loss of pay, and at a reasonable time and place. Associates who may be routinely exposed to chemicals will receive an examination at least once per year. Those that may be exposed sporadically (that is, their jobs do not require them to spend more than short, infrequent periods in the lab) will receive an examination approximately every eighteen months.

Additional medical examinations will be performed whenever:

- Signs and symptoms of exposure associated with a hazardous chemical develop;
- An event takes place in the work area such as a spill, leak, or release that results in an exposure to hazardous chemicals; or
- Environmental monitoring reveals work area exposure levels routinely above the PELs established by OSHA, or the TLVs established by ACGIH.

In the event of an exposure, the physician should be provided with the following information:

- Identity of hazardous chemical(s) in the associate's work area;
- A description of the conditions under which the exposure occurred;
- A description of the signs and symptoms associated with exposure to the hazardous chemicals; and
- A copy of the MSDS for the chemical(s) involved. (This should be sent with the associate to the physician.)

The physician shall provide a written opinion on specific findings related to exposure including:

- Results of medical examination and any associated test;
- Recommendation for further medical follow-up;
- Medical conditions revealed in the course of the examination that may place the associate at increased risk as a result of future exposure to hazardous chemicals in the work area; and
- A statement that the associate has been informed of the consultation/examination results and any medical condition that may require further examination or treatment.

Substance-specific standards for chemicals appear in 29 CFR 1910. Specific medical monitoring requirements are part of these standards. Reference will be made to the appropriate standard to find the medical requirement. This information will be forwarded to the treating physician.

5.14.2 First Aid. Laboratories should have several associates (preferably three people per shift) trained and certified in first aid and cardiopulmonary resuscitation (CPR). This practice provides on-site response to accidents and injuries. Those facilities not within 4-5 minutes of professional medical aid will designate a minimum of two trained responders per shift. These associates will be afforded training and protection required under 29 CFR 1910.1300 and Shaw E & I Procedure HS512. These individuals should be listed in the facility specific Contingency Plan. Facilities that have designated people to provide first aid will ensure that an Exposure Control Plan, as required by OSHA, is written and approved by the National Director, HS.

Quick response to aid the victim involved in an accident or spill can help minimize the damage that results. The following guidelines are useful when chemicals are splashed on an associate:

- Eye contact: Immediately flush eyes with water for at least 15 minutes. Prompt medical attention will be obtained.
- Ingestion: Encourage the individual to drink large amount of water. Do not make the person vomit. Seek medical attention.
- Skin contact: Immediately begin flushing the affected area with large amounts of water; remove contaminated clothing. Continue flushing for 15 minutes and use the safety shower when skin contact is extensive. Seek medical attention, taking the MSDS (if possible) to the clinic, doctor, or hospital.
- Cleanup: Immediately determine the chemicals involved and using appropriate PPE, clean up the spill and properly dispose of the materials.

First aid kits are installed in the facility and are readily available if an accident occurs.

5.15 Hazard Communication Program

5.15.1 Program Elements

The elements of the hazard communication program for each Shaw E & I laboratory are defined in this Chemical Hygiene Plan, and in Shaw E & I Procedure HS060. The major elements are:

- Associates will be given information on the hazards of the chemicals they may encounter in the workplace;
- The interpretation of the information contained in Material Safety Data Sheets (MSDS);
- Recognition of potential exposure to chemicals;
- Use of engineering controls and personal protective equipment;
- Each facility will maintain an inventory of chemicals currently in use;
- Approval to bring new chemicals into the facility will be given by the HS professional in conjunction with the laboratory director or his/her designee;
- Labeling on containers will include the chemical or trade name and information on the hazards of the contents;
- Collection and maintenance of MSDSs by the facility HS staff;
- MSDS are available to laboratory associates at all times; and
- Training for all laboratory associates concerning this program.

5.15.2 Chemical Inventory. The chemical inventory will be updated whenever new chemicals are received for use, and at least annually to reflect each chemical substance and the quantity on hand at the time of the inventory. The HS professional will keep a complete list of the chemicals.

5.15.3 Review and Approval of New Chemicals. The laboratory manager or his designee and the HS professional will review and approve the orders for chemicals new to the facility. No chemical may be released for use until the MSDS is available and the associates have been informed of the hazards.

Hazardous chemicals new to the facility will be reviewed by the Technical Director and HS **BEFORE** the order is placed. The use of substitutes (chemicals already in inventory) should be considered while a review of the new MSDS, methodology, monitoring requirements, specialized PPE requirements and training is conducted. It may be determined that Shaw E & I does not want the new chemical brought into the facility.

The supervisor, HS professional or their designee should train associates in the safe use of a new chemical **before** the chemical is released for use in a laboratory.

A chemical that has been purchased without authorization, free samples, and trial materials shall NOT be released for use until the hazards have been reviewed and its MSDS has been received and evaluated by the HS staff.

5.15.4 Labels. All chemicals in use will be labeled. Labels must include, at a minimum, the following information:

- Identity of the hazardous chemical, and
- Major Hazard(s).

The manufacturers' label shall not be defaced, or removed while there is still chemical remaining in the container. In the event a container is reused, it must be cleaned and the original label removed and replaced with a new label that indicates the contents and hazards.

5.15.5 Material Safety Data Sheets. A current MSDS will be obtained for each chemical. MSDS's shall be made readily available to the laboratory associates. This should be accomplished by locating copies of the MSDS pertinent to a specific laboratory in a labeled binder in or adjacent to the lab in question. The HS professional is responsible for maintaining the MSDS files.

5.15.6 Training. A training program that includes, but is not limited to, the following topics will be presented and documented for all laboratory personnel:

- Notification to associates of the hazardous substances used in their work area and the availability and content of MSDS's;
- Use of engineering, administrative controls, and personal protective equipment to reduce exposures;
- Determination of the potential fire, toxic, or reactivity hazards that are likely to be encountered in the handling, application, or utilization of a chemical; and
- Methods and observations that associates can use to detect the presence or release of a hazardous substance in the work area (such as visual appearance or odor of hazardous substances being released, etc.).

5.16 Contingency Plans

5.16.1 Site-Specific Plan. Each facility will develop and implement a Contingency Plan to document the procedures to be used in the event of an emergency. The plan is to be approved by the National or Group Director, Health & Safety, and must be reviewed and approved at least annually to ensure that it

reflects current conditions. A copy of the Contingency Plan is included with the facility-specific attachments to the CHP.

5.16.2 Contents. The Contingency Plan must address at least the following situations:

- Medical emergency;
- Fire;
- Spill response;
- Utility failure (gas, electric, water, sewer, heating, ventilation, and air conditioning [HVAC]);
- Natural disasters (such as earthquake, tornado, hurricane, severe weather); and
- Building evacuation (with drills).

5.16.3 Telephone Call List. Emergency telephone numbers shall be posted throughout the laboratory and shall include the following:

- Emergency Coordinator and alternate;
- Laboratory Director;
- Operations Manager;
- HS Staff;
- Group Leaders/Supervisors;
- Local Fire Department;
- Local Medical Emergency Team;
- Nearest Hospital; and
- Local Police Department.

The preferred order of call shall be indicated.

5.16.4 Spill Prevention Guidelines. The laboratory will implement a program to prevent spills or fires before they occur.

Bottles of corrosive or flammable chemicals will be transported in special carriers or carts large enough to contain any spills resulting from breakage of the bottles.

Waste containers will be kept in secondary containers in the lab.

Chemicals will be stored following the storage practices and the procedures outlined in Section 5.8.3 of this document. All metal containers will be examined periodically for signs of corrosion. Corroded containers shall be disposed of immediately and properly. Closures will be examined and determined to be secure and free from deformation.

5.16.5 Detectors and Alarms. Fire and emergency alarms must not depend on electrical power to the facility to operate and shall be audible throughout all the laboratories and buildings.

5.16.6 Emergency Equipment. Emergency equipment is provided in strategic locations marked with signs in the facility.

Diagram(s) will be included in the Contingency Plan to reflect the specific locations of the emergency equipment and first aid kits.

Safety equipment will be readily available. The HS staff, or local designee, shall inspect equipment at least monthly to confirm that access is not restricted or blocked by temporary storage of equipment or other objects and that the safety equipment and first aid kits are operational.

5.16.6.1 Eye Wash Fountains. The laboratory shall be equipped with eye wash stations that shall be tested at least monthly. Documentation of the inspection shall be maintained by the HS Coordinator. Steps will be taken to immediately repair any deficiencies.

5.16.6.2 Safety Showers. The laboratory shall be equipped with safety showers that shall be tested at least quarterly. Documentation of the testing shall be maintained by the HS Coordinator. Steps will be taken to immediately correct any deficiencies.

5.16.6.3 Fire Extinguishers

- Laboratories in which hazardous chemicals are used will be equipped with fire extinguishers compatible with the hazards in the area.
- Each fire extinguisher will be inspected monthly. The inspection will be documented.
- All fire extinguishers shall be certified annually by an approved outside vendor. Records of all inspections shall be maintained in the HS office.

5.16.6.4 Self-Contained Breathing Apparatus (SCBA). When self-contained breathing apparatus (SCBA) are supplied, there will be a minimum of two units in the facility.

- SCBA will be worn when a response is made to the release of hazardous gases and vapors over the PEL or TLV, or for unknown concentrations.
- SCBA will be worn only by trained individuals.

- A backup person equipped with the same equipment will act as stand-by during the emergency.
- SCBA will be inspected monthly.
- The SCBA will be maintained per manufacturer recommendations.
- If an SCBA is not available, no attempt will be made to enter an area where high concentrations of hazardous gases and vapors may be present.

5.16.6.5 Spill Cleanup Kits

- Each laboratory area will be equipped with spill cleanup kits possessing absorbent and neutralizers for the materials used in that area.
- Supplies used in a cleanup will be immediately replaced.
- The contents of each kit will be inventoried monthly.

5.16.6.6 Emergency Lights. Emergency lights shall be located throughout the laboratory building, not only in corridors, but also in larger rooms. These will be activated automatically in the event of a power failure. The lights will be tested during the monthly inspection with the records maintained in the HS office.

NOTE: Emergency lights are for evacuation from the building. They are <u>not</u> work lights.

5.17 Audit/Inspection Program

Safety awareness should become a standard practice for all associates. The associate is responsible for carrying out his/her work in accordance with safe work practices and procedures. Associates should prepare in advance for possible accidents by becoming familiar with the operation of emergency equipment.

A program of inspections and audits has been developed to ensure a safe work environment.

5.17.1 Inspections. Housekeeping is important to any safety program. Associates will continually inspect their area and maintain good housekeeping practices.

Each associate should also inspect their work area on a daily basis for health & safety concerns.

Each supervisor, similarly, should conduct inspections of their area of responsibility. The supervisor corrects or reduces deficiencies in the following manner:

- Immediately correcting unsafe conditions or practices, or initiating corrective action;
- Ongoing education/training of their associates;
- Daily inspection emergency equipment (such as fire extinguishers); and
- Reviewing and planning with HS how to address the hazards in non-routine work.

Facility inspections take place at all levels of management as prescribed by Shaw E & I Procedure HS021, and will include the following:

- Inspection teams will inspect the work areas periodically such that all work areas will be inspected monthly; and
- Each Vice President for Operations is encouraged to make an informal inspection and review the action item tracking sheet.

5.17.2 Facility Audits. The National HS Director or his designee will conduct a comprehensive audit, or cause a comprehensive audit to be conducted, of each laboratory at least annually. Follow-up inspections will be conducted as required. Quarterly interim reports will be required to report on progress towards correcting deficiencies.

5.17.3 Equipment Inspections. Associates should continually inspect the equipment they will be using.

Exhaust hoods will be tested at least semi-annually. Test results will be posted on the fume hood. Documentation of the tests will be maintained by the HS Coordinator.

The exhaust and HVAC systems will be given routine preventive maintenance. Any changes or major repairs to the ventilation systems will be cause for retesting the operation of the fume hoods. Repairs will be documented.

Emergency equipment will be inspected monthly. All inspections will be documented.

5.18 Record keeping

The Laboratory Standard and Shaw E & I Procedure HS102 require that records of exposure evaluations, medical consultations, and examinations be maintained in accordance with 29 CFR 1910.20. These records must be maintained the duration of employment plus 30 years and will be made available to associates or their representatives on request.

Other records that will be retained include:

- Accident reports including Review Board reports when needed;
- Near miss reports;

- Repair and maintenance records for control systems, including evidence of a preventive maintenance program;
- Training records, including awareness and "Tailgate" safety meetings (forwarded to the Training Department);
- Associate complaints, investigations and resolution;
- Biohazard program training and orientation (records will be kept for at least 5 years);
- Records relating to the hazardous waste program, including inspection reports, manifests, analytical data, etc. Manifests and shipping documents will be kept indefinitely; and
- Major safety suggestions from associates.

5.19 Mobile and Field Laboratories

Mobile and field laboratories will follow the requirements of the project-specific Health and Safety Plan (HASP).

An approved facility-specific CHP is required for mobile and field laboratory operations. This CHP will reference the site specific HASP for the project. In the absence of a facility specific CHP, the Shaw E & I CHP will be followed.

6.0 EXCEPTION PROVISIONS

Exceptions shall be per the requirements of Shaw E & I Procedure HS013**.**

7.0 REFERENCES

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NFPA-45: Standard on Fire Protection for Laboratories Using Chemicals, 1986

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American National Standard for Laboratory Ventilation, ANSI/AIHA Z9.5 - 1992, American Industrial Hygiene Association, Fairfax, VA., 1993

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Regulated Chemicals
3. Guideline for Preparing: Waste Management Program SOP
4. Guideline for Preparing: Waste Characterization and Categorization SOP
5. Guideline for Preparing: Waste Collection, Accumulation and Storage SOP
6. Guideline for Preparing: Waste Shipping and Manifesting SOP
7. Guideline for Preparing: Waste Minimization SOP
8. Guideline for Preparing: Laboratory Fume Hood Air Flow Measurement and Maintenance SOP

ATTACHMENT 1
CHEMICAL HYGIENE PLAN

Responsibility Matrix

The duties of each of the following are listed in Section 5.1, as indicated below:

Responsibility	**Procedure Section**
Chief Executive Officer	5.1.1
Vice Presidents for Operations	5.1.2
Director of Health & Safety	5.1.3
Laboratory Director	5.1.4
Laboratory Operations Manager	5.1.5
Health & Safety Professional	5.1.6
Laboratory Team Leaders & Supervisors	5.1.7
Laboratory Associates	5.1.8

ATTACHMENT 2
REGULATED CHEMICALS

The chemicals listed in this attachment have been identified by OSHA to be particularly hazardous substances and are considered regulated chemicals for the purpose of this chemical hygiene plan.

NOTE: The Chemical Abstracts Service (CAS) Number is given in parenthesis after the name.

CHEMICALS REGULATED BY OSHA

1.0 PART 1910- OCCUPATIONAL SAFETY AND HEALTH STANDARDS SUBPART Z- CARCINOGENS

Section:

1910.1001	Asbestos, tremolite, anthophyllite, and actinolite.
1910.1002	Coal tar pitch volatiles.
1910.1003	4-Nitrobiphenyl.
1910.1004	alpha-Naphthylamine.
1910.1005	[Reserved]
1910.1006	Methyl chloromethyl ether.
1910.1007	3,3-Dichlorobenzidine (and its salts).
1910.1008	bis-Chloromethyl ether.
1910.1009	beta-Naphthylamine.
1910.1010	Benzidine.
1910.1011	4-Aminodiphenyl.
1910.1012	Ethyleneimine.
1910.1013	beta-Propiolactone.
1910.1014	2-Acetylaminofluorene.
1910.1015	4-Dimethylaminoazobenzene.
1910.1016	N-Nitrosodimethylamine.
1910.1017	Vinyl chloride.
1910.1018	Inorganic arsenic.
1910.1025	Lead.
1910.1028	Benzene.
1910.1029	Coke oven emissions.
1910.1043	Cotton dust.
1910.1044	1,2-dibromo-3-chloropropane.
1910.1045	Acrylonitrile.
1910.1047	Ethylene oxide.
1910.1048	Formaldehyde.

2.0 CARCINOGENS

These materials are listed by IARC and NTP as carcinogens, or suspected carcinogens.

	Waste #
Acetaldehyde (75-07-0)	U001
2-Acetylaminofluorene (53-96-3)	U005
Acrylamide (79-06-1)	U007
Acrylonitrile (107-13-1)	U003
Adriamycin (23214-92-8)	
AF-2 [2-(2-Furyl)-3-(5-nitro-2-furyl)acrylamide]	
Aflatoxins (1402-68-2)	
Aluminium production	
2-Aminoanthraquinone (117-79-3)	
4-Aminobiphenyl (92-67-1)	
1-Amino-2-methylanthraquinone (82-28-0)	
4-Aminoazobenzene (60-09-3)	
o-Aminoazotoluene (97-56-3)	
2-Amino-3-methylimidazo[4,5-f]quinoline	
2-Amino-5-(5-nitro-2-furyl)-1,3,4-thiadiazole, (triafur) (712-68-5)	
A-a-C(2-Amino-9H-pyrido[2,3-b]indole)	
Amitrole (61-82-5)	U011
Analgesic mixtures containing phenacetin	
Androgenic (anabolic) steroids	
o-Anisidine hydrochloride (134-29-2)	
Aramite (R) (140-57-8)	
Arsenic (7440-38-2) and arsenic compounds	
Asbestos	
Auramine, manufacture of	U014
Auramine, technical-grade (492-80-0)	U014
Azacytidine (320-67-2)	
Azaserine (115-02-6)	U015
Azathioprine (446-86-6)	
Benz(a)anthracene (56-55-3)	U018
Benzene (71-43-2)	U019
Benzidine (92-87-5)	U021
Benzidine-based dyes	
Benzo(b)fluoranthene (205-99-2)	
Benzo(f)fluoranthene (205-82-3)	
Benzo(k)fluoranthene (207-08-9)	
Benzo(a)pyrene (50-32-8)	U022
Benzotrichloride (98-07-0)	U023
Benzyl violet 4B	
Beryllium (7440-41-7) and beryllium compounds	P015
Betel quid with tobacco	
2,2-Bis(bromomethyl)-1,3-propanediol (3296-90-0)	
Bischloroethyl nitrosourea (BCNU) (154-93-8)	
N,N-Bis(2-chloroethyl)-2-naphthylamine (Chlornaphazine) (494-03-1)	U026
Bis(chloromethyl)ether (542-88-1) and technical grade chloromethyl methyl ether (107-30-2)	P016 U046
Bitumens, extracts of steam-refined and air-refined	
Bleomycins	
Bracken fern	
Bromodichloromethane (75-27-4)	
1,3-Butadiene (106-99-0)	
1,4-Butanediol dimethanesulphonate (Myleran, Busulfan) (55-98-1)	
Butylated hydroxyanisole (BHA) (25013-16-5)	
B-Butyrolactone (36536-46-6)	
Cadmium (7440-43-9) and cadmium compounds	

Carbon-black extracts (7440-44-0)	
Carbon tetrachloride (56-23-5)	
Carrageenan, degraded	U211
Ceramic fibers (respirable size)	
Chlorambucil (305-03-3)	
Chloramphenicol (56-75-7)	U035
Chlordecone (Kepone) (143-50-0)	
A-Chlorinated toluenes	U142
1-(2-Chloroethyl)-3-cyclohexyl-l-nitrosourea (CCNU) (13010- 47-4)	
1-(2 Chloroethyl)-3-(4-methylcyclohexyl)-1-nitrosourea (MeCCNU) (13909-09-6)	
Chloroform (67-66-3)	
Chlorophenols (ortho isomer)	U044
Chlorophenoxy herbicides	U048
4-Chlorophenoxy herbicides	
4-Chloro-phenylenediamine (95-83-0)	
p-Chloro-o-toluidine (95-69-2)	
Chlorozotocin (54749-90-5)	U049
Chromium (7440-47-3) and certain hexavalent chromium compounds	
Cisplatin (15663-27-1)	
C. I. Basic Red 9 monohydrochloride (569-61-9)	
Citrus Red No. 2 (6358-53-8)	
Coal-tar pitches	
Coal-tars	
Coke production	
Conjugated estrogens	
Creosotes	
p-Cresidine (120-71-8)	U051
Cycasin (14901-08-7)	
Cyclophosphamide (50-18-0)	
Cyclosporine (59865-13-3)	U058
Dacarbazine (4342-03-4)	
Daunomycin (20830-81-3)	
DDT (50-29-3)	U059
N,N-Diacetylbenzidine	U062
2,4-Diaminoanisole sulfate (39156-41-7)	
4,4'-Diaminodiphenyl ether	
2,4-Diaminotoluene (95-80-7)	
Dibenz[a,h]acridine (226-36-8)	
Dibenz[a,j]acridine (224-42-0)	
Dibenz[a,h]anthracene (53-70-3)	
7H-Dibenzo[c,g]carbazole (194-59-2)	U063
Dibenzo[a,e]pyrene (192-65-4)	
Dibenzo[a,h]pyrene (189-64-0)	
Dibenzo[a,i]pyrene (189-55-9)	
Dibenzo[a,l]pyrene (191-30-0)	U064
1,2-Dibromo-3-chloropropane (96-12-8)	
Dibromoethane (106-93-4)	U066
p-Dichlorobenzene (106-46-7)	U067
3,3'-Dichlorobenzidine (91-94-1)	U072
3,3'-Dichlorobenzidine dihydrochloride (612-83-9)	U073
3,3'-Dichloro-4,4'-diaminodiphenyl ether	
1,2-Dichloroethane (107-06-2)	
Dichloromethane (methylene chloride) (75-09-2)	U077
2,3-Dibromo-1-propanol (96-13-0)	U080
1,3-Dichloropropene (technical-grade) (542-75-6)	
Diepoxybutane (298-18-0)	U084
Di(2-ethylhexyl)phthalate (dioctylphthalate) (117-81-7)	U085
1,2-Diethylhydrazine (1615-80-1)	U028
	U086
Diethylstilbestrol (DES) (56-53-1)	
Diethyl sulphate (64-67-5)	U089

Diglycidyl resorcinol ether (101-90-6)	
Dihydrosafrole (94-58-6)	U090
1,2-Dihydro-2,2,4-trimethylquinoline (monomer)(147-47-7)	
1,8-Dihydroxyanthraquinone (117-10-2)	
3,3'-Dimethoxybenzidine (o-Dianisidine) (119-90-4)	U091
3,3'-Dimethoxybenzidine Dihydrochloride (20325-40-0)	
4-Dimethylaminoazobenzene (Methyl yellow) (60-11-7)	U093
trans-2[(Dimethylamino)methylimino]-5-[2-(5-nitro-2-furyl)vinyl]-1, 3,4-oxadiazole	
3,3'-Dimethylbenzidine (o-Tolidine) (119-93-7)	
Dimethylcarbamoyl chloride (79-44-7)	U095
1,1-Dimethylhydrazine (57-14-7)	U097
1,2-Dimethylhydrazine (540-73-8)	U098
Dimethyl sulphate (77-78-1)	U099
Dimethylvinyl chloride (513-37-1)	U103
1,6-Dinitropyrene (42397-64-8)	
1,8-Dinitropyrene (42397-65-9)	
1,4-Dioxane (123-91-1)	
Direct Black 38 (1937-37-7)	U108
Direct Blue 6 (2602-46-2)	
Disperse Blue (2475-45-8)	
Epichlorohydrin (106-89-8)	
Erionite fibers (66733-21-9)	U041
Estrogens, not conjugated:	
Estradiol-17 (50-28-2)	
Estrone (53-16-7)	
Ethinyl estradiol (57-53-6)	
Mestranol (72-33-3)	
Ethyl acrylate (140-88-5)	
Ethylene dibromide (106-93-4)	U113
Ethylene oxide (75-21-8)	U067
Ethylene thiourea (96-45-7)	U115
Ethyl methanesulphonate (62-50-0)	U116
N-Ethyl-N-nitrosourea (759-73-9)	U119
Formaldehyde (50-00-0)	
2-(2-Formylhydrazone)-4-(5-nitro-2-furyl)thiazole	U122
Furan (100-00-9)	
Glass wool	U124
Glu-P-1 (2-Amino-6-methyldipyrido[1,2-a]-3',2'-diimidazole)	
Glu-P-2 (2-Aminodipyrido[1,2-a]-3',2'-diimidazole)	
Glycidaldehyde (765-34-4)	
Glycidol (556-52-5)	U126
Griseofulvin (126-07-8)	
Hexachlorobenzene (118-74-1)	
Hexachloroethane (67-72-1)	U127
Hexamethylphosphoramide (680-31-9)	U131
Hydrazine (302-01-2) and Hydrazine sulfate (10034-93-2)	
Hydrazobenzene (122-66-7)	U133
Indeno[1,2,3-cd]pyrene (193-39-5)	
Iron-dextran complex (9004-66-4)	U137
Isobutyl nitrate (542-56-3)	
Isopropyl alcohol manufacture, strong-acid process	
Kepone (chlordecone) (143-50-0)	
Lasiocarpine (303-34-4)	U142
Lead (7439-92-1) and inorganic lead compounds	U143
Lindane and other Hexachlorocyclohexane Isomers	
Magenta (632-99-5), manufacture of	U129
MeA-a-C(2-Amino-3-methyl-9H-pyrido[2,3-b]indole)	

Melphalan (148-82-3)	U150
Mestranol (72-33-3)	

Methoxyprogesterone acetate	
8-Methoxypsoralen (Methoxsalen) (298-81-7) plus ultraviolet A radiation (PUVA)	
5-Methoxypsoralen (484-20-8)	
2-Methylaziridine (propylenimine) (75-55-8)	
Methylazoxymethanol acetate (592-62-1)	P067
5-Methylchrysene (3697-24-3)	
4,4'-Methylene bis(2-chloroaniline) (MBOCA) (101-14-4)	
4,4'-Methylene bis(N,N-dimethyl)benzenamine (101-61-1)	U158
4,4'-Methylene bis(2-methylaniline)	
Methylene chloride (75-09-2)	
4,4'-Methylenedianiline (101-77-9)	U080
4,4'-Methylenedianiline dihydrochloride (13552-44-8)	
Methyl methanesulphonate (66-27-3)	
2-Methyl-l-nitroanthraquinone (uncertain purity)	
1-Methyl-3-nitro-1-nitrosoguanidine (MNNG) (70-25-7)	
N-Methyl-N-nitrosourea	U163
N-Methyl-N-nitrosourethane	
Methylthiouracil (56-04-2)	
Metronidazole (443-48-1)	U164
Michler's Ketone (90-94-8)	
Mineral oils, untreated and mildly-treated	
Mirex (2385-85-5)	
Mitomycin C (50-07-7)	
Monocrotaline (315-22-0)	U010
MOPP [combined therapy with nitrogen mustard, vincristine (57-22-7), procarbazine (671-16-9) and prednisone (53-03-2)] and other combined chemotherapy including alkylating agents	
5-(Morpholinomethyl)-3-[(5-nitrofurfurylidene)amino]-2-oxazolidinone	
Mustard Gas, (sulphur mustard) (505-60-2)	
Nafenopin	
2-Naphthylamine (91-59-8)	
Nickel (7440-02-0) and nickel compounds	U168
Niridazole (61-57-4)	
Nitrilotriacetic Acid (139-13-9)	
5-Nitroacenaphthene (602-87-9)	
o-Nitroanisole (91-23-6)	
Nitrochrysene (7496-02-8)	
Nitrofen (technical-grade) (1836-75-5)	
1-[(5-Nitrofurfurylidene)amino]-2-imidazolidinone	
N-[4-(5-Nitro-2-furyl)-2-thiazolyl]acetamide	
Nitromethane (75-52-5)	
Nitrogen mustard (51-75-2)	
Nitrogen mustard hydrochloride (55-86-7)	
Nitrogen mustard N-oxide (126-85-2)	
2-Nitropropane (79-46-9)	
1-Nitropyrene (5522-43-0)	U171
4-Nitropyrene (57835-92-4)	
N-Nitrosodi-n-propylamine (621-64-7)	
N-Nitroso-N-ethylurea (759-73-9)	
3-(N-Nitrosomethylamino)propionitrile	U176
4-(N-Nitrosomethylamino)-1-(3-pyridyl)-l-butanone (NNK) (64091-91-4)	
N-Nitrosomethylethylamine (10595-95-6)	
N-Nitroso-N-methylurea (684-93-5)	
N-Nitrosomethylvinylamine (4549-40-0)	
N-Nitrosomorpholine (59-89-2)	U177
N-Nitrosonornicotine (16543-55-8)	P084

N-Nitrosopiperidine (100-75-4)	U179
N-Nitrosopyrrolidine (930-55-2)	U180
N-Nitrososarcosine (13256-22-9)	
Norethisterone (68-22-4)	

Ochratoxin A (303-47-9)	
Oestrogen replacement therapy	
Oestrogens, nonsteroidal	
Oestrogens, steroidal	
Oil Orange SS	
Oral contraceptives, combined	
Oral contraceptives, sequential	
4,4'-Oxydianiline (101-80-4)	
Oxazepam	
Oxymetholone (434-07-1)	
Panfuran S (containing dihydroxmethylfuratizine)	
Phenacetin (62-44-2)	U187
Phenazopyridine Hydrochloride (136-40-0)	
Phenobarbital (50-06-6)	
Phenolphthalein (77-09-8)	
Phenoxybenzamine hydrochloride (63-92-3)	
Phenytoin (diphenylhydantoin) (57-41-0)	
Polybrominated biphenyls	
Polychlorinated biphenyls	
Polycyclic Aromatic Hydrocarbons (PAHs)	
Benz[a]anthracene (56-55-3)	U018
Benzo[b]fluoranthene (205-99-2)	
Benzo[j]fluoranthene (205-82-3)	
Benzo[k]fluroanthene (207-08-9)	
Benzo[a]pyrene (50-32-8)	U022
Dibenz[a,h]acridine (226-36-8)	
Dibenz[a,j]acridine (224-42-0)	
Dibenz[a,h]anthracene (53-70-3)	U063
7H-Dibenzo[c,g]carbazole (194-59-2)	
Dibenzo[a,e]pyrene (192-65-4)	
Dibenzo[a,h]pyrene (189-64-0)	
Dibenzo[a,i]pyrene (189-55-9)	U064
Dibenzo[a,l]pyrene (131-30-0)	
Indeno[1,2,3-cd]pyrene (193-39-5)	U137
5-Methylchrysene (3697-24-3)	
Ponceau MX	
Ponceau 3R (3564-09-8)	
Potassium bromate (7758-01-2)	
Procarbazine hydrochloride (366-70-1)	
Progestins	
Progesterone (57-83-0)	
1,3-Propane sultone (1120-71-4)	U193
B-Propiolactone (57-57-8)	
Propylene oxide (75-56-9)	
Propylthiouracil (51-52-5)	
Radon	
Reserpine (50-55-5)	U200
Saccharin (81-07-2)	U202
Safrole (94-59-7)	U203
Salicylazosulfapyridine (399-79-1)	
Selenium sulfide (7488-56-4)	U205
Shale-oils	
Silica, crystalline (respirable)	
Quartz (14808-60-7)	
Cristabolite (14464-46-1)	
tridymite (15468-32-3)	
Sodium o-phenylphenate	

Soots, tars
Sterigmatocystin (10048-13-2)

Streptozotocin (18883-66-4)	U206
Styrene (100-42-5)	
Styrene oxide (96-09-3)	
Sulfallate (95-06-7)	
Talc containing asbestiform fibres	
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) (1746-01-6)	
Tetrachloroethylene (perchloroethylene) (127-18-4)	U210
Tetrafluoroethylene (116-14-3)	
Tetranitromethane (509-14-8)	P112
Thioacetamide (62-55-5)	U218
4,4'-Thiodianiline	
Thiourea (62-56-6)	U219
Thorium dioxide (1314-20-1)	
Tobacco products, smokeless	
Tobacco smoke	
Toluene diisocyanate (26471-62-5)	U223
o-Toluidine (95-53-4) and o-Toluidine hydrochloride (636-21-5)	U328/U222
Toxaphene (Polychlorinated camphenes) (8001-35-2)	P123
Treosulphan	
2,4,6-Trichlorophenol (88-06-2)	F027
Trichloropropane (96-18-4)	
Tris(1-aziridinyl)phosphine sulphide (Thiotepa) (52-24-4)	
Tris(2,3-dibromopropyl)phosphate (126-72-7)	U235
Trp-P-1 (3-Amino-1,4-dimethyl-5H-pyrido[4,3-b]indole)	
Trp-P-2 (3-Amino-1-methyl-5H-pyrido[4,3-b]indole)	
Trypan blue (72-57-1)	U236
Uracil mustard (66-75-1)	U237
Urethane (ethyl carbamate) (51-79-6)	U238
4-Vinyl-1-cyclohexene diepoxide (106-87-6)	
Vinyl chloride (75-01-4)	U043
Vinyl bromide (593-60-2)	

EQUIVOCAL CARCINOGENS:

Triampterene (396-01-0)
4-Nitroaniline (100-01-6)
Molylodenum trioxide (1313-27-5)
Butylbenzenephthalate (85-68-7)

3.0 REPRODUCTIVE TOXINS

2-Acetylaminofluorene (53-96-3)	U005
Acrylonitrile (107-13-1)	U009
Ammonium chloride (12125-02-9)	
Arsenic (7440-38-2)	D004
Benzene (71-43-2)	U019
Cadmium (7440-43-9)	D006
Carbon disulfide (75-15-0)	P022
Cellosolve solvents	U044
Chloroform (67-66-3)	
Chloroprene (126-99-8)	
DBCP (dibromochloropropane) (96-12-8)	U066
1,2-Dimethoxyethane (110-71-4)	
Dimethylacetamide (127-19-5)	
4-Dimethylaminoazobenzene (60-11-7)	U093
Dimethylformamide (68-12-2)	
Dimethylsulfoxide (67-68-5)	
Dinitrotoluene (25321-14-6)	

Epichlorohydrin (106-89-8)	U041

2-Ethoxyethanol (110-80-5)	U359
Ethylenedibromide (EDP) (106-93-4)	U067
Ethyleneglycolmomoethylether (110-80-5)	U359
Ethylenegylcolmonomethylether (109-86-4)	
Ethylene oxide (75-21-8)	U115
Ethylene thiourea (96-45-7)	U116
Fluorocarbon-22	
Formamide (75-12-7)	
Glycidyl ethers	
Hexafluoroacetone (684-16-2)	
Inorganic lead	
Ionizing radiation	
Karathene (dinocap)	
Lead (7439-92-1)	D008
Magnesium sulfate (7487-88-9)	
Mercury all forms	
2-Methoxyethanol (109-86-4)	
Organophosphate pesticides	
PCBs (polychlorinated biphenyls)	
Styrene (100-42-5)	
Sulfonylurea derivatives	
TCDD (1766-01-6) (dioxin)	
TCDF (furan)	
Tetramethylurea (632-22-4)	
TOK herbicide	
Vinyl Chloride (75-01-4)	U043
Waste anesthetic gases and vapors	

Any chemical whose MSDS lists possible embryo-fetus toxicity.

4.0 CHRONIC TOXICITY

Acrylonitrile (107-13-1)	U003
Beryllium (7440-41-7)	P015
Cadmium (7440-43-9)	D006
Carbon disufide (75-15-0)	P022
Carbon tetrachloride (56-23-5)	U211
DDT (50-29-3)	U061
Hexachlorobenzene (118-74-1)	U127
Mercury (7439-97-6)	U151
Poly Aromatic Hydrocarbons (PAHs)	
Silica (7631-86-9)	
TDI (toluene diisocyanate) (26471-62-5)	U223

5.0 ACUTELY TOXIC

Hydrofluoric acid (7664-39-3)	U134
Hydrogen cyanide (74-90-8)	P0 63
Hydrogen sulfide (7783-06-4)	U135
Perchloric acid (7601-90-3)	
Potassium cyanide (151-50-8)	P098

ATTACHMENT 3
GUIDELINES FOR PREPARING: WASTE MANAGEMENT PROGRAM STANDARD OPERATING PROCEDURES SOP NO. 1

1.0 PURPOSE AND APPLICATION

This attachment has been written to give guidance in the development in site-specific procedures to ensure that hazardous waste is managed in an occupationally safe, environmentally responsible, legally compliant, and economically efficient manner;

To define the responsibility and accountability within each facility for the management of hazardous samples and wastes; and

To ensure that the management of hazardous waste adheres to Shaw E & I standards according to the following parameters:

- Waste Characterization and Categorization;
- Waste Storage;
- Manifesting and Shipment; and
- Waste Minimization.

It is the responsibility of the laboratory manager or his/her designee to develop these procedures, addressing each of these parameters.

2.0 REFERENCES

Code of Federal Regulations Title 29, Department of Labor (OSHA)
Code of Federal Regulations Title 40, Protection of Environment (EPA)
Code of Federal Regulations Title 49, Transportation (DOT)

3.0 ASSOCIATED SOPs

Shaw E & I CHP SOP NO. 2, Waste Characterization and Categorization
Shaw E & I CHP SOP NO. 3, Waste Collection, Accumulation and Storage
Shaw E & I CHP SOP NO. 4, Waste Packaging, Manifesting and Shipping
Shaw E & I CHP SOP NO. 5, Waste Minimization
Shaw E & I CHP SOP NO. 6, Laboratory Fume Hood Air Flow Measurement and Maintenance

4.0 APPROACH

Procedures to manage hazardous waste will probably vary for each facility because of the different wastes being generated and the disposal methods available. Waste streams should be segregated according to the chemical compatibility and by chemical classes identified by the disposal facility. The rationale is to prevent the potential for an unexpected reaction, the inability of a facility to handle the waste because of a small amount of contamination, and to reduce the cost of disposal by knowing the methods used by the disposal facility and the capability to destroy certain contaminants. For example, the disposal facility may require that chlorinated solvents be segregated from other non-chlorinated solvents because a particular incinerator cannot tolerate the corrosion created by hydrochloric acid formed during combustion of chlorinated solvents. The cost to dispose of chlorinated solvents may be greater because they must be shipped to a different facility thus incurring additional transportation and handling costs. Another example is to place small amounts of certain mercury salts that cannot be disposed of into a container, which means the whole container, can no longer be treated and disposed.

Provided in this Attachment are guidelines to enable each facility to develop its own waste management procedures. It is recommended that the Hazardous Waste Coordinator talk with representatives from the TSDF to ensure the waste streams can be handled. The costs for disposal will be minimized only after the facility understands the parameters and costs, and decides how to segregate the waste in the laboratory.

5.0 TEXT

- Each Laboratory Director is responsible for waste management and environmental compliance activities at his/her facility, including the development and maintenance of site-specific waste management SOPs.
- The Laboratory Director is responsible for ensuring that current copies of 29 CFR 1910, Department of Labor, 40 CFR Subchapter I Solid Waste (40 CFR Section 240-281), and DOT 49 CFR Chapter I, Subchapter C, (49 CFR 171-177), are maintained on site.
- The Laboratory Director shall designate an individual to oversee waste management activities within the facility.
- Laboratory personnel responsible for handling hazardous wastes shall be trained in hazardous waste management procedures to the degree appropriate for their position. This program should include instruction in governmental regulations associated with hazardous waste management.
- All laboratory hazardous waste procedures must comply with the following guidelines:
  - Hazardous wastes must not be discharged to a publicly owned treatment works (POTW).
  - Evaporation in laboratory fume hoods shall not be used as a means for disposal of waste chemicals.
  - RCRA regulated hazardous waste shall not be disposed of to a sanitary landfill.
  - Laboratory hazardous waste management methods must be prioritized according to the following:

    - Waste minimization
    - Reuse
    - Recycle

- Incineration
- Biological or chemical treatment
- Landfill

However, the best available technology is to be used.

- Only EPA-permitted TSDF's shall be used for treatment, storage and disposal of hazardous wastes.
- All laboratories will be audited by National HS on an annual basis. This audit will ensure compliance with governmental regulations and to monitor changes in each laboratory's operations.

NOTE: In developing these procedures, the standard Shaw E & I SOP format is to be used. Since these procedures are a part of the facility attachments to the CHP, the will be approved by National HS.

6.0 NON-CONFORMANCE AND CORRECTIVE ACTION

Failure to prepare and implement hazardous waste disposal may result in regulatory non-compliance, legal liabilities, unsafe waste management operations and/or waste streams that cannot be accepted by TSDFs. This may result in inadequate identification, collection, accumulation and storage of wastes, improper transportation, and additional costs for waste management.

Initial corrective action will involve the proper implementation of these guidelines. Written documentation of corrective actions shall be kept by with the person designated to manage hazardous waste.

ATTACHMENT 4
GUIDELINE FOR PREPARING:
WASTE CHARACTERIZATION AND CATEGORIZATION
STANDARD OPERATING PROCEDURE
SOP NO. 2

1.0 PURPOSE AND APPLICATION

The purpose of this SOP is to provide information for characterizing and categorizing wastes. This provides the basis for collection, accumulation, storage, packaging, shipping, and disposal of waste.

2.0 REFERENCES

Code of Federal Regulations Title 29, Department of Labor
Code of Federal Regulations Title 40, Protection of Environment
Code of Federal Regulations Title 49, Transportation

3.0 ASSOCIATED SOPs

Shaw E & I CHP SOP NO. 1, Waste Management Program
Shaw E & I CHP SOP NO. 3, Waste Collection, Accumulation and Storage
Shaw E & I CHP SOP NO. 4, Waste Packaging, Manifesting and Shipping
Shaw E & I CHP SOP NO. 5, Waste Minimization
Shaw E & I CHP SOP NO. 6, Laboratory Fume Hood Air Flow Measurement and Maintenance

4.0 DEFINITIONS

Facility - all contiguous land and structures with a common EPA ID Number.

Incompatible Waste - wastes that should not be combined because of the possibility of a chemical reaction, container degradation, or the mixture might produce a dangerous final product.

Laboratory - individual analytical rooms or sections within a facility where small quantities of hazardous chemicals are used on a non-production basis.

Satellite Accumulation - the collection of hazardous waste at or near a site of generation that is under the direct control of the generator.

Satellite Accumulation Container (SAC) - a container used for the satellite accumulation of hazardous waste.

Treatment, Storage and Disposal Facility (TSDF) - an EPA permitted facility that treats, stores, or disposes of hazardous waste.

5.0 TEXT

This section provides an outline of the items that need to be addressed during the laboratory-specific waste characterization and categorization procedures. Under each heading of this section the appropriate information must be supplied.

5.1 Waste Identification

Identify and name each waste category and give a description of the contents. Consult with your disposal facility for additional information as necessary. The following must be considered as a guideline:

- Corrosivity;
- Ignitability;
- Reactivity;
- TCLP;
- PCB;
- Dioxin;
- Radioactivity;
- P, U, or F listed wastes; and
- Others as needed.

NOTE: The hazard characteristic of waste samples must be verified before disposal in a specific waste stream. Samples are not to be discarded in a waste stream just because an analysis was requested for a RCRA hazard.

5.2 Segregation and Combination

Describe how the waste categories will be separated or combined. In doing so, consider the following:

- Container and chemical compatibility;
- TSDF requirements;
- Volume increases from waste combinations; and
- Generation of undesirable by-products from waste combinations.

6.0 NON-CONFORMANCE AND CORRECTIVE ACTION

Failure to comply with these guidelines will result in inadequate identification of waste categories. This may result in hazardous wastes that cannot be accepted by TSDFs.

Initial corrective actions will involve characterizing unidentified waste categories. Documentation of corrective actions shall be in writing and a copy kept by the HS staff.

7.0 RECORDS MANAGEMENT/DOCUMENTATION

Waste management records will be maintained for a minimum of three years within the facility. Thereafter, they should be maintained indefinitely in an accessible records storage area.

ATTACHMENT 5
GUIDELINE FOR PREPARING:
WASTE COLLECTION, ACCUMULATION AND STORAGE
STANDARD OPERATING PROCEDURE
SOP NO. 3

1.0 PURPOSE AND APPLICATION

The purpose of this SOP is to outline the procedure for collecting hazardous waste in satellite accumulation containers (SACs) located within each laboratory. This SOP also provides information for the accumulation and storage of hazardous wastes within a facility.

Collection, accumulation and storage of hazardous waste must comply with local, state and federal regulations.

2.0 REFERENCES

Code of Federal Regulations, Title 29, Department of Labor
Code of Federal Regulations, Title 40, Protection of Environment
Code of Federal Regulations, Title 49, Transportation

3.0 ASSOCIATED SOPs

Shaw E & I CHP SOP NO. 1, Waste Management Program
Shaw E & I CHP SOP NO. 2, Waste Characterization and Categorization
Shaw E & I CHP SOP NO. 4, Waste Packaging, Manifesting and Shipping
Shaw E & I CHP SOP NO. 5, Waste Minimization
Shaw E & I CHP SOP NO. 6, Laboratory Fume Hood Air Flow Measurement and Maintenance

4.0 DEFINITIONS

Accumulation Time - the period for which hazardous wastes may be legally held on site prior to transfer to a treatment, storage or disposal facility (TSDF). (40 CFR, Part 262.34)

Disposal Facility - a facility or part of a facility at which hazardous waste is intentionally placed into or on any land or water, and at which wastes will remain after closure.

Hazardous Waste - a solid waste (see definition) is hazardous if it satisfies the definition of a hazardous waste in 40 CFR, Part 261.3.

Hazardous Waste Management - the orderly process of minimization, source separation, collection, accumulation, storage, transportation, treatment, and disposal of hazardous waste.

Lab Packing - the packaging or placement of small containers ($\leq$5 gallon for plastic and $\leq$1 gallon for glass) of hazardous waste of a like hazardous category (e.g., flammables, poisons, and

corrosives) into larger containers (30, 40, or 55 gallon drums) for shipment to a TSDF for disposal.

Sample - solid waste, water, soil or air, which is collected for the sole purpose of testing to determine its characteristics or composition.

Sample Evaluation - process by which a sample is determined to be hazardous or non-hazardous.

Satellite Accumulation - the collection of hazardous waste at or near a site of generation that is under the direct control of the generator.

Solid Waste - solid, liquid, semi-solid or contained gaseous material which is discarded, has served its intended purpose, or is the by-product of a process (40 CFR, Part 261.2).

Source Separation - segregation of wastes into discrete wastes categories for the purpose of accumulation, treatment, storage or disposal.

Storage - the folding of hazardous waste for a temporary period, at the end of which the hazardous waste is treated, disposed of or stored elsewhere (40 CFR, Part 260.10).

Treatment - any method, technique, or process, including neutralization, designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize such waste, or so as to recover energy or material resources from the waste, or so as to render such waste non-hazardous, or less hazardous; safer to transport, store, or dispose of; or amenable for recovery, amenable for storage, or reduced in volume (40 CFR, Part 260.10).

Treatment, Storage and Disposal Facility (TSDF) - an EPA permitted facility that treats, stores or disposes of hazardous waste.

Waste Accumulation - the gathering and/or collection of hazardous wastes at a location other than the satellite accumulation location (40 CFR, Part 262.34).

Waste Collection - the satellite accumulation of hazardous wastes.

Waste Minimization - any change in operation procedures that results in the reduction of hazardous waste volume or toxicity.

Waste Packaging - the proper containment and labeling of wastes in DOT approved containers for shipment to a TSDF (49 CFR, Parts 171-177).

5.0 TEXT

This section provides an outline of the items that need to be addressed in the laboratory-specific waste collection, accumulation and storage procedures. Under each heading of this section, the appropriate information must be supplied, with details of the procedures that will be followed in the lab. The procedures, at minimum, must include the following guidelines:

5.1 Collection

This includes specific descriptions of site-specific collection procedures.

- **Responsibility** - Describe who is responsible for the items listed in this section.

- **Containers** - Describe the size, type and location of containers used for each waste category. Indicate that these containers must remain closed unless transfers are taking place.

  - Satellite accumulation containers must be labeled with other descriptive information that describes the contents.
  - The selection of container must address waste compatibility.
  - Describe how often these containers are emptied or moved to the waste accumulation area.
  - Remember that while the maximum amount of waste that can be present at a satellite location is 55 gallons, good safety practices would limit the size to 5 gallons.

  88Color coding of the containers is recommended, if applicable, but may not be used in place of adequate labeling.

- **Labeling** - Describe the labels and marking used on the satellite accumulation containers (SACs) in the facility. As a minimum the SACs must be labeled with the type of material contained inside.

- **Secondary Containment** - Describe the size and type of secondary spill containment for the SACs.

5.2 Accumulation/Storage

This refers to accumulation away from the point of generation, not to satellite accumulation. This section must include a description of the site-specific collection procedures.

- **Responsibility** - Describe who is responsible for the items listed in this section.

- **Containers** - Describe the size, type and location of containers used for each waste category. Be sure to choose containers that are compatible with the wastes. This should also contain information on how containers are selected to comply with the DOT shipping regulations.

- **Labeling** - Describe the labels and markings used on your waste containers. **At a minimum, the containers must be labeled with an EPA approved hazardous waste label at the time filling begins.** Information regarding hazards, the facility EPA ID Number, container start date, and responsible party address is necessary on these labels. Each container must be labeled with a sequential number unique to the facility.

- **Accumulation Area** - Describe the waste accumulation area, including secondary containment, hazard warning signs, communication equipment, security, emergency equipment (fire extinguisher, spill control, safety shower, etc.).

- **Accumulation Time** - Describe the approximate frequency of the hazardous waste shipments based on the generator status of your facility. Thus a large quantity generator could indicate that shipments will occur approximately 60-75 days after the last one. The following holding times apply:

  - **Small Quantity Generator** - less than 1,000 kg. per month and less than 6,000 kg. on-site at any given time; 180 days or 270 days if your TSDF is more than 200 miles away.
  - **Large Quantity Generator** - equal to or greater than 1,000 kg. per month; 90 days.

- **Container Inspections** - Describe the facility procedure for inspecting the waste storage. **At a minimum, the containers and accumulation areas must be inspected weekly. These inspections must be documented.** Typically, this inspection pertains to waste segregation, leaks, labels, container degradation and area security. This documentation must be retained for three years.

5.3 Non-Conformance and Corrective Action

Failure to comply with the above guidelines may result in legal liabilities, unsafe waste management operations, and/or waste streams that cannot be accepted by TSDFs. Therefore, failure to comply with these guidelines will result in inadequate collection, accumulation and storage.

5.4 Records Management/Documentation

Describe how waste collection records are set-up and managed. Waste management records will be maintained within the facility for a minimum of three years. Records are to be maintained indefinitely in an accessible records storage area.

ATTACHMENT 6
GUIDELINE FOR PREPARING: WASTE SHIPPING AND MANIFESTING STANDARD OPERATING PROCEDURE SOP NO. 4

1.0 PURPOSE OF APPLICATION

The purpose of this document is to provide information for manifesting and shipping hazardous waste. All shipments of hazardous wastes from Shaw E & I generators to EPA permitted TSDFs must follow DOT regulations.

All shipments of hazardous waste must be manifested.

2.0 REFERENCES

Code of Federal Regulations, Title 29, Department of Labor
Code of Federal Regulations, Title 40, Protection of Environment
Code of Federal Regulations, Title 49, Transportation

3.0 ASSOCIATED SOPs

Shaw E & I CHP SOP NO. 1, Waste Management Program
Shaw E & I CHP SOP NO. 2, Waste Characterization and Categorization
Shaw E & I CHP SOP NO. 3, Waste Collection, Accumulation and Storage
Shaw E & I CHP SOP NO. 5, Waste Minimization
Shaw E & I CHP SOP NO. 6, Laboratory Fume Hood Air Flow Measurement and Maintenance

4.0 DEFINITIONS

Accumulation Time - the period for which hazardous wastes may be legally held on-site prior to transfer to a treatment, storage or disposal facility (TSDF). (40 CFR, Part 262.34)

Disposal - the shipment of hazardous wastes to an EPA permitted disposal facility.

Disposal Facility - a facility or part of a facility at which hazardous waste is intentionally placed into or on any land or water, and at which wastes will remain after closure.

Hazardous Waste - a solid waste (see definition) is a hazardous waste if it is defined as a hazardous waste in 40 CFR, Part 261.3.

Hazardous Waste Management - the orderly process of minimization, source separation, collection, accumulation, storage, transportation, treatment, and disposal of hazardous waste.

Sample - solid waste, water, soil or air which is collected for the sole purpose of testing to determine its characteristics or composition.

Sample Evaluation - the process by which a sample is determined to be hazardous or non-hazardous.

Satellite Accumulation - the collection of hazardous waste at or near a site of generation that is under the direct control of the generator.

Solid Waste - solid, liquid, semi-solid or contained gaseous material which is discarded, has served its intended purpose, or is the by-product of a process. (40 CFR, Part 261.2)

Source Separation - the segregation of wastes into discrete waste categories for the purpose of accumulation, treatment, storage or disposal.

Storage - the holding of hazardous waste for a temporary period, at the end of which the hazardous waste is treated, disposed of or stored elsewhere. (40 CFR, Part 260.10)

Transportation - the movement of hazardous materials by air, rail, highway or water.

Treatment - any method, technique or process, including neutralization, designed to change the physical, chemical or biological character or composition of any hazardous waste so as to neutralize such waste, or so as to recover energy or material resources from the waste, or so as to render such waste non-hazardous, or less hazardous; safer to transport, store or dispose of; or amenable for recovery, amenable for storage, or reduced in volume. (40 CFR, Part 260.10)

Treatment, Storage and Disposal Facility (TSDF) - an EPA permitted facility that treats, stores or disposes of hazardous waste.

Uniform Hazardous Waste Manifest - EPA Form 8700-22 or an equivalent -specific form that is originated, signed and maintained by the generator for the purpose of tracking hazardous waste shipments. (40 CFR, Part 262.23)

Waste Accumulation - the gathering and/or collection of hazardous wastes at a location other than the satellite accumulation location. (40 CFR, Part 262.34)

Waste Collection - the satellite accumulation of hazardous wastes.

Waste Minimization - any change in operating procedures that results in the reduction of hazardous waste volume or toxicity.

Waste Packaging - the proper containment and labeling of wastes in DOT approved containers for shipment to a TSDF. (49 CFR, Parts 171-177)

Waste Transportation - moving and manifesting of waste to an offsite TSDF.

5.0 TEXT

5.1 Shipping

All associates presenting hazardous materials for shipment will have obtained formal training in DOT requirements (HM 181 and 126F) (49 CFR 172.704). This training will be repeated every two years and will be documented in the HS training files.

Information necessary for completing the shipping procedures is outlines below.

- Determine the proper shipping name (40 CFR 172.101, Hazardous Materials Table, Column 2).
- Determine the proper hazard class or division (40 CFR 172.101, Column 3) or classes for materials having more than one hazard class (40 CFR 173.2).
- Select proper identification numbers (UN and NA) (49 CFR 172.101, Column 4).
- Determine and select the proper packaging group (see Column 5 of 49 CFR 172.101, Hazardous Materials Table).
- Determine the proper placard(s) (40 CFR 172.506). Each shipper (generator) is responsible for ensuring the proper placards are displayed by the transporter (40 CFR 172.506) and for supplying them as needed.

5.2 Manifesting

Information contained in 5.1 (Shipping) is necessary in order to fulfill the site-specific manifesting procedures. Consider the following as guidelines in completing your manifesting procedures for shipping hazardous waste to a TSDF:

- **Responsibility** - It is the Laboratory Director's responsibility to ensure the proper manifesting of hazardous waste shipments.
- **Need for Manifest** - A manifest is required for all shipments of hazardous waste that leave the generator's facility (40 CFR 262.20). The only exceptions are for samples shipped to or from an analytical lab for the sole purpose of testing to determine whether their characteristics or composition are exempt from manifesting requirements (40 CFR 261.4). However, **samples that are DOT hazardous materials must be labeled, packaged and shipped in compliance with DOT guidelines. Samples shipped by Federal Express must comply with the International Air Transport Association (IATA) requirements.**
- **Type of Manifest** - This section describes the guidelines for selecting a hazardous waste manifest (40 CFR 262.21):
    - If the state to which the shipment is manifested supplies a manifest, the generator must use that manifest.

- If the state to which the shipment is manifested does not supply a manifest, but the generator's state does supply a manifest, the generator's state manifest must be used.

- If neither the generator's state or the state to which the shipment is manifested provide a manifest, a generic manifest such as EPA Form 8700-22 may be used.

- **Manifesting Instructions** - An example of the Uniform Hazardous Waste Manifest (Forms 8700-22 and 8700-22A) and instructions can be found in the Appendix to 40 CFR 262.

5.3 Non-Conformance and Corrective Action

Failure to comply with the above guidelines may result in legal liabilities, unsafe waste management operations and/or waste streams that cannot be accepted by TSDFs. Failure to comply with these guidelines will also result in unlawful transportation of hazardous waste.

5.4 Records Management/Documentation

Waste management records will be maintained within the facility for a minimum of three years and indefinitely in an accessible records storage area.

ATTACHMENT 7
GUIDELINE FOR PREPARING: WASTE MINIMIZATION STANDARD OPERATING PROCEDURE SOP NO. 5

1.0 PURPOSE AND APPLICATION

The purpose of this SOP is to provide information pertinent to hazardous waste minimization and to direct laboratories in fulfilling their waste minimization requirements as defined by local, state and/or federal regulations.

Every laboratory shall have a program in place to reduce the volume and toxicity of waste generated, to a degree that has been determined to be economically practicable.

2.0 REFERENCES

Code of Federal Regulations, Title 29, Department of Labor
Code of Federal Regulations, Title 40, Protection of Environment
Waste Minimization Opportunity Assessment Manual, 1988, EPA/625/7-88/003

3.0 ASSOCIATED SOPs

Shaw E & I CHP SOP NO. 1, Waste Management Program
Shaw E & I CHP SOP NO. 2, Waste Characterization and Categorization
Shaw E & I CHP SOP NO. 3, Waste Collection, Accumulation and Storage
Shaw E & I CHP SOP NO. 4, Waste Packaging, Manifesting and Shipping
Shaw E & I CHP SOP NO. 6, Laboratory Fume Hood Air Flow Measurement and Maintenance

4.0 DEFINITIONS

Accumulation - management of wastes prior to shipment off-site in less than 90 days from the time the waste is generated.

Facility - all contiguous land and structures, other appurtenances and improvements on the land used for generating, treating, storing or disposing of hazardous waste. For our purposes, a building or complex that houses a group of laboratories.

Generator - any person, by site, whose act or process produces hazardous waste identified or listed in 40 CFR Part 261 or whose act first causes a hazardous waste to be come subject to regulation.

Laboratory - a workplace where the “laboratory use of hazardous chemicals” occurs in relatively small quantities and on a non-production basis. For our purpose, individual analytical rooms or sections within a facility in which specific analyses are conducted and specific waste streams generated.

Recycling - the reuse and recycling of waste for original or some other purpose, such as materials recovery or energy production.

Source Reduction - any activity that reduces or eliminates the generation of hazardous waste at the source, usually by minimizing the amounts of materials purchased and/or used in a process.

Waste Constituents - a constituent that causes the waste to be listed in 40 CFR Part 261, Subparts C and D.

Waste Minimization - the reduction, to the extent feasible, of hazardous waste that is generated or subsequently treated, stored or disposed of. The working definition currently used by EPA consists of source reduction and recycling.

5.0 TEXT

This section outlines the items that need to be addressed in the laboratory-specific waste minimization procedures. Under each heading of this section, fill in the appropriate information and give complete details as to your laboratory procedure. The procedures, at minimum, must include the following guidelines:

- If possible, establish overall waste management program goals such as percent reduction in the total amount of hazardous waste shipped to TSDFs;
- Establish a waste tracking system;
- Prioritize the waste categories or facility areas for assessment; and
- Determine whether waste minimization will be accomplished through source reduction or recycling.
    - Source reduction can be accomplished by requesting the minimum amount of sample necessary for conducting the analysis.
    - Samples that have not been shown by analysis to be hazardous can be disposed in other waste streams.
    - Hazardous lab trash can be compacted.
    - Certain empty glass chemical containers can be triple rinsed, dried, and crushed for disposal.
    - Waste minimization can be accomplished by returning samples to the client whenever practical.
    - Waste streams that can be recycled either for metal recovery or burned for energy recovery in boilers and industrial furnaces should be managed by these means whenever practical.
    - Waste should be segregated whenever practical to reduce its toxicity and/or volume.
    - While not strictly defined as waste minimization, solvent streams that are not gross mixtures can be shipped for redistillation. An example of this would include Freon recovery.

In some instances, a permit would have to be obtained from state or local authorities.

5.1 Non-Conformance and Corrective Action

Failure to develop and implement a waste minimization program will result in the generation of unnecessary waste, resulting in additional costs due to the larger amounts of waste involved and from state "penalties".

5.2 Records Management/Documentation

Records of waste minimization will be maintained within the facility for a minimum of three years, and then indefinitely in an accessible records storage area. Records of all waste categories and the amount of waste minimized per category will be maintained.

ATTACHMENT 8
GUIDELINE FOR PREPARING: LABORATORY FUME HOOD AIR FLOW: MEASUREMENT AND MAINTENANCE STANDARD OPERATING PROCEDURE SOP NO. 6

1.0 PURPOSE AND APPLICATION

This procedure is used to determine and record the face velocity air flow in a laboratory fume hood.

Safety glasses must be worn while conducting measurements in laboratory areas.

2.0 REFERENCES

American National Standard for Laboratory Ventilation, ANSI/AIHA Z9.5, 1992

Industrial Ventilation, A Manual of Recommended Practice, American Conference of Governmental Industrial Hygienists, 1990

3.0 ASSOCIATED SOPs

Shaw E & I CHP SOP NO. 1, Waste Management Program
Shaw E & I CHP SOP NO. 2, Waste Characterization and Categorization
Shaw E & I CHP SOP NO. 3, Waste Collection, Accumulation and Storage
Shaw E & I CHP SOP NO. 4, Waste Packaging, Manifesting and Shipping
Shaw E & I CHP SOP NO. 5, Waste Minimization

4.0 DEFINITIONS

(Not Applicable)

5.0 TEXT

5.1 Frequency of Hood Face Velocity Measurement

Hood equipment with installed fume hood air flow monitors need to be checked annually. Where no hood flow measurement device is installed, the hood flows need to be checked monthly.

5.2 Acceptable Hood Flow Velocities

Acceptable hood face velocities range from 80 to 120 linear feet per minute (lfpm). Hoods that contain materials that are known or suspected human carcinogens (see the chemical's Material Safety Data Sheet) should have face velocities in the 100 to 120 lfpm range. Other less hazardous chemicals need only to average 80 to 100 lfpm.

5.3 Hood Flow Measurements

- Clear away any glassware, equipment or containers that may be closer than six inches from the face of the hood.
- Open the hood sash to full open position. Make sure that other hoods in the room are in their normal operational condition (if the hoods are normally on, leave then on).
- Review the operating instructions of the air flow measurement device (such as an Alnor velometer or thermal anemometer) for proper usage methods. Be sure to check the battery life of the instrument and replace if necessary.
- Note the direction of flow that air must enter the measurement device (review the operation directions) and orient the measurement device to measure the air flowing into the hood.
- Mentally divide the face of the fume hood into twelve sections (in a 4 x 3 grid) for large hood (larger than 3 feet x 3 feet) openings and into nine sections (in a 3 x 3 grid) for smaller hood (3 feet x 3 feet or smaller) openings.
- Hold the measurement instrument away from the body of the person measuring the hood flow (so that the body is not interfering with the air flow), and place the measurement instrument wand parallel with the face of the hood.
- Measure and record the air flows at the center of each of the grid sections.
- Add all measurements together and divide by the number of measurements made to calculate the average hood flow velocity.
- Check each of the individual section hood flow measurements to assure that all measurements are within 20% of the average hood flow velocity.
- If any one measurement is more than 20% out from the average, look for blockages in front of the hood exhaust slots found in the rear or top of the hood, and move the equipment or containers away from the slots.
- If hood face velocities in the bottom grids are still more than 20% out of the average, adjust the rear slot opening (for those with adjustable opening slots) or inspect the cavity behind the rear slots for materials blocking the air path and remove.
- For hoods with adjustable slots in the top inside rear wall of the hood or in the “ceiling” of the fume hood, adjust these slot widths to increase or decrease the face velocities of the hood face sectors at the top of the hood face.
- Record the average face velocity in a log book.

- For hoods with installed fume hood air flow monitors, adjust the readout on the device to equal the average face velocity measured.

- For hoods that do not have an installed fume hood air flow monitor, record the average face velocity, the initials of the person checking the hood, and the date of the most recent measurement on a sticker that is applied to the face of the fume hood.

- If hood does not meet minimum specifications, report hood for repair.

NOTE: On a yearly basis, perform the following smoke tests to check for interferences and cross-drafts from lab air supply systems and from people traffic patterns.

- Open the hood sash to full open.

- Break open smoke tube.

- Keeping the smoke tube near the face of the hood (use the squeeze bulb to generate smoke with the smoke tube), watch the smoke patterns as the smoke is being drawn into the hood.

- Watch for the effects of air supply vents on the hood draw patterns. Change vent air flow directions if heating and air conditioning (HVAC) air supplies interfere or “scoop” air out from the hood face.

- Next, have an assistant open and close doors in the vicinity of the hood while generating smoke around the face of the hood. Watch for the effects of the change in air movement on hood air draw patterns. If disturbance of hood flow is too great, either restrict access to the area while working in the hood or devise a way to block the effects of the change in flow patterns.

- Place smoke tube approximately six inches inside the face of the hood, and look at the draw patterns. All smoke should evenly flow away from the hood face to the back of the hood with lesser amounts flowing to the top of the hood.

- If smoke flow patterns are uneven, balance the flow by opening and closing the slots in the rear and top of the hood cavity. Some hood designs contain only slots on the back wall of the cavity at the bottom and top of the wall. Open and close these as necessary to balance the smoke flow.

- Record changes made in balancing the hood in the annual maintenance record.

5.4 Materials/Equipment Required

- Alnor CompuFlow ThermoAnemometer Model 8525 or equivalent
- MSA Smoke Tube Kit, Part #5645 or equivalent
- Fume hood test logbook

STANDARD OPERATING PROCEDURE

Subject: Health and Safety Procedure Variance

UNCONTROLLED WHEN PRINTED

1. PURPOSE

This procedure provides a mechanism for the establishment of alternate practices when the implementation of established Health and Safety (H&S) procedures is either not feasible or would create additional hazards.

2. SCOPE

This procedure applies to all approval requests for practices that differ from established H&S procedures. There shall be no exceptions to this procedure.

3. REFERENCES

None

4. DEFINITIONS

- **Company**—All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The E&I Senior Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

5.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1, "Health and Safety Procedure Variance Request Responsibility Matrix."

6. PROCEDURE

6.1 General

Variances shall be approved for specific projects or locations and shall expire at the conclusion of the work for which they were approved. Long-term operational differences between various company business lines will generally not be recognized by the issuance of a "permanent variance." The effected procedure shall instead be amended to accommodate these operational differences.

6.2 Variance Request and Approval

In the event that unusual circumstances make observance of established company H&S policy and procedures unfeasible or unsafe, the responsible business line or Project Manager, with the help of an H&S representative, may develop an alternative procedure that will provide equivalent protection for employees and equipment. Documentation of the need for a variance and alternate procedure must

be provided on the attached H&S Procedure Variance Request form. Variances will be approved only for the duration of a specific project, or until a specified expiration date is reached.

No request for variance may be implemented until appropriate approvals are obtained. Required approvals, in order, are as follows:

- Business Line or Project Manager
- Business Line H&S Manager
- Senior Director, H&S

6.3 Variance Distribution

Copies of variances will be issued to the variance requestor and all approvers of the variance. All variances are to be placed in the requestor's H&S procedure manual until they expire or are revoked at which time they shall become a permanent part of the project file.

A copy of variances shall be maintained at the effected work sites, and shall be reviewed with employees.

7. ATTACHMENTS

- Attachment 1, Health and Safety Procedure Variance Request Responsibility Matrix

8. FORMS

- EI-HS01301_1, Health and Safety Procedure Variance Request

9. REVISION HISTORY

Revision Level / Revision Date	Revision Description	Responsible Manager
01 8/3/2009	• References to Tailgate Safety Meetings have been deleted.	Zustra, Mike

Attachment 1
Health and Safety Procedure Variance Request
Responsibility Matrix

Action	Procedure Section	Responsibility			
		Business Line/ Project Manager	H&S Representative	Business Line H&S Manager	Senior Director of H&S
Determine need for variance, develop alternate procedure, initiate Form HS013A	6.1	X	X		
Approve Form HS013A	6.1	X		X	X
Set variance duration and distribute copies	6.2				X
Place in project file	6.2	X			
Post variance, train employees	6.2	X	X		
Implement variance requirements	6.2	X	X	X	

Shaw™ Shaw E & I

Health and Safety Procedure Variance Request

Variance Request for Company Procedure:	Date of Request:
Requestor:	Location:
Describe Reason for Variance: (Use back of form or additional pages if additional space is needed.)	
Alternate Procedure(s) that will be implemented:	

APPROVED	REJECTED
Business Line/Project Manager	
Business Line Health & Safety Manager	
Senior Director, Health & Safety	

For H&S use:

Variance #:
Project:
Expires:

Note: Forward signed copy to all signatures of this variance.

Form HS013A

STANDARD OPERATING PROCEDURE

Subject: Severe Weather Policy and Procedures

UNCONTROLLED WHEN PRINTED

1. PURPOSE

The purpose of this procedure is to provide general guidance to office and site personnel regarding emergency planning and actions to be taken during severe weather conditions such as hurricanes, tornadoes, high winds, severe thunderstorms, and winter storms.

2. SCOPE

This procedure applies to all personnel and subcontractors of The Shaw Group Inc.'s Environmental & Infrastructure Group (Shaw E&I) working in offices or on projects where severe weather safety requirements are applicable, and to all Shaw E&I office and project locations where severe weather may occur.

Variances and exceptions may be requested pursuant to the provisions of EI-HS013, "Health and Safety Procedure Variances."

3. REFERENCES

- Procedure No. EI-HS013, Health and Safety Procedure Variances

4. DEFINITIONS

- **Thunderstorm**—A storm normally accompanied by heavy rains, hail, lightning, thunder, high winds, and tornadoes. A severe thunderstorm can be very destructive.
- **Tornado**—A violent destructive whirling wind accompanied by a funnel-shaped cloud which progresses in a narrow path over land. Tornadoes are violent storms of short duration which occur during all seasons and in all 50 states.
- **Hurricane**—A tropical storm with winds of 74 miles per hour (mph) or greater that is usually accompanied by heavy rain, thunder, or lightning and sometimes moves into temperate latitudes. The path of destruction can be as wide as 500 miles. The hurricane season begins June 1 and ends November 30 in the northern hemisphere.
- **Tornado or Severe Thunderstorm Watch**—Issued when conditions are favorable for a tornado or severe thunderstorm to develop.
- **Tornado Warning**—Issued when a tornado or funnel cloud has been spotted or indicated on radar.
- **Severe Thunderstorm Warning**—Issued when a severe storm is occurring or has been spotted on radar. A severe thunderstorm has winds of 58 mph or greater, or hail three-fourths of an inch in diameter or larger.
- **Hurricane Watch**—Issued for a coastal area when there is a threat of hurricane conditions within 24 to 36 hours.
- **Hurricane Warning**—Issued when hurricane conditions are expected in a specific coastal area in 24 hours or less.

- **Winter Storm/Blizzard**—Issued for your area, that means that hazardous winter weather conditions (snow greater than 6 inches in 24 hours, winds gusting over 35 mph, or visibility less than ¼ mile) are expected in the next 12 to 36 hours.

5. RESPONSIBILITY MATRIX

5.1 Procedure Responsibility

The Senior Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure. California-based Health and Safety Management is responsible for submitting change requests to the Senior Director of Health and Safety for revisions and approval.

5.2 Action/Approval Responsibilities

The Responsibility Matrix is shown as Attachment 1, "Responsibility Matrix."

6. PROCEDURE

Severe weather and its accompanying hazards pose a threat to the safety of employees and property. For this reason, it is of vital importance that adequate precautions be taken to minimize their effect. This procedure should be followed whenever a potential severe weather threat to life and/or property exists. Expedient and proper response is required by all local personnel to minimize the possibility of injury and/or property damage due to severe weather conditions. The key to dealing with any type of severe weather is to develop an Emergency Management Plan for the types of severe weather that may be encountered at the specific office or project location.

6.1 Responsibilities

The Office Manager/Project Site Supervisor is responsible for implementing and enforcing this procedure. When there are watches, warnings or indications of impending severe weather, conditions shall be monitored by the Office Manager/Project Site Supervisor and appropriate precautions must be taken to protect personnel and property. Use a National Oceanic and Atmospheric Administration (NOAA) weather radio with a tone alert to keep informed of watches and warnings issued for your area.

The Office Manager is responsible for updating the portion of the office "Emergency and Security Management Plan" that addresses severe weather. The Safety Representative is responsible for monitoring compliance with this procedure.

6.2 Thunderstorms

Employees shall seek shelter indoors or inside a vehicle during a thunderstorm. Lightning is a thunderstorm's most dangerous component (see Section 6.3).

The rains accompanying a thunderstorm may create flooding conditions. National Weather Service advisories shall be monitored for flash flood warnings. Employees shall be instructed to avoid flood plains, drainage ditches, and dried creek beds when a flash flood warning is issued.

Employees must take certain precautions while driving during a thunderstorm. When poor visibility is encountered, the driver shall stop his vehicle until visibility improves. When lightning is in the immediate area, the employee shall seek shelter indoors, or remain in the vehicle away from interior metal parts. When high winds or flooding accompany the thunderstorm, the employee shall seek an appropriate protected area.

Employees shall not be permitted to work on or operate cranes during a thunderstorm. To prevent damage or injury, cranes shall be grounded. If the crane is located on a barge or other vessel, the

crane shall be adequately bonded. The crane's boom shall be lowered when winds exceed approximately 30 mph. Barges and other vessels shall be secured to a stationary source.

6.3 Lightning

Lightning causes around 100 deaths in the United States annually (more than hurricanes and tornadoes combined). Lightning can strike up to several miles away from the thunderstorm.

At project sites, the Site Supervisor will proactively monitor conditions that may produce lightning and thunderstorms. A daily weather forecast will be tracked and communicated to site personnel. All outside activities will be suspended when lightning is in the immediate area. Outdoor activities will resume when 30 minutes have passed since the last observed lightning flash. Other recommendations include:

- Avoid using the telephone or other electrical appliances.
- Avoid water. Avoid the high ground. Avoid open spaces. Stay away from trees.
- Avoid all metal objects including electric wires, fences, metal pipes, machinery, motors, power tools, etc.
- Lower crane booms and keep clear of long boom cranes.
- Find shelter in substantial buildings or in a fully enclosed vehicle such as a car, truck, or van with the windows completely shut. Keep hands on lap while in a vehicle, if possible.
- If lightning is striking nearby and you are caught outside or you feel your hair standing on end, you should:
  - Crouch down/squat. Put feet together. Place hands over ears to minimize hearing damage from thunder. Do not lie flat!
  - Avoid proximity (minimum 15 feet) to other people.

6.4 Hurricanes

Hurricanes and tropical storms are most likely to occur between June and November. At office locations where hurricanes are possible, employees should follow the guidance provided in the office "Emergency and Security Management Plan." Project locations that are in areas where hurricanes are possible should develop a "Hurricane Preparedness Plan" (see Attachment 2, "Project Site Hurricane Preparedness Plan Template," for a template). The Project Manager is responsible for developing a "Hurricane Preparedness Plan" for their project.

Upon issuance of hurricane warnings, the Office Manager or Site Supervisor shall designate an individual to be responsible for monitoring the hurricane path reported by the National Weather Service. The designated individual shall maintain a weather chart indicating the path and progress of the storm and noting projections furnished by the National Weather Service advisories. The location of the eye, or center of the storm, should be determined as near as possible.

If evacuation is necessary, the local governmental agencies evacuation plan shall also be followed.

To protect the project site against the destructive winds associated with hurricanes, the following preparations shall be made:

- All loose material shall be securely anchored or stored before the storm arrives. Special attention shall be paid to flat, light, and empty containers.
- Windows that may be affected shall be taped or boarded. Larger windows may be broken by high winds, while smaller windows may be broken by windblown objects.

- All unfinished masonry walls and forms for concrete walls shall be additionally braced.
- Tarpaulins and temporary covers shall be confirmed waterproof and tightly secured.
- Light siding shall be secured.
- All small buildings shall be tied down to deadmen or similarly anchored. These include such buildings as trailers, portable toilets, and craft change houses.
- Roofs shall be made as clear as possible. Items not completely installed, such as vents, chimneys, heating and ventilating ducts shall be secured.
- Openings or ducts from fans, ventilators, and air conditioners shall be mechanically closed.
- Small, lightweight equipment shall be placed in warehouses or buildings, or be weighted down.
- Scaffolds shall be taken down or adequately secured.

To protect the site from heavy driving rains and flood waters, the following preparations shall be made:

- Equipment shall be placed on high ground or where it will be least affected.
- Entrances and openings subject to flooding shall be protected with sand bags or sand dikes.
- All stationary exterior equipment necessary for continuous site operation shall be protected with tarpaulins and/or sand bags, or by similar means.
- Emergency procedures for electrical shutdown shall parallel normal shutdown procedures.
- Office equipment, files, records, and other important items shall be placed above expected flood level.
- Tanks of flammable, caustic, acidic, gaseous, or corrosive materials, which may float off their foundations, shall be secured. Welding and cutting gas lines should be valved off at the source.
- To prepare the jobsite for an emergency such as a hurricane, certain basic emergency supplies shall be kept available. These supplies include sand, sand bags, tarpaulins, lumber, plywood, polyethylene sheeting, screw anchors, heavy rope, and emergency generators. Battery operated radios and lights shall be kept on hand.
- A hurricane may disrupt normal operations in the area of the jobsite. An adequate supply of fresh drinking water and gasoline shall be stored on the site in case they are not available after the storm.
- Crane booms, when not in use, such as overnight/weekends, shall be lowered to the ground or placed into its stored position. Where this is not possible the load line shall be secured to a suitable object to prevent the crane from swinging.
- Locate and retain pumps and hoses, make preparations for water removal.
- Set up emergency call-out for personnel should the storm strike on a weekend.
- Locate and retain portable generating equipment as needed.
- Fill all tanks. Be prepared to hand pump.
- Remove all construction equipment from low areas that may become flooded.
- Roll-up all welding leads and hoses and do final cleanup of work areas.

- Check to see that all underground piping and tanks are filled or secured against floating.
- Secure all drawings, files, etc. Provide water/wind protection in case of roof or window damage. Store all calculators, typewriters, etc. Cover printers, copiers, and print paper. Remove all vital records and move to safe storage. Protect and seal all data processing equipment.
- Release employees on a rotating basis to take precautions at home.
- Prior to leaving the job site, turn off power at main switches.

6.5 Tornadoes

When a tornado is expected in or near the area, a tornado watch is issued by the Weather Bureau. When a tornado watch is issued, the Office Manager/Project Site Supervisor shall appoint an individual to monitor the National Weather Service advisories. A tornado warning is issued when a tornado has actually been sighted. The tornado warning will state where the tornado was sighted, where the tornado is expected to move, and when it is expected to affect the area warned.

In office locations where tornadoes are possible, employees should follow the procedures and responsibilities identified in the office "Emergency and Security Management Plan." A copy of the plan can be viewed on the office homepage or by requesting a copy from the Office Manager.

When a tornado warning is issued, emergency precautions shall be taken immediately. An emergency alarm shall be sounded and all employees shall move to designated emergency shelters. The predetermined shelter should be located in a reinforced building, the basement of a building, an inner hallway on a lower floor, or a similar location away from windows. A large room with a wide, free-span roof shall not be used.

Battery powered radios shall be available in the event of a power failure. During the tornado, alert weather information shall be monitored for further advisories.

Once a tornado has actually been sighted immediate action should be taken to protect employees from being blown away, struck by falling objects, or injured by flying debris. The best protection is an underground shelter or a substantial steel framed or reinforced concrete building. If none of these shelters are available, have employees assemble in an interior hallway, well away from glass windows. Stay away from glass enclosed places or areas with wide-span roofs such as auditoriums and warehouses.

If in a car or mobile home/office type structure, abandon them immediately. Most deaths occur in cars and mobile homes. Leave them and go to a substantial structure or designated tornado shelter.

If in open country and no suitable structure is nearby, lie flat in the nearest ditch or depression and use your hands to cover your head.

After Severe Storms:

- Walk or drive carefully; snakes, scorpions, fallen trees, and power lines may be a hazard.
- Do not attempt to ford water crossing roads.
- Test drinking water for contamination. Wells should be pumped out and tested before drinking.
- Only cleanup crews, medical personnel, and authorized supervisory personnel should be allowed at a disaster area.
- Do not handle live electrical equipment in wet areas. Electrical equipment should be checked and dried before start-up.
- Use battery powered lanterns or flashlights to examine buildings. Flammables may be inside.

- Report broken utility lines to local authorities.
- Keep tuned to local radio or television for advice and instructions on where to obtain medical care and assistance for housing, clothing, and food.
- Stay out of flooded areas until advised to go back in.
- Dry out water-impacted building interiors as quickly as possible to prevent mold growth.

6.6 Winter Storm/Blizzard Preparedness

If a winter storm "watch" has been issued for your area, that means hazardous winter weather conditions (snow greater than 6 inches in 24 hours, winds gusting over 35 mph, or visibility less than ¼ mile) are expected in the next 12 to 36 hours. You should prepare for the worst:

- Check snow removal equipment.
- Verify adequate supplies of food and water.
- Fill all equipment/vehicle fuel tanks.
- Stockpile rock salt or other less corrosive material to melt ice on walkways, and sand or kitty litter to generate temporary traction.
- Check walkways for debris and tripping hazards that may be covered by snow. Consider visibility of walkways after storm hits and use rope on posts to delineate paths.
- Check drainage to reduce flooding problems during a thaw.
- Consider snow fences to reduce drifting in roads and paths, which could block access. Use a National Oceanic and Atmospheric Administration (NOAA) Weather Radio with a tone alert to keep informed of watches and warnings issued in your area. The tone alert feature will automatically sound when a "watch" or "warning" is issued regardless of weather type.
- Be aware of changing conditions. Temperature may drop rapidly, winds may increase, or snow may fall at heavier rates.
- Consider releasing nonessential personnel due to possibility of deteriorating road conditions.

6.6.1 Winter Storm "Warning" or Blizzard "Warning"

If a winter storm "warning" or blizzard "warning" has been issued for your area, the hazardous winter weather conditions are expected in the next 12 hours or are already occurring.

Stay indoors and dress warmly. Wearing loose layers of loose-fitting, lightweight, warm clothing will keep you warmer. Remove layers to avoid overheating, perspiration, and subsequent chill.

Listen to a battery-powered radio or television for updated emergency information.

Eat regularly. Food provides the body with energy for producing its own heat.

Keep the body replenished with fluids to prevent dehydration. Avoid caffeine and alcohol, which can cause dehydration.

Conserve fuel. Winter storms can last several days. Suppliers of propane and fuel oil may not be able to replenish depleted supplies during severe weather.

6.6.2 After a Winter Storm

Continue listening to local radio or television or a NOAA Weather Radio for updated information and instructions.

Avoid overexertion. Heart attacks from shoveling heavy snow are a leading cause of death during winter.

Check crane booms, pipe racks, towers, etc. for snow and ice loading. Be aware of the potential for falling ice.

Follow forecasts and be prepared when venturing outside. Major winter storms are often followed by even colder conditions.

6.7 Emergency Evacuations and Site Inspections

When an emergency evacuation is necessary for any severe weather condition, the Office Manager/Project Site Supervisor shall decide whether a small force should remain on site for jobsite maintenance, etc. The emergency evacuation should be in accordance with the procedure in this section. Evacuations of personnel should be made with sufficient time allowed for safe execution of the evacuation; factors such as visibility, road conditions, and traffic congestion should be considered.

After the storm, a team shall thoroughly inspect the site or office before employees return. This inspection team, appointed by the Office Manager/Project Site Supervisor, shall inspect the entire site to asses the damage and determine the repairs.

7. ATTACHMENTS

- Attachment 1, Responsibility Matrix
- Attachment 2, Project Site Hurricane Preparedness Plan Template

8. FORMS

None

9. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
01 03/17/2009	• The Project Site/Construction Site Hurricane Procedure has been deleted from the body of the procedure and a new “Project Site Hurricane Plan Template” has been added as Attachment 2. • References to our office-specific “Emergency & Security Management Plans” have been added. • The information content provided in the lightning and hurricane sections has been enhanced.	Zustra, Mike

Attachment 1
Severe Weather Policy
Responsibility Matrix

Action	Responsible Party			
	Project Site Supervisor	Office Manager	Health and Safety Representative	Senior Director of Health and Safety
Issue, Revise, and Maintain Procedure				X
Communicate office “Emergency and Security Plan” to employees		X		
Develop and Communicate Severe Weather Plans to Project Site Personnel	X		X	
Monitor Severe Weather	X	X		
Suspend Work Activities When Lightning is Observed	X			
Purchase and Maintain Supplies	X	X		

Attachment 2
Project Site Hurricane Preparedness Plan Template

HURRICANE PREPAREDNESS PLAN FOR

Prepared for:

Prepared by:

Reviewed by:

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Acronyms and Abbreviations

COR	Condition of Readiness
FEMA	Federal Emergency Management Administration
HPP	Hurricane Preparedness Plan
mph	Miles per Hour
NOAA	National Oceanic and Atmospheric Administration
PPE	Personal Protective Equipment
PM	Project Manager
SS	Site Supervisor
SSO	Site Safety Officer

1.0 Introduction

This Hurricane Preparedness Plan (HPP) outlines the general responsibilities and actions to be taken in preparation for and response to a hurricane or hurricane warnings at _____ in _____. All personnel should understand that predicting the occurrence and path of a hurricane is difficult, however the risk can be minimized and controlled by following the procedures in this plan.

This procedure is applicable to all site personnel, including subcontractors; temporary construction facilities; and remediation equipment present at _____.

This procedure provides information on how to protect personnel and property in the event of a hurricane. In the _____ area, attention must be paid to all hurricanes, since there is no way to determine with 100 percent accuracy whether a hurricane will actually hit the area until a few hours before landfall.

Table 1, "Hurricane Landfall Forecast Demonstration," demonstrates that the accuracy of forecasting where a hurricane landfall will occur is very low more than 24 hours in advance of a storm.

Table 1
Hurricane Landfall Forecast Demonstration

Hours Before Landfall	Maximum Probability Values
72 Hours	10 Percent
48 Hours	13-18 Percent
36 Hours	20-25 Percent
24 Hours	35-45 Percent
12 Hours	60-70 Percent

2.0 Definitions

The following definitions apply to various terms used in this document:

- **Conditions of Readiness (COR):**
  - **Condition V** – Destructive winds are possible at the _____ site within 96 hours. Normal daily job-site cleanup and good housekeeping practices.
  - **Condition IV** – Destructive winds are possible at the _____ site within 72 hours. Normal daily job-site cleanup and good housekeeping practices. Collect and store in piles or containers, scrap lumber, waste material, and rubbish for removal and disposal at the end of each work day. Maintain the construction site, including storage areas, free of accumulation of debris. Stack form lumber in neat piles less than 4 feet high. Remove all trash debris and other objects which could become missile hazards.
  - **Condition III** – Destructive winds are possible at the _____ site within 48 hours. Maintain Condition IV requirements. Begin securing the job-site for and taking those actions necessary for Condition I that cannot be completed within 18 hours. Cease all routine activities that might interfere with securing operations. Begin collecting and stowing all gear and portable equipment. Make preparations for securing buildings. Review requirements pertaining to Condition II and continue action as necessary to attain Condition III readiness.
  - **Condition II** – Destructive winds are possible at the _____site within 24 hours. Curtail or cease routine activities until securing operations are complete. Reinforce or remove form work and scaffolding. Secure machinery, tools, equipment and materials, or remove from job site. Expend every effort to clear all missile hazards and loose equipment from the job-site.
  - **Condition I** – Destructive winds are possible at the _____ site within 12 hours. Perform and complete all remaining actions required for lower conditions of readiness. Secure the job-site and leave the government premises.
- **Destructive Winds** – Generally winds reaching or exceeding the force of a tropical storm (greater than or equal to 39 miles per hour [mph] or 34 knots). Winds from any storm system (tropical or otherwise) that are determined to have the potential to cause property damage or personal injury that would warrant a Condition IV alert.
- **Gale** – Non-tropical windstorm with winds 38 to 63 mph (33 to 55 knots).
- **Hurricane Watch** – An announcement for specific areas where a hurricane or an incipient hurricane poses a possible threat to a coastal area, generally within 36 hours.
- **Hurricane Warning** – A warning that sustained winds of 74 mph (64 knots) or higher, associated with a hurricane are expected in a specified coastal area in 24 hours or less.

- **Hurricane** – A tropical cyclone in which the maximum sustained surface wind is 74 mph (64 knots) or greater.
- **Missile Hazard** – Any object that may become airborne during high winds.
- **Severe Weather** – Any storm of tropical or non-tropical origin that has the capacity to produce destructive winds.
- **Small Area Storms** – Thunderstorms or tornadoes.
- **Small Area Storms Condition I** – Destructive winds, heavy rain, lightening, and hail are imminent within 1 hour.
- **Small Area Storms Condition II** – Destructive winds, heavy rain, lightening, and hail are expected within 6 hours.
- **Storm** – Non-tropical windstorm with winds 38 to 63 mph (33 to 55 knots).
- **Storm Surge** – An abnormal rise in sea level accompanying a hurricane or other intense storm, and whose height is the difference between the observed level of the sea surface and the level that would have occurred in the absence of the storm.
- **Storm Tide** – The actual sea level resulting from the astronomical tide combined with the storm surge. This term is used interchangeably with "Hurricane Tide."
- **Tornado** – Violent rotating columns of air with winds 115 to 288 mph (100 to 250 knots).
- **Tropical Depression** – A tropical low pressure system in which the maximum sustained surface wind is 38 mph (33 knots) or less.
- **Tropical Storm** – A tropical low pressure system in which the maximum surface wind ranges from 39 to 73 mph (34 to 63 knots) inclusive. This is the strength at which the National Hurricane Center applies a name to the storm.
- **Tropical Storm Watch** – Tropical storm conditions pose a threat to a coastal area generally within 36 hours.
- **Tropical Storm Warning** – A warning for tropical storm conditions with sustained winds within the range of 39 to 73 mph (34 to 63 knots) that are expected in a specified coastal area within 24 hours or less.

3.0 Responsibilities

3.1 Project Manager

The Project Manager is responsible for ensuring that all adequate measures have been taken to prepare for hurricanes and to protect site personnel and property in the event of a hurricane. The Project Manager will ensure that ample resources are available to implement this plan and that all personnel are aware of this plan and their responsibilities.

3.2 Site Supervisor

The Site Supervisor will communicate all hurricane information to site personnel and keep the site personnel continually informed of the measures to be taken. The Site Supervisor is responsible for the coordination and direction of site equipment shut-down and will oversee the preparation of site facilities for any imminent storm. The Site Supervisor will oversee the coordination of both pre- and post-storm operations and will ensure that the proper material, equipment, and supplies are utilized to implement this procedure.

3.3 Site Safety Officer

The Site Safety Officer (SSO) will monitor weather information, including the National Weather Service probability values for landfall. The SSO will maintain the necessary emergency supplies, and will periodically tour the site to ensure that proper steps are being taken to protect site personnel and property. The SSO will develop the emergency contact list will be maintained in a site dedicated vehicle.

Note: When personnel identified in Section 3.0 leave the site, they are responsible for notifying the Site Supervisor or a designated back-up person. The back-up person will be instructed in their responsibilities in the event of a hurricane.

4.0 Emergency Operating Procedures

4.1 Condition V – Early Preparedness

The Site Supervisor will notify the Project Manager when a tropical storm has been named and/or any severe weather has the potential to produce destructive winds at the _____ within 96 hours. This will initiate COR Condition V. This phase will continue until:

- The storm or condition is downgraded
- The storm track poses no threat to the site
- Condition IV begins

During Condition V, the progress of the storm will be monitored and tracked. The Program Manager will be contacted at least twice daily for Condition Requirements updates and to inform him of completion of required actions for Condition V.

See Appendix A, "Hurricane Preparedness Responsibility Punch List," for the Hurricane Preparedness Responsibility Punch List – Condition V.

4.2 Condition IV – (Destructive Winds are Possible within 72 Hours)

This COR starts when severe weather is within 72 hours of posing a threat to the project location. The SSO will ensure that the following steps are taken:

- Monitor the storm and inform the Project Manager of its progress
- Check Personal Protective Equipment (PPE) supplies and equipment to determine if any shipments are required or if pending shipments should be advanced or postponed

During Condition IV, the progress of the storm will be continuously monitored and tracked. The Site Supervisor will instruct site personnel to begin general cleanup of all loose materials that may pose a hazard during high winds or rain. This will include removal of all debris, trash, and other items that may become missile hazards. All lumber will be stacked in neat piles less than 4 feet high. The Program Manager will be contacted at least twice daily for Condition Requirements updates and to inform him of completion of required actions for Condition IV.

The Site Supervisor will keep all site personnel advised of the status of the storm and site preparation activities. Due to the urgency and amount of work involved in preparing for a threatening storm, all construction operations that might interfere with securing operations, such as starting a major excavation, will cease.

The Site Supervisor will ensure that the following steps are taken:

- Fill fuel tanks in all equipment on-site
- Secure stockpiled material on-site
- Review requirements for Condition II with all site personnel
- Maintain condition IV requirements.

See Appendix A for the Hurricane Preparedness Responsibility Checklist – Condition IV.

4.3 Condition III – Tropical Storm Warning (Destructive Winds are Possible within 48 Hours)

This COR starts when severe weather places the project site under a tropical storm warning. Condition III activities will also start if a threatening tropical storm is upgraded to a hurricane, or a severe storm approaching the _____ area has generated destructive winds in other locations. The Project Manager, Site Supervisor, and SSO will determine when to cease all operations based upon current weather conditions. If the storm or Condition is downgraded, the Project Manager and Site Supervisor will meet with the Program Manager to decide if a downgrade of the COR is appropriate. Actions for Condition III will be maintained and the following shall also be completed:

- Machinery, tools, equipment, and materials will be secured or removed form the site
- Take actions to secure job-site necessary for Condition II that cannot be completed within 18 hours.

See Appendix A for the Hurricane Preparedness Responsibility Checklist – Condition III.

4.4 Condition II – Destructive Winds are Anticipated within 24 hours or a Small Area Storm is Anticipated within 6 hours

Condition II begins when destructive winds are anticipated within 24 hours or a small area storm within 6 hours. The Project Manager and Site Supervisor will determine when to demobilize from the site based upon weather conditions. During this phase the Site Supervisor will direct the following actions:

- Secure machinery, tools, equipment and materials or remove them from the job-site
- Conduct a roll call of personnel on-site and inform the SSO
- Notify personnel on leave of schedule changes
- Personnel needing to leave the project to attend to personal matters will notify their Site Supervisor immediately
- Heavy equipment will be secured according to the manufacturer's recommendations
- All small field equipment will be secured

- All visitors from the site are evacuated
- Make a final site walk-through to determine that the site is secure and clear all missile hazards from the job-site
- Inform the Project Manager that all personnel are being released from the site.

If the storm or Condition is downgraded, the Project Manager and Site Supervisor will meet to decide if a downgrade of the phase is necessary.

See Appendix A for the Hurricane Preparedness Responsibility Checklist – Condition II.

4.5 Condition I – Destructive Winds are Anticipated within 12 hours or a Small Area Storm is Imminent within 1 hour

Complete all remaining actions required for lower conditions of readiness. Secure job-site access and evacuate to safe refuge. See Appendix A for the Hurricane Preparedness Responsibility Checklist – Condition I.

4.6 Resume Site Operations

The Project Manager will contact the Program Manager to determine when site operations will resume. Although the hurricane/severe weather has passed, hazards may still exist because of water damage, other hazardous conditions, dangers from electric shock, poisonous snakes, etc.

The Site Supervisor and SSO will conduct a damage survey with the Project Manager. Photographs of the storm damage at the site will be taken by the Site Supervisor or SSO. They will develop a prioritized recovery plan from the survey findings. Subsequently, all site personnel will be notified when it is safe to return to work. Required personnel and subcontractor expertise will be mobilized to the site to repair any damaged equipment.

See Appendix D for the Hurricane Preparedness Responsibility Checklist – Resume Site Operations.

5.0 Debriefing

Following the return to work of site personnel, the Site Supervisor will conduct a debriefing with site personnel. The debriefing will accomplish the following objectives:

- Finalize a recovery plan
- Review the Hurricane Plan for effectiveness
- Suggest and agree on improvements to the plan
- Incorporate plan changes

When completed, the Project Manager and Site Supervisor will meet with site personnel to discuss any corrective actions or changes in this plan.

6.0 References

The list of emergency telephone numbers is included as Appendix B, "Emergency Telephone Numbers." In addition, an example of a Hurricane Tracking Chart is presented in Appendix C, "Hurricane Tracking Map."

The following references and sources of information may be consulted for additional guidance on hurricane preparedness and response.

- Disaster Planning Guide for Business and Industry, Federal Emergency Management Administration (FEMA)
- U.S. Department of Commerce; National Oceanic and Atmospheric Administration (NOAA)

Appendix A
Hurricane Preparedness Responsibility Checklists

HURRICANE PREPAREDNESS CHECKLIST

Condition V

Date/Time Entered Condition V: _____

Severe Weather/Tropical Storm: _____

Action Items

- ☐ Project Manager Notified
- ☐ Track of Storm Poses No Threat
- ☐ Storm or Condition is Downgraded
- ☐ Upgrade to Condition IV

Storm Location

Date/Time: _____ Date/Time: _____

Location/Coordinates: _____ Location/Coordinates: _____

Date/Time: _____ Date/Time: _____

Location/Coordinates: _____ Location/Coordinates: _____

Condition V Action Items Complete: _____ Date: _____

HURRICANE PREPAREDNESS CHECKLIST

Condition IV (Landfall within 72 hours)

Date/Time Entered Condition IV: _____

Action Items:

- ☐ Notify Project Manager
- ☐ Notify Project Supervisor
- ☐ Notify Site Personnel
- ☐ Assemble shift personnel to begin preparation
- ☐ Track storm on hurricane tracking map (Appendix C) (if applicable)
- ☐ Secure all heavy equipment located at the site in accordance with manufacturer's specifications. All equipment will be moved to a secured site location.
- ☐ All equipment fuel tanks will be filled.
- ☐ All subcontractors with equipment or supplies on-site will be notified to begin removal procedures

Condition IV Action Items Complete: _____ Date: _____

HURRICANE PREPAREDNESS CHECKLIST

Condition III (Landfall within 48 hours)

Date/Time Entered Condition III: _____

Action Items:

- ☐ Provide the status of the storm to site personnel on an hourly basis
- ☐ Take actions to secure job-site necessary for Condition I that cannot be accomplished in 18 hours
- ☐ Recheck all items on checklist IV to ensure they are complete (i.e., gas tanks are still filled)

See itemized equipment checklist (itemized list of equipment to be secured/removed and COR for action)

Condition III Action Items Complete: _____ Date: _____

HURRICANE PREPAREDNESS CHECKLIST

Itemized Equipment Checklist, Condition III

Equipment	Secure in Place	Remove from Project Site

HURRICANE PREPAREDNESS CHECKLIST

Condition II

Date/Time Entered Condition II: _____

Action Items:

- ☐ Evacuate all visitors from the site
- ☐ Conduct a role call of site personnel and inform the Project Manager
- ☐ Check the status all incoming shipments of supplies and equipment
- ☐ Remove all unnecessary vehicles from the site
- ☐ Secure heavy equipment in accordance with manufacturer's specification
- ☐ Secure all valuable records and equipment
- ☐ Release personnel from the site
- ☐ Recheck all items on checklist IV and III to ensure they are complete (i.e., gas tanks are still filled)

Condition II Action Items Complete: _____ Date: _____

HURRICANE PREPAREDNESS CHECKLIST

Condition I

Date/Time Entered Condition I: _____

Action Items:

- ☐ Complete all action items for lower conditions of readiness
- ☐ Secure job-site access and evacuate to safe refuge

Condition I Action Items Complete: _____ Date: _____

Appendix B
Emergency Telephone Numbers

Appendix C
Hurricane Tracking Map

Appendix D
Resume Site Operations Checklist

HURRICANE PREPAREDNESS CHECKLIST

Resume Site Operations

Date/Time Resume Site Operations: _____

Action Items:

- ☐ Conduct a damage survey
- ☐ Notify all site personnel when to return to work
- ☐ Develop a prioritized recovery plan
- ☐ Inspect electrical equipment before re-energizing to detect and repair damage
- ☐ Provide bottled water for drinking until normal drinking water is deemed safe to drink
- ☐ Remove storm debris from site
- ☐ Notify Program Manager of the resumption of site activities

Resume Site Operations Action Items Complete: _____

Date: _____

STANDARD OPERATING PROCEDURE

Subject: Safety Councils

UNCONTROLLED WHEN PRINTED

1. PURPOSE

The purpose of this procedure is to establish the framework for conducting safety councils.

2. SCOPE

This procedure applies to all employees within Shaw's Environmental & Infrastructure Group (Shaw E&I). Variances and exceptions may be requested pursuant to the provisions of Shaw E&I Procedure No. HS013, "Health and Safety Procedure Variance."

3. REFERENCES

- Shaw E&I Procedure No. HS013, Health and Safety Procedure Variance
- Shaw E&I Procedure No. HS023, Accident Prevention Program: Safety Incentive Award Program

4. DEFINITIONS

None.

5. RESPONSIBILITY MATRIX

5.1 Procedure Responsibility

The Senior Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

5.2 Action/Approval Responsibilities

The Responsibility Matrix is shown as Attachment 1, "Safety Councils Responsibility Matrix."

6. PROCEDURE

Safety councils are an integral part of Shaw E&I's management approach to safety and are required at the corporate, business line, and division levels throughout the company. Essential provisions of this procedure include:

- Safety Council Charter, Purpose, and Duties
- Organization
- Membership
- Subcommittees
- Safety Council Meetings
- Reporting Requirements

6.1 Safety Council Charter, Purpose, and Duties

The company safety policy states that we will provide a safe and healthful workplace for all employees, subcontractors, and others that work with us. Safety councils help to fulfill this policy by providing a mechanism for management and employees to take a proactive role in providing a safe workplace.

6.1.1 Charter

The charter of each safety council is to implement an effective safety program at the management level of the council, within the policy, procedures, and guidelines of the company. Each safety council is chartered to act within the bounds of the authority approved for that management level.

6.1.2 Purpose

The purpose of each safety council is to create an environment that actively involves management and employees in the continual enhancement of the safety of our workplaces.

6.1.3 Duties

It is expected that the duties of each safety council will evolve to meet the needs of the management level that it serves. A list of key safety council duties is provided below:

- Monitor the activities of lower level councils
- Coordinate and monitor the safety inspection program
- Verify that safety incident investigations and follow-up procedures are met
- Establish activity-specific work rules at the level of the council and review annually
- Administer safety awareness and recognition programs

6.2 Organization

Safety councils will function at various management levels across the company, including corporate, business line, and division levels. Safety councils serving large business lines may, at their discretion, create a fourth tier of program or project safety councils.

Each safety council is accountable to the safety council above it in the organization and is responsible for monitoring those safety councils below it. The safety councils may execute many of their duties through subcommittees and ad hoc committees (refer to Section 6.4).

Safety councils at all levels are empowered with the authority to act through the mandatory membership and participation of the senior manager at the level of the council (e.g., President at corporate level, business line manager at business line level). Authority to act includes the management authorities stated in various company procedures for the management level responsible for the safety council.

6.3 Membership

Each safety council will have a chairperson and secretary. The senior manager at the level of the council will be designated as the council chairperson. The senior health and safety representative at the level of the council will be the secretary. For example, the corporate safety council chairperson will be the President and the secretary will be the Senior Director of Health and Safety. In the absence of a health and safety representative at a particular council location, the chairperson will appoint a secretary who is knowledgeable in company health and safety requirements.

Total membership of each safety council should be limited to approximately eight people, and should be equally divided between management and other employees. It is the responsibility of the chairperson to provide a safety council membership that represents a cross section of the employees within the council's responsibility. It is important that safety council members be highly visible within the organization represented by the council so that employees can communicate potential problems and ideas for improvement to members of the safety council.

Safety council members are expected to serve at least a 1-year term before rotating. The position of a chairperson does not rotate and remains the senior manager of the council level. The secretary does not rotate unless there are multiple health and safety representatives at the level of the council.

6.4 Subcommittees

Much of the work of each safety council can be accomplished by standing subcommittees and ad hoc committees. Each subcommittee or ad hoc committee will have as its chairperson a member of the safety council appointed by the council chairperson. Subcommittee and ad hoc committee membership should be equally split between management and other employees so that the necessary authority and influence exist to act upon recommendations for improvement, solve potential problems, and provide solutions to the safety council.

Following are the subcommittees which are a permanent part of each safety council.

6.4.1 Incident Investigation Subcommittee

This subcommittee reviews all incident reports, investigations, and accident review board proceedings, which are the responsibility of the management level of the council. The subcommittee monitors compliance with company procedures, verifies that the investigation process identified the root cause of the incidents, tracks the timely completion of corrective action items, ensures consistency of disciplinary action, helps management identify trends, and conducts follow-up for serious incidents. It is not the function of this committee to conduct incident investigations.

6.4.2 Safety Inspection Subcommittee

This subcommittee reviews all inspection reports to verify that inspections required by company procedure are conducted, tracks the timely completion of action items, and helps management identify trends.

6.4.3 Work Rules Subcommittee

The work rules subcommittee is responsible for the development and implementation of safe work rules at the safety council level. Work rules must be approved by the next higher level of safety council and must be reviewed annually.

Most work rule development will be done by business line subcommittees, relating to a specific operation of the business line. Higher level safety councils will, in general, provide guidance for the lower level safety councils to implement work rules.

6.4.4 Awareness and Recognition Subcommittee

This subcommittee is responsible for developing and implementing safety awareness and recognition programs, such as internal safety awards and external safety competition participation. All locations are encouraged to participate in the company's safety incentive award program detailed in EI-HS023, "Accident Prevention Program: Safety Incentive Award Program."

6.4.5 Ad Hoc Committees

Ad Hoc committees are to be appointed by the safety council chairperson for the solution of specific problems and to act on specific recommendations, which are not part of the ongoing activities of other

subcommittees. As for subcommittees, ad hoc committees can resolve issues only within their level of authority.

6.5 Safety Council Meetings

Safety council meetings shall be held at least bi-monthly, preferably as part of a regularly scheduled management meeting. It is estimated that approximately 1 hour will be required for the conductance of a safety council meeting.

6.5.1 Agenda

The agenda for each safety council meeting should include, as a minimum, the topics listed below:

- Accident statistics report from the most recent period
- Potentially unsafe conditions that have been identified and correction action taken
- Preventive action and corrective action taken since the last safety council meeting
- Report of activity and findings since the previous safety council meeting from each subcommittee chairperson, including progress on action items
- Proposed work rule changes
- Summary of lower level safety council activity

6.5.2 General Rules of Operation

The general rules of operation are listed below:

- Safety council and committee members participate on company time.
- Safety council meetings are open to all employees.
- All work rules must be approved by the next higher level of safety council.
- Safety councils are encouraged to operate by consensus. When a vote is needed, a simple majority with one vote per member shall prevail.
- The chairperson of the safety council may not overrule a decision of the safety council. The chairperson may refer an issue to a higher level council prior to action, or for resolution, as appropriate.
- Safety councils must operate within their level of assigned management authority.
- Spending authority is limited to that of the safety council chairperson.
- Safety councils may not change company policy and procedures or guidelines established by a higher level safety council; however, safety councils may recommend revisions to policy, procedures, or guidelines.
- Work rules cannot be set beyond the authority of the safety council.
- Safety council members are to seek employee input regarding unsafe conditions and/or safety program enhancement. All such comments must be presented to and responded to by the safety council which has the management authority to act.

6.6 Reporting Requirements

Each safety council is required to prepare a monthly report of activities. This report is to be prepared by the secretary and submitted to the secretary of the next higher level safety council by the fifth of the following month. Monthly reports from safety councils are to be posted on the local employee bulletin board or distributed electronically.

7. ATTACHMENTS

- Attachment 1, Safety Councils Responsibility Matrix

8. FORMS

None.

9. REVISION HISTORY

Revision Level / Revision Date	Revision Description	Responsible Manager
01 6/4/2009	• Modified position titles and business line structure to reflect current organization • The required safety council meeting frequency was changed to at least bi-monthly.	Zustra, Mike

Attachment 1
Safety Councils
Responsibility Matrix

Action	Procedure Section	Responsible Party		
		Senior Manager	Senior Health and Safety Representative	Senior Director of Health and Safety
Issue, Revise, and Maintain Procedure	5.1			X
Fulfill Position and Duties of Council Chairperson	6.3	X		
Fulfill Position and Duties of Council Secretary	6.3		X	
Establish Council Membership	6.3	X		
Appoint Subcommittee Chairpersons	6.4	X		
Maintain Meeting Minutes and Distribute Agenda	6.5		X	
Submit Monthly Council Report to Secretary of the Next Higher Level Council	6.6		X	

STANDARD OPERATING PROCEDURE

Subject: **Injury and Illness Prevention Program**

UNCONTROLLED WHEN PRINTED

1. PURPOSE

The purpose of this procedure is to set forth the requirements of the Shaw Group Inc.'s Environmental & Infrastructure Group (E&I) Injury and Illness Prevention Program (IIPP), applicable to California operations only. This procedure is also a point-source reference for the E&I procedures that together form the IIPP.

2. SCOPE

This procedure applies to all employees either based or working in the state of California.

Variances and exceptions may be requested pursuant to the provisions of Procedure No. EI-HS013, "Health and Safety Procedure Variance."

3. REFERENCES

- California Code of Regulations, Title 8, Industrial Relations, Section 1509, Injury and Illness Prevention Program: Construction, database current through 3/20/09, <http://www.calregs.com/linkedslice/default.asp?SP=CCR-1000&Action=Welcome> (March 2009).
- California Code of Regulations, Title 8, Industrial Relations, Section 3203, Injury and Illness Prevention Program: General Industry, database current through 3/20/09, <http://www.calregs.com/linkedslice/default.asp?SP=CCR-1000&Action=Welcome> (March 2009).
- California Code of Regulations, Title 8, Industrial Relations, Section 5192, Hazardous Waste Operations and Emergency Response, database current through 3/20/09, <http://www.calregs.com/linkedslice/default.asp?SP=CCR-1000&Action=Welcome> (March 2009).
- Code of Federal Regulations, Title 29, Part 1910, *Occupational Safety and Health Standards*, U.S. Government Printing Office, Washington, D.C., July 1, 2003, <http://www.access.gpo.gov/nara/cfr/index.html> (November 2008).
- Procedure No. EI-HS013, Health and Safety Procedure Variance
- Procedure No. EI-HS020, Accident Prevention Program: Reporting, Investigation and Review
- Procedure No. EI-HS021a, Tier 1, SR. Management, Leadership Safety Assessments
- Procedure No. EI-HS021b, Tier 2, Management Safety Inspections
- Procedure No. EI-HS021c, Accident Prevention Program: Management Safety Inspections
- Procedure No. EI-HS022, Accident Prevention Program: Review of New Proposals and Projects
- Procedure No. EI-HS050, Employee and Subcontractor Training Requirements
- Procedure No. EI-HS051, Tailgate Safety Meetings
- Procedure No. EI-HS060, Hazard Communication Program

- Procedure No. EI-HS091, Reporting of Fatality or Multiple Hospitalization Incidents to OSHA
- Procedure No. EI-HS800, Motor Vehicle Operation: General Requirements

4. DEFINITIONS

- **Injury and Illness Prevention Program (IIPP)**—California Labor Code Section 6401.7 requires the Occupational Safety and Health Standards Board to adopt regulations requiring every employer to establish, implement, and maintain an IIPP. These regulations are in Title 8 of the California Code of Regulations, Section 1509 (Construction) and Section 3203 (General Industry).

  This IIPP must function as a self-supportive document. The IIPP reduces workplace hazards and thereby reduces the number and severity of injuries and illnesses.

- **Tier 1 Senior Manager**—Includes the Business Line Presidents and their direct reports.
- **Tier 2 Senior Manager**—Includes the managers, above the level of Project Manager, with operational responsibilities.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Senior Director of Health & Safety is responsible for the issuance, revision, and maintenance of this procedure.

5.2 Action/Approval Responsibilities

The Responsibility Matrix is shown as Attachment 1, “Responsibility Matrix.”

6. PROCEDURE

Key requirements of the IIPP include the following:

- Proper identification and evaluation, and appropriate address, of all workplace hazards.
- Employer/employee Safety Councils in each division to discuss workplace hazards and corrective actions, and to review inspection reports, accident investigation reports, and audits.
- E&I hazard training programs, noncompliance disciplinary procedures, and a specific IIPP recordkeeping procedure.

6.1 Identification and Evaluation of Workplace Hazards

All levels of management perform periodic audits of E&I facilities, operations, and projects to identify and evaluate workplace hazards. Procedure Nos. EI-HS021a, EI-HS021b, and EI-HS021c provide guidance for the conduct of safety audits as follows:

- Tier 1 Senior Managers – one quarterly project, laboratory, or office audit
- Tier 2 Senior Managers – two quarterly project, laboratory, or office audits
- Health and Safety Managers – three joint project, laboratory, or office audits with the corresponding Senior Manager
- Project Managers – one project audit per month

- Office Managers – one office audit every six months
- Project Supervisors – at least one project audit per month

The project supervisor completes a Tailgate Safety Meeting Form each day before beginning other work; whenever new substances, processes, procedures, or equipment are introduced into the workplace that represent a previously unaddressed hazard; and whenever a new person enters the work site. The supervisor conducts a Tailgate Safety Meeting to inform employees of the site hazards and required personal protective measures (Procedure No. EI-HS051).

All safety auditors record findings of daily audits on the Safety Improvement Log (Form EI-HS021) and submit them to the local Health and Safety Manager or Representative.

6.2 Methods and Procedures for Correcting Unsafe and Unhealthy Conditions and Work Practices

Procedure No. EI-HS020 sets forth the requirements for E&I's Accident Prevention Program: Reporting, Investigation, and Review. All employees report all accidents/incidents, vehicle incidents, and near-miss incidents to management immediately. Line management investigates all incidents and conducts Accident Review Boards. All accompanying documentation is forwarded to the regional Health and Safety Manager and the Senior Director of Health and Safety. Line management addresses all hazards in a timely manner on the basis of severity, with the more potentially hazardous conditions addressed first.

Each division maintains a Safety Council network. Safety Councils review reports from audits, inspections, and accident investigations; make recommendations for preventative and corrective actions; and track progress of corrective actions outlined in previous meetings while presenting a forum for discussion of safety-related issues. The Safety Council meets either monthly or bimonthly and distributes its minutes to all members and managers within the unit of organization.

Each Safety Council creates subcommittees for specific tasks. The incident investigation subcommittee is responsible for tracking accidents and incidents and determining the effectiveness of the prescribed preventative measures. The audit subcommittee is responsible for verifying that audits are done and for tracking satisfactory completion of the corrective actions identified. Divisions track the close out of action items assigned by the Safety Councils and the safety performance of their unit of organization. Safety Councils review Occupational Safety and Health Administration (OSHA) 300 logs, accident review board reports, safety audit and inspection forms, and Safety Council reports.

6.3 Hazard Training

Procedure No. EI-HS050 sets forth the Training Requirements for E&I personnel and E&I subcontractors. E&I requires all employees whose work may expose them to hazardous waste or dangerous conditions to attend training on safe work practices. E&I training programs satisfy federal and state mandated training regulations.

Field supervisors train personnel on site specific hazards through Tailgate Safety Meetings (Procedure No. EI-HS051). During these daily meetings the supervisor discusses potential physical, chemical, radiological, and biological hazards associated with the work scheduled for the day and the appropriate methods of dealing with these hazards. These discussions include instructions on the implementation and operation of engineering controls and the selection and use of personal protective equipment. All personnel acknowledge their understanding of the issues presented at the Tailgate Safety Meeting by signing the Tailgate Safety Meeting Form before entering the site.

The Health and Safety staff develop site specific Health and Safety Plans for each project regulated by 29 Code of Federal Regulations 1910.120. The Project Manager, Site Supervisor, and a Health and Safety professional review the site specific Health and Safety Plan and sign it upon approval. The site specific Health and Safety Plan addresses all health and safety related issues associated

with the proposed project. The site specific Health and Safety Plan addresses all issues required by the hazardous waste operations and emergency response regulations (29 CFR 1910.120 and Title 8 of the California Code of Regulations, Section 5192). Projects not regulated under these standards conform to the specific Health and Safety guidelines determined in the mandatory Health & Safety Pre-Project Review, as set forth in Procedure No. EI-HS022.

6.4 Communication of Safety and Health Matters

Procedure No. EI-HS060 details the components of the E&I Hazard Communication Program. This program provides training to employees on hazardous materials they might encounter in the course of their work. This training includes instructions on labeling, interpretation of material safety data sheets, recognition of hazardous releases, and general chemical hazards associated with hazardous materials. All field personnel attend this training annually.

All employees are instructed to report all hazardous conditions in the workplace immediately upon discovery. To disseminate this information effectively and productively, the local Health and Safety professional reviews this information and the location manager addresses it in the safety council meeting. An audit committee tracks the progress of corrective actions and reports its findings to the Safety Council (Section 6.2 above). The members of the Safety Council route this information to the respective discipline leader in charge of the project, facility, or operation in question so that corrective actions are taken on a line management level. (Some members of the Safety Council will be nonmanagement field personnel.)

6.5 Ensuring Compliance: Incentive and Disciplinary Measures

In accordance with E&I's Code of Conduct, an employee failing to report immediately an accident or incident is subject to termination. Procedure No. EI-HS800 provides a numerical rating system for evaluating employee's motor-vehicle driving performance and delineates the appropriate disciplinary steps for violations of its provisions. Serious injuries and fatalities are reported according to Procedure No. EI-HS091. Disciplinary measures are enforced against any employee who violates E&I Health and Safety Procedures, in accordance with the E&I progressive discipline system.

6.6 Record-Keeping Requirements

The local Health and Safety Manager tracks completion of all accident/incident reports, accident investigation reports, audit forms, and safety council reports. Recordable injuries and illnesses are recorded on an electronic OSHA 300 log and in the corporate Integrated Management System.

7. ATTACHMENTS

- Attachment 1, Injury and Illness Prevention Program Responsibility Matrix

8. FORMS

None.

9. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
01 06/04/2009	• Section 5.1 has been modified to reflect the management safety assessment frequencies outlined in Procedures HS021a, HS021b, and HS021c. • The Safety Council structure descriptions have been changed to indicate the current division structure, and both monthly and bimonthly meeting frequencies have been recognized. • The record-keeping section has been completely revised and now references the Integrated Management System.	Zustra, Mike

Attachment 1
Injury and Illness Prevention Program
Responsibility Matrix

Action	Procedure Section	Responsible Party					
		Line Management	Local Health and Safety	Location Manager	Regional Health and Safety	Senior Director of Health and Safety	Safety Council
Identification of Workplace Hazards	6.1	X	X	X	X	X	X
Conduct Tailgate Safety Meetings	6.1	X					
Accident and Incident Investigations	6.2	X	X				X
Hazard Training	6.3	X	X	X			
Health and Safety Plans	6.3	X	X				
Reporting Hazardous Conditions, Accidents, and Incidents	6.4	**ALL EMPLOYEES**					
Corrective Action Tracking	6.4	X	X	X	X	X	X
Disciplinary and Incentive Measures	6.5			X			
IIPP Recordkeeping	6.6		X		X	X	X

PROCEDURE

Subject: ACCIDENT PREVENTION PROGRAM: REPORTING, INVESTIGATION, AND REVIEW

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to establish the requirements for incident reporting, investigation, and review. This procedure is an integral part of the company's overall accident prevention program and aids in the identification of potential causal factors and corrective actions. Key elements of this procedure include:

- **All occupational injuries/illnesses, vehicle accidents, and near miss incidents must be promptly reported and investigated.**

- All Occupational Safety and Health Administration (OSHA) recordable injuries/illnesses and chargeable vehicle accidents must be reviewed by an Accident Review Board. The Accident Review Board report is submitted to the Baton Rouge Corporate Safety Department, for production to and retention on behalf of the Legal Department.

- All incidents involving a fatality, major injury/illness, or resulting in significant property damage will be immediately reported to: the business line Health & Safety Manager; the Corporate Health and Safety Department; Business Line Vice President and the Legal Department.

- All investigations and associated materials obtained and/or produced, in association with OSHA recordable injuries/illnesses, chargeable vehicle accidents, fatalities, major injury/illness, or incidents resulting in significant property damage, are to be performed for & on behalf of the legal department and will be subject to being classified as Confidential Attorney-Client / Attorney Work Product.

- All business line Health & Safety Managers are required to prepare a Monthly Loss Report summarizing all current month, and year-to date, chargeable vehicle accidents, injury/illness cases (requiring outside medical care), lost work day totals and restricted work day totals. This report shall then be forwarded, by the 10th day of the following month, to the Baton Rouge Corporate Safety Office.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Corporate Health & Safety Department is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Chargeable Vehicle Accident - Any **at-fault** vehicle accident meeting any **one** of the following criteria:

- An individual other than an employee of the company is a party in the accident
- Property owned by a person or entity other than the company is damaged
- When company owned, leased or rented vehicles are involved and damage exceeds $2,500.00.
- When an employee is driving a personal vehicle while on company business and damage exceeds $2,500.00.

Company - All affiliates, indirect and wholly owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Days Away From Work - Days away from work are the number of **calendar** days following the injury or illness, excluding the date of the injury.

Job Safety Analysis (JSA) – The JSA is an effective management technique for identifying hazardous conditions and unsafe acts in the workplace. A JSA is intended to analyze the individual steps or activities, which together create a job or specific work duty, and to detect any actual or potential hazards that may be present. (See HS045: Job Safety Analysis)

Restricted Work – Occurs when, as the result of a work-related injury or illness:

- A physician or other licensed health care professional recommends that the employee not perform one or more of the routine functions of his or her job, or not work the full workday that he or she would otherwise have been scheduled to work

Near Miss Incident - Any incident where no injury occurred, but where the potential for injury existed.

OSHA Recordable Case – See Attachment 8

Vehicle - Any passenger vehicle, including trucks, used upon the highway or in private facilities for transporting passengers and/or property. For the purpose of this procedure, off-road vehicles such as earthmoving equipment, forklifts, non-highway use trucks, etc., are not considered vehicles. (See HS800 Motor Vehicle Operation: General Requirements)

5.0 TEXT

5.1 Incident Reporting Process

Employees are required to immediately report to their direct supervisor all occupational injuries, illnesses, accidents and near miss incidents having the potential for injury. Site Business Line Managers or Supervisors (supervisor directly responsible for the employee involved in the incident) with first-hand knowledge of an incident is required to:

- Immediately arrange for appropriate medical attention and notify the responsible health and safety representative.

- **As soon as practical, but not longer than one hour after gaining knowledge of the occurrence**, notify the Shaw Notification Hotline/Helpdesk by calling 1-866-299-3445 (Attachment 10) of any injury requiring off-site medical treatment, any chargeable vehicle accident or equipment incident involving property damage exceeding $2,500 in value (Shaw or third party).

- Inform Health Resources of all incidents requiring off-site medical attention by calling 1-800-350-4511. This call should be made **prior** to transporting the employee such that they can coordinate physicians services prior to arrival of the employee to the clinic, and provide the following information:

  - Company Name (Shaw E&I) & Business Line (e.g. DOD, Commercial)
  - Employee Name
  - Name of anticipated, treating medical facility and phone number
  - Brief description of incident.

  Health Resource's role is to interface with the treating physician, to ensure that appropriate care is provided to the injured employee.

- Complete the *Authorization for Treatment, Release of Medical Information*, and *Return to Work* (Attachment 9A, 9B, 9C) and the *Supervisor's Employee Injury Report* (Attachment 2) for all cases requiring off-site medical attention. The Site Safety and Health Representative or responsible supervisor shall ensure that the forms are completed and faxed to Health Resources at (800) 853-2641 prior to leaving the medical facility or as soon as reasonably possible.

- Post accident drug and alcohol testing shall occur in accordance with HS101 Drug and Alcohol Testing, immediately following an incident.

  NOTE: Prior to performing non-DOT post accident testing, it is the responsibility of the employee's supervisor to ensure that Health Resources has verified that this testing is not prohibited or restricted by state or local regulations.

- Prior to an injured employee returning to his/her job duties, a follow-up call by Health Resources will be made to the project site. The purpose of this call is to ensure work restrictions are clarified and planned work activities are consistent with medical recommendations.

- The Supervisor shall initiate/complete the appropriate company documentation in accordance with the following incident classifications: (note: if a Site Safety and Health Representative is on site, he should work in concert with the supervisor)

  - OSHA Recordable Cases
    a. Supervisor's Employee Injury/Illness Report (Attachment 2)
    b. Incident Investigation Report (Attachment 5)
    c. Witness Statement Form (Attachment 6)
    d. Accident Review Board (Attachment 7)

  - First Aid Cases
    a. Supervisor's Employee Injury/Illness Report (Attachment 2)
    b. Incident Investigation Report (Attachment 5)
    c. Witness Statement Form (Attachment 6)

  - Chargeable Vehicle Accidents
    a. Vehicle Accident Report (Attachment 3)
    b. Incident Investigation Report (Attachment 5)
    c. Witness Statement (Attachment 6)
    d. Accident Review Board (Attachment 7)
    e. Driving Record Certification (Procedure HS800)

  - Non-Chargeable Vehicle Accidents
    a. Vehicle Accident Report (Attachment 3)
    b. Incident Investigation Report (Attachment 5)
    c. Witness Statement (Attachment 6)

- Equipment, Property Damage and General Liability Incidents
  a. Incident Investigation Report (Attachment 5)
  b. Witness Statement Form (Attachment 6)
  c. Equipment, Property Damage and General Liability Loss Report (Attachment 4).

- Near Miss
  a. Incident Investigation Report (Attachment 5)

5.2 Supervisor's Employee Injury/Illness Report (Attachment 2)

The Supervisor's Employee Injury Report is to be completed for all incidents that result in an employee occupational injury or illness requiring off-site medical attention. It is to be initiated by the supervisor of the injured employee and forwarded to the respective Business Line Safety Manager for review / comments. Upon completion of review and comments the report should be forwarded, **within 24 Hours,** to the Shaw Corporate Claims department in Baton Rouge, via the corporate claims fax number (225.932.2636).

5.3 Vehicle Accident Report (Attachment 3)

The Vehicle Accident Report must be completed for any vehicle accident in which a company vehicle is involved. This includes company-owned or leased vehicles, rental vehicles, and personal vehicles being used for company business. This report is to be initiated by both the employee involved in the accident and his/her direct supervisor and forwarded to the respective Business Line Safety Manager for review / comments. Upon completion of review and comments the report should be forwarded to the Shaw Corporate Claims department in Baton Rouge (fax number 225.932.2636).

5.4 Equipment, General Liability, Property Damage, and Loss Report (Attachment 4)

The General Liability, Property Damage, and Loss Report is to be used for all losses or damage to company property in excess of $2,500.00. This form must be completed for all third party property, regardless of value, damaged as a result of company activities. The employee most familiar with the events that contributed to the loss or damage will complete the form, and then forward it to the project/location manager. The Corporate Claims Department and the respective Business Line Safety Manager must receive a copy of the report within one business day of the incident.

5.5 Incident Investigation Report (Attachment 5)

All injuries, illnesses, accidents, and near miss incidents will be investigated. Once arrangements for immediate medical care have been made, the employee's direct supervisor, with assistance from the health and safety representative and Business Line Health and Safety Manager, will:

· Collect the facts;

· Describe and document (include sketch, photos, etc.) how the incident occurred;

- Collect support documentation (JSA's, AHA's, Tailgate Safety Meetings, Work Orders, etc.);

- List witnesses and collect written statements;

  If applicable, contact the employee's Functional Manager in an effort to gain relevant information

- Identify the causative factors;

- Identify potentially unsafe acts or unsafe conditions that may have contributed to the incident;

- Identify potential curative action; and

- List the corrective actions which are to be executed, appropriate curative action, the person(s) responsible for the corrective action, and the date by which action is to be completed.

The investigation will be started as soon as possible following the incident and the relevant reports and support documentation (JSA's, AHA's, Tailgate Safety Meetings, Work Orders, etc.) shall be submitted to the appropriate Business Line Health and Safety Manager within 72 hours. In addition to the previous information, reports from external sources (police, insurance carriers, testing laboratories, etc.) are to be obtained as soon as they become available and forwarded by the Business Line Safety Manager to the Corporate Claims department in Baton Rouge.

5.6 Injured Employee Statement & Witness Statement Forms (Attachment 6a & 6b)

The Injured Employee and Witness Statement Forms allow for consistency in the development of the investigation process. The Injured Employee Statement must be completed in all cases where an employee injury results in off site medical treatment. If there are witnesses to the accident/incident, the Witness Statement form should be completed and signed by the subject witness. Both of these forms should be attached to the incident investigation report. It is essential that these statements are executed immediately following the incident to ensure an accurate account of the events.

5.7 Accident Review Board (ARB) (Attachment 7)

The purpose of the Accident Review Board is to collect and review the information gathered for each incident, report that information to the Legal Department and take appropriate curative action. In all cases, the purpose of the entire investigative process, inclusive of conducting an ARB, is to identify curative actions as it relates to the incident / injury. Accordingly, a diligent and concerted effort to accomplish these tasks must be established at the onset of all of the subject incidents.

In order to assist the Legal Department in evaluating the risk to, or liability of, the company, associated with OSHA recordable injuries, chargeable vehicle accidents, fatalities or incidents resulting in significant property damage, the responsible Project / Location Manager is required to coordinate with all parties and set up the ARB such that

it occurs **within 10 days of the accident**. The respective Business Line Health and Safety Manager, whose project/location experiences accident is then required to conduct the subject ARB.

The Accident Review Board shall be composed of the project/location manager, the employee's direct supervisor (at time of incident), a health and safety representative, and the employee(s) involved in the incident.

Additionally, there may be cases that involve an employee that has been assigned to a project and the Functional Manager of that employee may not have direct knowledge of an incident. In cases such as these, the Functional Manager shall be notified of the incident and requested to participate in the ARB. Also, as determined by the Business Line Health and Safety Manager, a representative of other internal sources of expertise should be involved where applicable.

All investigations and associated materials obtained and/or produced, in association with injuries/illnesses resulting in OSHA recordable classification, chargeable vehicle accidents, fatalities or incidents resulting in significant property damage, are to be performed for and on behalf of the legal department and will be subject to being classified as Confidential Attorney-Client / Attorney Work Product. If the ARB is initiated under a Confidential Attorney-Client / Attorney Work Product status, all documents and other work product arising out of, or associated with, the investigation process, including the ARB, shall be prepared in anticipation of litigation. The Accident Review Board report, and associated documents, is submitted to the Corporate Safety Department, for production to and retention on behalf of the Legal Department.

The ARB report, and all associated documents, shall be completed as soon as practicable, but not more than 5 business days following the ARB meeting, and forwarded by the Business Line Safety Manager to the Corporate Safety Department, via the Corporate Claims fax number. The original documents shall then be mailed to the Corporate Safety Department. These documents shall then be filed in a lockable cabinet, separate from files not meeting the subject criteria, by the Corporate Safety Department, for production to and retention on behalf of the Legal Department. In the event that copies of these files are maintained by Business Line Safety Managers and / or the respective location in which the injury occurred, the same filing criteria shall be followed. The criteria shall be that these documents are filed in lockable cabinets, separate from files not meeting the subject Attorney-Client / Attorney Work Product criteria.

It is generally not acceptable to discipline an employee for having an accident. However, if in the opinion of the Accident Review Board, it is determined that the accident resulted from an intentional unsafe act or intentional violation of company procedure on the employee's part, the employee may be subject to disciplinary action in accordance with the company's progressive disciplinary action system (see Human Resources Procedure HR207).

5.8 Monthly Loss Report

Each business line Health and Safety Manager is responsible to submit a Monthly Loss Report summarizing incidents that took place within their business line during the previous month. The business line Health and Safety Manager is responsible for submitting a consolidated package for the entire business line to the corporate health and safety office for **receipt no later than the 10th working day of the following month**.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

HR207 Disciplinary Action
HS013 Health and Safety Procedure Variances
HS101 Drug and Alcohol Testing
HS800 Motor Vehicle Operations - General Requirements
HS810 Commercial Motor Vehicles

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Supervisor's Employee Injury/Illness Report
3. Vehicle Accident Report
4. Equipment, Property Damage and General Liability Loss Report
5. Incident Investigation Report
6. a. Injured Employee Statement
   b. Witness Statement
7. Accident Review Board Report
8. Injury/Illness Classification Guidelines
9. Medical Forms
   a. Authorization for Treatment of Occupational Injury/Illness
   b. Authorization for Release of Medical Information
   c. Return to Work Examination Form.
10. Help Desk / Hotline Notification Guidelines

ATTACHMENT 1

ACCIDENT PREVENTION PROGRAM: REPORTING, INVESTIGATION, AND REVIEW RESPONSIBILITY MATRIX

Action	Procedure Section	*Responsible Party*					
		Employee	**Supervisor**	**Project/ Location Manager**	**Site Health and Safety Rep. / Officer**	**Business Line Health and Safety Manager**	**Corporate Health & Safety Manager**
Issue, Revise, and Maintain Procedure	3.1						X
Report All Incidents to Supervisor	5.1	X					
Notify Health and Safety Representative	5.1		X				
Arrange Medical Care	5.1		X		X		
Notify Health Resources or Gates McDonald of Incident	5.1		X		X		
Initiate/Complete Company Forms	5.1		X		X		
Complete Investigation of incident	5.5		X	X	X	X	
Complete Equipment, Property Damage and General Liability Loss Report Incident	5.4	X					
Coordinate and Set up Accident Review Board	5.7			X			
Conduct Accident Review Board	5.7					X	
Participate in Accident Review Board	5.7	X	X	X	X	X	
Complete Monthly Loss Report	5.8					X	

Attachment 2

REPORT ALL WORKER'S COMPENSATION INJURIES TO SHAW CLAIMS DEPARTMENT
FAX REPORT WITHIN 24 HOURS OF INCIDENT TO 225-932-2636.
Phone all injuries/ illnesses to Shaw Notification Hotline/Helpdesk
1-866-299-3445

Supervisor's Employee Injury/Illness Report Form

EMPLOYEE INFORMATION

Employee's Social Security Number:		Claim Number:	
Employee's Name:		Home Phone Number:	
Home Address:			Business Line Code:
Male Female	Date of Birth:	Hire Date:	
Dependents:	Dependents Under 18:	Marital Status:	
Occupation:		Department Name:	
State Hired:	Currently Weekly Wage:	Hourly Wage:	
Hours/Days Worked Per Week:	Days Per Week	Hours Worked Per Day:	
Employment Status:	Employee Report No.: N/A		Employee ID No.: N/A
Salaried Continued:	Paid For Date of Injury:		Education No. of Years:
Ever Injured on the Job:	Supervisor Name & Phone:		

EMPLOYER INFORMATION

Employer Name:	The Shaw Group, Inc.		
Work Location:			
Contact Name:	Troy Allen	Telephone Number:	(800)747-3322
Employer SIC:		Employer Location Code:	
Employer FED ID:		Employer Code:	N/A
Nature of Business:			
Policy Number:			

ACCIDENT INFORMATION

Date and Time of Injury:			
Did the Accident Occur at the Work Location:		If no, where did the accident occur?	N/A
Accident Address:			
Nature of Accident:			

Give a Full Description of the Accident: (Be as Factually Complete As Possible)

Are Other WC Claims Involved?	No	Date and Time Reported to Employer:	
Person Reported To:			

WITNESS INFORMATION

Were There Any Witnesses?

If Yes, List Names and How to Contact Them:

INJURY INFORMATION

Which Part of the Body Was Injured? (e.g. Head, Neck, Arm Leg)

What Was the Nature of Injury? (e.g. Fracture, Sprain, Laceration)

Part of Body Location: (e.g. Left, Right, Upper, Lower)

Injury Description:

Source of Injury:	Is Employee Hospitalized?
Lost Time:	If Yes, What was First Full Day Out:
Date Last Day Worked:	Date Disability Began: N/A
Date Returned to Work:	Estimated Return Date: N/A

MEDICAL INFORMATION

ER Treated & Released:	Hospitalized:	Phy./Clinic:
Hospital - Name, Address, Phone Number:	Was Employee Transported via Ambulance: Yes No	

N/A

Clinic - Name, Address, Phone Number:

ADDITIONAL COMMENTS & INFORMATION

REPORT PREPARED BY

Name:	Title:
Signature:	Phone:

ATTACHMENT 3
VEHICLE ACCIDENT REPORT
Page 1 of 2

ACCIDENT DESCRIPTION

This report is to be initiated by the employee involved in the accident or his/her direct supervisor. Please answer all questions completely. This report must be forwarded to the appropriate health and safety representative within 24 HOURS of the accident. Attach police report.

ACCIDENT DATE _____ TIME _____ ☐ A.M. or ☐ P.M.

LOCATION OF ACCIDENT (CITY, STATE) _____

DESCRIPTION OF ACCIDENT _____

_____

_____

WITNESS _____ PHONE NO. _____

ADDRESS _____ CITY _____ STATE _____ ZIP _____

POLICE OFFICER'S NAME AND BADGE #_____ DEPARTMENT _____

COMPANY VEHICLE

DRIVER _____ DRIVERS LICENSE NO. _____ STATE _____

ADDRESS _____ _____ CITY _____ STATE _____ ZIP _____

WORK PHONE NO. _(_____)_____ S.S. NO. _____ PROJECT NAME/NO. _____

VEHICLE NO. _____ YEAR _____ MAKE _____ MODEL _____ LICENSE PLATE NO. _____

STATE _____ VEHICLE OWNER: ☐ COMPANY ☐ LEASED/RENTED ☐ PRIVATE VEHICLE

VEHICLE TYPE: ☐ COMMERCIAL MOTOR VEHICLE ☐ NON-COMMERCIAL

IF NOT COMPANY-OWNED: OWNER _____ PHONE NO _(____)_____

ADDRESS _____ _____ CITY _____ STATE _____ ZIP _____

VEHICLE DAMAGE _____

NO. OF VEHICLES TOWED FROM SCENE _____ NUMBER OF INJURIES _____ NUMBER OF FATALITIES _____

WERE HAZARDOUS MATERIALS RELEASED? ☐ NO ☐ YES IF YES, DESCRIBE MATERIALS _____

_____

OTHER VEHICLE

DRIVER _____ DRIVERS LICENSE NO. _____ STATE _____

ADDRESS _____ CITY _____ STATE _____ ZIP _____

PHONE NO. _(_____)_____ S.S. NO. _____

OWNER'S NAME (☐ CHECK IF SAME AS DRIVER) _____

ADDRESS _____ CITY _____ STATE _____ ZIP _____

INSURANCE COMPANY _____ POLICY NO. _____

AGENT'S NAME _____ PHONE NO. _(_____)_____

ADDRESS _____ CITY _____ STATE _____ ZIP _____

VEHICLE YEAR _____ MAKE _____ MODEL _____ PLATE NO. _____ STATE _____

VEHICLE I.D. NO. _____

VEHICLE DAMAGE _____

PASSENGERS: ☐ NO ☐ YES INJURIES: ☐ NO ☐ YES (If Yes, list names and telephone numbers below)

_____

_____

_____

VEHICLE ACCIDENT REPORT

WEATHER: ☐ Clear ☐ Cloudy ☐ Fog ☐ Rain ☐ Sleet ☐ Snow Other _____

PAVEMENT: ☐ Asphalt ☐ Steel ☐ Concrete ☐ Wood ☐ Gravel/Dirt ☐ Brick/Stone Other _____

CONDITION: ☐ Dry ☐ Wet ☐ Icy ☐ Pot Holes Other _____

TRAFFIC CONTROL: ☐ Traffic Light ☐ Stop Sign ☐ Railroad ☐ No Intersection ☐ No Control

ROADWAY: Number of Lanes Each Direction: _____ ☐ Residential ☐ Divided Highway ☐ Undivided Highway

Draw and name roadways showing each vehicle, direction of travel, and point of impact. Indicate travel before the accident with a solid line, and post-accident movement with a broken line.

SYMBOLS:

Your Vehicle ①

Other Vehicle(s) ②③

Pedestrian

Stop Sign

Yield

Railroad

ADDITIONAL INFORMATION: _____

EMPLOYEE _____ (Print) _____ (Signature) _____ (Date)

SUPERVISOR _____ (Print) _____ (Signature) _____ (Date)

HEALTH & SAFETY REP. _____ (Print) _____ (Signature) _____ (Date)

ATTACH POLICE REPORT TO VEHICLE ACCIDENT REPORT

REPORT MUST BE FAXED TO:
CORPORATE CLAIMS DEPARTMENT (FAX: 225-932-2636)
WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY.

REPORT ALL CHARGEABLE VEHICLE ACCIDENTS TO SHAW NOTIFICATION HOTLINE/HELPDESK
(PHONE: 1-866-299-3445)

ATTACHMENT 4

EQUIPMENT, PROPERTY DAMAGE AND GENERAL LIABILITY LOSS REPORT

This report is to be completed for all losses or damage to company property in excess of $2,500.00 and all third party damage, regardless of value, resulting from company activities.

PROJECT/LOCATION _____ PROJECT NO. _____ DATE _____

ADDRESS _____

HOW DID DAMAGE OR LOSS OCCUR: _____

_____

_____

DESCRIPTION AND VALUE ($) OF DAMAGED/LOST/STOLEN PROPERTY: _____

_____

LOCATION OF DAMAGED/LOST/STOLEN PROPERTY (Before Loss): _____

_____

DATE AND TIME OF DAMAGE, LOSS, OR THEFT: Date: _____ Time: _____

a.m./p.m.

OWNER OF DAMAGED/LOST/STOLEN PROPERTY:

Name _____ Phone No. (____) _____

Address _____ City _____

Employer and Address _____

INJURED PARTIES (Also complete a Supervisor's Employee Injury Report if a Company Employee):

Name _____ Phone No. (____) _____

Address _____ City _____

Employer and Address _____

Description of Injury _____

WITNESSES:

1. Name _____ Home Phone (____) _____
   Home Address _____ City _____
   Employer and Address _____
2. Name _____ Home Phone (____) _____
   Home Address _____ City _____
   Employer and Address _____

WERE PICTURES TAKEN? ☐ YES ☐ NO

WERE POLICE NOTIFIED? ☐ YES ☐ NO DEPT. _____ REPORT NO. _____

COMPLETED BY: _____ _____ _____

(Print) (Signature) (Date)

PROJECT/LOCATION MANAGER: : _____ _____ _____

(Print) (Signature) (Date)

REPORT MUST BE FAXED TO:
CORPORATE CLAIMS DEPARTMENT (FAX: 225-932-2636)
WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY

ATTACHMENT 5
INCIDENT INVESTIGATION REPORT

*** Must Be Completed Within 72 HOURS & Relevant Support Documentation Must Be Attached / Submitted***

Investigation Date _____ Date of Incident _____

Employee Name _____

Supervisor Name _____

Project Number/Name _____ / _____

Location of Incident _____

· Incident Classification

Injury	☐ First Aid	Vehicle	☐ Chargeable	DOT	☐ DOT Vehicle
	☐ OSHA Recordable		☐ Non-chargeable		☐ DOT Reportable
	☐ Lost Workday				
	☐ Restricted Workday	Near Miss	☐	General Liability	☐

· Description (Provide facts, describe how incident occurred, provide diagram [on back] or photos)

_____

_____

· Analysis (What unsafe acts or conditions contributed to the incident?)

_____

_____

_____

_____

· Corrective Action(s) (List corrective action items, responsible person, scheduled completion date)

_____

_____

_____

· Witness Names (Complete Attachment 6 – Employee Witness Statement)

_____

_____

_____

_____

Investigated By _____ (Print Name) _____ (Signature) _____ (Date)

Project/Location Mgr. _____ (Print Name) _____ (Signature) _____ (Date)

ATTACHMENT 6a
Injured Employee Statement
MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by the injured employee involved in the incident. Describe only the facts for which you have personal knowledge. If you have no knowledge of a particular question, write "no knowledge".

Company _____

Exact Location of Incident/Accident _____

Name of Injured Employee _____

Date of Incident/Accident _____ Time _____ am pm

Date of this Statement _____ Time _____ am pm

Time your shift begins? Time _____ am pm Time your shift ends? Time _____ am pm

Name of Known Witnesses:

Name _____

Name _____

Name _____

Name _____

Your Immediate Supervisors Name _____

If not employed by Shaw E&I, enter name of company and phone number _____

Have you had a prior injury similar to this injury? _____

Was it while you were at work? _____

What date did the prior injury occur? _____

Stating Only Factual Information, Describe in Detail What Happened and Include Any Applicable Events Leading to the Incident/Accident.

_____

_____

_____

_____

_____

_____

_____

_____

I certify that, to the best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

_____ _____

Signature/Date Print Name

ATTACHMENT 6b
Employee Witness Statement
MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by every employee working in the crew of the injured employee and by every other employee with knowledge of events or circumstances involved in the incident. This information is being solicited from you so that the company can accurately assess the reported incident to avoid similar occurrences in the future. Describe only the facts for which you have personal knowledge. If you have no knowledge of the incident, write "no knowledge".

Company _____

Exact Location of Incident/Accident _____

Name of Injured Employee _____

Date of Incident/Accident _____ Time _____ am pm

Date of this Statement _____ Time _____ am pm

Time your shift begins? Time _____ am pm Ends _____ am pm

Witness Information:

Name _____

Home Phone No. _____

Home Address _____

County _____ Zip _____

Witness' Supervisor Name _____

If not employed by Shaw E&I, enter name of company _____

Company Phone Number _____

Did You See the Incident/Accident? _____

How Far From You (approx., in feet) Did the Incident/Accident Occur? _____

Stating Only Factual Information, Describe in Detail What Happened and Include Any Applicable Events Leading to the Incident/Accident.

_____

_____

_____

_____

_____

_____

_____

_____

I certify that, to the best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

_____ _____

Witness Signature/Date Print Name

ATTACHMENT 7

ACCIDENT REVIEW BOARD

DATE:	LOCATION:
BOARD MEMBERS:	
ACCIDENT DATE:	EMPLOYEE(S) INVOLVED IN INCIDENT:
INVESTIGATION COMPLETE: YES ☐ NO ☐	ACCIDENT CLASSIFICATION:

THE FOLLOWING INFORMATION MUST BE PROVIDED BY THE REVIEW BOARD FOR THIS INCIDENT (PRINT):

SUPERVISOR: _____ **PROJECT/LOCATION MGR.:** _____

POTENTIAL CAUSE OF ACCIDENT:

ACTION BY BOARD*:

* ALL ACTIONS BY THE ACCIDENT REVIEW BOARD ARE SUBJECT TO FINAL REVIEW BY THE HUMAN RESOURCES AND LEGAL DEPARTMENTS.

ACCEPTED:

_____ (Employee Signature)

_____ (Supervisor Signature)

APPROVED:

_____ (Project/Location Manager)

REJECTED FOR:

_____

_____

APPROVED:

_____ (Business Line Health and Safety Manager or Designee)

REJECTED FOR:

_____

_____

APPROVED:

_____ (Business Line Vice President)

REJECTED FOR:

_____

_____

ATTACHMENT 8

INJURY/ILLNESS CLASSIFICATION GUIDELINES

First Aid Treatment – If the incident requires only the following types of treatment, consider it first aid. **Do Not** record the case if it involves only:

- Using non-prescription medications at non-prescription strength
- Administering tetanus immunizations
- Cleaning, flushing, or soaking wounds on the skin surface
- Using wound coverings such as bandages, Band-Aids™, gauze pads, etc., or using SteriStrips™ or butterfly bandages
- Using hot or cold therapy
- Using any totally non-rigid means of support, such as elastic bandages, wraps, non-rigid back belts, etc.
- Using temporary immobilization devices while transporting an accident victim (slings, neck collars, or back boards)
- Drilling a fingernail or toenail to relieve pressure, or draining fluids from blisters
- Using eye patches
- Using simple irrigation or a cotton swab to remove foreign bodies not embedded in or adhered to the eye
- Using irrigation, tweezers, cotton swab or other simple means to remove splinters or foreign material from areas other than the eye
- Using finger guards
- Using massages
- Drinking fluids to relieve heat stress

Medical Treatment – Includes managing and caring for a patient for the purpose of combating disease or disorder. The following are **not** considered medical treatments and are not recordable:

- Visits to a doctor or Licensed Health Care Professional (LHCP) solely for the purpose of observation or counseling
- Diagnostic procedures, including administering prescription medications that are used solely for diagnostic purposes
- Any procedure that can be labeled first aid (see above descriptions)

OSHA Recordable Injuries and Illnesses

Work related injuries and illnesses that result in the following should be recorded on the OSHA 300 Log:

- Death
- Loss of consciousness
- Days away from work
- Restricted work activity or job transfer
- Medical treatment beyond first aid.

You must also record any **work related** injury or illness that involves cancer, chronic irreversible disease, a fractured or cracked bone, or a punctured eardrum.

Additional Recordable Criteria

You must also record the following conditions when they are work related:

- Any needle stick injury or cut from a sharp object that is contaminated with another person's blood or other potentially infectious material
- Any case requiring an employee to be medically removed from a site under the requirements of an OSHA health standard
- Any Standard Threshold Shift (STS) in hearing (i.e., cases involving an average hearing loss of 10dB or more in either ear)
- Tuberculosis infection as evidenced by a positive skin test or diagnosis by a physician or other licensed health care professional after exposure to a known case of active tuberculosis.

ATTACHMENT 9B
MEDICAL FORMS

AUTHORIZATION FOR TREATMENT OF OCCUPATIONAL INJURY/ILLNESS

Employee Name: _____
Social Security #: _____ Injury: ☐ Illness: ☐
Job Title: _____ Incident Date: _____
Project/Location _____ Location of Accident/Exposure:
Telephone #: _____ _____
H&S Representative: _____
Body Part(s) Injured: _____
Describe in detail how incident occurred: _____
_____

TO TREATING PHYSICIAN:

In the case of occupational injury/illness, please examine the employee and render necessary conservative treatment directly related to the occupational injury/illness.

Light Duty Work:
It is the policy of our company to provide work assignments, whenever possible, for employees with physical activity restrictions resulting from an occupational injury/illness. If the employee will be subject to a restriction, please contact **Health Resources** before releasing the employee, so that a light duty assignment may be arranged.

Medically Unfit to Return to Work:
It is the policy of our company to assist employees unable to return to work, due to an injury/illness, in obtaining needed medical care and other available benefits. Medical findings are also used to help evaluate unsafe conditions that may have led to the incident. Please help us assist our employees by contacting **Health Resources** with your findings as soon as possible, preferably before the employee leaves your office, but not later than the close of business on the day of initial treatment.

Health Resources: Telephone: 1-800-350-4511 Fax: (800) 853-2641

Please Send Reports To Both of the Following: **Health Resources** 600 West Cummings Park, Suite 3400 Woburn, Massachusetts 01801 ***AND*** **The Shaw Group, Inc. Corporate Claims Department** 4171 Essen Lane Baton Rouge, LA 70809

Please Send Bills To: **The Shaw Group, Inc. Corporate Claims Department**
4171 Essen Lane
Baton Rouge, LA 70809

DOCTOR, Please provide:
Medical Diagnosis: _____
Treatment Provided: _____
_____
Recommended Work Limitation/Restriction: _____
Return Visit Needed: No ☐ Yes ☐ Date if Yes _____ First Aid Only ☐
Physician Name: _____ Physician Telephone: _____
Physician Signature: _____ Date: _____

YOU MUST CALL HEALTH RESOURCES FOR ALL OCCUPATIONAL INJURIES/ILLNESSES REQUIRING OUTSIDE MEDICAL TREATMENT: 1-800-350-4511.

FAX COMPLETED FORM TO HEALTH RESOURCES (800) 853-2641.

Send Bills to Shaw Corporate Claims Department

ATTACHMENT 9B
MEDICAL FORMS
AUTHORIZATION FOR RELEASE OF PROTECTED MEDICAL INFORMATION

Printed Name: _____ Date of Birth: _____

Address:_____

Social Security #:_____ Home Telephone:_____

Authority to Release Protected Health Information

I hereby authorize the release of medical information, identified in this authorization form, and provide such information to:

HEALTH RESOURCES
600 West Cummings Park, Suite 3400
Woburn, Massachusetts 01801
Phone: (800) 350-4511
Fax: (800) 853-2641

AND

The Shaw Group Inc.
4171 Essen Lane
Baton Rouge, Louisiana 70809
Phone: 225-932-2500
Fax: 225-932-2636

The Information To Be Released includes the following:

Complete health record	Discharge summary	Progress notes
History and physical exam	Consultation reports	X-ray films / images
Laboratory test results	X-ray & Image reports	Itemized bill
Diagnosis & treatment codes	Complete billing record	

Other, (specify)_____

Purpose of the Requested Disclosure of Protected Health Information

I am authorizing the release of my Protected Health Information.

Drug and/or Alcohol Abuse, and/or Psychiatric, and/or HIV/AIDS Records Release

I understand if my medical or billing record contains information in reference to, psychiatric care, sexually transmitted disease, hepatitis B or C testing, previous drug and/or alcohol abuse and/or other sensitive information, I agree to its release. ***Check One:*** ☐ **Yes** ☐ **No**

I understand if my medical or billing record contains information in reference to HIV/AIDS (Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome) testing and/or treatment I agree to its release. ***Check One:*** ☐ **Yes** ☐ **No**

Right to Revoke Authorization

Except to the extent that action has already been taken in reliance on this authorization, the authorization may be revoked at any time by submitting a written notice to ***The Corporate Claims Dept.*** **at** ***The Shaw Group Inc., 4171 Essen Lane, Baton Rouge, Louisiana 70809***. Unless revoked, this authorization will expire at which time completion of treatment for the injury or illness has been accomplished.

Re-disclosure

I understand the information disclosed by this authorization may be subject to re-disclosure by the recipient and no longer be protected by the Health Insurance Portability and Accountability Act of 1996.

Signature of Patient or Personal Representative Who May Request Disclosure

I understand that I do not have to sign this authorization. However, if health care services are being provided to me for the purpose of providing information to a third-party (e.g. fitness-for-work test), I understand that services may be denied if I do not authorize the release of information related to such health care services to the third-party. I can inspect or copy the protected health information to be used or disclosed. **I hereby release and discharge _*The Shaw Group Inc* of any liability and the undersigned will hold *The Shaw Group Inc* harmless for complying with this Authorization.**

Signature: _____ Date: _____

Description of relationship if not patient: _____

ATTACHMENT 9C
MEDICAL FORMS

RETURN-TO-WORK EXAMINATION FORM

Exam Date: _____ / _____ / _____ **Employee Name:** _____

Birth Date: _____ / _____ / _____ **Social Security #:** _____ - _____ - _____

Job Title: _____ **Sex:** ❑ Male ❑ Female

Examining Provider: **Please complete this form and fax to Health Resources at (800) 853-2641. Please contact Health Resources at (800) 350-4511 to report status of employee post-treatment.**

DIAGNOSIS: _____

TREATMENT PLAN: _____

MEDICATIONS: _____

PHYSICAL THERAPY: _____

OTHER: _____

- ❑ May return to full duty work effective ___/___/
- ❑ May return to limited duty from ___/___/___ to ___/___/
- ❑ Unable to return to work from ___/___/___ to ___/___/

WORK LIMITATIONS:

- ❑ Restricted lifting/pushing/pulling: maximum weight in lbs: _____ (company limits all lifting to ≤ 60 lbs).
- ❑ Work only with right/left hand.
- ❑ Restricted repetitive motion right/left hand.
- ❑ Sitting job only.
- ❑ Restricted operation of moving equipment.
- ❑ Other: _____

FOLLOW-UP PLAN:

- ❑ Release from care.
- ❑ Schedule for follow-up appointment on ___/___/___.
  Time _____ AM/PM
- ❑ Referral to _____
  Appointment date ___/___/___ Time _____ AM/PM

Comments: _____

Examiner's Name (*print)*	Examiner's Signature	Date

ATTACHMENT 10

HELP DESK / HOTLINE NOTIFICATION GUIDELINES

Any incident, as defined in the bulleted items below, requires corporate notification **as soon as practical but not longer than one hour after occurrence**, via the Health and Safety Help Desk / Hotline. This requirement is a corporate wide directive and applies to all Shaw Group companies, not just Shaw E&I. As such, the responsibility for whom makes this notification has purposefully not been defined. This is due to the various types of projects in which The Shaw Group performs activities. Some projects may only consist of three technicians at a site; others may involve multiple levels of site management and consist of 200+ employees. Therefore, the intent is for the supervisory/management person to communicate the notification requirements to his/her employees and make the appropriate determination as to how the notification takes place.

Immediate Corporate Notification via Help Desk: 1-866-299-3445

- Illness and/or injury (doctors cases and above);
- Property damage (dollar amount greater than $2,500);
- Automobile accidents (All);
- Criminal activity (i.e. bomb threat, theft);
- Natural disaster (i.e. earthquakes, flood, storm damage, hurricanes);
- Explosion and/or fires (that results in property damage greater then $2,500 or result in injury);
- Environmental spills/releases (incidents that requires regulatory notification or have an offsite impact);
- Regulatory visit (i.e. OSHA, EPA, DEQ, MSHA, etc.);
- Fatalities

Note:

- Help Desk / Hotline notification is in addition to the requirement to inform Health Resources of all incidents requiring off-site medical attention by calling 1-800-350-4511. This call should be made **prior** to transporting the employee such that they can coordinate physicians' services prior to arrival of the employee to the medical facility.

- As stated above, the notification requirements are a corporate directive and apply to the entire Shaw Group. . Accordingly, Shaw E&I managers/supervisors should use sound judgment as it pertains to the two bulleted items that have been highlighted above. Although they may not be desired events, some Environmental spills/releases that occur may not be an uncommon situation at a particular site. In addition, there may be projects in which the EPA or some other regulatory agency visits on some normal frequency. Events such as these, which would typically be unusual at a construction or fabrication site, are not so unusual to some of our environmental projects. As such, a notification to the helpdesk would not be required.

PROCEDURE

Subject: **ACCIDENT PREVENTION PROGRAM: TIER 1, SR. MANAGEMENT, LEADERSHIP SAFETY ASSESSMENTS**

1.0 PURPOSE AND SUMMARY

This procedure establishes the requirement for our Senior Management staff to perform Leadership Safety Assessments (LSA's) of Shaw E&I project, laboratory and office locations. For this procedure, Tier 1 Senior Management is considered to be Business Line President's and their direct report staff. These assessments are an integral part of the overall accident prevention program by proactively identifying opportunities for safety improvement and demonstrating Senior Management's commitment to health and safety.

2.0 TABLE OF CONTENTS

3.0 PROCEDURE

Assessments and inspections of project, laboratory, and office locations by managers, supervisors, and the health and safety staff are critical factors in a comprehensive accident prevention program. Senior Management LSA's help demonstrate management's commitment to employee, subcontractor and client stakeholder safety and serve to assist in gauging the safety culture and value system of the company. Senior Management assessments are not designed to be as robust as the more technical and detail specific safety inspections performed by project management, safety officers, etc., however, they are critical to our continuous improvement process.

3.1 Safety Assessment Performance, Documentation and Responsibilities

Safety assessments are required by various tiers and functions of, and within, the management structure. The objective for Senior Management is for these leaders to visibly demonstrate their concern for safety by direct contact with employees while in the workplace. Each assessment is to be documented on the Leadership Safety Assessment report (see Attachment 3).

The primary responsibilities of the senior manager include but are not limited to:

- Interviewing employees with regard to health and safety issues and how they might be corrected. Sample questions are provided, but managers should refrain from having notes with them during interviews
- Observing and, if detected, correcting unsafe conditions and acts
- Reviewing relevant documents as well as verbally verifying that corrective actions have been assigned to a responsible site manager and implemented
- Reviewing the Safety Improvement Log to ensure progress is being made on correcting unsafe acts or conditions identified in other inspections

Positive safety observations and safety issues not specifically addressed in the safety inspection report can be documented on the last page of the report. Project / Site management will be given the information and data observed by the senior manager and they will be responsible to enter each unsafe act/condition and respective corrective action(s) on the Safety Improvement Log. In addition, the LSA will be forwarded to the Regional Safety Manager or Business Line Safety Director for recordkeeping and data collection purposes. See Attachment 2 for more detail on the proper routing of each inspection report.

3.2 Best Practices

Observations of superior safety practices that may be benchmarked at other projects, offices or laboratories should be documented on the last page of the appropriate safety inspection report.

3.3 Training

Tier 1 Senior Managers must complete Leadership Safety Assessment training to develop their inspection skills. Health and Safety representatives will provide this training as needed.

3.4 Joint Inspections

Tier 1 Senior Managers are encouraged to conduct safety inspections jointly with Health and Safety Managers and Directors.

3.5 Safety Improvement Log

Each project, office and laboratory will maintain a Safety Improvement Log (Attachment 6). The Safety Improvement Log is the central repository for all observations for safety improvements identified through any type of safety inspection. Project, Office and Laboratory Managers will **verify** that corrective actions listed in the Safety Improvement Log are completed in a timely manner and **validate** that the corrective action(s) taken is effective in preventing accidents.

3.6 Guidance Documents

Prior to conducting a safety inspection, inspectors should consult the Safety Observation Guidance Checklist (Attachment 4) and Management Safety Assessment Inquiry

Guidance (Attachment 5) which contains sample questions for supervisors and hourly employees for assistance in preparing for the inspection.

4.0 RESPONSIBILITY MATRIX

4.1 Procedure Responsibility

The Sr. Director of EH&S is responsible for the issuance, revision, and maintenance of this procedure.

4.2 Action/Approval Responsibilities

4.2.1 Tier 1 Senior Management

Each senior manager is required to conduct Leadership Safety Assessments (LSAs), at field projects, laboratories or offices at the minimum rate of one per quarter, to demonstrate their commitment to safety and reinforce the responsibilities of project management. For this procedure, Senior Management is considered to be Business Line President's and their direct reports to the Business Line. Findings during each Leadership Safety Assessment are to be brought to the attention of the project manager and/or Site Manager so that corrective action can be initiated. The Leadership Safety Assessment is documented on the Leadership Safety Assessment Report (Attachment 3).

4.2.2 Business Line EHS Director

The Business Line EHS Director will oversee the safety inspection process within the respective business lines, annually review the process for effectiveness, and review the content of safety inspection reports to identify trends. The Business Line Health and Safety Director will also ensure that the Business Line Health and Safety Administrator maintains metrics for the completion of each type of required safety inspection and index and compiles inspection data.

5.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

6.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances

7.0 ATTACHMENTS

1 Management Safety Inspections Responsibility Matrix
2 Management Safety Inspections Requirement Matrix
3 Leadership Safety Assessment Report.
4 Safety Observation Guidance Checklist
5 Safety Inspection Inquiry Guidance
6 Project/office/Laboratory Safety Improvement Log

ATTACHMENT 1

ACCIDENT PREVENTION PROGRAM: MANAGEMENT SAFETY INSPECTIONS RESPONSIBILITY MATRIX

Action	Procedure Section	*Responsible Party*					
		Business Line EH&S Director	**Senior Manage-ment**	**Project Manager/ Site Manager**	**Project Supervisor**	**Regional/ Site H&S Rep**	**Sr. Director of EH&S**
Issue, Revise, and Maintain Procedure	4.1						X
Conduct Leadership Safety Assessments	3.1 4.2.1		X				
Conduct Safety Inspections	3.1 4.2.1		X				
Give Completed Reports to Health and Safety Representative	3.1			X	X		
Review Reports and Forward to Health and Safety Manager	3.1					X	
Conduct Inspection Workshops	3.3					X	
Process Review, Trend Analysis and Maintenance of Performance Metrics	4.2.2	X					

ATTACHMENT 2

ACCIDENT PREVENTION PROGRAM: MANAGEMENT SAFETY INSPECTIONS REQUIREMENT MATRIX

Tier Level	Management Level	Form used	Frequency	Routing (1)
1	Tier 1 Senior Management	Leadership Safety Assessment Report HS-021a	One / quarter	BL H&S Director
2	Tier 2 Senior Management	Leadership Safety Assessment Report HS-021b	Two/quarter	BL H&S Director
3	Project Managers/ Site Managers	Project Manager/Site Manager Safety Inspection HS-021c	Two / Month	Direct Supervisor, Site Safety Officer (if applicable) and Regional H&S Manager
3	Office Managers	Office Safety Inspection Report HS-021c	Semi-annually	Direct Supervisor, Regional H&S Manager
3	Laboratory Managers	Laboratory Safety Inspection Report HS-021c	Semi-annually	Direct Supervisor, Regional H&S Manager
3	Project Supervisors	Project Safety Inspection Report HS-021c	Two / Month	Project Manager, Site Safety Officer (if applicable) and Regional H&S Manager
3	Health & Safety Managers/Representatives	Joint Inspections (with Senior Managers, Project/Site Managers, Office Managers, Lab Managers or Project Supervisors) HS-021c	Three/quarter	As appropriate

(1) The BL H&S Director and Regional H&S Managers will forward a copy to the BL H&S Administrator for filing and metric tracking

ATTACHMENT 3
TIER 1 LEADERSHIP SAFETY ASSESSMENT REPORT

Click here to access the on-line form

Environmental Shaw Health & Safety

Shaw

Tier 1 Leadership Safety Assessment Report

Assessor(s):	Location Name:	Location Manager:
Location Type: Select...		Project Number (if applicable):
Category: ○ Federal ○ Op's ○ CSLE Select...	H&S Manager: Select...	Assessment Date:

Safety and Health Issues to be Verified (All Locations - Projects, Facilities, Offices, etc.)	Yes	No	NA
1. Are newly hired personnel and subcontractors completing the site specific New Employee Orientation? Explanation:	○	○	○
2. Are vehicles used in accordance with HS800 Motor Vehicle Policy? Explanation:	○	○	○
3. Has the Safety Plan (HASP, APP, or Office/Facility Emergency Action Plan) been developed, revised, and signed by all Shaw employees and subcontractor employees with H&S management concurrence within the last year? Explanation:	○	○	○
4. Does the location have a safety council or are they a part of a regional safety council? Explanation:	○	○	○
5. Do personnel possess updated *Employee Authorization to Stop Work* cards (Jim Bernhard signature)? Explanation:	○	○	○
6. Is there a written Safety Incentive Award Program in place? Explanation:	○	○	○
7. Is housekeeping up to standards and does location appear to be professionally operated? Explanation:	○	○	○
8. Does the location have any radiological components? If yes, have the appropriate radiological personnel been involved in plan/procedure development and execution? Explanation:	○	○	○

Safety and Health Issues to be Verified (All Locations - Projects, Facilities, Offices, etc.)	Yes	No	NA
9. Are Job Safety Analyses being performed? Remember to personally review at least one JSA during assessment. Explanation:	○	○	○
10. Is the project using any additional innovative safety practices? Explanation:	○	○	○

List any other safety deficiencies/comments observed below:

Description of Deficiency or Comment	Recommended Action to Correct Deficiency or Recommended Action	Site Person Responsible for Correcting Deficiency or Action	Projected Deficiency Resolution Date

List any positive observations below:

1.
2.
3.
4.
5.

Document employee interview below:

Safety Issue:

1.
2.
3.
4.
5.

Corrective Action:

1.
2.
3.
4.
5.

Click here to access the on-line form

ATTACHMENT 4

SAFETY OBSERVATION GUIDANCE CHECKLIST

(Use as a guidance tool, review before going out to the field to do your safety assessment

CATEGORY A

Personal Protective Equipment

____ Eyes and Face
____ Ears
____ Head
____ Hands and Arms
____ Feet and Legs
____ Respiratory System
____ Trunk

CATEGORY B

Positions of People

____ Striking Against
____ Struck By
____ Caught Between
____ Falling
____ Temperature Extremes
____ Electrical Current
____ Inhaling
____ Absorbing

CATEGORY C

Reactions of People

____ Adjusting Personal Protective Equipment
____ Changing Position
____ Rearranging Job
____ Stopping Job
____ Attaching Grounds
____ Hiding, Dodging
____ Changing Tools

CATEGORY D

Tools and Equipment

____ Right for Job?
____ Used Correctly
____ In Safe Condition?
____ Seat Belts in Use?
____ Barricades or Warning Lights
____ Chocks/Restraints Properly Used?

CATEGORY E

Procedures

____ Is Standard Practice Adequate for Job?
____ Is Standard Practice Established?
____ Is Standard Practice Being Maintained
____ Work Permit Proper?
____ Fire Watch Adequate?
____ Gas Test (if needed) Satisfactory?

CATEGORY F

Orderliness

____ Standards Established?
____ Standards Understood?
____ Obstruction in Passageways
____ Disorganized Tools, Materials
____ Obstructions by Stairs/Platforms

CATEGORY G

Physical Appearance Considerations

Deafness
Age
Size
Blisters
Cuts or Abrasions
Stiff Joints
Shortness of Breath
Glasses

CATEGORY H

Clothing

____ Loose Clothing?
____ Watches, Rings, and Chains?
____ Lose Shoelaces?
____ Safety Shoes?
____ Loose Shoe Soles or Heels?
____ Glasses? (Broken or Missing Parts)

CATEGORY I

Performance

____ Unsafe Acts
____ Job Knowledge
____ Initiative (Interest)
____ Following Standard Practice
____ Quality of Workmanship

CATEGORY J

Attitude

____ Preoccupied?
____ Worried?
____ Angry?
____ Quick Tempered?
____ Cooperative?

ATTACHMENT 5

MANAGEMENT SAFETY ASSESSMENT INQUIRY GUIDANCE

Addressed to Supervisory Employees *(Do not ask all; select 4-5 that you believe apply most or you feel most comfortable asking)*

1) Which rules and procedures do your employees find difficult to follow? Why?

2) What do you think your employees think you expect of them?

3) Tell me about the safety program.

4) What changes have you seen in site safety in the past year or two?

5) What approach do you use to help your employees become more familiar with rules and procedures?

6) What are you doing to achieve accident-free performance?

7) What part of safety do you emphasize? How? Why?

8) What area, job, activity, or piece of equipment do you think needs safety attention? Why?

9) What assignments or jobs do you think your employees worry about most regarding safety? Why?

10) Why are rules and procedures violated?

11) What is the injury experience of your employees?

12) How do you measure your employees' safety performance?

13) What are your employees' safety needs?

14) What does your manager expect of you with respect to safety? How are these expectations communicated to you?

15) How often do you discuss safety with your manager? On what occasions?

16) Does your manager tell you what he or she thinks of your group's safety performance? Does your manager tell you what he or she thinks of your performance and contribution?

17) Does your manager inspection with you? How frequently? How do you benefit from this activity?

18) Can you use disciplinary measures to correct safety violations? Have you ever done so? When?

19) Do you give pre-job safety instructions? What do you say? Do you check to ensure compliance?

20) How much time do you spend in the site?

21) How often do you watch people work?

22) Do you ever try to anticipate the next injury? Where and how do you think it will occur?

MANAGEMENT SAFETY ASSESSMENT INQUIRY GUIDANCE

Addressed to Hourly Employees *(Do not ask all; select 4-5 that you believe apply most or you feel most comfortable asking)*

1) What has been the safety experience of this group?
2) What, if anything, needs additional safety attention?
3) What part of your job do you worry about most? Why?
4) What do you think your supervision expects of you regarding safety?
5) Why are rules and procedures violated?
6) Which rules and procedures do you find difficult to follow?
7) Which tools and/or equipment do you find difficult or hazardous to use? Why?
8) What areas of safety has supervision emphasized? How?
9) Who in the site do you think is really responsible for developing and maintaining good safety performance?
10) Tell me about the safety training you received for your job.
11) Have you ever short cut safety practices on your job? What caused you to take this action?
12) Do you ever contribute to developing safety measures, ideas, or rules and procedures?
13) Have you ever submitted a safety suggestion? Why? What were the results of your action?
14) How do you evaluate supervision's efforts in the safety program?
15) What aspect of the safety program do you like? Why?
16) If you were in charge of administering the safety program, what changes would you make? How? Why?
17) To whom do you go when you have a safety problem?
18) Where is the greatest potential for serious injury in your area?
19) What aspects of the operation are most likely to cause trouble?
20) Tell me about your safety meetings. Are they worthwhile? Are they opportunities for two-way communications?

ATTACHMENT 6

Project/Office/Lab Safety Improvement Log

Date Identified	Source (1)	Observation Description	Severity Level (2)	Corrective Action	Person Responsible	Projected Resolution Date	Date Corrected	Verified By (Initials)	Validation By (Initials)

(1) Source: Safety Observation (SO)
Project Safety Inspection Report (PSIR)
Project/Site Manager Safety Audit (PMSA)
Office Safety Inspection Report (OSIR)
Laboratory Safety Inspection Report (LSIR)
Leadership Safety Assessment (LSA)

(2) Severity Level: 1 OSHA / Regulatory Violation
2 Internal / Client Violation
3 Recommended / Best Practice

PROCEDURE

Subject: **ACCIDENT PREVENTION PROGRAM: TIER 2 MANAGEMENT SAFETY INSPECTIONS**

1.0 PURPOSE AND SUMMARY

This procedure establishes the requirement for management safety inspections of Shaw E&I project, laboratory and office locations. For this procedure, Tier 2 Senior Management is considered to be those managers above the level of Project Manager (PM) with operational responsibilities. Senior PM's with multiple projects are also considered as Tier 2. This would include Program Managers, Directors, and Department heads that are not direct reports to their respective Business Line President.

These inspections are an integral part of the overall accident prevention program by proactively identifying opportunities for safety improvement and demonstrating management's commitment to health and safety.

2.0 TABLE OF CONTENTS

3.0 PROCEDURE

Regular inspections of project, laboratory and office locations by managers, supervisors, and the health and safety staff are critical factors in a comprehensive accident prevention program. Management safety inspections help demonstrate management's commitment to safety and verify that proper work practices are in use. These inspections are also used to verify the existence of safe work conditions and regulatory compliance. All employees are afforded the opportunity to participate in the inspection via the safety interview process.

3.1 Safety Inspection Types, Documentation and Responsibilities

Safety inspections are required by various tiers and functions of, and within, the management structure. The objective is for managers to visibly demonstrate their concern for safety by direct contact with employees while in the workplace. Each

inspection is to be documented on the appropriate safety inspection report (see Attachment 3). Tier 1 Management Safety Assessments are covered under HS021.a.

The primary responsibilities of the inspector include:

- Interviewing employees with regard to health and safety issues and how they might be corrected. Sample questions are provided, but inspectors should not have notes with them during interviews
- Observing and correcting unsafe conditions and acts
- Verifying that corrective actions have been assigned to a responsible employee and implemented
- Reviewing the Safety Improvement Log to ensure progress is being made on correcting unsafe acts or conditions identified in other inspections

Positive safety observations and safety issues not specifically addressed in the safety inspection report can be documented on the last page of the report. A list of all corrective action items will be maintained showing the corrective action, responsible person, and the date action is to be completed. Project management will enter each unsafe act/condition and respective corrective action(s) on the Safety Improvement Log. Completed inspection reports are given to the project/office health and safety representative for initial review. A copy of the completed report will then be forwarded to the respective business line manager and business line health and safety manager for further review and tracking. See Attachment 2 for more detail on the proper routing of each inspection report.

3.2 Best Practices

Observations of superior safety practices that may be benchmarked at other projects, offices or laboratories should be documented on the last page of the appropriate safety inspection report.

3.3 Training

Senior Managers must complete Leadership Safety Assessment training to develop their inspection skills. Health and Safety representatives will provide this training as needed.

3.4 Joint Inspections

Managers are encouraged to conduct safety inspections jointly with EH&S Managers and Directors.

3.5 Safety Improvement Log

Each project, office and laboratory will maintain a Safety Improvement Log (Attachment 6). The Safety Improvement Log is the central repository for all observations for safety improvements identified through any type of safety inspection. Project, Office and Laboratory Managers will **verify** that corrective actions listed in the Safety Improvement Log are completed in a timely manner and **validate** that the corrective action(s) taken is effective in preventing accidents.

3.6 Guidance Documents

Prior to conducting a safety inspection, inspectors should consult the Safety Observation Guidance Checklist (Attachment 4) and Management Safety Assessment Inquiry Guidance (Attachment 5) which contains sample questions for supervisors and hourly employees for assistance in preparing for the inspection.

4.0 RESPONSIBILITY MATRIX

4.1 Procedure Responsibility

The Sr. Director of EH&S is responsible for the issuance, revision, and maintenance of this procedure.

4.2 Action/Approval Responsibilities

4.2.1 Tier 2 Senior Management

Each tier 2 senior manager is required to conduct Leadership Safety Assessments (LSAs), at field projects, laboratories or offices at the minimum rate of two per quarter, to demonstrate their commitment to safety and reinforce the responsibilities of project management. For this procedure, Tier 2 Senior Management is considered to be those managers above the level of Project Manager (PM) with operational responsibilities. Senior PM's with multiple projects are also considered as Tier 2. This would include Program Managers, Directors, and Department heads that are not direct reports to their respective Business Line President.

Findings during each Leadership Safety Assessment are to be brought to the attention of the project manager and/or Site Manager so that corrective action can be initiated. The Leadership Safety Assessment is documented on the Leadership Safety Assessment Report (Attachment 3).

4.2.2 Health and Safety Managers

Health and Safety Managers must conduct joint inspections of projects, offices or laboratories, within their respective jurisdictions, with the corresponding Senior Managers, Project/Site Managers, Office Managers, Laboratory Managers, or Project Supervisors at the rate of three per quarter. Health and Safety Managers will document the joint inspections by co-signing the appropriate report (Attachment 3). Additionally, Health and Safety Managers will review all other inspection reports done by managers in their respective jurisdictions and assess that Safety Improvement Logs at projects, offices and laboratories are maintained. Safety inspections must be completed and submitted as outlined in Attachment 2.

4.2.3 Business Line Health and Safety Director

The Business Line EH&S Director will oversee the safety inspection process within the respective business lines, annually review the process for effectiveness, and review the content of safety inspection reports to identify trends. The Business Line EH&S Director will also ensure that the Business Line Health and Safety Administrator maintains metrics for the completion of each type of required safety inspection and index and compiles inspection data.

5.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

6.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances

7.0 ATTACHMENTS

1. Management Safety Inspection Responsibility Matrix
2. Management Safety Inspection Requirement Matrix
3. TIER 2 Leadership Safety Assessment Report
4. Safety Observation Guidance Checklist
5. Management Safety Assessment Inquiry Guidance
6. Project/Office/Lab Safety Improvement Log

ATTACHMENT 1

ACCIDENT PREVENTION PROGRAM: MANAGEMENT SAFETY INSPECTIONS RESPONSIBILITY MATRIX

Action	Procedure Section	*Responsible Party*					
		Business Line EH&S Director	**Senior Manage-ment**	**Project Manager/ Site Manager**	**Project Supervisor**	**Regional/ Site H&S Rep**	**Sr. Director of EH&S**
Issue, Revise, and Maintain Procedure	3.1						X
Conduct Leadership Safety Assessments	4.1.1		X				
Conduct Safety Inspections	4.1.2 4.1.3 4.1.4			X	X		
Give Completed Reports to Health and Safety Representative	4.1.2 4.1.3 4.1.4			X	X		
Review Reports and Forward to Health and Safety Manager	4.1.5					X	
Conduct Inspection Workshops	4.2					X	
Process Review, Trend Analysis and Maintenance of Performance Metrics	4.1.9	X					

ATTACHMENT 2

ACCIDENT PREVENTION PROGRAM: MANAGEMENT SAFETY INSPECTIONS REQUIREMENT MATRIX

Tier Level	Management Level	Form used	Frequency	Routing (1)
1	Tier 1 Senior Management	Leadership Safety Assessment Report HS-021A	One / quarter	BL EH&S Director
2	Tier 2 Senior Management	Leadership Safety Assessment Report HS-021B	Two/quarter	BL EH&S Director
3	Project Managers/ Site Managers	Project Manager/Site Manager Safety Inspection HS-021C	Two / Month	Direct Supervisor, Site Safety Officer (if applicable) and Regional H&S Manager
3	Office Managers	Office Safety Inspection Report HS-021C	Semi-annually	Direct Supervisor, Regional H&S Manager
3	Laboratory Managers	Laboratory Safety Inspection Report HS-021C	Semi-annually	Direct Supervisor, Regional H&S Manager
3	Project Supervisors	Project Safety Inspection Report HS-021C	Two / Month	Project Manager, Site Safety Officer (if applicable) and Regional H&S Manager
3	Health & Safety Managers/Representatives	Joint Inspections (with Senior Managers, Project/Site Managers, Office Managers, Lab Managers or Project Supervisors) HS-021C	Three/quarter	As appropriate

(1) The BL EH&S Director and Regional H&S Managers will forward a copy to the BL H&S Administrator for filing and metric tracking

ATTACHMENT 3

Click here to access on-line form

Environmental Shaw Health & Safety

Shaw

Tier 2 Leadership Safety Assessment Report

Location Type:	Location Name:	Location Manager:
Select...		
Assessor:	**Office Director/Facility Manager:**	**Project Number:**
H&S Manager:	**Project Manager:**	**Assessment Date:**
Select...		

Category:
- Federal
- Op's
- CSLE

Select...

Safety and Health Issues to be Verified (All Locations - Projects, Facilities, Offices, etc.)	Does Not Meet	Partially Meets	Meets	N/A
1. Are newly hired personnel completing the 37 minutes New Employee Safety Orientation? Explanation:	○	○	○	○
2. Does the location have access to a set of H&S policies and procedures applicable to their work location? (Electronic, Hardcopy, ShawNet). Explanation:	○	○	○	○
3. Is a Safety Plan (HASP, APP, or Office/Facility Emergency Action Plan) applicable to the location, developed and available? Explanation:	○	○	○	○
4. Has the Safety Plan (HASP, APP, or Office/Facility Emergency Action Plan) been reviewed and revised, with H&S management concurrence within the last year? Explanation:	○	○	○	○
5. Are personnel familiar with the location's emergency procedures? Explanation:	○	○	○	○
6. Is there a designated primary and alternate safety official, including each shift? Explanation:	○	○	○	○
7. Has a safety council been establish in accordance with HS018 and/or BL specific guidance conducted at facility/office locations? Explanation:	○	○	○	○

Safety and Health Issues to be Verified (All Locations - Projects, Facilities, Offices, etc.)	Does Not Meet	Partially Meets	Meets	N/A
8. Do personnel possess updated *Employee Authorization to Stop Work* cards (Jim Bernhard signature)? Explanation:	○	○	○	○
9. Is there a written and approved Safety Incentive Award Program in place? Explanation:	○	○	○	○
10. Has the team received any internal/external safety awards or other client recognition? Explanation:	○	○	○	○
11. Has a Health Resources occupational medicine clinic been identified and audited to ensure that the clinic truly understands occupational care? Explanation:	○	○	○	○
12. Is a suitable first aid kit with personnel trained in first aid/CPR available? Explanation:	○	○	○	○
13. Is there a safety bulletin board and is it consistent with the current operation, in clear view of employees; and protected against the elements and unauthorized removals? Explanation:	○	○	○	○
14. Has the location had any previous H&S assessments by senior level management (if so, how recent)? Explanation:	○	○	○	○
15. Are Management Safety Inspections performed in accordance with HS021 or equivalent? Explanation:	○	○	○	○
16. Are the safety and health deficiencies identified entered on the safety improvement log and corrected or addressed promptly? Explanation:	○	○	○	○
17. Is housekeeping up to standards and does location appear to be professionally operated? Explanation:	○	○	○	○
18. Do Shaw-provided vehicles appear to be managed in a professional manner and are vehicles being used in accordance with HS 800? Explanation:	○	○	○	○
19. Does the location have any radiological components? If yes, have the appropriate radiological personnel been involved in plan/procedure development and execution? Explanation:	○	○	○	○
20. Has equipment-related, task-related, and hazard communication training been conducted and documented? Explanation:	○	○	○	○

Safety and Health Issues to be Verified (All Locations - Projects, Facilities, Offices, etc.)	Does Not Meet	Partially Meets	Meets	N/A
21. Have planned inspections (supervisor site safety, laboratory, eye wash, fire extinguishers, SCBA, heavy equipment, etc.) and emergency drills been conducted at required frequencies? Explanation:	○	○	○	○
22. In accordance with projects following HAZWOPER regulations, does the project have all training and medical documentation for subcontractors and Shaw personnel? Explanation:	○	○	○	○
23. Have all subcontractors had their qualifications reviewed and approved by health and safety? Explanation:	○	○	○	○
24. Have all equipment and personnel incidents been properly reported and investigated and have Accident Review Boards been held as required? Explanation:	○	○	○	○
25. Are Near Misses being reported? Explanation:	○	○	○	○

	Poor	Average	Excellent
26. What was the general workforce's attitude and ownership of the site safety culture? Explanation:	○	○	○
27. What was the overall impression of the site management team's commitment to safety? Explanation:	○	○	○

Safety and Health Issues to be Verified (Project Locations Only)	Does Not Meet	Partially Meets	Meets	N/A
28. Have Shaw personnel and subcontractor personnel attended a site specific safety orientation and signed the HASP or APP Acknowledgement form? Explanation:	○	○	○	○
29. Is a Tailgate Safety Meeting being conducted and properly documented before each shift? Explanation:	○	○	○	○

Safety and Health Issues to be Verified (Project Locations Only)	Does Not Meet	Partially Meets	Meets	N/A
30. Are Job Safety Analyses/Activity Hazard Analyses being performed as specified in HS045, for current activities (or equivalent for JV-LLC)? Explanation:	○	○	○	○
31. Do the Site Supervisor and SSHO perform daily safety inspections with proper documentation? Explanation:	○	○	○	○
32. Are the safety and health deficiencies identified in the inspections corrected or addressed promptly? Explanation:	○	○	○	○
33. Is the project using any additional innovative safety practices? Explanation:	○	○	○	○
34. Has the project implemented a Safety Observation Program? Explanation:	○	○	○	○

List any other safety deficiencies/comments observed below:

Description of Deficiency or Comment	Recommended Action to Correct Deficiency or Recommended Action	Person Responsible for Correcting Deficiency or Action	Projected Deficiency Resolution Date

List any positive observations below:

1.
2.
3.
4.
5.

Document employee interview below:

Safety Issue:

1.
2.
3.
4.
5.

Corrective Action:

1.
2.
3.
4.
5.

Click here to access on-line form

ATTACHMENT 4

SAFETY OBSERVATION GUIDANCE CHECKLIST

(Use as a guidance tool, review before going out to the field to do your safety assessment

CATEGORY A

Personal Protective Equipment

____ Eyes and Face
____ Ears
____ Head
____ Hands and Arms
____ Feet and Legs
____ Respiratory System
____ Trunk

CATEGORY B

Positions of People

____ Striking Against
____ Struck By
____ Caught Between
____ Falling
____ Temperature Extremes
____ Electrical Current
____ Inhaling
____ Absorbing

CATEGORY C

Reactions of People

____ Adjusting Personal Protective Equipment
____ Changing Position
____ Rearranging Job
____ Stopping Job
____ Attaching Grounds
____ Hiding, Dodging
____ Changing Tools

CATEGORY D

Tools and Equipment

____ Right for Job?
____ Used Correctly
____ In Safe Condition?
____ Seat Belts in Use?
____ Barricades or Warning Lights
____ Chocks/Restraints Properly Used?

CATEGORY E

Procedures

____ Is Standard Practice Adequate for Job?
____ Is Standard Practice Established?
____ Is Standard Practice Being Maintained
____ Work Permit Proper?
____ Fire Watch Adequate?
____ Gas Test (if needed) Satisfactory?

CATEGORY F

Orderliness

____ Standards Established?
____ Standards Understood?
____ Obstruction in Passageways
____ Disorganized Tools, Materials
____ Obstructions by Stairs/Platforms

CATEGORY G

Physical Appearance Considerations

Deafness
Age
Size
Blisters
Cuts or Abrasions
Stiff Joints
Shortness of Breath
Glasses

CATEGORY H

Clothing

____ Loose Clothing?
____ Watches, Rings, and Chains?
____ Lose Shoelaces?
____ Safety Shoes?
____ Loose Shoe Soles or Heels?
____ Glasses? (Broken or Missing Parts)

CATEGORY I

Performance

____ Unsafe Acts
____ Job Knowledge
____ Initiative (Interest)
____ Following Standard Practice
____ Quality of Workmanship

CATEGORY J

Attitude

____ Preoccupied?
____ Worried?
____ Angry?
____ Quick Tempered?
____ Cooperative?

ATTACHMENT 5

MANAGEMENT SAFETY ASSESSMENT INQUIRY GUIDANCE

Addressed to Supervisory Employees *(Do not ask all; select 4-5 that you believe apply most or you feel most comfortable asking)*

1) Which rules and procedures do your employees find difficult to follow? Why?

2) What do you think your employees think you expect of them?

3) Tell me about the safety program.

4) What changes have you seen in site safety in the past year or two?

5) What approach do you use to help your employees become more familiar with rules and procedures?

6) What are you doing to achieve accident-free performance?

7) What part of safety do you emphasize? How? Why?

8) What area, job, activity, or piece of equipment do you think needs safety attention? Why?

9) What assignments or jobs do you think your employees worry about most regarding safety? Why?

10) Why are rules and procedures violated?

11) What is the injury experience of your employees?

12) How do you measure your employees' safety performance?

13) What are your employees' safety needs?

14) What does your manager expect of you with respect to safety? How are these expectations communicated to you?

15) How often do you discuss safety with your manager? On what occasions?

16) Does your manager tell you what he or she thinks of your group's safety performance? Does your manager tell you what he or she thinks of your performance and contribution?

17) Does your manager inspection with you? How frequently? How do you benefit from this activity?

18) Can you use disciplinary measures to correct safety violations? Have you ever done so? When?

19) Do you give pre-job safety instructions? What do you say? Do you check to ensure compliance?

20) How much time do you spend in the site?

21) How often do you watch people work?

22) Do you ever try to anticipate the next injury? Where and how do you think it will occur?

MANAGEMENT SAFETY ASSESSMENT INQUIRY GUIDANCE

Addressed to Hourly Employees *(Do not ask all; select 4-5 that you believe apply most or you feel most comfortable asking)*

1) What has been the safety experience of this group?
2) What, if anything, needs additional safety attention?
3) What part of your job do you worry about most? Why?
4) What do you think your supervision expects of you regarding safety?
5) Why are rules and procedures violated?
6) Which rules and procedures do you find difficult to follow?
7) Which tools and/or equipment do you find difficult or hazardous to use? Why?
8) What areas of safety has supervision emphasized? How?
9) Who in the site do you think is really responsible for developing and maintaining good safety performance?
10) Tell me about the safety training you received for your job.
11) Have you ever short cut safety practices on your job? What caused you to take this action?
12) Do you ever contribute to developing safety measures, ideas, or rules and procedures?
13) Have you ever submitted a safety suggestion? Why? What were the results of your action?
14) How do you evaluate supervision's efforts in the safety program?
15) What aspect of the safety program do you like? Why?
16) If you were in charge of administering the safety program, what changes would you make? How? Why?
17) To whom do you go when you have a safety problem?
18) Where is the greatest potential for serious injury in your area?
19) What aspects of the operation are most likely to cause trouble?
20) Tell me about your safety meetings. Are they worthwhile? Are they opportunities for two-way communications?

ATTACHMENT 6

Project/Office/Lab Safety Improvement Log

Date Identified	Source (1)	Observation Description	Severity Level (2)	Corrective Action	Person Responsible	Projected Resolution Date	Date Corrected	Verified By (Initials)	Validation By (Initials)

(1) Source: Safety Observation (SO)
Project Safety Inspection Report (PSIR)
Project/Site Manager Safety Audit (PMSA)
Office Safety Inspection Report (OSIR)
Laboratory Safety Inspection Report (LSIR)
Leadership Safety Assessment (LSA)

(2) Severity Level: 1 OSHA / Regulatory Violation
2 Internal / Client Violation
3 Recommended / Best Practice

PROCEDURE

Subject: **ACCIDENT PREVENTION PROGRAM: MANAGEMENT SAFETY INSPECTIONS**

1.0 PURPOSE AND SUMMARY

This procedure establishes the requirement for management safety inspections of project and office locations. These inspections are an integral part of the overall accident prevention program and help to demonstrate management's commitment to safety. Key requirements of this procedure include:

- Project managers are required to conduct one inspection per month and ensure that at least one other inspection is conducted during the month;
- Office managers are required to conduct an office safety inspection once every six months.
- Laboratory managers are required to conduct a laboratory safety inspection every six months or more frequent as new processes or chemicals are introduced to the laboratory.
- Completed inspection reports are given to the project/office health and safety representative for review. A copy of the completed report will then be forwarded to the respective business line health and safety manager.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Sr.Director of EH&S is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 TEXT

Inspections of project, laboratory, and office locations by managers, supervisors, and the health and safety staff are critical factors in a comprehensive accident prevention program. Management safety inspections help demonstrate management's commitment to safety and verify that proper work practices are in use. These inspections are also used to verify the existence of safe work conditions and regulatory compliance. All employees are afforded the opportunity to participate in the inspection via the safety interview process.

4.1 Safety Inspections and Documentation

Safety inspections are required by various tiers and functions of, and within, the management structure. The objective is for operation managers to visibly demonstrate their concern for safety by direct contact with employees while in the workplace. Each inspection is to be documented on the appropriate Safety Inspection Report (Attachments 3,4 or 5).

The primary responsibilities of the inspector include but are not limited to:

- Interviewing employees with regard to health and safety issues and how they might be corrected;
- Observing and correcting unsafe conditions and acts; and
- Verifying that corrective actions have been assigned to a responsible employee and implemented.

Positive safety observations and safety issues not specifically addressed in the Safety Inspection Report can be documented on the last page of the report. A list of all corrective action items will be maintained showing the corrective action, responsible person, and the date action is to be completed. Completed reports are to be given to the project/office health and safety representative, then forwarded to the respective business line health and safety manager. See Attachment 2 for more detail on the proper routing of each inspection report.

4.2 Best Practices

Observations of superior safety practices that may be benchmarked at other projects, offices or laboratories should be documented on the last page of the appropriate safety inspection report.

4.3 Joint Inspections

Managers are encouraged to conduct safety inspections jointly with EH&S personnel.

4.4 Safety Improvement Log

Each project, office and laboratory will maintain a Safety Improvement Log (Attachment 6). The Safety Improvement Log is the central repository for all observations for safety improvements identified through any type of safety inspection. Project, Office and Laboratory Managers will **verify** that corrective actions listed in the Safety Improvement Log are completed in a timely manner and **validate** that the corrective action(s) taken is effective in preventing accidents.

4.5 Management Site Visits

Each senior manager is encouraged to make an informal safety inspection and review previously conducted inspection reports, during each site visit, to demonstrate their commitment to safety and reinforce the responsibilities of project management. Findings during this informal inspection are to be brought to the attention of the project manager so that corrective action can be initiated.

4.5.1 Project Managers

All project managers are required to complete at least one safety inspection per month and ensure that at least one other safety inspection per month is conducted. In the event that the project manager is not present at the project site during the month, this responsibility may be delegated to the project supervisor.

4.5.2 Office Managers

Office managers are required to conduct an office safety inspection once every six months. Managers are encouraged to conduct more frequent inspections if the office location is being remodeled or if new space is being occupied that was not previously inspected.

4.5.3 Laboratory Managers

Laboratory managers are required to conduct a laboratory safety inspection once every six months or more frequent if new test chemicals, sample types, equipment or instrumentation have been introduced that pose a greater risk.

4.5.4 Project Supervisors

Project supervisors are expected to inspect their projects monthly and ensure that corrective actions are implemented. Dependent upon project manager participation, project supervisors may also be required to conduct an additional monthly inspection. The requirement to conduct these inspections cannot be delegated.

4.5.5 Health and Safety Representative

Health and safety representatives must continually observe activities and correct unsafe acts/conditions as soon as reasonably possible. They are also required to review each Safety Inspection Report completed at their location to ensure that corrective actions are implemented. Once this review is complete, they will forward the reports to the appropriate business line health and safety manager.

4.6 Workshops

Health and safety representatives will present workshops and/or conduct joint inspections to help managers and supervisors develop their inspection skills.

5.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

6.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances

7.0 ATTACHMENTS

1 Management Safety Inspection Responsibility Matrix
2 Management Safety Inspection Requirement Matrix
3 Project Safety Inspection Report
4 Office Safety Inspection Report
5 Laboratory Inspection Report
6 Safety Improvement Log

ATTACHMENT 1

ACCIDENT PREVENTION PROGRAM: MANAGEMENT SAFETY INSPECTIONS RESPONSIBILITY MATRIX

Action	Procedure Section	*Responsible Party*				
		Senior Managers	**Project/ Office Manager**	**Project Supervisors**	**Health and Safety Representative**	**Sr. Director of EH&S**
Issue, Revise, and Maintain Procedure	3.1					X
Conduct Informal Safety Inspections and Review Previously Completed Reports	4.1.1	X				
Conduct Safety Inspections	4.1.2 4.1.3 4.1.4		X	X		
Give Completed Reports to Health and Safety Representative	4.1.2 4.1.3 4.1.4		X	X		
Review Reports and Forward to Health and Safety Manager	4.1.5				X	
Conduct Inspection Workshops	4.2				X	

ATTACHMENT 2

ACCIDENT PREVENTION PROGRAM: MANAGEMENT SAFETY INSPECTIONS REQUIREMENT MATRIX

Tier Level	Management Level	Form used	Frequency	Routing (1)
1	Tier 1 Senior Management	Leadership Safety Assessment Report HS-021A	One / quarter	BL EH&S Director
2	Tier 2 Senior Management	Leadership Safety Assessment Report HS-021B	Two/quarter	BL EH&S Director
3	Project Managers/ Site Managers	Project Manager/Site Manager Safety Inspection HS-021C	Two / Month	Direct Supervisor, Site Safety Officer (if applicable) and Regional H&S Manager
3	Office Managers	Office Safety Inspection Report HS-021C	Semi-annually	Direct Supervisor, Regional H&S Manager
3	Laboratory Managers	Laboratory Safety Inspection Report HS-021C	Semi-annually	Direct Supervisor, Regional H&S Manager
3	Project Supervisors	Project Safety Inspection Report HS-021C	Two / Month	Project Manager, Site Safety Officer (if applicable) and Regional H&S Manager
3	Health & Safety Managers/Rep -resentatives	Joint Inspections (with Senior Managers, Project/Site Managers, Office Managers, Lab Managers or Project Supervisors) HS-021C	Three/quarter	As appropriate

(1) The BL H&S Director and Regional H&S Managers will forward a copy to the BL H&S Administrator for filing and metric tracking

ATTACHMENT 3

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ **DATE** _____

BUSINESS LINE: _____ PROJECT NAME/NUMBER:
PROGRAM MANAGER: _____ PROJECT MANAGER:
GENERAL PROJECT DESCRIPTION:
SITE ACTIVITIES AT TIME OF INSPECTION:

INTERVIEWED EMPLOYEE:
SAFETY ISSUE:
CORRECTIVE ACTION:

ASSIGNED TO: _____ FOLLOW-UP DATE:
CORRECTION VERIFIED BY: _____ DATE:

INTERVIEWED EMPLOYEE:
SAFETY ISSUE:
CORRECTIVE ACTION:

ASSIGNED TO: _____ FOLLOW-UP DATE:
CORRECTION VERIFIED BY: _____ DATE:

INSPECTION COMPLETED BY: _____ DATE:

HEALTH AND SAFETY REVIEW BY: _____ DATE:

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ **DATE** _____

	YES	NO	N/A
FIRST AID			
1. Are first aid kit locations identified and accessible?			
2. Are emergency eye wash/safety showers available and inspected monthly?			
3. Are first aid kits inspected weekly?			
4. Is a qualified first aid/CPR provider on site?			
PERSONAL PROTECTIVE EQUIPMENT			
1. Have levels of personnel protection been established?			
2. Are respirators decontaminated, inspected, and stored according to standard procedures?			
3. Have employees been fit-tested?			
4. Is defective personal protective equipment tagged and taken out of service?			
5. Does compressed breathing air meet CGA Grade "D" minimum?			
6. Are there sufficient sizes and quantities of protective equipment?			
7. At a minimum, are employees utilizing safety glasses, hard hats, and steel toe boots?			
FIRE PREVENTION			
1. Are employees smoking only in designated outdoor areas?			
2. Are fire lanes established and maintained?			
3. Are flammable liquid dispensing systems bonded?			
4. Are approved safety cans available for storage of flammable liquids?			
5. Has the local fire department been contacted?			
6. Are fire extinguishers available and inspected monthly?			
7. Are flammables and combustibles properly stored?			
8. Are flammable storage cabinets available and used when needed?			
AIR MONITORING			
1. Is required air monitoring being conducted?			
2. Are air monitoring instruments calibrated daily?			
3. Are air monitoring logs up to date?			
4. Are instrument user manuals available?			
5. Are instruments being maintained?			
6. Are employees notified of personal sampling results within 5 days of receipt?			
WELDING AND CUTTING			
1. Are fire extinguishers present at welding and cutting operations?			
2. Are confined spaces evaluated prior to and during cutting and welding operations?			
3. Have Hot Work Permits been completed?			
4. Are proper helmets, goggles, aprons, and gloves available for welding and cutting operations?			
5. Are welding machines properly grounded?			
6. Are oxygen and fuel gas cylinders stored a minimum of 20 feet apart?			
7. Are only trained personnel permitted to operate welding and cutting equipment?			
8. Are gas cylinders transported in a secured vertical position with caps in place?			
HAND AND POWER TOOLS			
1. Are defective hand and power tools tagged and taken out of service?			
2. Is eye protection available and used when operating power tools?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ **DATE** _____

	YES	NO	N/A
3. Are guards and safety devices in place on power tools?			
4. Are power tools inspected before each use?			
5. Are nonsparking tools available when necessary?			
6. Is the correct tool being used for the job?			
MOTOR VEHICLES			
1. Are vehicles regularly inspected?			
2. Are personnel licensed for the vehicles they operate?			
3. Are unsafe vehicles tagged and reported to supervision?			
4. Is vehicles safety equipment operating properly?			
5. Are loads secure?			
6. Are vehicle occupants using safety belts?			
7. Are current insurance cards and blank accident report forms located in vehicles?			
EMERGENCY PLANS			
1. Are emergency telephone numbers posted?			
2. Have emergency escape routes been designated?			
3. Are employees familiar with the emergency signal?			
4. Has the emergency route to the hospital been established and posted?			
5. Is a vehicle on site that can transport injured employees to the hospital?			
MATERIALS HANDLING			
1. Are materials stacked and stored to prevent sliding or collapsing?			
2. Are tripping hazards identified?			
3. Are semi-trailers chocked?			
4. Are fixed jacks used under semi-trailers?			
5. Are riders prohibited on materials handling equipment?			
6. Are approved manlifts provided for the lifting of personnel?			
7. Are personnel in manlifts wearing approved fall protection devices?			
8. Are only qualified operators utilized i.e., forklift trained?			
FIRE PROTECTION			
1. Has a fire alarm system been established?			
2. Do employees know the location and use of all fire extinguishers?			
3. Are fire extinguisher locations posted?			
4. Are combustible materials segregated from open flames?			
5. Have fire extinguishers been professionally inspected during the last year?			
6. Are fire extinguishers visually inspected monthly?			
7. Has a fire drill occurred within the last 12 months?			
ELECTRICAL			
1. Is electrical equipment and wiring properly guarded and maintained in good condition?			
2. Are extension cords kept out of wet areas?			
3. Is damaged electrical equipment tagged and taken out of service?			
4. Have underground electrical lines been identified by proper authorities?			
5. Has a lockout/tagout system been established?			
6. Are GFCIs being used on all temporary electrical systems and as needed?			
7. Are extension cords being inspected daily (i.e., group pin in place, no			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ **DATE** _____

	YES	NO	N/A
unapproved splices)?			
8. Are warning signs exhibited on high voltage equipment (250V or greater)?			
9. Is adequate distance maintained from overhead electrical lines?			
10. Are switches, circuit breakers, and switchboards installed in wet locations enclosed in weatherproof enclosures?			
11. Are restricted or limited approach boundaries identified on electrical panels?			
12. Are authorized electricians trained in NFPA 70?			
13. Are only electrically rated tools being used for electrical work?			

CRANES AND RIGGING

1. Are cranes inspected daily prior to use?			
2. Are crane swing areas barricaded or demarked?			
3. Is all rigging equipment tagged with an identification number and rated capacity?			
4. Is rigging equipment inspection documented?			
5. Are slings, chains, and rigging inspected before each use?			
6. Are damaged slings, chains, and rigging tagged and taken out of service?			
7. Are slings padded or protected from sharp corners?			
8. Do employees keep clear of suspended loads?			
9. Are rated load capacities and special hazard warnings posted on crane?			
10. Are the records of annual crane inspection available?			
11. Has accessible areas within the swing radius of the rear of the crane been barricaded?			
12. Do crane operators have required training/certification?			

COMPRESSED GAS CYLINDERS

1. Are breathing air cylinders charged only to prescribed pressures?			
2. Are like cylinders segregated and stored in well ventilated areas?			
3. Is smoking prohibited in cylinder storage areas?			
4. Are cylinders stored secure and upright?			
5. Are cylinders protected from snow, rain, etc.?			
6. Are cylinder caps in place before cylinders are moved?			
7. Are fuel gas and oxygen cylinders stored a minimum of 20 feet apart?			
8. Are propane cylinders stored and used only outside of buildings?			

SCAFFOLDING

1. Is scaffolding placed on a flat, firm surface?			
2. Are scaffold planks free of mud, ice, grease, etc.?			
3. Is scaffolding inspected before each use?			
4. Are defective scaffold parts taken out of service?			
5. Have employees completed scaffold user training?			
6. On scaffolds where platforms are overlapped, is planking overlapped a minimum of 12 inches?			
7. Does scaffold planking extend over end supports between 6 to 18 inches (dependent upon platform length)?			
8. Are employees restricted from working on scaffolds during storms and high winds?			
9. Are all pins in place and wheels locked?			
10. Is required perimeter guarding (top rail, mid rail, and toe board) present?			
11. Has a competent person been designated to oversee scaffold construction?			
12. Are employees prohibited from moving mobile scaffold horizontally while employees are on them?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ **DATE** _____

	YES	NO	N/A
13. Are all scaffold components manufactured by the same company?			

WALKING AND WORKING SURFACES

1. Are ladders regularly inspected?			
2. Are access ways, stairways, ramps, and ladders clean of ice, mud, snow, or debris?			
3. Are ladders being used in a safe manner?			
4. Are ladders kept out of passageways, doors, or driveways?			
5. Are broken or damaged ladders tagged and taken out of service?			
6. Are metal ladders prohibited in electrical service?			
7. Are stairways and floor openings guarded?			
8. Are safety feet installed on straight and extension ladders?			
9. Is general housekeeping being maintained?			
10. Are ladders tied off?			
11. Are handrails and side rails installed along the unprotected sides of stairways having 4 or more risers or rising more than 30 inches?			

SITE SAFETY PLAN

1. Is a site safety plan available on site or accessible to all employees?			
2. Does the safety plan accurately reflect site conditions and tasks?			
3. Have potential hazards been described to employees on site?			
4. Is there a designated safety official on site?			
5. Have all employees signed the safety plan acknowledgment form?			

SITE POSTERS

1. Are the following posters displayed in a prominent and accessible area?			
A. Minimum Wage			
B. OSHA Job Protection			
C. Equal Employment Opportunity			
D. Family and Medical Leave			
E. Employee Polygraph Protection			
F. Uninformed Services Employment and Reemployment Rights Act			
G. Shaw Speak Up			
H. Shaw HR203 Harassment Policy			
I. Shaw Equal Employment Opportunity and Affirmative Action			
2. Are all required state-specific posters displayed?			

SITE CONTROL

1. Are work zones clearly marked?			
2. Are support trailers located to minimize exposure from a potential release?			
3. Are support trailers accessible for approach by emergency vehicles?			
4. Is the site properly secured during and after work hours?			
5. Is an exclusion zone sign-in/sign-out log maintained?			
6. Are only personnel with current training and physicals permitted in exclusion or contamination reduction zone?			

HEAVY EQUIPMENT

1. Is heavy equipment inspected as prescribed by the manufacturer?			
2. Is defective heavy equipment tagged and taken out of service?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ **DATE** _____

	YES	NO	N/A
3. Are project roads and structures inspected for load capacities and proper clearances?			
4. Is heavy equipment shut down for fueling and maintenance?			
5. Are backup alarms installed and working on mobile equipment?			
6. Have qualified equipment operators been designated?			
7. Are riders prohibited on heavy equipment?			
8. Are guards and safety appliances in place and used?			
9. Are operators using the "three point" system when mounting/dismounting equipment?			

EXCAVATION

1. Has a "competent person" been designated to oversee excavation activities?			
2. Prior to opening excavations, are utilities located and marked?			
3. Has a professional engineer evaluated all excavations greater than 20 feet deep?			
4. Is there rescue equipment on site and accessible to the excavation area?			
5. Is excavated material placed a minimum of 24 inches from the excavation?			
6. Are the sides of excavations sloped or shored to prevent cave ins?			
7. Have excavations greater than 4 feet deep been monitored for hazardous atmospheres (i.e., LEL/O_2 deficiency)?			
8. Are ladders or ramps used in excavations over 4 feet deep?			
9. Are means of egress available so as to require no more than 25 feet of lateral travel?			
10. Are barriers, i.e., guardrails or fences, placed around excavations near pedestrian or vehicle thoroughfares?			
11. Is excavation inspected daily by competent persons and documented?			

CONFINED SPACES

1. Have employees been trained in the hazards of confined spaces?			
2. Are confined space permits posted at entrance to confined space?			
3. Is a copy of the confined space entry procedure available?			
4. Has a rescue plan been established?			
5. Is an entry supervisor present at each permit-required entry?			
6. Are required extraction/fall protection devices being used?			

DECONTAMINATION

1. Are decontamination stations set up on site?			
2. Is decontamination water properly contained and disposed of?			
3. Are all pieces of equipment inspected for proper decontamination before leaving the site?			
4. Are shin/metatarsal guards being used during power washing activities?			

HAZARD COMMUNICATION

1. Is there a copy of the HAZCOM procedure on site?			
2. Are there MSDSs for required materials/chemicals present on site?			
3. Are all containers properly labeled, as to content, hazard?			
4. Have employees been trained in accordance with the HAZCOM procedure?			
5. Do employees (including subcontractors) know and understand the effects of exposure from the chemicals on site?			
6. Have all personnel signed the HAZCOM acknowledgment form?			
7. Is there an updated list of chemicals maintained on site?			

TRAINING

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ **DATE** _____

	YES	NO	N/A
1. Are tailgate safety meetings being conducted daily or before each shift?			
2. Are current training/medical records maintained on site?			

DOCUMENTATION

1. Is an OSHA 300 Log maintained and the 300A posted during February 1, to April 30,?			
2. Are accident report forms available?			
3. Is a copy of health and safety policy and procedures available on site?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ **DATE** _____

ALL NEGATIVE RESPONSES	CORRECTIVE ACTION	ASSIGNED TO	DATE ASSIGNED	DATE COMPLETED	VERIFIED BY

DESCRIBE POSITIVE SAFETY OBSERVATIONS

ATTACHMENT 4

OFFICE SAFETY INSPECTION REPORT

OFFICE _____ **DATE** _____

DATE: _____ OFFICE NAME:
OFFICE MANAGER:
AREA(S) OF OFFICE INSPECTED:

INTERVIEWED EMPLOYEE:
SAFETY ISSUE:
CORRECTIVE ACTION:

ASSIGNED TO: _____ FOLLOW-UP DATE:
CORRECTION VERIFIED BY: _____ DATE:

INTERVIEWED EMPLOYEE:
SAFETY ISSUE:
CORRECTIVE ACTION:

ASSIGNED TO: _____ FOLLOW-UP DATE:
CORRECTION VERIFIED BY: _____ DATE:

INSPECTION COMPLETED BY: _____ DATE:

HEALTH AND SAFETY REVIEW BY: _____ DATE:

OFFICE SAFETY INSPECTION REPORT

OFFICE _____ **DATE** _____

	YES	NO	N/A
FIRST AID			
1. Are first aid kits accessible and identified?			
2. Are emergency eye wash/safety showers available where needed and inspected?			
3. Are first aid kits inspected weekly?			
FIRE PREVENTION			
1. Are employees smoking only in designated outdoor areas?			
2. Are fire lanes/evacuation routes established and maintained?			
3. Are approved safety cans/cabinets available for storage of flammable liquids?			
4. Are fire exits clearly identified and unobstructed?			
5. Are sprinkler heads unobstructed?			
FURNITURE AND EQUIPMENT			
1. Are desks, file cabinets, etc. arranged so that drawers do not open into aisles or walkways?			
2. Are desk and file drawers closed after use?			
3. Is weight distributed in file cabinets so that upper drawer contents does not create a top-heavy condition?			
4. Are cabinets, bookcases, and shelves secured to prevent their falling over?			
5. Are faulty desks, chairs, or other office equipment repaired or taken out of service?			
6. Is adequate and sufficient lighting provided in all work areas?			
7. Are paper cutter blades in fully down and locked position when not in use?			
8. Are work stations arranged to be comfortable without unnecessary strains on backs, arms, necks, etc.?			
9. Do machines with exposed moving parts have appropriate guards?			
AISLES AND FLOORS			
1. Is aisle clearance adequate for two-way traffic and for unobstructed access to all parts of the office and building?			
2. Does office arrangement allow easy egress under emergency conditions?			
3. Are wastebaskets, briefcases, or other objects placed where they are not a tripping hazard?			
4. Are floors clear of pencils, bottles, and other loose objects?			
5. Are tripping hazards from electrical cords, phone outlets, or other protrusions on the floor prevented by arrangement of furniture or other means?			
6. Are floors free of loose tiles and projections that can create a tripping hazard?			
7. Is carpeting in good condition and not badly worn or torn?			
HAND AND POWER TOOLS			
1. Are defective hand and power tools tagged and taken out of service?			
2. Is eye protection available and used when operating power tools?			
3. Are guards and safety devices in place on power tools?			
4. Are power tools inspected before each use?			
5. Is the correct tool being used for the job?			
6. Do knife blades have guards when not in use?			
MOTOR VEHICLES			
1. Are vehicles regularly inspected?			
2. Are personnel licensed for the vehicles they operate?			
3. Are unsafe vehicles reported to supervision?			

OFFICE SAFETY INSPECTION REPORT

OFFICE _____ **DATE** _____

	YES	NO	N/A
4. Is safety equipment on vehicles?			
5. Are loads secure on vehicles?			
6. Are vehicle occupants using safety belts?			
7. Are current insurance cards and blank accident report forms located in vehicles?			
EMERGENCY PLANS			
1. Are emergency telephone numbers posted?			
2. Have emergency escape routes been designated?			
3. Are employees familiar with the emergency signal?			
4. Has an emergency route to the hospital been established and posted?			
5. Has an fire drill occurred within the last 12 months?			
MATERIALS HANDLING			
1. Are materials stacked and stored to prevent sliding or collapsing?			
2. Are flammables and combustibles stored in approved containers?			
3. Are tripping hazards identified?			
4. Are riders prohibited on material handling equipment?			
5. Are only qualified operators utilized i.e., forklift trained?			
FIRE PROTECTION			
1. Has a fire alarm system been established?			
2. Do employees know the location and use of all fire extinguishers?			
3. Are fire extinguisher locations marked?			
4. Have fire extinguishers been professionally inspected during the last year?			
5. Are fire extinguishers visually inspected monthly?			
6. Is there an operating fire detection system?			
ELECTRICAL			
1. Are extension cords kept out of wet areas?			
2. Are certified electricians used for electrical work?			
3. Are GFCIs being used as needed?			
4. Are extension cords not being used in lieu of permanent wiring?			
5. Are warning signs exhibited on high voltage equipment (250V or greater)?			
6. Are switches, circuit breakers, and switchboards installed in wet locations enclosed in weatherproof enclosures?			
7. Are electric fans protected with guards of not over one-half inch mesh, which prevents fingers getting inside guard?			
8. Are cords, panels, receptacles, and plugs in good condition?			
9. Are multi-outlet strips not plugged into other multi-outlet strips?			
10. Are extension cords not plugged into other extension cords?			
11. Are circuit breakers or fuse panels properly labeled, kept closed, and accessible?			
12. Are extension cords arranged so that they are not placed over radiators, steam pipes, through doorways, or under carpets?			
13. Do space heaters have automatic shut-offs that will actuate if the heater tips over?			
14. Are space heaters UL listed and plugged directly into a wall receptacle?			
15. Are space heaters located at least 3 feet from combustible material?			
16. Are restricted and limited approach boundaries identified on electrical panels?			
17. Are authorized electricians trained in NFPA 70?			
18. Are only electrically rated tools being used for electrical work?			

OFFICE SAFETY INSPECTION REPORT

OFFICE _____ **DATE** _____

	YES	NO	N/A
WALKING AND WORKING SURFACES			
1. Are cords, cables, and other items not placed in walkways?			
2. Are ladders regularly inspected?			
3. Are access ways, stairways, ramps, and ladders clean of ice, mud, snow, or debris?			
4. Are ladders being used in a safe manner?			
5. Are ladders kept out of passageways, doors, or driveways?			
6. Are broken or damaged ladders tagged and taken out of service?			
7. Are metal ladders prohibited in electrical service?			
8. Are stairways and floor openings guarded?			
9. Are safety feet installed on straight and extension ladders?			
10. Are employees walking instead of running?			
11. Are handrails and side rails installed along the unprotected sides of stairways having 4 or more risers or rising more than 30 inches?			
12. Are there torn, loose, or curled carpets?			
HOUSEKEEPING			
1. Is good housekeeping maintained?			
2. Are paper and materials stored properly?			
3. Are cleaning fluids used only in small quantities and stored in closed containers that are kept in well-ventilated areas?			
4. If cleaning fluids are flammable, are they not used near a flame or an open heating element?			
5. Are wastebaskets emptied on a daily basis?			
SITE POSTERS			
1. Are the following posters displayed in a prominent and accessible area?			
A. Minimum Wage			
B. OSHA Job Protection			
C. Equal Employment Opportunity			
D. Family and Medical Leave			
E. Employee Polygraph Protection			
F. Uninformed Services Employment and Reemployment Rights Act			
G. Shaw Speak Up			
H. Shaw HR203 Harassment Policy			
I. Shaw Equal Employment Opportunity and Affirmative Action			
2. Are all required state-specific posters displayed?			
HAZARD COMMUNICATION			
1. Is the written HAZCOM program available?			
2. Is there a MSDS FOR EACH HAZARDOUS CHEMICAL present in the office?			
3. Are all containers properly labeled, as to content, hazard?			
4. Have employees been trained on chemical hazards?			
5. Have all employees signed the HAZCOM acknowledgment form?			
6. Is there a list of chemicals maintained on site?			
DOCUMENTATION			
1. Is an OSHA 300 Log maintained and a 300A posted during February1, to April 30?			
2. Are accident report forms available?			
3. Is a copy of health and safety policy and procedures available?			

OFFICE SAFETY INSPECTION REPORT

OFFICE _____ **DATE** _____

ALL NEGATIVE RESPONSES	CORRECTIVE ACTION	ASSIGNED TO	DATE ASSIGNED	DATE COMPLETED	VERIFIED BY

DESCRIBE POSITIVE SAFETY OBSERVATIONS

ATTACHMENT 5
LABORATORY SAFETY INSPECTION REPORT

LOCATION _____ **DATE** _____

		YES	NO	N/A
I.	FIRST AID			
1.	Are first aid kit locations identified and accessible?			
2.	Are emergency eye wash/safety showers available and inspected monthly?			
3.	Is access to eye wash units and safety showers unimpeded?			
II.	PERSONAL PROTECTIVE EQUIPMENT			
1.	Are employees wearing safety glasses in the laboratory?			
2.	Are laboratory coats worn by all employees and visitors when working with chemicals and/or samples?			
3.	Are gloves worn when chemicals and samples are handled?			
III.	FIRE PREVENTION/FIRE PROTECTION			
1.	Are employees smoking only in designated outdoor areas?			
2.	Are flammable storage cabinets available and used when needed?			
3.	Has a fire alarm system been established?			
4.	Are fire extinguishers available and inspected monthly?			
5.	Do employees know the location and use of fire extinguishers?			
6.	Are fire extinguisher locations posted?			
7.	Have fire extinguishers been professionally inspected during the last year?			
IV.	EMERGENCY PLANS			
1.	Are emergency telephone numbers posted?			
2.	Have emergency escape routes been designated?			
3.	Are employees familiar with the emergency signal?			
4.	Are appropriate spill kit supplies available?			
5.	Are emergency exits marked?			
6.	Are sprinkler heads unobstructed?			
7.	Has a fire drill occurred within the last 12 months?			
V.	ELECTRICAL			
1.	Are extension cords kept out of wet areas?			
2.	Are extension cords arranged so that they are not placed over radiators, steam pipes, through doorways, or under carpets?			
3.	Are cords, panels, receptacles, and plugs in good condition?			
4.	Are extension cords not being used in lieu of permanent wiring?			
5.	Are extension cords not plugged into other extension cords?			
6.	Are multi-outlet strips not plugged into other multi-outlet strips?			
7.	Has a lockout/tagout system been established?			
8.	Are GFCIs being used on all temporary electrical systems and as needed?			
9.	Are warning signs exhibited on high voltage equipment (250V or greater)?			
10.	Are circuit breakers or fuse panels properly labeled, kept closed, and accessible?			

ATTACHMENT 5
LABORATORY SAFETY INSPECTION REPORT

LOCATION _____ **DATE** _____

	YES	NO	N/A
11. Are restricted and limited approach boundaries identified on electrical panels?			
12. Are authorized electricians trained to NFPA 70?			
13. Are only electrically rated tools being used for electrical work?			
VI. COMPRESSED GAS CYLINDERS			
1. Are like cylinders segregated and stored in well ventilated areas?			
2. Is smoking prohibited in cylinder storage areas?			
3. Are cylinders stored secure and upright?			
4. Are cylinders protected from snow, rain, etc.?			
5. Are cylinder caps in place for storage and movement?			
VIII. WALKING AND WORKING SURFACES			
1. Are accessways, stairways, and ramps clean of ice, mud, snow, or debris?			
2. Are stairways and floor openings guarded?			
3. Are handrails and siderails installed along the unprotected sides of stairways having 4 or more risers or rising more than 30 inches?			
4. Are tripping hazards from electrical cords, phone outlets, or other protrusions on the floor prevented by arrangement of furniture or equipment?			
5. Are floors free of loose tiles and projections that can create a tripping hazard?			
VIII. HAZARD COMMUNICATION			
1. Is there a copy of the Chemical Hygiene Plan (CHP) on site?			
2. Have employees been trained in accordance with the CHP?			
3. Are all containers properly labeled as to content, hazard, etc.?			
4. Is there an updated list of chemicals maintained at the laboratory?			
5. Are there MSDSs for the chemicals present in the laboratory?			
6. Do employees know and understand the effects of exposure from the chemicals they work with?			
IX. DOCUMENTATION			
1. Is an OSHA 300A Log maintained on site and posted between February 1and May 1?			
2. Are accident report forms available?			
X. FURNITURE AND EQUIPMENT			
1. Are desks, file cabinets, etc. arranged so that drawers do not open into aisles or walkways?			
2. Are desk and file drawers closed after use?			
3. Are cabinets, bookcases, and shelves secured to prevent their falling over?			
4. Is adequate and sufficient lighting provided in all work areas?			
5. Are work stations arranged to be comfortable without unnecessary strains on backs, arms, necks, etc.?			
6. Do machines with exposed moving parts have guards?			
XI. LABORATORY FUME HOODS			
1. Are face velocities posted on each hood?			
2. Is the average face velocity at least 100 ft/min.?			
3. Is the sash position marked or otherwise indicated to show the acceptable			

ATTACHMENT 5
LABORATORY SAFETY INSPECTION REPORT

LOCATION _____ **DATE** _____

		YES	NO	N/A
	position for achieving the desired airflow rate?			
4.	Has the hood face velocity been measured with a calibrated instrument in the last 6 months?			
5.	Are signs posted on hoods that are not working correctly?			
6.	Does the hood contain visual indicators that it is working properly (e.g., manometer, magneheilic guage, etc.)?			
XII.	GENERAL LABORATORY RULES			
1.	Are open-toed shoes and sandals prohibited in the laboratory?			
2.	Are eating, drinking, chewing gum or tobacco products prohibited in the laboratory?			
3.	Are food refrigerators labeled such as to prevent chemical storage or vice versa?			
XIII.	HOUSEKEEPING			
1.	Are lab benches orderly?			
2.	Are laboratories free of liquid spills?			
3.	Are sinks free of accumulated glassware?			
4.	Are waste disposal containers available and labeled?			

ATTACHMENT 6

Project/Office/Lab Safety Improvement Log

Date Identified	Source (1)	Observation Description	Severity Level (2)	Corrective Action	Person Responsible	Projected Resolution Date	Date Corrected	Verified By (Initials)	Validation By (Initials)

(1) Source: Safety Observation (SO)
Project Safety Inspection Report (PSIR)
Project/Site Manager Safety Audit (PMSA)
Office Safety Inspection Report (OSIR)
Laboratory Safety Inspection Report (LSIR)
Leadership Safety Assessment (LSA)

(2) Severity Level: 1 OSHA / Regulatory Violation
2 Internal / Client Violation
3 Recommended / Best Practice

STANDARD OPERATING PROCEDURE

Subject: **Accident Prevention Program: Review of New Proposals, Projects, Operations, Construction, and Jobs by Health and Safety**

1. PURPOSE

This procedure requires health and safety review of new proposals and projects, which involve potential employee exposure to hazardous substances or physical agents.

2. SCOPE

This procedure applies to all new Shaw Environmental & Infrastructure, Inc. (Shaw E&I) proposals and projects involving potential employee exposure to hazardous substances or physical agents. Exceptions shall be per the requirements of EI-HS013, “Health and Safety Procedure Variances.”

3. REFERENCES

Shaw E&I Procedure No. HS052, “Health and Safety Plans.”

4. DEFINITIONS

Company – All wholly-owned subsidiaries of Shaw E&I.

5. RESPONSIBILITY MATRIX

5.1 Procedure Responsibility

The Senior Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

5.2 Action/Approval Responsibilities

The Responsibility Matrix is shown as Attachment 1, “Responsibility Matrix.”

6. PROCEDURE

Some company operations may involve the potential for exposure of employees, clients, and the public to hazardous substances or physical agents. In order to evaluate the risks associated with these potential hazards, it is imperative that a company Health and Safety representative review new proposals and projects with the potential for employee exposure to hazardous substances or physical agents. Proposals or Requests for Proposals (RFPs) should be reviewed as early in the bid process as possible so that hazards can be assessed and resources can be included to address those hazards. Project reviews should occur well in advance of mobilization to allow for Health and Safety Plan preparation, resource allocation, etc.

Business Line/Proposal Group Managers, or other managers responsible for such operations, are required to establish a system to ensure review of new proposals and projects by a Health and Safety Representative, whenever such activity involves the potential for exposure to hazardous substances or physical agents. The required review shall be completed before the company commits to undertake such activity or operation.

7. ATTACHMENTS

- Attachment 1, Responsibility Matrix

8. FORMS

None.

9. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
01 / 05/06/2009	The Responsibility matrix was revised.	Mike Zustra

PROCEDURE

Subject: ACCIDENT PREVENTION PROGRAM: EMPLOYEE SAFETY INCENTIVES & TEAM SAFETY AWARD PROGRAM

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to establish the guidelines for developing and implementing company safety incentive award programs and recognizing group accomplishments through the team award programs. The available awards have been created to recognize projects & offices in differing categories such to capture the varying size and complexity of project & office teams. The purpose of this procedure is designed to recognize group safety performance and reward the individual only when the project/location team has achieved its established goals. It is intended to encourage all employees to be concerned not only for their own safety, but for the safety of co-workers as well. Key elements of this procedure include:

- Eligibility;
- Program Development;
- Award Value;
- Program Funding;
- Minimum Goals;
- Award Request; and
- Goal Verification.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Company - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

OSHA Recordable Injury/Illness - All work-related deaths and illnesses, and those work-related injuries which result in: loss of consciousness, restriction of work or motion, transfers to another job, or require medical treatment beyond first aid.

Lost/Restricted Workday Injury/Illness - Cases which involve days away from work and/or days of restricted work activity. Days away from work are: the number of calendar days (consecutive or not), excluding the date of injury, the employee would have worked, but could not because of occupational injury or illness; and/or the number of workdays (consecutive or not), excluding the date of injury, on which, because of injury or illness:

- The employee was assigned to another job on a temporary basis; or
- The employee worked at a permanent job less than full time; or
- The employee worked at a permanently-assigned job, but could not perform all duties normally connected with it.

Chargeable Vehicle Accident - Any at-fault vehicle accident meeting any one of the following criteria:

- An individual other than an employee of the company is a party in the accident.
- Property owned by a person or entity other than the company is damaged.
- When only company employees, company owned or leased (not rented) vehicles and property is involved and damage exceeds $2,500.00.

Safety Incentive Award – Monetary or non-monetary award granted to each member of a team that achieves its documented safety goals as defined in project/office-specific plans.

Safety Team Award – Commemorative plaque / trophy / certificate given to a project or office team that achieves company-wide safety goals or otherwise demonstrates outstanding safety performance.

5.0 Project/Location Safety Incentive Awards

5.1 Eligibility

All company employees are eligible to participate in a safety incentive award program. In certain instances, subcontractors, teaming partners, and/or clients may also be eligible for participation. Each project/location manager must determine who will be eligible to participate prior to the initiation of a program. Only those employees physically present at one project/location for five days or more during a calendar month period will be eligible for an award. No employee will be permitted to participate in more than one program at any one time.

5.2 Program Development

The project/office (hereafter referenced as location) manager is responsible for developing a safety incentive award program tailored to their specific location needs. This program must comply with the guidelines contained in this procedure and be approved by the appropriate business line lead and the respective business line EHS manager. The location manager is responsible for obtaining all required approvals prior to implementing a program (Attachment 2).

5.3 Award Value

For every calendar month in which a location achieves its goals, all approved participants will receive an award valued at a maximum value of $10.00/calendar month. The location manager will be responsible for determining the value and type of award. It is also recommended that awards be non-monetary in nature, such as Shaw logo merchandise (jackets, hats, ice chests) or safety related merchandise (first aid kits, fire extinguishers, etc). Gift certificates and gift cards are considered the equivalent to cash and therefore those requests would have to go through payroll for tax withholding purposes. Location Managers are encouraged to follow the requirements set forth by the Transactional Processing department to ensure compliance with the applicable payroll procedures.

Awards may not be accumulated for a period of greater than five months unless approved by the Regional EHS Manager and the responsible Location Manager.

5.4 Program Funding

All costs associated with the awards must be approved by the location manager. Project awards will be funded by the project budget and will apply to project personnel, regardless of home business unit (HBU). Location awards for offices, facilities, etc. that otherwise include employees from various HBU's will be charged to either the locations designated budget for the award, or through prior approval for funding through the employee's HBU. In all cases whereby the office or location is not funding the program, and the location is comprised of employees from various HBU's, the "Requesting Manager" who is establishing the program and completing Attachment 2 shall ensure that employees have received concurrence from their supervisor to participate in the program.

In some cases, clients may establish safety incentive programs that differ from the guidelines established in this procedure. Client-sponsored incentive programs, while in effect, will be used in lieu of this safety incentive award program.

5.5 Minimum Goals

The safety incentive award program is designed to recognize and reward exemplary team safety performance. At a minimum, the participating team must achieve the following goals:

- Zero Recordable Injury/Illness Cases;
- Zero Lost/Restricted Workday Injury/Illness Cases; and
- Zero Chargeable Vehicle Accidents.

Other health and safety related goals, such as timely completion of Safety Inspection Reports, safety meeting participation, etc., may be established at the discretion of the project/location manager.

5.6 Award Request

A representative from each location must submit a list of employees eligible for an award to the location manager. The location manager is then responsible for submitting the eligibility list and the Safety Incentive Award Request Form (Attachment 3) to the awareness and recognition subcommittee of a local safety council for approval. Approval by the subcommittee is required prior to award distribution.

5.7 Goal Verification

Determining when a safety award goal has been achieved is the ultimate responsibility of the local safety council administering the program. If the awareness and recognition subcommittee of the council determines that accidents are not being reported or that accident reports are modified for the purpose of maintaining the goals, the program will be discontinued. Reinstatement of the program may only be achieved if the location manager submits a letter to the awareness and recognition subcommittee detailing the corrective actions that will be taken to prevent further deficiencies. The subcommittee must then obtain approval from the Business Line EHS Director prior to reinstating the program.

6.0 Corporate Level / Business Line Level Project & Office Location Safety Team Awards

6.1 Eligibility/Minimum Goals/Award Request Requirements

The Safety Incentive section of this procedure is significant, as it recognizes individual employees, however, it is of similar importance to capture group recognition through the Team Award program. As shown in Attachment 4, the Team Awards have been established in an effort to recognize exemplary performance throughout the organization, regardless of size of the operation.

The available awards have been created to recognize projects & offices in differing categories such to capture the varying size and complexity of project & office teams. The eligibility, minimum goals, and award request requirements for these awards are outlined in Attachment 4. .

6.2 Award Funding

These awards will be funded at the Shaw E&I / Business Line Level. Additional funding for celebrations related to theses awards will be determined at the Business Line level for

the project/location that receives any Shaw E&I Corporate or Business Line Level Award.

6.3 Verification

Verification will be conducted by either the Shaw E&I Senior Director of EHS, the respective Business Line EHS Director, or his/her designee.

6.4 Project Quarterly Safety Excellence Award and Safe Project of the Year Award

A project whose demonstrated commitment to safety goes beyond what was expected will be recognized for their effort. Project Managers may nominate their respective teams for the award up through their respective business line with the intent to be selected by the Business Line's Senior Leadership. The Business Line's Senior Leadership Safety Councils will select quarterly and annual winners. The annual awards will be voted on by the Shaw E&I Executive Leadership Safety Council and the awards will be presented to the project teams in the categoris listed in Attachment 5. The criteria for nominations may include, but is not limited to:

- minimal incidents (first aid, OSHA-recordable, lost time, chargeable vehicle)
- a robust Safety Observer Program
- a robust near miss reporting program
- a current Safety Improvement Log
- completion of required safety assessments
- a safety communication bulletin board
- a productive, employee owned Safety Council
- root cause analysis of incidents, with proven and actionable results

7.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

8.0 CROSS REFERENCES

HS001 Safety Policy
HS013 Health and Safety Procedure Variances
HS018 Safety Councils
HS020 Accident Prevention Program: Reporting, Investigation, and Review

9.0 ATTACHMENTS

1. Responsibility Matrix
2. Project/Location Safety Incentive Award Program Approval
3. Project/Location Safety Incentive Award Request Form
4. Health and Safety Team Award Nomination Form
5. Shaw E&I Health and Safety Team Award Matrix

ATTACHMENT 1

ACCIDENT PREVENTION PROGRAM: SAFETY INCENTIVE AWARD PROGRAM
Responsibility Matrix

Action	Procedure Section	*Responsible Party*					
		Project/Location Representative	**Business Line EHS Director**	**Project/ Office Manager**	**Local Safety Council**	**Business Line Lead**	**Sr. Director of Health and Safety**
Issuance, Revision, and Maintenance of Procedure	3.1						X
Determine Who is Eligible for Participation	5.1	X		X			
Develop Project/Location Specific Incentive Award Program	5.2			X	X		
Approve Programs	5.2		X			X	
Forward Approved Program to BL EHS Director	5.2			X	X		
Approve One-Time Awards of Greater Than $50.00	5.3		X			X	
Determine Value and Type of Award	5.3			X	X		
Establish Goals Beyond Minimum Requirement	5.5	X		X	X		
Submit List of Award Eligible Employees to Project/Location Manager	5.6	X			X		
Complete Attachment 2 and Forward to Local Safety Council	5.6			X			
Determine When Goals are Achieved	5.7	X		X	X		

ATTACHMENT 2

SAFETY INCENTIVE AWARD PROGRAM APPROVAL

I HAVE REVIEWED THE ATTACHED SAFETY INCENTIVE AWARD PROGRAM FOR _____ AND APPROVE OF ITS USE.

Project/Location

Requesting Manager (Printed)	Requesting Manager (Signature)	Date

Business Line EHS Manager (Printed)	Business Line EHS Manager (Signature)	Date

ATTACHMENT 3

SAFETY INCENTIVE AWARD REQUEST FORM

I AM REQUESTING THAT THE ATTACHED LIST OF EMPLOYEES AT THE _____
Project/Location

PROJECT/LOCATION BE PRESENTED A SAFETY INCENTIVE AWARD. THESE

INDIVIDUALS WILL BE GIVEN _____ (MAXIMUM VALUE OF $10.00 PER
Type of Award

MONTH) ON_____ FOR ACHIEVING ESTABLISHED GOALS FOR THE
Date of Award

MONTH(S) _____.
Month(s)/Year

SAFETY COUNCIL SUBCOMMITTEE, OPERATIONS MANAGER & EHS MANAGER SIGNATURES REQUIRED

_____	_____	_____
Project/Location Manager (Printed)	Project/Location Manager (Signature)	Date
_____	_____	_____
Chairperson (Printed)	Chairperson (Signature)	Date
_____	_____	_____
Business Line EHS Manager (Printed)	Business Line EHS Manager (Signature)	Date

ATTACHMENT 4

Health and Safety Team Award Nomination Form

Project Name:	**Project Number:**	**Award Name**:	**Project / Office Address:**
Client's Name:	**Proj. or Office Manager:**		**Site Contact Number:**
Business Line:	**Regional Operations Manager:**		**Regional Operations Mgr Contact Number:**
Small, Med or Large Award Category:	**Criteria Information: (<50 employees or >50 employees)**		**Time Period of Achievement:**
Name of Safety Award Nomination :			
Project / Office Description:			
Significant or Unique Safety Challenges/Accomplishments:			
Any Client Recognition of Project / Office Performance (Safety or Otherwise):			
Other Justification for Nomination (attach additional sheets if needed):			

Nomination Authorizations

Project / Office Manager's Name:	**Signature:**
Program / District Manager's Name:	**Signature:**
Regional Business Line Leader's Name:	**Signature:**
Business Line EHS Director's Name:	**Signature:**
Sr. Director EHS, Shaw E&I Name:	**Signature:**

Attachment 5

Shaw E&I Team Awards

Safety Award Name	Criteria	Awarded From	Request Requirement
Million Man-hour Award	Project that achieves 1,000,000 without a lost time injury	President of Shaw E&I	Intended for projects. Project management requests the award through Business Line EHS Organization.
Shaw E&I -President's Award	Awarded to projects or offices at increments of 1,000 calendar days without a lost time injury.	President of Shaw E&I	Intended for projects. Project management requests the award through Business Line EHS Organization.
Targeting Zero Award	Awarded to projects or offices that achieve triple zeros over a twelve month period	President of Shaw E&I	Intended for projects and office locations. Operations Management requests the award through Business Line EHS Organization.
Safety Excellence Award	Awarded to projects/offices with: • >50 people -one year without a lost time • <50 people – 100,000 hours without a lost time	President of Shaw E&I	Intended for projects and office locations. Operations Management requests the award through Business Line EHS Organization.
Quarterly Safety Excellence Award	Triple zeros within any fiscal quarter (min). Awarded to one project at each of three levels: • Small < 5,000 man-hours in the quarter • Medium > 5,000 < 25,000 man-hours in the quarter • Large > 25,000 man-hours in the quarter.	Shaw E&I Business Line Presidents	Intended for projects. Project management requests recognition for the award by submission through Business Line Safety Council Network. Project winners selected at the Business Line Leadership Safety Council.
Safe Project of the Year Award	Selected at the small, medium, and large levels from the Quarterly Safety Excellence Award winners. Winners selected under same man-hour criteria listed above: • Small < 5,000 man-hours in the quarter • Medium > 5,000 < 25,000 man-hours in the quarter • Large > 25,000 man-hours in the quarter.	Shaw E&I Corporate	Intended for projects. Business Line Leadership Safety Council submits annual request of recognition for the award by submission of Quarterly Safety Excellence Award winners to Shaw E&I Executive Leadership Safety Council.

STANDARD OPERATING PROCEDURE

Subject: Prevention of Repetitive Motion Injuries (Applies to California Only)

UNCONTROLLED WHEN PRINTED

1. PURPOSE

This procedure prescribes requirements to minimize Repetitive Motion Injuries (RMI) among employees working in California offices, in compliance with the California/Occupational Safety and Health Administration standard for Repetitive Motion Injuries (Title 8, California Code of Regulations, Section 5110). It includes procedures for:

- Anticipating RMIs
- Evaluating work sites suspected of causing RMIs
- Controlling exposures that either have or could have caused RMIs
- Training employees in the recognition and prevention of RMIs

2. SCOPE

This procedure applies to all employees who work in California offices.

2.1 Exception Provisions

Variances and exceptions may be requested pursuant to the provisions of Shaw Environmental & Infrastructure, Inc. (Shaw E&I) Procedure No. HS013, “Health and Safety Procedure Variances.”

3. REFERENCES

3.1 Internal References

- HS013, “Health and Safety Procedure Variance”
- HS020, “Accident Prevention Program: Reporting, Investigation, and Review”
- HS021, “Accident Prevention Program: Management Safety Inspections”

3.2 External References

- California Code of Regulations, 2009, Title 8, Industrial Regulations, Section 5110, Repetitive Motion Injuries, August 7.

4. DEFINITIONS

Company—All wholly-owned subsidiaries of Shaw E&I.

Repetitive Motion Injury—A musculoskeletal injury that has been caused by a repetitive motion such as, but not limited to, word processing, lifting, or loading, and that has been objectively identified and diagnosed as such by a licensed physician.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Senior Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure. California-based Health and Safety Management is responsible for submitting change requests to the Senior Director of Health and Safety for revisions and approval.

5.2 Action/Approval Responsibilities

The responsibility requirements are included in Attachment 1, "Repetitive Motion Injuries, Responsibility Matrix."

6. PROCEDURE

6.1 Identification and Anticipation of RMI Hazards

Each California Office Director is responsible for the administration of this procedure. The Office Director may appoint a person (e.g., Local Health and Safety Representative) to assist in identifying and correcting any RMI hazards. The Office Director or appointee shall encourage employees to promptly report any pain or discomfort that might be caused by work-related repetitive motion, work station equipment, or configuration, and shall look for signs of RMIs and ergonomic hazards during office safety inspections that are required by Shaw E&I Procedure No. HS021, "Accident Prevention Program: Management Safety Inspections."

Employees may request an evaluation of their workstations by contacting their supervisors or a Shaw E&I Health and Safety professional. The Workstation Evaluation Request Form (Form 1) may be used to facilitate the request.

6.2 RMI Investigation

When a potential or an actual RMI or discomfort that could lead to an RMI is identified, it will be reported to the employee's immediate supervisor who will then contact the local Environmental Health and Safety Manager. The condition will be investigated pursuant to Shaw E&I Procedure No. HS020, "Accident Prevention Program: Reporting, Investigation, and Review." The task that allegedly caused the RMI will be evaluated to identify the root cause(s).

6.3 Controls

Conditions that have either caused or are likely to cause RMIs will be corrected or minimized in a timely manner using engineering controls such as work station redesign, adjustable fixtures, or tool redesign, if feasible. Administrative controls such as job rotation, work pacing, or work breaks may also be used in lieu of, or in addition to, engineering controls.

6.4 Training

Where needed, employees who are exposed to RMI hazards will be provided training in the control measures needed to prevent injury.

Employees who use computers for four or more hours per day will be provided office ergonomics awareness training. As a minimum the training will include:

- Contents of this procedure
- The exposures associated with their job assignments that either have or could cause RMIs, for example, keyboarding, mousing, switchboard usage, prolonged sitting, and improper lifting

- Symptoms and consequences of injuries such as carpal tunnel syndrome, tendonitis, and back pain
- The importance of reporting work-related RMI discomfort as soon as it is noticed
- Control procedures such as particular ergonomics hardware, frequent break periods, exercise regimes, and proper workstation set-up that are applicable to the trainees' particular workstations
- Documentation of training should be recorded on Form No. E1-HS024.2_0, "RMI Hazards Training Record" and forwarded to the Health & Safety Records Department in Knoxville, TN.

7. ATTACHMENTS

- Attachment 1, Prevention of Repetitive Motion Injuries Responsibility Matrix

8. FORMS

- Form EI-HS024.1, Workstation Evaluation Request
- Form EI-HS024.2, RMI Hazards Training Record

9. REVISION HISTORY

Revision Level / Revision Date	Revision Description	Responsible Manager
1 / 1/5/10	Attachment 3, Workstation Assessment Checklist, has been deleted.	Allen, Troy

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Attachment 1
Prevention of Repetitive Motion Injuries
Responsibility Matrix

Action	Procedure Section	Responsible Party				
		Supervisor	California-Based Health and Safety Rep	Employee	California Office Director	Senior Director of Health and Safety
Understand and Comply with State and Local Regulations	1.0		X		X	
Issuance, Revision, and Maintenance of Procedure	5.1					X
Submit Revisions of Procedure to the Vice President of Health and Safety	5.1		X			
Identify/Anticipate RMIs	6.1	X	X	X	X	
Administration of Procedure	6.1				X	
Conduct Office Safety Inspections	6.1				X	
Complete Workstation Evaluation Request Form	6.1	X	X	X		
Complete Workstation Evaluation	6.2		X			
Control RMI-Causing Conditions	6.3	X		X		
Conduct Training	6.4		X		X	

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Workstation Evaluation Request

EMPLOYEE

Please complete form and forward to your immediate supervisor for review and discussion.

Name: _____ Employee# _____

Home Dept. # _____ Room # _____ Ext. # _____

Position: _____ % of Time in Office: _____

Supervisor: _____ Facility Address: _____

Phone #: _____ _____

Briefly explain your concern with your work area below:

_____

_____

_____

_____

_____

_____ _____

Employee's Signature Date

SUPERVISOR

Please review the above issue(s) with Employee and forward to the Health & Safety Representative.

Comments:

_____

_____

_____

_____

_____

_____ _____ _____

Supervisor's Signature Date Phone #

HEALTH AND SAFETY

Recommended Corrective Action(s):

_____

_____

_____

_____

_____

_____ _____

Print Name Phone #

_____ _____

Signature Date

Shaw™ Shaw E &

RMI Hazards Training Record

I certify that I have received training about the sources and risks of Repetitive Motion Injuries (RMI) by covering the items listed below:

1. The contents of Shaw Environmental & Infrastructure, Inc. Procedure No. HS024, "Prevention of Repetitive Motion Injuries (Applies to California only)"

2. Possible exposures associated with my job assignment that have or could cause RMIs such as keyboarding, mousing, switchboard usage, prolonged sitting, and improper lifting

3. Symptoms and consequences of injuries such as carpal tunnel syndrome, tendonitis, and back pain

4. The importance of reporting work-related RMI discomfort as soon as it is noticed

5. Control procedures such as particular ergonomics hardware, frequent break periods, exercise regimes, and proper workstation set-up that are applicable to my work location

PRINTED NAME: _____

SIGNATURE: _____ DATE: _____

TRAINER: _____ DATE: _____

Send completed training record to the Health & Safety Records Department in Knoxville, Tennessee.

PROCEDURE

Subject: Workplace Anti-Violence Policy

1.0 PURPOSE AND SUMMARY

Shaw E&I has a strong commitment of providing a safe environment for their employees, the public, and is committed to identifying and eliminating barriers to such safety. This procedure applies to all Shaw E&I offices and project locations whenever safety and health activities are implemented under project contractual and/or EH&S Procedural Requirements.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health & Safety is responsible for the issuance, revision, and maintenance of this procedure. The Manager/Supervisor is responsible for providing safety and health direction and implementation of this procedure and Attachment 2, The Receipt of Workplace Anti-Violence policy and Consent to Search.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 TEXT

4.1 Workplace Anti-Violence Policy

Shaw E&I prohibits firearms, illegal weapons, or paraphernalia that has the appearance of weapons (i.e. toy guns, knives, etc.) on property owned, leased, or under the control of Shaw E&I. This includes, but is not limited to:

- Premises, parking lots (including privately owned vehicles on above-mentioned Shaw E&I properties), or offices.

- Weapons are not permitted in desks, lockers, or personal belongings on premises. Possession of a weapon will be subject to corrective action up to and including termination.
- These provisions also, apply while on paid travel time or work assignments for Shaw E&I and while conducting any company business.
- The only exception is that supervisors/management are allowed to maintain hunting weapons in their vehicles while traveling on Shaw E&I home office premises – but only during hunting season and only after notifying the respective Shaw E&I safety department. In advance to gain permission.

4.2 Disruptive Behavior

Shaw E&I will not accept nor tolerate any disruptive behavior interpreted as a threat. A threat will be considered, but not limited to:

- Any statement or action by an individual that constitutes a clear and present and/or future danger to either: a co-worker, any property owned/leased by an employee/contractor or vendor.

4.3 Reporting

It is the employee's responsibility to report threatening statements or actions immediately. Any employee who has been personally threatened should contact a member of management (supervision), the Human Resources department or Security personnel immediately. Employees reporting statements or actions should be prepared to identify and describe the following:

- The statement(s) made or actions(s) observed.
- The circumstances in which the incident occurred
- Relevant background information the employee has about he person making the threat/action.
- The relationship between the employee and the one making the threat
- The identity of other witnesses of the incident and of other employees who may have personal knowledge of the threatener's past history of odd or abnormal behavior.

If after review, the situation is determined to be dangerous, the results will be considered by Human Resource s, Security and the department management, who determine the appropriate follow up actions. These may include disciplinary actions up to and including discharge and reporting to the local law enforcement personnel.

The following are points to remember in the event of a dangerous threat or action:

- Report threats even if made humorously and report knowledge of others in possession of weapons immediately.
- Every reported incident will be addressed.
- Employees requesting follow up information will receive notification of on the status and disposition of the incident.

4.4 Witnessing a Threat

A safe and secure workplace is a shared responsibility. It is everyone's responsibility to know and follow company policies. Anyone overhearing or witnessing a threat should report it immediately to supervision.

4.5 Responding to Threats

When confronted with a threatening situation never provoke or elevate the situation. A maintain a professional disposition and inform the individual that if they cannot control their behavior the police (or proper authorities) will be called, for their safety and remove them from the premises.

- At no time will a supervisor respond to a threatening situation alone.
- Whenever any situation could result in violent behavior such as, discharging employees, there should always be at least two supervisors.
- Isolate the individual from others. Ask them politely into the office or somewhere out of the working environment.
- Never elevate your voice when talking.
- Never turn your back to a disgruntled employee.
- Maintain your distance – do not allow yourself to come closer than an arm length away.
- Never touch or use aggressive postures. If at anytime you feel the situation getting out of control, back away and call for help.

4.6 Training and Education

- Review of this policy
- Risk factors that cause or contribute to assaults
- Early recognition of escalating behavior or warning signs
- Reporting incidents immediately and necessary actions to follow
- Ways to prevent volatile situations

5.0 ATTACHMENTS

1. Responsibility Matrix
2. Workplace anti-Violence Policy and consent to Searches form

ATTACHEMENT 1

WORKPLACE ANTI-VIOLENCE POLICY
Responsibility Matrix

Action	Procedure Section	Human Resources	Director of Safety & Health	Managers & Supervisors
Issuance, revision and maintenance of this procedure	3.1		X	
Distribute General Rules	6.1			X
Maintaining consent forms	6.1	X		

ATTACHMENT 2

WORKPLACE ANTI-VIOLENCE POLICY AND CONSENT TO SEARCHES

I hereby acknowledge receipt of Shaw E&I's workplace Anti-Violence Policy. In consideration of the company's provision of its facilities for my convenience, I agree that I will not use them for any purpose that would constitute a violation of any company rule or local, state or federal law.

I hereby acknowledge that Shaw E&I has provided me with furniture, containers, drawers, equipment, or other facilities for my use and convenience, and they belong to Shaw E&I, and I consent to the search of any furniture, containers, drawers, equipment, or other facilities, lunch boxes, brief cases, personal bags, parking lots, and at any time by Shaw E&I.

I also understand that the purpose of the Shaw E&I Workplace Anti-Violence Policy is to provide a safe working environment for persons and property. Accordingly, I agree not to violate any provision of the Policy and not to engage in conduct which may harm the person or property of another associate, the company, or any individual on company premises or the work-site.

I agree to abide by the Workplace Anti-Violence Policy and not to possess, sell, store, or otherwise bring any weapon as defined in the policy onto company premises.

I understand that the results of any search will be considered in any employment decision, including termination of my employment.

(Print Name)	(Signature)	(Date)

(Supervisor Print Name)	(Signature)	(Date)

STANDARD OPERATING PROCEDURE

Subject: Safety Observation Program

1. PURPOSE

This procedure establishes the requirement for a Safety Observation program at Shaw Environmental & Infrastructure, Inc. (E&I) field based projects. Safety observations are behavior-based and are an integral part of the overall accident prevention program that provides a systematic feedback process between line personnel and supervision to pro-actively identify opportunities for safety improvement in work areas.

2. SCOPE

This procedure applies to all field-based projects greater than 10 days in duration.

3. REFERENCES

None.

4. DEFINITIONS

None.

5. RESPONSIBILITY MATRIX

5.1 Procedure Responsibility

The Senior Director of Health & Safety is responsible for the issuance, revision, and maintenance of this procedure. The Project Manager and Site Supervisor are responsible for implementation and administration of this procedure on site. The Site Safety Officer will assist with providing hands-on field training to observers and general technical assistance.

5.2 Action/Approval Responsibilities

The Responsibility Matrix shown as Attachment 1, “Responsibility Matrix.”

6. PROCEDURE

6.1 Background

Employees engaged in work activities are often the most knowledgeable about the hazards of their work and can provide valuable feedback on unsafe conditions and unsafe practices that require corrective action.

The Safety Observation Program is a tool for employees to provide information on actual, or potential safety hazards that they observe in their workplace, which if left unreported might result in an accident or injury to a Shaw employee, subcontractor, client, or the public. This Program also provides recommendations to correct the hazards.

The Shaw E&I Safety Observation Program will:

- Pinpoint practices that could cause accidents, injuries, or damage

- Determine specific needs for coaching and training
- Check the adequacy of the Health and Safety Plan, Activity Hazard Analyses, Job Safety Analyses, general site rules, and other procedures
- Follow-up on the effectiveness of training

This procedure outlines the basic elements of the Safety Observation Program. The Project Manager is responsible for developing and implementing a site-specific Safety Observation Program, which meets the requirements of each element of this procedure within 10 days of the start of field work. The Project Manager is responsible for promoting the Program and for assuring that the Program is implemented according to this procedure.

6.2 Safety Observation Schedule

Each project must develop a schedule for conducting Safety Observations. A general guideline for the number of observations in a week is one observation per 100 work hours on the project. Each project's Safety Observation schedule (number/time period) should consider project duration, number/complexity of tasks, degree of hazards, number of employees, experience of employees, and other relevant factors. The schedule for observations should be communicated to site personnel or posted for review.

6.3 Safety Observation Reporting Card

The results of each Safety Observation should be recorded on the Safety Observation Reporting Card (Attachment 2). Observation cards will document the following:

- Review of work practices
- Evaluation of procedure effectiveness
- Suggestions for reducing task/job risk
- Need for follow-up, if any

Additional information should include positive observations of good safety practices. The reports must be dated and include the Safety Observer's name and should be submitted to the Site Supervisor by the end of each shift on which observations were performed.

6.4 Follow-Up Process

Tasks or items that require follow-up because of serious risk potential must be addressed immediately by the site supervisor. Items with lesser risk should be discussed in the next Tailgate Safety Meeting. The Safety Observation Program must have an effective process to track action items identified by the Safety Observer and document the corresponding corrective actions completed by site management. The action items and corrective actions, including due dates and responsible person(s) should be documented in the Safety Improvement Log (Attachment 3). The status of observations and corrective actions should be posted for site personnel to review. Safety Observation Cards that identify follow-up requirements should be retained on-site until resolved or completed.

6.5 Employee Information and Training

Project personnel shall be informed of the site-specific Safety Observation Program developed by site management. Site managers and supervisors are encouraged to solicit input from site personnel concerning the best approach. All Safety Observers shall be trained on site to conduct effective safety observations. This training shall be provided by the Site Supervisor, Site Safety Officer, or other designated person.

6.6 Employee Recognition

A recognition program should be included to promote and maintain interest in the Safety Observation Program and to recognize significant achievements in contributing to the Targeting Zero philosophy. The recognition should be specified as part of the standard incentive/recognition program. Examples for recognition include Safety Observer of the Week or reaching a specified goal (e.g., submittal of two acceptable ideas for improving job or task safety).

7. ATTACHMENTS

- Attachment 1, Responsibility Matrix
- Attachment 2, Safety Observation Reporting Card
- Attachment 3, Safety Improvement Log

8. FORMS

None.

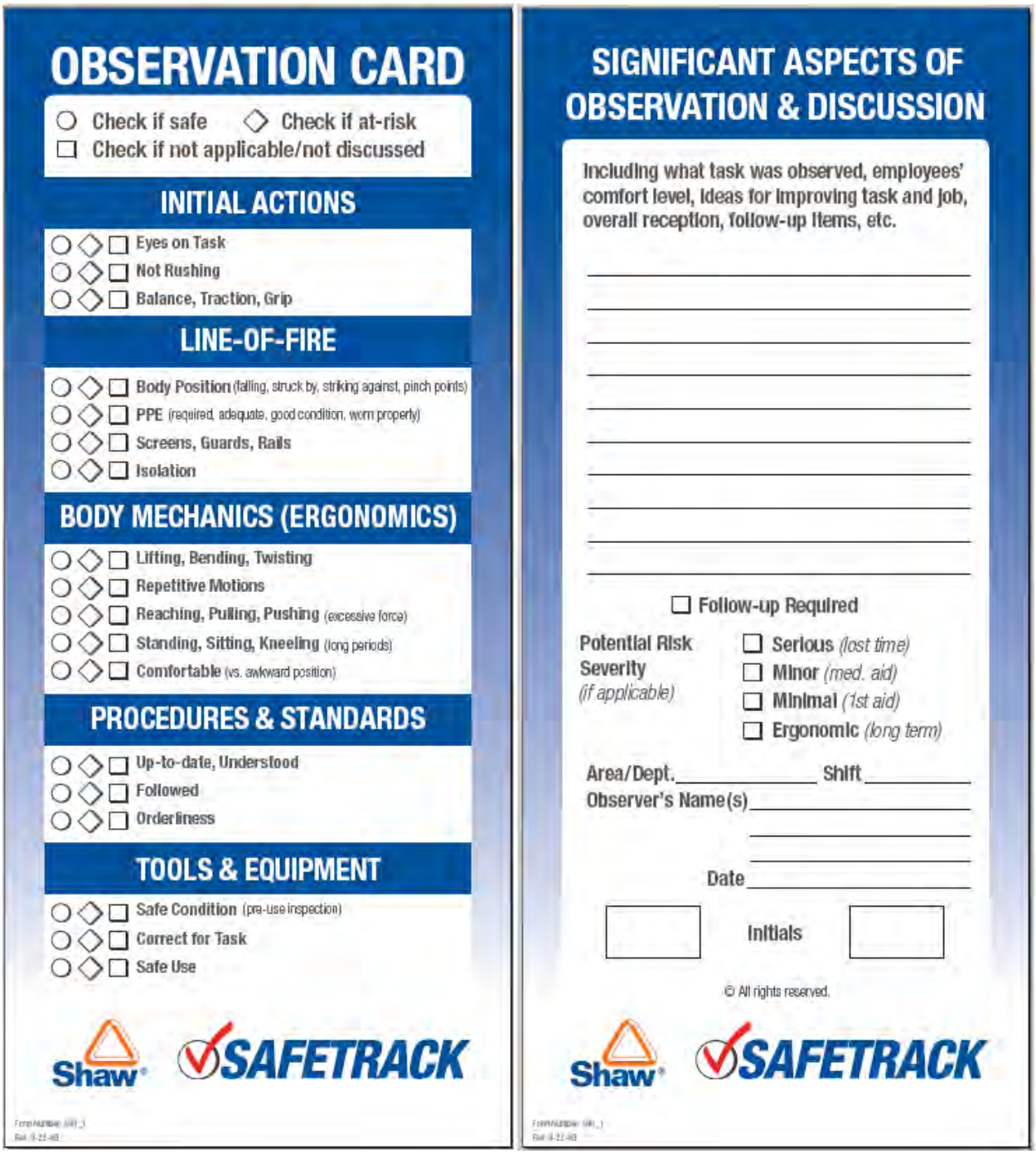
9. REVISION HISTORY

Revision Level / Revision Date	Revision Description	Responsible Manager
00 3/12/2009	• This new procedure formalizes the draft procedure that has been in place since 2002. • A new Safety Observation Reporting Card has replaced the form for focused and general safety observations. • Action items and corrective actions should be documented in the "Safety Improvement Log" • All field-based projects greater than 10 days in duration are required to implement Safety Observation Programs.	Zustra, Mike

Attachment 1
Safety Observation Program
Responsibility Matrix

Action	Procedure Section	Senior Director of Safety & Health	Managers & Supervisors	Site Safety Officer
Issuance, revision, and maintenance of this procedure	5.1	X		
Implement and administer program on site	5.1,6.1		X	
Provide on-site technical assistance	5.1			X
Develop a Safety Observation schedule	6.2		X	X
Address identified risks and document actions	6.4		X	
Implement employee recognition program	6.6		X	

Attachment 2
Safety Observation Reporting Card



OBSERVATION CARD

○ Check if safe ◇ Check if at-risk
☐ Check if not applicable/not discussed

INITIAL ACTIONS

○ ◇ ☐ Eyes on Task
○ ◇ ☐ Not Rushing
○ ◇ ☐ Balance, Traction, Grip

LINE-OF-FIRE

○ ◇ ☐ Body Position (falling, struck by, striking against, pinch points)
○ ◇ ☐ PPE (required, adequate, good condition, worn properly)
○ ◇ ☐ Screens, Guards, Rails
○ ◇ ☐ Isolation

BODY MECHANICS (ERGONOMICS)

○ ◇ ☐ Lifting, Bending, Twisting
○ ◇ ☐ Repetitive Motions
○ ◇ ☐ Reaching, Pulling, Pushing (excessive force)
○ ◇ ☐ Standing, Sitting, Kneeling (long periods)
○ ◇ ☐ Comfortable (vs. awkward position)

PROCEDURES & STANDARDS

○ ◇ ☐ Up-to-date, Understood
○ ◇ ☐ Followed
○ ◇ ☐ Orderliness

TOOLS & EQUIPMENT

○ ◇ ☐ Safe Condition (pre-use inspection)
○ ◇ ☐ Correct for Task
○ ◇ ☐ Safe Use

Shaw® SAFETRACK

SIGNIFICANT ASPECTS OF OBSERVATION & DISCUSSION

Including what task was observed, employees' comfort level, ideas for improving task and job, overall reception, follow-up items, etc.

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

☐ Follow-up Required

Potential Risk Severity *(if applicable)*

☐ Serious *(lost time)*
☐ Minor *(med. aid)*
☐ Minimal *(1st aid)*
☐ Ergonomic *(long term)*

Area/Dept._____ Shift_____
Observer's Name(s)_____
_____
_____
Date_____

Initials ☐ ☐

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Attachment 3
Safety Improvement Log

Date Identified	Observation Description	Corrective Action	Person Responsible	Projected Resolution Date	Date Corrected	Verified By Initial

PROCEDURE

Subject: STOP WORK AUTHORITY

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to recognize the authority of company employees to stop work when unsafe conditions warrant.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Company – All wholly-owned subsidiaries of Shaw, Environmental & Infrastructure, Inc. (Shaw E & I)

Stop Work Order – Order that may be issued by any employee of the company when workplace conditions are observed that present an immediate uncontrolled risk of injury or illness.

5.0 TEXT

All employees have the right and duty to stop work when conditions are unsafe, or when established safety procedures are being disregarded. Whenever an employee determines that workplace conditions present an immediate uncontrolled risk of injury or illness, immediate resolution with the appropriate supervisor shall be sought. Should the supervisor be unable or unwilling to correct the unsafe conditions, the employee is authorized and required to issue a Stop Work Order. The specific activity or operation in question shall be discontinued until the issue is resolved.

Upon issuance of a Stop Work Order, the supervisor shall contact the project/location manager and the project/location H&S representative and request their assistance in assessing the situation or conditions that lead to the Stop Work Order. If the project manager and the H&S representative are unable to agree on the necessary corrective actions, or the appropriateness of the Stop Work Order, the issue shall be referred to the business line/program manager and the Director of Health and Safety.

Resumption of safe operations is the primary objective; however, operations shall not resume until an H&S representative has given approval that workplace conditions now meet acceptable safety standards. Any supervisor or manager responsible for resuming operations without H&S approval, thereby endangering project personnel, shall be subject to termination.

6.0 EXCEPTION PROVISIONS

(Not Applicable)

7.0 CROSS REFERENCE

(None)

8.0 ATTACHMENT

1. Responsibility Matrix

ATTACHMENT 1
STOP WORK AUTHORITY

Responsibility Matrix

Actions	Procedure Section	*Responsible Party*					
		Employee	**Supervisor**	**Project/ Location Manager**	**Business Line/Program Manager**	**H&S Representative**	**The Director of Health & Safety**
Resolve unsafe condition(s)	5.0	X	X				
Issue Stop Work Order if resolution not immediately possible	5.0	X					
Resolve unsafe conditions when field supervisor unable to do so	5.0			X		X	
Resolve unsafe conditions when lower level management refers issue	5.0				X		X
Issue Approval to Resume Operations	5.0					X	

PROCEDURE

Subject: EMBRYO-FETUS PROTECTION PROGRAM

1.0 PURPOSE AND SUMMARY

Shaw Environmental & Infrastructure, Inc. (Shaw E & I) Health and Safety procedures, like OSHA and Nuclear Regulatory Commission regulations, establish work practices and exposure limits designed to protect a normal healthy adult employee. However, some chemical substances have been determined to present a particular risk to the developing embryo-fetus. These substances may exert their toxic effect on the embryo-fetus at lower exposure levels, due to their ability to cross the placental membrane and bio-accumulate. For this reason, and the small overall body of technical information available, Shaw E & I has established this protective program defining the steps to be taken jointly by management and employees, to protect the developing embryo-fetus. Key elements include:

- Employee education regarding the Embryo-Fetus Protection Program;
- Employees encouraged to inform company regarding planned, suspected, or confirmed pregnancies;
- Pregnancy-related transfer to alternate duties; and
- List of substances believed to have potential to be reproductive toxins.

2.0. TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health & Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1 in Section 8.0.

4.0 DEFINITIONS

Embryo - The developing unborn baby during the first eight weeks of pregnancy.

Fetus - The developing unborn baby after the first eight weeks of pregnancy.

5.0 TEXT

5.1 Education

Implementation of this procedure initially requires that the Health and Safety representative at each Shaw E & I location provide instruction to all employees about this procedure and the risks of chemical exposure inside and outside the workplace during pregnancy. All employees will complete form HS041A, acknowledging being informed about these risks, and the Shaw E & I procedures for protection.

The Health & Safety representative will explain the program to all new employees, and obtain a completed form HS041A. Form HS041A will be forwarded to the appropriate Human Resources office for retention in the personnel file for the employee.

5.2 Protective Measures

Employees are strongly urged to inform their supervisor when pregnancy (self or spouse) is imminently planned, suspected, or confirmed. No supervisor is authorized to take any action that would violate an employee's right to continue normal duties while pregnant or attempting pregnancy. All information will be kept strictly confidential.

5.2.1 Accommodation and Transfer. Any employee whose duties involve chemical handling and/or exposure, and who plans, suspects or has confirmed pregnancy, may request that the Health and Safety Department assess the job requirements and working conditions for exposure to hazardous chemicals. Health and Safety is responsible for conducting and making this determination regarding the potential for exposure within a few days of the request. The results of the assessment will be documented and shared with the employee and with the Corporate Medical Consultant. The results may be discussed by the employee with Human Resources, Health and Safety and, as needed, the Corporate Medical

Consultant. After this discussion, the employee may request that the Human Resources Department arrange a job accommodation or transfer to alternate duties not involving chemical handling or exposure. The decision to approve such a transfer will be based on medical considerations. Such transfer shall last for the duration of the pregnancy for women. Transfer for men shall last until spousal pregnancy is confirmed, or for a reasonable period of time while attempting pregnancy. The Health and Safety Department is responsible for the final determination regarding the potential for exposure to hazardous chemicals.

Any employee transferring to alternate duties during pregnancy shall continue to receive their normal rate of pay, and seniority in their position shall be fully protected, through the end of the pregnancy.

5.3 Chemicals Toxic to the Embryo-Fetus

To assist employees in deciding whether to continue normal duties or request a pregnancy-related transfer, Shaw E & I has compiled a list of chemicals believed to be capable of embryo-fetal damage. This list is based upon the best information available to the company, but should not be considered comprehensive due to the limited body of research knowledge available. **Any employee who suspects or has confirmed pregnancy should consult her personal physician.**

5.3.1 List of Chemical/Substances Believed to be Reproductive Toxins

2-Acetylamino/Fluroene
Acrylonitrile
Ammonium chloride
Arsenic
Benzene
Cadmium
Carbon disulfide
Cellosolve solvents
Chloroform
Chloroprene
DBCP (dibromochloropropane)
1, 2-Dimethoxyethane
Dimethyl acetamide
4-Dimethylaminoazobenzene
Dimethylformamide
Dimethylsulfoxide
Dinitrotoluene
EDB (ethylene dibromide)
Epichlorophydrin
2-Ethoxyethanol
Ethylene glycol monoethyl ether
Ethylene glycol monomethyl ether
Ethylene oxide
Ethylene thiourea
Flurocarbon-22
Formamide
Glycidyl Ethers
Hexafluoracetone
Inorganic Lead
Ionizing radiation (Attachment 3)
Karat hene
Lead
Magnesium sulfate
Mercury, all forms
2-Methoxyethanol
Organophosphate pesticdes
Polychlorinated biphenyl
Styren
TCDD (dixin)
TCDF (fura)
Tetramethyluea
TOK herbicid
Vinyl chloride

Waste anesthetic gases & vapors.
Any chemical whose MSDS lists possible embryo-fetus toxicity.

6.0 EXCEPTION PROVISIONS

Variances may be requested as described in procedure HS013; Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

(Not Applicable)

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Embryo-Fetus Protection Program - Acknowledgment (Form HS041A)
3. NRC Guidelines for Fetal Exposure to Ionizing Radiation
   (NOTE: Contact your local HS professional or the National HS Office in Baton Rouge for a copy of the most current version of the NRC Guidelines.)

ATTACHMENT 1

EMBRYO-FETUS PROTECTION PROGRAM
Responsibility Matrix

Action	*Responsible Party*			
	Procedure Section	**Human Resources**	**Health & Safety**	**Associates**
Conduct briefings	5.1		X	
Attend briefings	5.1			X
Complete Form HS041A	5.1			X
Place form in personnel file	5.1	X		
Conduct workplace evaluation	5.2.1		X	
Request accommodation/transfer	5.2.1			X
Arrange transfer	5.2.1	X		

ATTACHMENT 2

EMBRYO-FETUS PROTECTION PROGRAM
Acknowledgment

EMPLOYEE NAME (Print):

SOCIAL SECURITY #:

I hereby acknowledge that I have received a briefing about the risks of chemical exposure during pregnancy, and the provisions of Shaw E & I's Embryo-Fetus Protection Program.

_____ /
Signature of Employee Date

_____ /
Signature of HS or HR Representative Date

ATTACHMENT 3
U.S. NUCLEAR REGULATORY COMMISSION

REGULATORY GUIDE

OFFICE OF NUCLEAR REGULATORY RESEARCH
REGULATORY GUIDE 8.36
Revision 1 - February 1996

(Contact your local HS professional or the National Health & Safety office in Baton Rouge for a current copy of this document.)

PROCEDURE

Subject: JOB SAFETY ANALYSIS (JSA)

1.0 PURPOSE AND SUMMARY

This procedure provides the guidelines to perform a Job Safety Analysis. The (JSA) is an effective management technique for identifying hazardous conditions and unsafe acts in the workplace. A JSA is intended to analyze the individual steps or activities, which together create a job or specific work duty, and to detect any actual or potential hazards that may be present. This process can identify less obvious potential hazards that may go undetected during routine management observations or audits. **A new JSA must be completed every day, before commencement of any work activity and updated in the event of changing conditions. It should be understood that changing conditions that a work crew encounters during a work period (inclement weather, another contractor began work in area, etc.) requires that the JSA be modified to address the new hazards. The JSA should be changed to reflect new conditions in the task being performed or new hazards not identified previously.**

2.0 TABLE OF CONTENTS

3.0 Responsibility Matrix

3.1 Procedure Responsibility

- The Manager/Supervisor is responsible for implementing and enforcing this procedure.
- The Safety Representative is responsible for monitoring compliance with this procedure.
- Each Employee is responsible for complying with the project safety program, along with the rules and regulations as stipulated in this procedure and instructions issued by the employee's supervisor.
- It is the responsibility of management and supervision to ensure that this policy is followed. Accordingly, should the project / site requirements stipulate the use of another method of job safety analysis, it is the responsibility of management and supervision to ensure that the proposed method either meets or exceeds this JSA policy and the accompanying JSA form. Any policy or JSA form that does not cover the items contained herein shall not be used.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1

4.0 DEFINITIONS

HAZARD - A potential danger. Oil on the floor is a hazard.

ACCIDENT - An unintended happening that may result in injury, loss or damage.

EXAMPLE - Slipping on the oil is an accident.

INJURY - The result of an accident. A sprained wrist from the fall would be an injury.

5.0 TEXT

5.1 General Requirements

The first page of the JSA form is a checklist that should be used for reference purposes and serves to assist the work crew and supervisor in completing the second page of the JSA. The first page of the JSA form is used to write out the various tasks involved, potential hazards, recommended actions, etc.

Job Safety Analysis is a procedure used to review job methods and uncover hazards:

- That may have been overlooked in a Hazard Analysis, project layout or design of the equipment, tools processes or work area.

- That may have developed after production started.

- That may have resulted from changes in work procedures or personnel

The three basic steps in performing a job safety analysis are:

- Job Task - Break the job down into successive steps or activities and observe how these actions are performed.
- Potential Hazards - Identify the hazards and potential accidents. This is the critical step because only an identified problem can be corrected or eliminated.
- Recommended Actions - Develop safe job procedures to eliminate the hazards and prevent potential accidents.

5.2 Methods of Conducting JSA's

There are two basic methods for conducting the Job Safety Analysis:

— Direct observation

— Group discussion

A fast and efficient method of conducting a JSA is through direct observations of job performance. In many instances, however, this method may not be practical. However, through direct observation, one can gain knowledge concerning an activity and use it on a future JSA.

For instance, new jobs and those that are done infrequently do not lend themselves to direct observation. When this is the case, the JSA can be made through discussions with persons familiar with the job. Individuals often involved in the process include, but are not limited to, first line supervisors, safety specialists, engineers, experienced employees and outside contractors.

5.3 Analyzing The Job

When analyzing the job, most people start with the worst first. You should be guided by the following factors:

- **Frequency of Accidents** (Including "near misses"):

An element of a job that repeatedly produces accidents is a candidate for starting a JSA. The greater the number of incidents associated with a job element, the greater its priority claim for a JSA.

- **New or Revised Jobs**:
  Jobs created by changes in equipment or in processes obviously have no history of accidents, but their accident potential may not be fully appreciated. Analysis should not be delayed until accidents or near misses occur. Any changes from the original task/job shall be noted on the form as a revision. Once this has occurred the new found hazards must be reviewed with the crew.

- **Multiple Employee Exposure**
  Jobs that expose more than one individual to potential hazards should also be analyzed.

5.4 Common Errors

Five common errors that are often made when performing a job analysis are:

- Making the breakdown so detailed that an unnecessarily large number of steps are listed.
- Making the job so general that basic steps are not recorded.
- Failure to identify the education and experience level of the target audience.
- Failure to identify end use(s). (i.e., training, actual procedure, basis for procedure, etc.)
- Always relying on the Supervisor for completing the JSA. Supervisor should describe work scope to the crew. The crew should then assist in identifying hazards and controls at the job site with active involvement from the Supervisor. Ultimately, the supervisor is responsible, however, crew members and the Supervisor should be actively involved in each JSA.

5.5 Identifying the Hazards and Potential Accidents

The purpose is to identify all hazards, both **physical** and **environmental**. To do this, ask yourself these questions about each step:

- Is there a danger of striking against, being struck by, or otherwise making harmful contact with an object?
- Can the employee be caught in, on, by or between objects?
- Is there a potential for a slip, trip or fall? If so, will it be on the same elevation or to a different elevation?
- Can he strain himself by pushing, pulling, lifting, bending or twisting?

- Is the Environment hazardous to one's safety or health? Has the weather been considered as a factor? Has the work product of others, as it pertains to the environment, been considered?

5.6 Accident Types

- Struck by
  - moving or flying object
  - falling material
- Struck against
  - stationary or moving object
  - protruding object
  - sharp or jagged edge
- Contact with
  - acid
  - electricity
  - heat
  - caustic
  - cold
  - radiation
  - toxic and noxious substances
- Overexertion / repetitive
  - Lifting
  - pulling
  - pushing
  - reaching
  - twisting
- Caught
  - in
  - on
  - between
- Fall to
  - same level
  - lower level
- Bodily reaction from
  - voluntary motion
  - involuntary motion
- Rubbed or abraded by
  - friction
  - pressure
  - vibration

5.7 Writing Instructions

- Put any qualifying statements first, not last.
- Start each instruction with an action word.
- Each instruction should be observable.
- Each instruction should be measurable.

When evaluating a given procedure, ask the following question.

"What should the employee do -- or not do -- to eliminate this particular hazard or prevent this potential accident?"

Answer must be specific and concrete to be beneficial. General precautions such as

"be careful"; "use caution" or "be alert" are useless. Answers should state what to do and how to do it.

This recommendation, "Make certain the wrench does not slip or cause loss of balance" is incomplete. It does not tell how to prevent the wrench from slipping. Here is a more complete recommendation. "Set the wrench properly and securely. Test its grip by exerting a slight pressure on it. Brace yourself against something immovable, or take a stance with feet wide apart before exerting full pressure. This prevents loss of balance if the wrench slips."

Job Safety Analyses can be very beneficial if they are performed correctly. They not only result in a safer job, but also increase productivity and eliminate waste. Take the time to do them correctly; **and more importantly, use them.**

5.8 Develop Solutions

The final step in conducting a JSA is to develop a recommended safe job procedure to prevent the occurrence of potential accidents. The principle solutions are:

- Find a new way to do the job.
- Change the physical conditions that create the hazard.
- Try to eliminate remaining hazards by changing work methods or procedures.
- Try to reduce the necessity of doing a job, or at least the frequency that it must be performed.

6.0 Specific Requirements

Instructions for Completing Job Safety Analysis Form

Job Safety Analysis (JSA) is an important accident prevention tool that works by finding hazards and eliminating or minimizing them before the job is performed, and before they have a chance to become accidents.

- Use your JSA for job clarification and hazard awareness
- as a guide in new employee training
- for periodic contacts and for retraining of senior employees
- as a reference tool to be used prior to commencing a job which is performed infrequently
- as an accident investigation tool
- Informing employees of specific job hazards and protective measures.

6.1 Sequence of Basic Job Steps

Break the job down into steps. Each of the steps of a job should accomplish some major task. The task will consist of a set of movements used to perform a task, and then determine the next logical set of movements.
For example, the job might be to move a box from a conveyor in the receiving area to a shelf in the storage area. How does that break down into job steps? Picking up the box from the conveyor and putting it onto a hand truck is one logical set of movements, so it is one job step.
Everything related to that one logical set of movements is part of that job step. The next logical set of movements might be pushing the loaded hand truck to the storeroom. Removing the boxes from the truck and placing them on the shelf is another logical set of movements. Finally, returning the hand truck to the receiving area might be the final step in this type of job.

Be sure to list all the steps in a job. Some steps might not be done each time -- checking the casters on a hand truck, for example. However, that task is part of the job as a whole, and should be listed and analyzed.

6.2 Potential Hazards

Identify the hazards associated with each step. Examine each step to find and identify hazards -- actions, conditions and possibilities that could lead to an accident. It is not enough to look at the obvious hazards. It is also important to look at the entire work environment and discover every conceivable hazard that might exist.

- Be sure to list health hazards as well, even though the harmful effect may not be immediate. A good example is the harmful effect of inhaling a solvent or chemical dust over a long period of time.
- Hazards contribute to accidents, injuries and occupational illnesses. In order to do part three of a JSA effectively, you must identify potential and existing hazards. That's why it's important to distinguish between a hazard, an accident and an injury. Each of these terms has a specific meaning:

Some people find it easier to identify possible accidents, illnesses, and work back from them to the hazards. If you do that, you can list the accident and illness types in parentheses following the hazard. However, be sure you focus on the hazard for developing recommended actions and safe work procedures.

6.3 Recommended Action Procedure

Decide what actions are necessary to eliminate or minimize the hazards that could lead to an accident, injury or occupational illness. Among the actions that can be taken are:

1) Engineering the hazard out

2) Administrative controls

- Job instruction training
- Good housekeeping
- Good ergonomics
  (Positioning the person in relation to the machine or other elements in the Environmental in such a way as to eliminate stresses and strains)

3) Providing personal protective equipment

- List recommended safe operating procedures on the form, and list required or recommended personal protective equipment for each step of the job.
- Be specific. Say exactly what needs to be done to correct the hazard, such as “lift, using your leg muscles.” Avoid general statements like “be careful.”
- Give a recommended action or procedure for every hazard.
- If the hazard is a serious one, it shall be corrected immediately.

The JSA should be changed to reflect new conditions in the task being performed or new hazards not identified previously.

7.0 REFERENCES

"Job Hazard Analysis", U.S. Dept. of Labor -- OSHA Publication No. 3071

"Job Safety Analysis" - Safety Manual No. 5, U.S. Dept. of Interior, Mining Enforcement and Safety Administration

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Job Safety Analysis Form

ATTACHMENT 1
EMPLOYEE AND SUBCONTRACTOR TRAINING REQUIREMENTS

Responsibility Matrix

Action	Procedure Section	*Responsible Party*		
		Manager/ Supervisor	**H&S Representative**	**Employee**
Responsible for implementing and enforcing procedure	3.1	X		
Monitoring for compliance with the procedure.	3.1		X	
Complying with the project JSA program, along with the rules and regulations as stipulated in this procedure	3.1			X
Review completed JSA forms for any errors and communicate to the originator of the changes.	5.5		X	

JOB SAFETY ANALYSIS

DATE:
JOB#:
PERMIT#:
ISSUED BY:

SUPERVISION/FOREMAN _____ _____

Consider the following and check the items which apply to the job, then review with the work crew.

PERMITS
- ____ Required
- ____ Cold Work
- ____ Hot Work
- ____ Entry Permit
- ____ All Conditions Met
- ____ Signed Off When Complete
- ____ Other _____

PERSONAL PROTECTIVE EQUIP. (PPE)
- ____ Type of Gloves
- ____ Composition of Gloves
- ____ Special Purpose Gloves
- ____ Tyvek Suit
- ____ Acid Suit /Slicker Suit
- ____ Rubber Boots
- ____ Mono Goggles (vented/non-vented)
- ____ Face Shield
- ____ Respirator
- ____ Fresh Air
- ____ Ear Protection
- ____ Safety Harness
- ____ Burning Goggles
- ____ Other _____

TOOLS
- ____ Current Inspection
- ____ Proper Tools for the Job
- ____ Good Tool Condition
- ____ Qualifications
- ____ Other _____

EMERGENCY EQUIPMENT
- ____ Fire Extinguishers
- ____ Safety Shower
- ____ Evacuation Route
- ____ Other _____

ACCESS
- ____ Scaffold (properly inspected)
- ____ Ladder (Tied off)
- ____ Manlift
- ____ Personnel Basket (inspected & approved)
- ____ Operator Training
- ____ Special Provisions
- ____ Other

WELDING
- ____ Flashburns
- ____ Combustibles
- ____ Spark Containment
- ____ Shields
- ____ Grounding
- ____ Water Hose
- ____ Fire Extinguisher
- ____ Fire Blanket
- ____ Fire Watch
- ____ Sewer Covers
- ____ Other _____

OVERHEAD WORK
- ____ Barricades
- ____ Signs
- ____ Hole Cover
- ____ Handrail
- ____ Other _____

ELECTRICAL
- ____ Locked & Tagged out
- ____ Try Start/Stop Switch
- ____ GFCI Test
- ____ Assured Grounding
- ____ Extension Cord Inspection
- ____ Other _____

LIFTING
- ____ Forklift
- ____ Cherry Picker
- ____ Load Chart
- ____ Angle
- ____ Crane
- ____ Chainfall
- ____ Proper Rigging Practices
- ____ Manual Lifting
- ____ Condition of Equipment
- ____ Operator Certificate

HAZARDS (ENVIRONMENTAL)
- ____ Electrical Shock
- ____ Heat Stress
- ____ Heavy Objects
- ____ Hot/Cold Surf. Or Mat.
- ____ Inadequate Lighting
- ____ Line Breaking
- ____ Noise
- ____ Poor Access/Egress
- ____ Sharp Objects
- ____ Other _____

HAZARDS/CHEMICALS
- ____ Chemical Burn Shin/Eyes
- ____ Flammable
- ____ Ingestion
- ____ Inhalation
- ____ Skin Contamination

HAZARDS/BODY
- ____ Fall Potential
- ____ Pinch Points
- ____ Slip-Trip Potential
- ____ Other _____

OTHER WORK IN AREA
- ____ Others Working Overhead
- ____ Type Work Others Doing
- ____ PPE Due to Other Work
- ____ Other _____

Confined Space

Know the Following:

- Possible hazards within the confined space
- First signs of exposure
- How to summons help
- How to track personnel
- Entering and exiting the confined space
- Maintain contact with all entrants by voice or visual
- Do not attempt to rescue unless you are a part of a coordinated effort
- Remain at entry point assume no duties with take you from there.

SUPERVISOR/FOREMAN RECOMMENDATION: _____ _____ _____

JOB SAFETY ANALYSIS

DATE:
JOB#:
PERMIT#:
ISSUED BY:

Location of Job
(Unit/Location on Project):

Required PPE:	**Safety Access/ Location**	Supervisor of Work:
	Safe Haven:	JSA Prepared By:
	Wind Direction:	Are other crews in area?
Pre-Job Preparation 1. Fill out JSA 2. Review JSA (EVERYONE) 3. Sign JSA (EVERYONE)	Evacuation Route: Assembly Point:	New: / Revised:

Job Task (What are You Doing)	**Audit the Job** Audit Time:
Potential Hazards	**Supervisors Comments**
Recommended Action or Procedure	**Supervisor's Initials:**

Crew Name Signatures:		

PROCEDURE

Subject: EMPLOYEE AND SUBCONTRACTOR TRAINING REQUIREMENTS

1.0 PURPOSE AND SUMMARY

This procedure sets forth minimum training requirements for employees and subcontractors. Training requirements are established for tasks or types of work to be executed. Functional leads and project managers are responsible for ensuring that adequate numbers of employees are trained for the types of work applicable to their projects or business areas.

2.0 TABLE OF CONTENTS

3.0 PROCEDURE RESPONSIBILITY

The Training Manager and the Director of Health and Safety are jointly responsible for the issuance, revision, and maintenance of this procedure. Functional leads and project managers shall ensure compliance with this procedure.

4.0 DEFINITIONS

Annual Refresher
Training on a subject which requires refresher training annually.

Attendant
One who monitors those who enter a permit-required confined space.

Company Vehicle
Any vehicle (Shaw E & I rental, lease, or personal) used on Shaw E & I business.

Emergency Response
A response effort by employees from outside the immediate release area or by other designated responders to an occurrence which results, or is likely to result, in an uncontrolled release of a hazardous substance.

Entrant
One who enters a permit-required confined space. This occurs as soon as any part of the entrant's body breaks the plane of an opening into the space.

Entry Supervisor
The person responsible for authorizing and overseeing entry into a permit-required confined space.

Hazardous Materials
Anything defined by the U.S. Department of Transportation (DOT) or Environmental Protection Agency (EPA) as hazardous materials. This term includes hazardous materials, substances, and wastes.

Probationary Driver
Person in probationary driving status based on accumulation of points as provided in Shaw E & I Procedure HS800.

Rescue Personnel
Personnel designated to rescue entrants from a permit-required confined space. Personnel shall have trained together as a team prior to being designated.

Trainer
A company employee or subcontractor who has been approved by the Training Manager to conduct a specific training course.

5.0 TEXT

5.1 Minimum Training Requirements

This procedure establishes the minimum employee **(including temporary personnel)** training requirements for work involving potential exposures to hazards greater than those found in the normal office environment. Additional training requirements may be established by state, local, or site authorities, as well as by OSHA regulations that are not routinely applicable to company operations.

5.2 State and Local Training Requirements

This procedure focuses on national-level requirements. Local managers and HS representatives shall also identify and comply with applicable state, local, and client requirements. Documentation of these requirements shall be included in the project-specific HASP.

5.3 Prior Outside Training

Documentation of prior outside training may be accepted by the Training Manager as equivalent to some company sessions. Documentation of training shall be provided to the Knoxville Health and Safety Training Records Center for inclusion in personnel training records.

5.4 Prior Approval for Outside Training

Use of training resources external to the corporation, except as specifically provided herein, requires prior approval of the Training Manager.

- **OSHA 8-Hour Refreshers -** Non-company delivered 8-Hour HAZWOPER Refresher courses must be approved by the training department. Employees will either attend a company provided classroom refresher session or will access the company computer delivered online refresher session. Unapproved sessions will not be entered into the Health and Safety Training Records Center database.

- **OSHA HAZWOPER Training -** Where possible, Shaw E & I employees should attend a company sponsored 40-Hour HAZWOPER training session. Where numbers of employees needing a 40-Hour session are too few to be cost effective to hold a company sponsored session, local outside training program providers will be evaluated by the Training Manager for meeting OSHA's and Shaw E & I's training requirements.

OSHA intended for the 8-Hour HAZWOPER Supervisor Training to cover the employer's procedures and policies as they relate work at 1910.120 sites. Employees who have received Supervisor training from outside providers are expected to become familiar with Shaw E & I Health and Safety Policies as they relate to work on Shaw E & I project sites.

5.5 Site-Specific Training

Site-specific training shall cover site-specific, client-specific and job-specific elements that necessarily cannot be covered in standardized formal training sessions. The project management team is responsible for coordinating this training and forwarding documentation to the HS department.

5.6 Exposure to Physical or Health Hazards

Anyone with potential exposure to physical or health hazards beyond those normal to the office environment, but not subject to training under 29 CFR 1910.120 or 1926.65 may be subject to other OSHA training requirements. Supervisors are encouraged to contact the Training Manager to help them develop and/or provide training support for those needs. Examples of such training would be ergonomic injury prevention, biologic hazards, unexploded ordinance safety, and fire safety. Documentation of training shall be provided to the Knoxville Health and Safety Training Records Center for inclusion in personnel training records.

5.7 Hazardous Waste Supervisor Training Requirement for Managers/Supervisors

Persons who supervise or manage (on *or* offsite) jobs regulated by 29 CFR 1910.120 or 1926.65 should complete the **company version** of Hazardous Waste Supervisor. For those who have taken this training prior to joining Shaw E & I, they must become familiar with Shaw E & I Health and Safety Policies as they relate to 1910.120 sites and projects.

5.8 Lab Safety Training Requirement for Laboratory Personnel

Persons who perform laboratory operations or work in a laboratory must complete Lab Safety Training prior to job assignment with a biennial refresher and Chemical Hygiene Plan training with an annual review. Documentation of training shall be provided to the Knoxville Health and Safety Training Records Center for inclusion in personnel training records.

5.9 40-Hour or 8-Hour HAZWOPER Training Requirements

Employees with duties on 29 CFR 1910.120 or 1926.65-regulated sites in other than the support zone must complete initial 40-hour and annual 8-hour refresher training commonly referred to as 40-hour "HAZWOPER" or 8-hour "HAZWOPER" refresher. Refer to Attachment 2 for a complete explanation of the company's annual refresher policy and Attachment 3 for the requirements to recertify an employee whose refresher has lapsed for a period of 25 months or greater. Persons who clearly meet the criteria of 29 CFR 1910.120/1926.65 (e)(3)(ii) or (iii) may be approved by the HS Manager responsible for the site following provisions documented in the HASP.

5.10 Requirements for RCRA-Permitted Sites

Employees with duties on RCRA-permitted sites shall comply with applicable training requirements. In addition to 40-hour or 24-hour training in compliance with 29 CFR 1910.120/1926.65 (p), other general and site-specific requirements are listed in 40 CFR 264.16/265.16 and in permits and contingency plans. Annual 8-hour refresher training is required. Documentation of training shall be provided to the Knoxville Health and Safety Training Records Center for inclusion in personnel training records.

5.11 Emergency Response

The company continues to contract with individual clients for whom the company provides spill clean-up services and other environmental services. Risks and potential exposures of personnel are well known for these clients. Project and business managers will coordinate training needs with the Training Manager and will assure that personnel assigned to these response groups have adequate OSHA-specified initial and annual refresher training. The Internal Training Group will provide specialized training and refreshers as requested.

5.12 Confined Space Entry

Persons doing work involving confined space entry shall have completed training as listed below:

- Entrants or Attendants must have completed approved Confined Space Entrant/Attendant training.
- Entry supervisors must have completed Confined Space Entry Supervisor training.
- Persons conducting atmospheric testing for confined space entry must have instrument specific training and experience with the testing equipment.
- Rescue personnel must have completed Rescue Service Training with a qualified and approved outside training source unless all entrants are lowered into the confined space with a tripod and non-entry rescue is anticipated. Designated personnel shall have trained together as a team and shall have conducted an annual drill in the space being entered by company personnel or one with a similar configuration. The Training Manager shall review qualifications of rescue services contracted by the company. Documentation of training shall be provided to the Knoxville Health and Safety Training Records Center for inclusion in personnel training records. Refer to HS300 for additional confined space requirements.

5.13 Issue of Hot Work Permits

Persons issuing Hot Work permits shall be trained on the requirements of HS314 Hot Work in Hazardous Locations. Documentation of training shall be provided to the Knoxville Health and Safety Training Records Center for inclusion in personnel training records.

5.14 Health Hazards

5.14.1 Health Hazard Training. Health hazard training is required for work involving the potential for exposure to the specific materials listed below in accordance with HS500. With the exception of asbestos, this training shall be conducted or arranged by local/regional HS representatives in accordance with the listed OSHA regulation, company procedure, and applicable state regulation. The training must be conducted

prior to work or immediately following receipt of industrial hygiene sample results demonstrating exposure above applicable action levels to the below-listed materials. The current substance-specific regulation must be consulted to verify correct application.

- 4-Nitrobiphenyl
- alpha-Naphthylamine
- Methyl chloromethyl ether
- 3,3'-Dichlorobenzidine (and its salts)
- bis-Chloromethyl ether
- beta-Naphthylamine
- Benzidine
- 4-Aminodiphenyl
- Ethyleneimine
- beta-Propiolactone
- 2-Acetylaminofluorene
- 4-Dimethylaminoazobenzene
- N-Nitrosodimethylamine
- Vinyl chloride
- Lead
- Benzene
- Coke oven emissions
- Cotton dust
- 1,2-dibromo-3-chloropropane (DBCP)
- Acrylonitrile
- Ethylene oxide
- Formaldehyde
- Polychlorinated biphenyls
- Arsenic
- Beryllium
- Dioxin
- Bloodborne pathogens and other potentially infectious materials.

Documentation of training shall be provided to the Knoxville Health and Safety Training Records Center for inclusion in personnel training records.

5.14.2 Asbestos. Asbestos workers regulated under AHERA (Asbestos Hazard Emergency Response Act) shall have satisfactorily completed Asbestos Abatement Worker training and annual refresher training. If there is a 2-year gap without any refresher training, then the initial training must be repeated.

Supervisors of AHERA-regulated asbestos workers shall have satisfactorily completed an Asbestos Abatement Supervisor course and annual refresher training thereafter. Successful completion of these courses is required to be eligible for project-level designation as a competent person.

Certificates from AHERA/EPA-approved training providers will be accepted for asbestos training and documentation of training shall be provided to the Knoxville Health and Safety Training Records Center for inclusion in personnel training records.

5.14.3 Ionizing Radiation (10 CFR Parts 20 & 835, 29 CFR 1910.1096). Persons with occupational exposure to ionizing radiation must be trained in radiation protection as follows:

- **GET:** Persons who may encounter radiological hazards as a result of their job description or work location, but who are not considered to be radiation workers, must complete an awareness level course such as General Employee Training in Radiation Protection (GET), Authorized User Training, and/or special briefings. Other site-specific (e.g., DOE) or license-specific (e.g., USNRC or individual state) training delivered on a project-specific basis may be substituted for this training requirement. For training content, see HS700, Radiation Protection Program.

- **Radiation Worker Training:** Those with potential to receive in excess of 100 millirem in one calendar year must complete the comprehensive 8-hour course titled Radiation Worker Training. This course is designed for radiological workers whose job assignments require unescorted access to radiation areas, contamination areas, or airborne radioactivity areas. See HS700 for information on content of training.

- **Authorized User Training**: In addition to Radiation Worker Training, advanced training in radiation protection shall be provided to Authorized Users who are not otherwise qualified by previous training and experience. Authorized User training consists of 40 hours of formal classroom, site-specific and on-the-job training, as well as a detailed briefing on the contents of location-specific hazard control plans and Standard Operating Procedures for Radiation Protection.

- **All forms of radiation training must be updated annually.** Documentation of such training shall be provided to the Knoxville Health and Safety Training Records Center for inclusion in personnel training records.

5.14.4 Embryo-Fetus Protection. Embryo-Fetus Protection training will be included every two years in the annual 8-hour HAZWOPER refresher training.

5.15 Use of Respirators

Persons using respiratory protection shall have completed a respirator training session within the last year in accordance with HS601. Fit testing will be provided by identified individuals within the local office or job site. Documentation of fit testing shall be provided to the

Knoxville Health and Safety Training Records Center for inclusion in personnel training records.

5.16 Operation of Company Vehicles

Persons who operate company-owned, leased, or rented pickups, vans, trucks, 4WD, and other vision-impaired vehicles, and persons in "probationary driver" status, shall have completed Safe Driver Training within the preceding year and refresher training at least every two years thereafter. An annual Safe Driver overview training session will be covered in the annual 8-hour HAZWOPER refresher, but this does not replace the more detailed bi-annual training requirement found in HS800 Section 5.5.

5.17 Department of Transportation HazMat Employees

5.17.1 General Awareness and Safety. Persons who may affect hazardous material transportation safety shall have Department of Transportation General Awareness and Safety training within the past **3 years**. This topic is included in the classroom 8-hour HAZWOPER refresher on a three-year cycle and in the on-line HAZWOPER refresher. This category includes anyone who is engaged in the following:

- Packing hazardous materials;
- Loading hazardous materials;
- Driving hazardous materials;
- Classifying hazardous materials;
- Shipping hazardous materials;
- Selecting packaging;
- Preparing shipping papers; or
- Supervising any of the above tasks.

5.17.2 Shippers. Any person who classifies hazardous or nonhazardous materials; prepares or signs shipping papers (including hazardous waste manifests [except for the driver portion thereof]); selects a DOT Proper Shipping Name; or plans or supervises the packaging, marking, or labeling of hazardous materials for shipment by ground transportation, shall complete the Shaw E & I Ground Shipment of Hazardous Materials course or an equivalent DOT shipping course. Also, Shaw E & I's Air Shipment of Hazardous Materials training is required for those who ship hazardous materials by air. Alternatively, persons who ship by air may attend another company-approved IATA course.

5.17.3 Local, Site-Specific, and Function-Specific Requirements. All persons potentially affecting the safety of hazardous materials transportation shall be trained in accordance with 5.17.1 and 5.17.2 above. In addition, local training shall be conducted to address any local, site-specific, and function-specific needs as required by 49 CFR 172.704 and 177.816. The impact that each person could potentially have on the safety of hazardous materials transportation must be reviewed in the context of the above requirements. The intent of the regulation is that each person

involved must be trained in the proper handling of hazardous materials as required by their job at that location. Completion of Department of Transportation General Awareness and Safety training will satisfy most, but not necessarily all, requirements. A local determination must be made based on the daily activities of the person concerned.

5.18 Equipment Operation

While training is necessary for operation of various pieces of heavy equipment, there is not an OSHA-specified training requirement. The Training Manager will recognize training from the equipment manufacturers, specialized heavy equipment schools and union training certificates. An additional alternative to the company training listed above is documented attendance of equivalent training, such as that provided by the National Safety Council, or an appropriate manufacturer or trade association, followed by a documented demonstration of competency using a performance checklist and an evaluation provided by a local experienced professional.

There are no current formal training programs for heavy equipment operators except forklift trucks. All Shaw employees that may be required to operate heavy equipment are required to comply with the requirements of EIFL-002 (Designated Qualified Operator Program) and its testing and medical qualification requirements. Heavy equipment operators often can receive training from classes supplied by equipment manufacturers or trade association groups. The skills of new equipment operators need to be evaluated by experienced and safe operators and evaluations documented in project files and in Health and Safety Training Center records.

5.19 Excavations

Each site where personnel are required to enter into an excavation must have an excavation competent person present to evaluate the construction and safety of the excavation as specified in HS307. This individual must have completed the company Excavation Competent Person course or an equivalent outside training course. The Training Manager will review and approve outside training courses for equivalency. Employees who enter excavations require Excavation Awareness Training or similar documented local site-specific training of approximately 1 to 2 hours to enable them to recognize unsafe conditions in and around the excavation. Excavation Awareness Training is given once every three years in the classroom version of the 8-hour HAZWOPER refresher and is available at all times within the on-line 8-hour HAZWOPER. Project health and safety personnel may also provide site-specific excavation awareness training. Site-specific training records should be sent to the Knoxville Health and Safety Training Records Center for inclusion into personnel training records.

5.20 Competent Person Drilling Oversight (CPDO) Training

When drilling activity is to take place, the Shaw's Field Team Leader (FTL) must have successfully completed Shaw's in-house training pertinent to Competent Person Drilling Oversight (CPDO) Training. The FTL is required not only to have successfully completed CPDO training but to have an appropriate educational background, coupled with field experience and, the authority to make changes to correct deficiencies, or to

stop the job if need be. The specific procedure that addresses CPDO training and utility contact prevention is HS308. The CPDO training module is available through online training. Requests for sign up and assignment of the CPDO training can be accomplished by contacting the Knoxville Health and Safety Training Records Center.

5.21 Work at Client Locations

Managers of work at client locations shall identify and comply with client requirements including the facility safety rules, the facility emergency action plan, and if applicable, any Process Safety Management requirements. In the event of conflict between company and client requirements the requirement which is more protective of company employees shall be followed.

5.22 First-Aid or CPR Providers/Bloodborne Pathogens

Those who perform first aid or CPR must have a current certification card. Additionally, those who are trained providers, as defined in Procedure HS512, must have completed Bloodborne Pathogen training. In order to comply with US Corps of Engineers and other client requirements, each project shall have at least two personnel on site at all times who are currently certified in first aid or CPR. It is recommended that each office also have, as a minimum, two personnel currently certified in first aid and CPR on duty during office hours.

5.23 Subcontractors

Subcontractors shall comply with all applicable OSHA and DOT regulatory training requirements, Shaw E & I Health and Safety policies and procedures, requirements established in the project-specific HASP, and client requirements. Proof of OSHA-required and Shaw E & I project-required training shall be presented to the project manager. Acceptable proof includes copies of certificates or signed statements on subcontractor's letterhead. The Training Manager will assist the project manager, as requested, in evaluating the adequacy of required training of subcontractors.

5.24 Recordkeeping

The official training records for the Corporation is the database and backup documents maintained by the Knoxville Health and Safety Training Records Center. Documentation for training listed below shall be forwarded to the Training Records Center for inclusion with company records.

- Training conducted by the Training Department
- Training conducted by other authorized internal trainers
- Training conducted by approved outside training sources
- For newly hired employees, records for training received prior to joining the company

All training records will be available through the Health and Safety Training Records Center. This will eliminate the need for maintaining training files at each office location.

6.0 EXCEPTION PROVISIONS

Variances to this procedure shall be requested in accordance with procedure HS013 Health & Safety Procedure Variances. For a variance relative to this procedure, approval of the Training Manager is required in addition to those listed in HS013.

7.0 CROSS-REFERENCES

HS013 Health & Safety Procedure Variances
HS800 Motor Vehicle Operation: General Requirements

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Shaw E & I OSHA HAZWOPER Refresher Training Policy
3. HAZWOPER Recertification Requirements
4. HAZWOPER Recertification Documentation Form

ATTACHMENT 1
EMPLOYEE AND SUBCONTRACTOR TRAINING REQUIREMENTS
Responsibility Matrix

Action	Procedure Section	*Responsible Party*					
		Project Manager	**Functional Lead**	**Employee**	**Employee's Supervisor or Manager**	**Training**	**H&S**
Maintaining current training status for adequate numbers of employees in the types of work applicable for their business.	1.0	X	X				
Comply with applicable state, local, and client training requirements.	5.2	X	X	X			X
Documentation of state, local and client requirements in the project-specific HASP.		X					X
Provision of all relevant information (manuals, schedules, syllabi, phone numbers), to the Training Department, for outside training courses.	5.3	X	X				X
Prior approval of outside training resources, except as specifically provided herein.	5.4					X	
Provide and document site-specific training.	5.5	X	X				X
Evaluation of subcontractor compliance.	5.22	X	X			X	X
Forwarding of documentation for training to the Knoxville Health and Safety Training Records Center for inclusion with company records	5.23	X	X			X	X
Maintenance of corporate training database.	5.23					X	
Review employee's work experience and training for recertification requirements (if applicable).	Attachment 3				X		
Complete and approve HAZWOPER Recertification Documentation Form (if applicable).	Attachment 4				X		X

ATTACHMENT 2

Shaw E &I HAZWOPER Refresher Training Policy

All employees who work at project sites that require compliance with the Hazardous Waste Operation and Emergency Response (HAZWOPER) standard, 29CFR1910.120, must have completed either the initial 40 or 24 hour training and have kept their certification active by completing the annual 8 hour refresher classes. The following is the policy of the company regarding the maintenance of certification to work at HAZWOPER sites:

1. Annual training is to be completed as close to the one-year anniversary date as possible.

2. For those employees who are not working on sites requiring compliance with 29CFR 1910.120 and allow their refresher training to lapse from 13 to 24 months since their last refresher training, attendance at a 8-hour refresher training is necessary to restore their certification. The employee can not work on a jobsite requiring a current certificate until the 8-hour refresher has been completed.

3. For those employees who have not had a refresher course for 25 or more months, they will be required to either attend a 40-hour HAZWOPER course or to satisfy the HAZWOPER recertification requirements described in Attachment 3 before they will be qualified to resume work on sites requiring compliance with the HAZWOPER standard.

Each employee is responsible for keeping his/her training status current and for completing either the company on-line HAZWOPER refresher or attending a company classroom version of the refresher.

ATTACHMENT 3

HAZWOPER RECERTIFICATION REQUIREMENTS

Employees who have had a 25 month or greater lapse of formal 8 hour classroom or internet refresher training may be considered for recertification by Shaw E & I, provided that they meet each of the following requirements:

1. The employee's manager or supervisor must review the employee's work experience during this 25 month or greater lapse period to determine if the employee had been actively engaged in job categories or projects which present hazards similar to those associated with HAZWOPER covered operations and if the employee had retained the necessary safety skills. For example, this could include work involving chemical manufacturing, usage or application or work for other environmentally-related industries that would indicate that the employee had retained key safety skills.

2. The employee must provide a list of all documented safety and health related training attended during the lapse period. Documentation to support this training could include registration materials, certificates of completion, time cards and expense reports. In order to be considered for recertification, the employee's manager or supervisor must review the documentation and verify that at least 8 hours of safety and health related course work had been accumulated during the lapse period.

3. If the employee's manager or supervisor believes that the employee meets the requirement identified in items 1and 2, the manager or supervisor will submit the completed HAZWOPER Recertification Documentation Form (Attachment 4) to the appropriate H&S manager.

4. Approved HAZWOPER Recertification Documentation Forms will be forwarded to the training Department by the H&S manager. The Training Department will then administer a 50 question test to the employee. If the employee completes the test with a score of 80% or higher, he/she will be scheduled to complete an 8-hour refresher either on the internet or in the classroom prior to resuming HAZWOPER field activities.

Note: If any of these requirements are not met, the employee must re-take the 40-hour course. Also, this recertification process is not valid for employees working at HAZWOPER sites in California or Washington.

ATTACHMENT 4

HAZWOPER RECERTIFICATION DOCUMENTATION FORM

Date: _____

Name:_____ Home Dept:_____ Employee No._____

Date: 40 Hr HAZWOPER Certification:_____
(Attach certificate of completion)

Date: 8 Hr Refresher (most recent): _____
(Attach certificate of completion)

Description of documented safety and health training during 25-month or greater lapse period:

- Shaw approved Training:

- Non-Shaw training:

Courses related to chemical or hazardous waste:

Seminars or symposiums related to chemical or hazardous waste:

Description of work experience during 25-month or greater lapse period:

- Work experience related to chemicals or hazardous waste:

- Other activity related to chemicals or hazardous waste:

_____ _____
Applicant Signature Supervisor Signature, Emp #, and Date:

H&S Assessment and Approval:

I, _____, H&S Manager for _____ have approved the application for equivalency of training and clear the applicant to take the equivalency test.

_____ _____
Printed Name Date

Date Forwarded to Shaw's Training Department: _____

STANDARD OPERATING PROCEDURE

Subject: Tailgate Safety Meetings

1. PURPOSE

This procedure establishes the requirement for the conductance of tailgate safety meetings. These meetings are to be conducted at each field-based project site, on a daily basis, prior to the start of any work activities.

2. SCOPE

This procedure applies to all field-based projects with at least two persons present, including subcontractors.

3. REFERENCES

- Shaw Environmental & Infrastructure, Inc. (Shaw E&I) Procedure No. HS013, "Health and Safety Procedure Variances"
- Shaw E&I Procedure No. HS045, "Job Safety Analysis"
- Shaw E&I Procedure No. HS060, "Hazard Communication Program"

4. DEFINITIONS

Company – All wholly-owned subsidiaries of Shaw E&I.

Tailgate Safety Meeting – A short training or informative session that provides safety guidelines for the planned work activities for the day or shift.

5. RESPONSIBILITY MATRIX

5.1 Procedure Responsibility

The Senior Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

5.2 Action/Approval Responsibilities

The Responsibility Matrix is shown as Attachment 1, "Responsibility Matrix."

6. PROCEDURE

The project supervisor or his/her designee conducts a tailgate safety meeting at the beginning of each shift or whenever new employees or subcontractors arrive at the work site. The topics discussed at the tailgate safety meeting should cover the work assignments for the day, the expected hazard(s) presented by the work, and an explanation on how employees and subcontractors will protect themselves from those hazards. The daily Tailgate Safety Meeting must be conducted in addition to reviewing job safety analyses for the various tasks.

The meetings are to be documented by the completion of a Tailgate Safety Meeting Form (Attachment 2). The project supervisor will assure that the form is properly completed and signed by all attendees. Completed forms will be maintained in the project files.

The following provides guidance for the completion of the form:

- **Project Name/Number** – Specific project name and number assigned to the project.
- **Date** – Date of meeting.
- **Time** – Time at which meeting is held.
- **Client** – Identification, name, etc. of entity for whom work is to be performed.
- **Work Activities** – Detailed description of the work activities to be performed that day.
- **Hospital Name/Address** – Hospital name and address designated to be used for the project.
- **Hospital Telephone Number** – Designated hospital nonemergency telephone number.
- **Ambulance Telephone Number** – Telephone number for medical emergency transportation.
- **Safety Topics Presented:**
  - **Chemical Hazards** – Specific chemical name and adverse properties of all chemicals to be encountered on the job that day. A Material Safety Data Sheet for each chemical should be available and discussed in accordance with Shaw E&I Procedure No. HS060.
  - **Physical Hazards** – Address physical hazards associated with the work site, such as slipping/tripping/falling hazards, pinch points, overhead hazards, and nearby operations that could pose a hazard. A Job Safety Analysis should be prepared for each work activity in accordance with Shaw E&I Procedure No. HS045.
  - **Personal Protective Equipment** – Specify levels of protective clothing and protective devices to be used by employees for each of the day's activities.
  - **New Equipment** – Indicate proper work techniques and any hazards associated with new or unfamiliar equipment.
  - **Other Safety Topic(s)** – List any remaining safety topics pertinent to the potential hazards of the job for that day. This is an area where different, unique subjects can be introduced to make the tailgate safety meeting more interesting.
- **Attendees** – Printed name and signature of all persons in attendance. (Also, list affiliation if not employed by the company.)
- **Meeting Conducted By** – Printed name and signature of individual conducting the Tailgate Safety Meeting.

7. EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Shaw E&I Procedure No. HS013.

8. ATTACHMENTS

- Attachment 1, Responsibility Matrix
- Attachment 2, Tailgate Safety Meeting Form

9. FORMS

None.

10. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
01 03/17/2009	• The procedure scope has been clarified to apply to all field-based projects with at least two persons present, including subcontractors. • Corrections have been made to the "Tailgate Safety Meeting'' form template.	Zustra, Mike

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Attachment 1
Tailgate Safety Meetings
Responsibility Matrix

Action	Procedure Section	Responsible Party	
		Senior Director of Health and Safety	Project Supervisor
Issuance, Revision, and Maintenance of Procedure	5.1	X	
Conduct and Document Meeting	6.0		X

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Attachment 2
Tailgate Safety Meeting Form

Project Name/Number: _____ Date: _____ Time: _____

Client: _____

Work Activities: _____

Hospital Name/Address: _____

Hospital Telephone No.: _____ Ambulance Telephone No.: _____

Safety Topics Presented

Chemical Hazards: _____

_____

Physical Hazards: _____

_____

Personal Protective Equipment:

Activity: _____ PPE Level: _____

Activity: _____ PPE Level: _____

Activity: _____ PPE Level: _____

Activity: _____ PPE Level: _____

Activity: _____ PPE Level: _____

New Equipment: _____

Other Safety Topic(s): _____

_____

Attendees

NAME PRINTED	SIGNATURE

Meeting conducted by:

_____

STANDARD OPERATING PROCEDURE

Subject: Health and Safety Plans

UNCONTROLLED WHEN PRINTED

1. PURPOSE

The purpose of this procedure is to establish standard requirements for the development, approval, and implementation of project-specific Health and Safety Plans (HASP). Specific requirements of this procedure include:

- All field projects executed under the Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response Regulation require a HASP.
- All field projects that pose a health or serious safety hazard to employees require a HASP.
- Health and Safety Plans shall be prepared addressing the content elements identified in Attachment 1, "Standard Content for Health and Safety Plans."
- All Health and Safety Plans require the written approval of a Health and Safety representative and Project Manager.

2. SCOPE

This procedure applies to all Shaw Environmental & Infrastructure, Inc. (Shaw E&I) projects executed under the OSHA Hazardous Waste and Emergency Response regulation or that pose a health or serious safety hazard to employees.

2.1 Exception Provisions

Variances and exceptions may be requested pursuant to the provisions of Shaw E&I Procedure No. HS013, "Health and Safety Procedure Variances."

3. REFERENCES

- Shaw E&I Procedure No. HS013

4. DEFINITIONS

Company – All wholly-owned subsidiaries of the Shaw E&I.

HASP Disclaimer – The following disclaimer is to appear on the cover page of all company HASPs:

"This HASP has been designed for the methods presently contemplated by the company for execution of the proposed work. Therefore, this HASP may not be appropriate if the work is not performed by or using the methods presently contemplated by the company. In addition, as the work is performed, conditions different from those anticipated may be encountered and this HASP may have to be modified. Therefore, the company only makes representations of warranties as to the adequacy of this HASP for currently anticipated activities and conditions."

Health and Safety Plan (HASP) – Project document that assesses project-specific hazards and prescribes appropriate control measures, including assignment of safety management responsibilities.

5. RESPONSIBILITY MATRIX

5.1 Procedure Responsibility

The Senior Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

5.2 Action/Approval Responsibilities

The Responsibility Matrix is shown as Attachment 2, "Responsibility Matrix."

6. PROCEDURE

6.1 Requirements for HASP

All field projects executed under the OSHA Hazardous Waste Operations and Emergency Response Regulation or subject to health or serious safety hazards require the development, approval, and implementation of a project-specific HASP. It is the responsibility of the Project Manager or his/her designee, to obtain the HASP, with all required approvals, prior to commencement of field operations, and to ensure that all project personnel are familiar with its contents.

6.2 HASP Format

All HASPs will address each content element identified in Attachment 1, unless the client requires a specific format, which complies with applicable regulations and is at least as comprehensive in scope as the company content.

6.3 Site-Specific Standard Operating Procedures (SOP)

Certain larger projects may need to establish site-specific SOPs covering a number of operational issues, including safety. All SOPs covering safety issues shall be documented in Section 4.2, *Project Specific Practices* of the project HASP.

6.4 HASP Approvals

All HASPs that will control the activities of company employees will be reviewed and approved by the Project Manager and a Health and Safety Representative.

All HASPs requiring the use of Level A or B personal protective equipment will be reviewed and approved by a Certified Industrial Hygienist. Business line Health and Safety managers may individually authorize location Health and Safety representatives to approve Level C or D HASPs they have authored. If there are radiological considerations, the HASP will also be reviewed and approved by a radiological representative.

6.5 HASP Review and Amendment

All project HASPs shall be reviewed whenever work conditions change, and should be reviewed periodically during the project. No project may go longer than six (6) months without a formal review of the HASP. Whenever the plan must be modified to fit current site conditions, these changes shall be made as an amendment to the HASP. The original text shall not be deleted, but can be lined through to indicate that it is no longer applicable.

All site personnel shall receive training on the amended HASP, and general refresher training on the unchanged provisions of the HASP. All HASP amendments shall be subject to approval per Section 6.4. Approved HASP amendments must be retained with the original HASP.

6.6 HASP Training

The HASP shall be reviewed with project personnel and subcontractors before work begins, to allow sufficient time for them to review and sign the HASP. New site personnel shall be given a copy of the HASP and are required to read and sign the HASP acknowledging their acceptance of site rules and understanding of site hazards prior to beginning work.

7. ATTACHMENTS

- Attachment 1, Standard Content for Health and Safety Plans
- Attachment 2, Responsibility Matrix

8. FORMS

None.

9. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
01 03/23/2009	The requirement for a standard Health and Safety Plan format has been replaced by the need to address each content element identified in Attachment 1.	Zustra, Mike

Attachment 1
Standard Content for Health and Safety Plans

REVIEW AND APPROVALS

HEALTH AND SAFETY PLAN ACKNOWLEDGMENT

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LIST OF ATTACHMENTS

LIST OF TABLES

1) INTRODUCTION
   - Objective
   - Site Location and Description
   - Policy Statement
   - References

2) ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES
   - All Personnel
   - Health and Safety Manager
   - Health and Safety Officer
   - Project Manager
   - Site Supervisors
   - Subcontractors, Visitors, and Other On-Site Personnel

3) JOB HAZARD ANALYSIS
   - Scope of Work
   - Job Hazard Assessment
   - Chemical Hazards

4) HAZARD CONTROL PROGRAM
   (Additional sections are to be included as project requirements dictate)
   - General Practices
   - Project Specific Practices
   - Health and Cold Illness Prevention
   - Hearing Conservation
   - Confined Spaces
   - Lockout/Tagout Procedures
   - Sanitation
   - Buddy System

5) PERSONAL PROTECTIVE EQUIPMENT
   - Respiratory Protection
   - Levels of Protection (Include in Hazardous Waste Operations Only)
     - Level A Protection
     - Level B Protection
     - Level C Protection
     - Level D Modified Protection
     - Level D Protection
   - Activity Specific levels of Protection
   - Donning/Doffing Personal Protective Equipment

6) SITE CONTROL MEASURES
   - Support Zone (Include in Hazardous Waste Operations Only)
   - Contamination Reduction Zone (Include in Hazardous Waste Operations Only)
   - Exclusion Zone (Include in Hazardous Waste Operations Only)

- Site Entry Requirements
- Posting Site

7) DECONTAMINATION (Include in Hazardous Waste Operations Only)
   - Procedures for Equipment Decontamination
   - Procedures for Personnel Decontamination

8) EXPOSURE MONITORING/AIR SAMPLING PROGRAM
   - Real Time Air Monitoring
   - Integrated Air Sampling
   - Action Levels
   - Calibration and Maintenance
   - Other Hazardous Conditions
   - Record Keeping

9) TRAINING
   - General Training
   - Hazardous Waste Operations Training (Include in Hazardous Waste Operations Only)
     - 40-Hour Training
     - 24-Hour Training
     - Supervisory Training
     - Refresher Training
     - Supervised Field Experience
     - Visitor Training
   - Tailgate Safety Meetings
   - Site-Specific Training
   - Hazard Communication
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10) MEDICAL SURVEILLANCE
   - Medical Examination
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   - Subcontractor Requirements
   - Medical Restrictions
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11) EMERGENCY RESPONSE PLAN AND CONTINGENCY
   - Personnel Roles/Lines of Authority
   - List of Emergency Contacts and Notification
   - Medical Emergency
   - Personal Exposure or Injury
   - Fire Control
   - Spills or Leaks
   - Site Evacuation
   - Emergency Decontamination Procedures
   - Adverse Weather Conditions/Natural Disasters
   - Critique and Follow-Up of Emergency Procedures

12) RECORD KEEPING AND DATA MANAGEMENT
   - Logs
   - Safety Inspections
   - Accident Reporting and Investigation

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LIST OF ATTACHMENTS

Site and Hospital Location Maps
Material Safety Data Sheets
Forms

- Accident Forms
- Air Monitoring Forms

LIST OF TABLES

Exposure Guidelines
Action Levels for Work Zone Air Monitoring
Emergency Telephone Numbers

Attachment 2
Health and Safety Plans
Responsibility Matrix

Action	Procedure Section	Responsible Party		
		Project Manager	Health and Safety Representative	Senior Director of Health and Safety
Issue, revise, and maintain procedure	5.1			X
Obtain Health and Safety Plan and approvals prior to operations	6.1	X		
Approve Health and Safety Plan	6.3	X	X	
Ensure that Health and Safety Plan is reviewed/amended as needed	6.5	X		
Health and Safety Plan training	6.6	X	X	

PROCEDURE

Subject: HAZARD COMMUNICATION PROGRAM

1.0 PURPOSE AND SUMMARY

This procedure has been developed to ensure that all affected company employees are provided with current information on the hazardous chemicals that they may encounter during their work. The basic principle of Hazard Communication (HAZCOM) is that anyone that works with hazardous chemicals has both a need and a right to know the identities and the hazards of any chemical to which they may be occupationally exposed. This principle has been propagated by the Occupational Safety and Health Administration (OSHA) in 29 Code of Federal Regulations (CFR) 1910.1200 *Hazard Communication*.

Some company activities are likely to occur in states or localities that either have or will have requirements that differ from those contained within the federal standard. In such circumstances, the local health and safety representative will be responsible for ensuring that these requirements are included in either a site health and safety plan or a similar document and conveyed to all affected employees. If federal, state, or local regulations vary or conflict, the more protective requirements and practices will be followed.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The EH&S Operations Manager is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Article - A manufactured item other than a fluid or particle which is formed to a specific shape or design during manufacture, has end use function dependent in whole or in part upon its shape or design during end use, which under normal conditions of use does not release more than trace amounts of a hazardous substance and does not pose a physical hazard or health risk to employees.

Affected Employee - Any company employee who may be exposed to hazardous chemicals under normal operating conditions or in foreseeable emergencies.

Company - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I)

Hazardous Chemical - Any chemical which poses a physical or health hazard.

Health Hazard - A chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. Health hazards include chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes.

Immediate Use - When hazardous chemicals will be under the control of and used only by the person who transfers it from a labeled container and only within the work shift in which it is transferred.

Label - Any written, printed, or graphic material displayed on or affixed to containers of hazardous chemicals.

Local Health and Safety Representative - The person who is responsible for the management and/or oversight of health and safety activities at a particular workplace. He/she may be assigned as a site health and safety officer or act as a home office health and safety manager who is responsible for multiple workplaces. This person does not necessarily need to be physically

located at a workplace in which they are responsible for ensuring that the requirements of this procedure are fulfilled. The local health and safety representative may designate another qualified individual to assume some or all of the responsibilities delineated in this procedure.

Physical Hazard - A chemical for which there is scientifically valid evidence that it is a combustible liquid, compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable, or reactive.

Responsible Party - The entity responsible for preparation or distribution of Material Safety Data Sheets (MSDS) that can provide additional information on the hazardous chemical and appropriate emergency procedures.

Trade Secret - Any confidential formula, pattern, process, device, information, or compilation of information that is used in an employers business, and that gives the employer an opportunity to obtain an advantage over competitors who do not currently know or use it.

Workplace - An establishment, job site, laboratory, office, or project at one geographic location containing one or more work areas.

5.0 TEXT

In accordance with the requirements established in 29 CFR 1910.1200, employers are required to develop, implement, and maintain at each workplace a HAZCOM program. The program contained herein is intended to ensure that the hazards of all chemicals used by employees are evaluated and that information concerning the hazards of each chemical are conveyed to affected employees. The company program generally consists of five provisions, including hazardous chemical inventories, procurement of hazardous chemicals, container labeling, MSDSs, and the development and implementation of employee training programs. Since the company does not typically produce, distribute, or import hazardous chemicals, the focus of this procedure is on establishing an effective consumer/handler type HAZCOM program and the communication of information to our affected employees.

There are some types of chemicals that are specifically exempt from this procedure. These materials include:

- Any hazardous waste as defined by the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1967, as amended (42 U.S.C. 6901 *et seq.*), when subject to regulations issued under that Act by the U.S. Environmental Protection Agency.

- Any hazardous chemical as defined by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) when the hazardous chemical is the focus of remedial or removal actions being conducted under CERCLA in accordance with U.S. Environmental Protection Agency regulations.

- Tobacco or tobacco products.

- Wood or wood products, including lumber which will not be processed, where the manufacturer or importer can establish that the only hazard they pose to employees is the potential for flammability or combustibility. Wood or wood products which have been treated with a hazardous chemical are covered by this procedure, and wood which may be subsequently sawed or cut, generating dust.

- Articles.

- Food or alcoholic beverages which are sold, used, or prepared in a retail establishment, or foods intended for personal consumption by employees while in the workplace.

- Any drug, as defined by the Federal Food, Drug, and Cosmetic Act, when it is in solid, final form for direct administration to patient; drugs which are packaged by the manufacturer for sale to consumers in a retail establishment; and drugs intended for personal consumption by employees while in the workplace.

- Cosmetics which are packaged for sale to consumers in a retail establishment, and cosmetics intended for personal consumption by employees while in the workplace.

- Any consumer product or hazardous chemical, as defined by Consumer Product Safety Act and Federal Hazardous Chemicals Act, where the employer can show that it is used in the workplace for the purpose intended by the manufacturer or importer of the product, and the use results in a duration and frequency of exposure which is not greater than the range of exposures that could reasonably be experienced by consumers when used for the purpose intended.

- Nuisance particulates where the manufacturer, distributor, or importer can establish that they do not pose any physical or health hazard covered under this procedure.

- Ionizing and nonionizing radiation.

- Biological hazards.

5.1 Hazardous Chemical Inventories

A complete list of all hazardous chemicals known to be present in the workplace that may expose an employee to a physical or health hazard will be maintained at each office location and project site. This list will be placed in the front section of the MSDS binder discussed in Section 5.4. The local health and safety representative/site safety officer will be responsible for maintaining the list and revising it as new chemicals are procured or when chemicals are no longer used and have been removed from the workplace. The identity of the hazardous chemical maintained on the list will be consistent with that

which appears on the MSDS. All affected employees will be made aware of the location of the MSDS binder.

5.2 Procurement of Hazardous Chemicals

Since the company does not typically manufacture, distribute, or import hazardous chemicals, procurement is the primary method of obtaining hazardous chemicals. The person initiating the procurement of a hazardous chemical will be responsible for requesting a MSDS from the manufacturer or distributor. This MSDS is to be provided either prior to or at the time of receipt of the chemical. Hazardous chemicals are strictly forbidden to be accepted without an accompanying MSDS. Upon receipt of a hazardous chemical, the person receiving the shipment will notify the local health and safety representative so that a review of the MSDS can be conducted. Also, note that the supplier is only required to submit a MSDS with the initial shipment of a hazardous chemical to a specific location.

In the unlikely event that a hazardous chemical is either manufactured, imported, or distributed by the company, the Vice President, Health and Safety will be notified so that required actions, as dictated by OSHA, can be implemented.

5.3 Container Labeling

Labeling on hazardous chemical containers is meant to provide immediate information to affected employees about the hazards of chemicals they will be expected to handle during the course of their job duties. It is the responsibility of the manufacturer, importer, or distributor of the chemical to ensure that each hazardous chemical leaving their place of business is labeled, tagged, or marked with the following information:

- Identity of the hazardous chemical (must be common to the label, the MSDS, and the chemical inventory list);
- Appropriate warnings of the hazardous effects of a chemical (words, pictures, symbols, or any combination that appears on the label and convey the specific physical or health hazards including target organ effects); and
- Name and address of the chemical manufacturer, importer, or other responsible party.

The person receiving the shipment is responsible to ensure that each container of hazardous chemical(s) has been provided with this labeling information. Hazardous chemicals that do not contain adequate labeling will not be accepted by the receiving person. In the event that hazardous chemicals that do not contain adequate labeling are inadvertently received, they are not to be handled until the identity of the material and appropriate hazard warnings are provided. If the hazardous chemical is regulated by a chemical-specific health standard, then it must be labeled in accordance with the requirements of that standard.

As long as the hazardous chemicals are maintained in their original, properly labeled container and their composition is not altered, there is no need for additional labeling. In the event that the chemical is transferred from a labeled container to an unlabeled portable container, the user must label this secondary container unless the container is intended for immediate use of the employee who performs the transfer. In this case, the container must be labeled with the identity of the chemical and the appropriate hazard warnings, as described above.

In locations where employees are present who only communicate in languages other than English, all labeling information must be presented in their language as well as in English.

5.4 Material Safety Data Sheets (MSDS)

MSDSs are written documents that convey specific, detailed information about the hazards associated with a specific chemical. It is the responsibility of the manufacturer, importer, or distributor to either provide MSDSs prior to shipment or with the shipped materials. The employee receiving the shipment of materials is responsible to ensure that a MSDS has been supplied. As described in Section 5.2, the employee initiating the procurement is responsible for requesting a MSDS from the manufacturer or distributor. In the event that a MSDS has not been provided, it is the responsibility of the receiving person to obtain one from the manufacturer or distributor as soon as possible. The material will not be handled prior to the receipt of a MSDS.

Each MSDS will be forwarded to the local health and safety representative/site safety officer or a designee who will then place a copy into a MSDS binder. This binder will be maintained in the workplace and updated as new materials arrive. The local health and safety representative/site safety officer will ensure that this binder is reviewed with all affected employees and is readily accessible during each work shift. A designated area for the storage of the binder will be established and all employees are to be informed of its location. Employees can request a personal copy of a MSDS by completing the Employee Request for MSDS form provided in Attachment 2. Where employees travel between workplaces during a work shift, the MSDSs may be kept at the primary workplace. Affected employees must be able to immediately obtain information from the MSDSs in the event of an emergency.

MSDSs will be in English and other languages, as necessary, for the particular employees in which the MSDSs will be used. MSDSs are to include the following information:

- Name, address, and telephone number of the responsible party;
- Identity of the chemical as it appears on the label;
- Hazardous ingredients;
- Physical and chemical characteristics;
- Physical and health hazards;
- Primary route(s) of entry;

- OSHA permissible exposure limit (PEL) or other applicable exposure limits;
- Carcinogen information;
- Safe handling and use information;
- Control measures;
- Emergency and first aid procedures; and
- Date of preparation and latest revision date.

5.5 Training

All affected employees will be provided with information and training on the hazardous chemicals in their work area at the time of their initial assignment, when new information about the hazards of a chemical is discovered, and whenever a new physical or health hazard that the employees have not previously been informed of is introduced into the workplace. The HAZCOM training record has been provided as Attachment 3.

Information provided in this training will include:

1. Requirements of the HAZCOM program.
2. Any operations in the work area where hazardous chemicals are present.
3. Location of written hazard communication program, listing of hazardous chemicals present and MSDS.
4. Methods and observations that may be used to detect the presence or release of hazardous chemicals by use of monitoring devices, visual appearance or odor.
5. The physical and health hazards of chemicals in the work area.
6. Protection measures to be utilized to prevent exposure, appropriate work practices, emergency procedures and proper PPE to be used.
7. Explanation of the labeling system and the MSDS and how employees can obtain and use the appropriate hazard information.

Training on this HAZCOM program may be satisfied by the use of two different types of training sessions. These sessions include:

- **Tailgate Safety Meetings** - These meetings will be used to convey the methods and observations that may be used to detect the presence or release of a hazardous chemical in the workplace, the physical and health hazards of the chemicals in the workplace, and the measures that can be taken to protect affected employees from these hazards. The guidelines for this meeting are described in Procedure HS051, Tailgate Safety Meetings.

- **Workplace-Specific or Annual Refresher Training** - Either of these training sessions can be used to convey the details of this HAZCOM program. These details include an explanation of labeling systems, the use of MSDSs, and how employees can obtain and use the appropriate hazard information. These training sessions are discussed further in Procedure HS050, Training Requirements.

Workplace-specific and tailgate safety meetings will be facilitated by the local health and safety representative or another individual who is knowledgeable on the requirements of the HAZCOM program and the specific chemicals that are being discussed. Training for non-English speaking employees shall be conducted in a manner such that the employee is able to comprehend. Annual refresher training can only be conducted by personnel previously approved by the company Training Department.

5.6 Trade Secrets

Some hazardous chemical manufacturers, importers, and distributors may withhold proprietary information required to be present on a MSDS. In such instances, the name and telephone number of the manufacturer, importer, or distributor will be forwarded to the Vice President of Health and Safety for further action. It will be the responsibility of the Vice President of Health and Safety to either obtain the necessary information or to decide to reject the chemical for use in company workplaces.

5.7 Contractors

During the execution of our work, there will be situations when the company will be at locations where employees of other entities may be exposed to chemicals being used by the company. It will be the responsibility of the local health and safety representative or designee to provide the other entities= site representative(s) with copies of all MSDSs in which their employees may be exposed, as well as the labeling system in place, the protective measures to be taken, safe handling procedures to be used, and the location and availability of the MSDS binder.

Periodically, company work areas will be located on or adjacent to a facility operated by another entity. In these situations, the local health and safety representative or designee will contact the other entity to obtain applicable MSDS(s) for hazardous chemicals that company employees may be exposed to.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS050 Training Requirements
HS051 Tailgate Safety Meetings
HS500 OSHA Regulated Toxic and Hazardous Chemicals
OSHA 29 CFR 1910.1200

8.0 ATTACHMENTS

1. Responsibility Matrix

2. Employee Request for MSDS
3. HAZCOM and Right-to-Know Standards Employee Training Record

ATTACHMENT 1
HAZARD COMMUNICATION PROGRAM

Responsibility Matrix

Action	Procedure Section	*Responsible Party*				
		Purchaser	**Receiver**	**Affected Employee**	**Local Health and Safety Representative**	**EH&S Operations Manager**
Understand and Comply With State and/or Local Regulations	1.0				X	
Issuance, Revision, and Maintenance of Procedure	3.1					X
Review and Understand This Procedure	5.0	X	X	X	X	
Establish, Update, and Revise MSDS Binder	5.1				X	
Request MSDSs for Procured Chemicals	5.2	X				
Initial Review of MSDSs	5.2				X	
Implement Requirements For Company Manufactured, Imported, or Distributed Chemicals	5.2					X
Review Incoming Shipments for Hazard Labeling/MSDS	5.3		X			
Request Missing MSDSs From Manufacturer or Distributor	5.4		X			
Provide HAZCOM Training	5.5				X	
Receive HAZCOM Training	5.5			X		
Obtain Information on Proprietary Chemicals	5.6					X
Transmit MSDSs to Contractors	5.7				X	
Obtain MSDSs From Other Entities	5.7				X	

ATTACHMENT 2

EMPLOYEE REQUEST FOR MATERIAL SAFETY DATA SHEET (MSDS)

Employee Name: (Please print) _____

Employee Number: _____

Job Title/Location: _____

Department/Work Area: _____

I am requesting a copy of the MSDS(s) for the following chemical(s):

(Chemical name, Common name, Trade name)

1. _____

2. _____

3. _____

_____

Signature Date

I have received a copy of the above MSDS(s) I requested.

_____

Signature Date

cc: Local Health and Safety Representative

ATTACHMENT 3

HAZARD COMMUNICATION AND RIGHT-TO-KNOW STANDARDS EMPLOYEE TRAINING RECORD

INITIAL:

1. I have been informed about the Hazard Communication Program, Material Safety Data Sheets (MSDS), their use and location, and the procedures to obtain copies. ☐

2. I have been informed that some of my work may involve exposure to toxic substances, the hazards of which will be reviewed with me in tailgate safety meetings or site-specific training. ☐

3. I have been informed about the right of employees to have access to relevant exposure and medical records, and the procedures for requesting access. ☐

4. I understand that the company must act upon a request in a reasonable amount of time so as to avoid interruption of normal work operations. ☐

5. I have been provided access to the applicable regulations governing hazard communication, and access to employee exposure and medical records. ☐

PRINT NAME: _____

SIGNATURE: _____

EMPLOYEE NUMBER: _____

DATE: _____

ATTACHMENT 4

CHEMICAL LISTING

Chemical	MSDS Number
A12 - Car Cleaner Wax	1
A-33 Dry	2
ABC Dry Chemical	3
Acetone	4
Acid, Acetic	5
Acid Hydrochloric	6
Acid, Nitric	7
Acid, Nitric (Lightning)	8
Acid, Oxalic Dihydrate	9
Alcohol, Ethyl	10
Alcohol, Isopropyl	11
Alcohol, Methanol	12
Alconox	13
All Weather DTR Primer White Comp A	14
Aluminum Nitrate, 9-Hydrate	15
Amine Mixture	16
Ammonium Hydroxide	17
Anti-Seize Lubricant (133K)	18
Anti-Static Spray #19050	19
Antimicrobial Wipes	20
Armor All Protectant	21
Barium Nitrate	22
Bentonite Extender D20	23
Bradley Opti-Aid and Opti-Aid Plan 1181	24
Brake Cleaner (Aerosol), GUNK	25
Buffer Solution pH4	26
Buffer Solution pH7	27
Buffer Solution pH10	28
Butyl Rubber Sealant	29
Butyl Tape Glazing Compound 250 H	30
Calcium Chloride, (Flake)	31
Calcium Oxide, (Lime)	32
Canvak Coating	33
Carbon Dioxide	34
Casrn 38640-62-9	35
Casrn 92-71-7	36
Castrol Super Clean	37
Cement sp-4633	38
Certicool Instant Cold Pack	39
Chemlok AP-134	40
Closed Cell Neoprene Sponge	41

Cobalt Nitrate, 6-Hydrate	42
Contrac Rodenticide	43
CPVC Orange Cement	44
Crazy Clean Cleaner (031)	45
Dap Kwik Foam	46
Day-Chem Cure & Seal 26% (J-22)	47
Day-Chem Cure & Seal 26% 1315 (J-22)	48
Dextrose	49
Diazinon Ultra Insect Spray	50
Diesel Aid	51
Diesel Fuel	52
Dow All Purpose Cleaner	53
Dow Disinfectant Bathroom Cleaner	54
Dow Glass Plus	55
Dragon Home Pest Killer	56
Dursban Many Purpose Concentrate	57
Dye, (D11006 Chromatint Uranine HS Liquid)	58
Dyed Fuel Oil #2	59
Enforcer Wasp and Hornet Killer XT	60
Enoz Old Fashioned Moth Balls	61
Environcide, Disinfectant Decontaminant/Cleaner	62
Enviroseal 20	63
Envirosorb	64
Eva-Pox Quick Gel #24	65
Ethyl Chloride	66
Ethylene Glycol	67
Eyesaline Concentrate	68
Eyesaline Solution	69
Fantastic All Purpose Cleaner	70
Fast Track Trim Adhesive - 3M Brand	71
Ferric Chloride, 6-Hydrate	72
Fly Ash. NO DESIGN. NO DESIGN	73
Formamide	74
Formula 409 Cleaner/Degreaser	75
Four Part Mix (H2S, CH4, CO & O2 in N2)	76
Freeze Ban	77
Freshly-Mixed, Unhardened Concrete	78
Gasoline	79
Glass, Fibrous	80
Great Stuff, Instafoam Products	81
Great Value Foaming Disinfectant Cleaner	82
Hazorb	83
Home Safeguard, Smoke Detector Tester	84
Hydraulic Fluid, ATF Automatic Transmission	85
Hydrogen Peroxide	86
Hydrogen Sulfide	87
Intraplast N	88

Insta-Gel	89
Insta-Gel XF	90
Iron Powder	91
Irritant Smoke	92
Isobutylene in Air	93
Isocyante Mixture	94
Iso-Flex Epoxy SF Primer(Part A)	95
Kerosene	96
Klean-Strip Mineral Spirits	97
Kolor Kut Water Finding Paste	98
KoolVest	99
Latex Acrylic Caulk, GE Silicones (GE91)	100
Lexel	101
Liquid Nails (LN 601)	102
Liquid Nails (LN 901)	103
Liquid Nitrogen	104
Liquid-Plumr	105
Lysol Brand Disinfectant Tub & Tile Cleaner	106
Magic American--Goo Gone Stain Remover	107
Magic Lens Cleaning Anti-Fogging Anti-Static Fluid	108
Micro Air I	109
Micro Air	110
Mop & Glo R	111
Mountain Grout "Accelerator"	112
Mountain Grout "Flexible"	113
Mountain Grout "Soil Stabilizer"	114
Mr. Jinx	115
Multi-Purpose Anti-Static Cleaner	116
Nickelous Nitrate, 6-Hydrate	117
Non-Flammable Gas Mixture (Multi-Gas)	118
Non-Flammable Gas Mixture (P-10)	119
Oil, Durafilm Air Line	120
Oil, Echo 30 Weight Bar & Chain	121
Oil & Grease - Cato - Mystic JT-6 Multipurpose	122
Oil, Husqvarna Pro Forest 30 Wt. Bar & Chain	123
Oil, Lubricating, Automatic Transmission	124
Oil, Mobile DTE, Heavy	125
Oil, Pennzoil - HD Motor Oil SAE 40	126
Oil, Pennzoil - Multi-Duty Motor Oil SAE 10W-40	127
Oil, Rigid Dark Thread Cutting Oil	128
Oil, Save-A-Chain 30 Weight	129
Oil, Shell Rotella T Oil 30	130
Oil, Unitrac Fluid 10W30	131
Paint, Color Place Spray Paint	132
Paint, Duralux Enamel	133
Paint, Fluorescent by Krylon	134
Paint, Frazee, 27 Primers by Plasti-Kote	135
Paint, Latex by Ace-Pro	136

Paint, Latex Semi-Gloss House & Trim, White	137
Paint, Lucite L Acrylic	138
Paint, Primer by Plasti-Kote	139
Paint, Quick Dry Enamel 139	140
Paint, Quick Dry Metal Primer 895-1157	141
Paint, Quik-Mark Inverted Marking Paints 3	142
Parabond	143
Petroleum Hydrocarbon	144
Phenolic Foam	145
Pico-Fluor 40	146
Pine-Sol Brand Cleaner, Professional Strength	147
Pitt Guard All Weather DTR Gray Coating	148
Pitt Guard Comp. 2	149
Ply-Mastic Epoxy Coating (044 Line)	150
Polyheed 997	151
Polymeric Barrier System	152
Portland Cement	153
Potassium Chloride	154
Potassium Permanganate	155
Premium Gel	156
Propane	157
PSF-12 Master Power Steering Fluid	158
PSF-32 Master Power Steering Fluid	159
PSF-128 Master Power Steering Fluid	160
Purple K Dry Chemical Extinguishing Agent	161
Raid Wasp & Hornet Killer	162
Rain-N-Shine PVC Cement, 30890	163
Regular Clear PVC Solvent Cement, 31	164
Regular Clorox Bleach	165
Safe-Cure Clear	166
Safe-Slip	168
Satellite Safe-T-Fresh (Toilet Deodorizer)	169
Sealed Standard, Blank (Toluene)	170
Sealtight Fibre Expansion Joint	172
Sight Savers Brand Disposable Cleaning Station	173
Sight-Savers Brand Premoistened Lens Cleaning Tissues	174
Sikaflex 1A	175
Sikaflex 1C SL	176
Sikaflex Primer 429/202	177
SikaSwell S	178
Silicone Rubber	179
Silver Nitrate	180
Snap Starting Fluid	181
Sodium Chloride	182
Sodium Hydroxide, Pellets	183
Soluble Barium Compound (as Barium)	184
Stencil Inks and Stencil Kovers	185
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Strontium Nitrate Anhydrous	187
Super Trim Adhesive, 3M Brand	188
Sureweld	189
Tarkett FB-20, Tile Flooring Adhesive	190
Tech 2000 Windshield Wash -25F	191
Texwipe - TX507 Office Duster 3	192
TFE Paste, 023017	193
Thermaflex Nosing Material Part A	194
Thermaflex Nosing Material Part B	195
Thorium Metal/Powder (compounds)	196
Toluene	197
Touch ‘n Foam	198
Triplex	199
Tube Paint Marker	200
Tuner/Control Cleaner and Lubricant	201
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Uranium	205
USG Steel Framing Components & Accessories	206
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Waterproofing Membrane System - HLM 5000, Sonneborn	208
WD-40 Aerosol	209
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PROCEDURE

Subject: HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to establish guidelines for preparing an Emergency Response Plan. These requirements are based on the federal Occupational Safety and Health Administration (OSHA) Hazardous Materials standard found in 29 Code of Federal Regulations (CFR) 1910.120.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health & Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Safety Representative

The Safety Representative is responsible for the development and monitoring of site specific emergency response requirements as part of the site specific Safety and Health Plan

3.3 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Buddy System - A system of organizing employees into work groups in such a manner that each employee of the work group is designated to be observed by at least one other employee in the work group. The purpose of the Buddy System is to provide rapid assistance to employees in the event of an emergency.

Clean-up Operation - An operation where hazardous substances are removed, contained, incinerated, neutralized, cleared-up, or in any manner processed or handled with ultimate goal of making the site safer for people or the environment.

Decontamination - The removal of hazardous substances from employees and their equipment to the extent necessary to preclude the occurrence of foreseeable adverse health affects.

Emergency Response or Responding to Emergencies - A response effort by employees from outside the immediate release area or by designated responders to an occurrence which results, or is likely to result, in an uncontrolled release of a hazardous substance.

Facility - Any building, structure, installation, equipment, pipe or pipeline, well, pit, pond, lagoon, impoundment, ditch, storage container, motor vehicle, rolling stock, or aircraft, or any site or area where a hazardous substance has been deposited, stored, disposed of, or placed, or otherwise come to be located; but does not include any consumer product in consumer use or any water-borne vessel.

Hazardous Substance- Any substance which results or may result in adverse affects on the health or safety of employees due to exposure.

5.0 TEXT

5.1 General An emergency response plan shall be developed and implemented to handle anticipated emergencies prior to the commencement of emergency response operations. The plan shall be in writing and available for inspection and copying by employees, their representatives and OSHA personnel.

In the event of an emergency, Shaw personnel and subcontractors will evacuate to a safe distance, notify local authorities of the emergency, and provide technical assistance requested by authorized personnel (i.e., local fire departments, client or local HAZMAT response teams, police officers, paramedics, etc.). All Shaw employees and

subcontractors are expected to follow directions by authorized emergency response personnel.

5.2 Elements of Emergency Response Plan

The Emergency Response plan shall incorporate the following as a minimum.

- Pre-emergency planning - Emergencies that may potentially occur on site, such as fire, personal injury, spills, etc., shall be anticipated and response actions planned and included.

- Personnel roles, lines of authority, and communication - The plan should clearly state who is in charge in the event of an emergency and how personnel shall be informed of site emergencies and evacuation requirements.

- Emergency recognition and prevention - As part of the site briefing, personnel shall be informed of how to recognize an emergency.

- Safe distances and places of refuge The plan shall identify specific locations of safe refuge.

- Evacuation routes and procedures - The plan shall discuss evacuation routes and procedures such as emergency shutdown of equipment and accounting for personnel on the site.

- Emergency decontamination procedures - The plan shall include procedures that are not covered by the Safety and Health Plan.

- Emergency medical treatment and first aid - The plan shall include the location of the site first aid kit and identification of a qualified first aid provider. The plan shall also include directions and a map to the nearest medical facility.

- Emergency alerting and response procedures - The plan shall identify the location or system for activating site alarms or otherwise notifying site personnel of a site emergency. The plan shall also include telephone numbers of local emergency response personnel including ambulance, fire fighters, police, and HAZMAT teams.

- Critique of response and follow-up - The plan shall evaluate the response and aftermath.

- Personal protective equipment (PPE) and clothing - If specialized PPE is used in the event of emergencies, such as escape respirators, this equipment shall be identified. (See training below for more information on chemical PPE)

5.3 Procedures for Emergency Response Plan

The Emergency Response Plan shall be a separate section of the site Safety and Health Plan or it may be a freestanding document depending on its length and complexity.

- The senior emergency response official responding shall become the individual in charge of a site-specific Incident Command System (ICS).

- The (ICS) leader shall identify, to the extent possible, all hazardous substances and conditions present. Based on this information the appropriate emergency operations shall be implemented, with assurance the responding employees are equipped with the correct personal protection equipment for the hazards present.

- Employees engaged in the emergency response shall wear a positive pressure self-contained breathing apparatus while there is a potential for an inhalation hazard. The level of respiratory protection shall be lowered once the (ICS) determines that the decrease will not result in a hazardous exposure.

- The emergency site shall be limited to the employees involved in the emergency operations. Employees performing operations within the emergency area shall work in-groups of two or more.

- A safety official shall be designated by the (ISC) with specific responsibility to identify and evaluate hazards and to provide direction with respect to safety operations. When the activities are judged by the safety official as an IDLH condition and/or imminent danger, they should have the authority to alter, suspend or terminate those activities.

- Proper decontamination procedures shall be implemented once the emergency operations are terminated.

- It shall be compatible and, where appropriate, integrated with the disaster, fire, and/or emergency response plans of local, state, and federal agencies.

- The site Emergency Response Plan shall be reviewed periodically and, as necessary, be updated to reflect new or changing site conditions or information.

- An alarm system or other emergency notification system shall be included in the plan to notify personnel of an emergency situation; to stop work activities if necessary; to lower background noise in order to speed communication; and

to initiate emergency procedures.

5.4 Training

Training shall be based on the duties and functions to be performed by each responder of an emergency response organization. The skill and knowledge required shall be conveyed to them through training before they are permitted to take part in actual emergency response operations. The training shall be given in accordance with the following. Trainers who will be teaching any of the above subjects shall have completed training courses for those particular subjects. Their training credentials and instructional experience should demonstrate their ability to present the subject material to employees and a strong sense of the subject matter. Refresher Training for employees shall be performed annually in the subject which is necessary, to maintain competency.

5.4.1 **First Responder Awareness Level** are classified as individuals who are likely to witness or discover a hazardous substance release. These individuals are trained to initiate notification the proper authorities. They are not to take any further action after to notify the proper authorities of the situation. Employees must demonstrate competency in the following:

- What hazardous substances are and what risks are associated with that substance in case of a discharge or release.
- The potential outcome associated with this type of hazardous substance release as well as the ability to recognize the presence of these materials in an emergency situation.
- Their role in the Company Emergency Response Plan including security of the site, the policies and the US Dept of Transportation's Emergency Response Guidebook.
- Recognize the need for additional means and making communication with such resources.

5.4.2 **First Responder Operations Level** are classified as individuals who will respond to releases or potential discharges initially for the purpose of protecting other individuals, property, equipment or other parts of the environment from the effects of the release. They are to respond in a defensive role not as one who will stop the discharge/release. Their duties shall not go beyond trying to contain it, keep it from spreading and preventing exposure. Awareness level individuals must have at least eight hours of training and be able to demonstrate competency in the following:

- Knowledge of basic hazards and risk assessment techniques.
- Proper selection and use of PPE associated with First Responder Operations level.

- Hazardous material terms and the implementation of basic contamination procedures
- Controlling, containing and/or confinement of the hazardous material within the constraints of the proper PPE
- Understanding basic operating and termination procedures of cleanup.

5.4.3 **Hazardous Materials Technicians** are individuals who respond to hazardous situations for the sole purpose of stopping the release. These individuals serve a more active position in that they will approach the point of release as to stop it from discharging more of the hazardous material. Hazardous Materials Technicians must have completed 24 hour training equal to operations level and be able to demonstrate competency in the following:

- Properly adhering to the Company Emergency Response Plan. (developed per individual job as site-specific)
- Identifying, classifying, and general knowledge of known and unknown materials using instruments and other equipment.
- Working within a field scope for the Incident Command System.
- Being familiar with PPE, the correct way it should be used and identifying the proper PPE for the task.
- Understand hazard and risk assessment techniques and procedures.
- Performing containment, controls and proper operations within the boundaries of resources and limitations of PPE.
- Have an understanding of, and be able to implement both decontamination procedures and termination procedures..
- Having knowledge of basic chemical and toxicological terms and behaviors of such substances.

5.4.4 **Hazardous Materials Specialist** employees are classified as individuals who will respond to and provide assistance to Hazardous Materials Technicians. Their duties require a more directed knowledge and a further response than that of a technician. A specialist will also act as a liaison with state, local, and federal officials dealing with site operations. The Hazardous Materials Specialist must receive at least 24 hours of training equal to the technician level. Moreover individuals should be able to demonstrate competency in the following:

- Implementing local emergency plans.
- Knowledge of local and state emergency plans/procedures, for implementation.

- Ability to select and use the proper PPE provided to the hazardous material specialist.
- Comprehension of in-depth hazard and risk techniques.
- Performing containment, controls and proper operations within the boundaries of resources and limitations of PPE.
- Determine and implement adequate decontamination procedures for task at hand.
- Ability to develop a site safety and control plan.
- Having knowledge of basic chemical and toxicological terms and behaviors of such substances.

5.4.5 On Scene Incident Commanders are individuals who assume control of the incident scene beyond that of a First Responder Level awareness. They shall have at least 24 hours equal to First Responder Level and able to demonstrate competency in the following:

- Ability to implement the Incident Command System and Company Emergency Response Plan.
- Understanding hazards and risks associated with employees working in proper chemical Personal Protection Equipment.
- Knowledge of local and state emergency response plans and also the Federal Regional Response Team.
- Understanding and knowledge of the decontamination processes and procedures.

5.4.6 Chemical Protective Clothing and equipment to be used by the hazardous material team or specialists shall meet the following requirements:

- Proper selection of PPE based on site and hazardous materials present. (Material, type, respirator type, etc.)
- The constraints and limitations of chemical PPE should be clearly communicated to employees.(i.e. extreme temperatures, stress due to heat and other elements, medical considerations)
- The time allotment of which an employee can work in the hazard area with PPE.
- Proper maintenance, storage, decontamination and disposal of PPE shall be properly communicated to employees.
- Training and fitting of equipment such as respirators and masks shall be mandatory and performed by competent individuals.

- It shall be properly communicated to employees the proper donning and doffing of PPE.
- Employees shall be instructed to properly inspect PPE before, during and after its use.

5.5 Medical Surveillance

Employees shall receive a base line physical examination and be provide with medical surveillance, as required in 1910.120 (f). Any employee who exhibits signs or symptoms which may have been the result of an exposure to hazardous substance, shall be provided medical consultation as required 1910.120(f)(3)(ii).

5.6 Post-Emergency Response Operations

If it is determined necessary to remove the hazardous substance, health hazards, and/or materials that are contaminated, employees performing the work shall have completed all applicable training associated with the work. Reference 1910.120; 1910.38(a); 1910.134; 1910.1200.

6.0 EXCEPTION PROVISIONS

(None permitted.)

7.0 CROSS REFERENCES

29 CFR 1910.120

8.0 ATTACHMENTS

1. Responsibility Matrix

ATTACHMENT 1
HAZARDOUS WASTE OPERATIONS AND EMERGENCY REPONSE

Responsibility Matrix

Action	*Responsible Party*		
	Procedure Section	**Project Manager**	**HS**
Verify compliance with OSHA Standard(s)	5.0	X	X
Ensure project-specific HASP documents all applicable health and safety requirements	5.0	X	X

ATTACHMENT 2

EMERGENCY RESPONSE SITE-SPECIFIC HEALTH & SAFETY PLAN FOR

_____

Prepared for:

_____

Prepared by:
Shaw Environmental & Infrastructure, Inc.

_____

Name_____

Title_____

Date_____

Project No. _____

Emergency Response - Health and Safety Plan

Client and Project Name: _____

Location: _____

I. Scope of Work

_____

_____

_____

_____

_____

II. Organization and Authorities

The Project Supervisor is responsible for the safe implementation of field activities and is ultimately responsible for site safety.

The Site Safety Officer (SSO) is responsible for implementing the site safety plan on-site and enforces the plan by performing routine site inspections. The SSO has the authority to immediately shut down site operations where unsafe conditions or practices are observed and takes the lead during site emergencies. If no SSO is present, the Project Supervisor will assume all the responsibilities and duties of the SSO.

Site personnel are responsible for following the requirements of this site-specific health and safety plan (HASP) and the directions of the SSO.

The Health and Safety Manager is responsible for providing guidance to the SSO and Project Supervisor on the implementation of this HASP.

Shaw E&I subcontractors may comply with the Shaw E&I HASP or develop and implement their own site safety plan. If a subcontractor develops their own plan, it must be as least as strict as the Shaw E & I requirements. The following personnel are designated to perform these job functions.

Project Supervisor: _____

Site Safety Officer: _____

Health and Safety Manager: _____

Subcontractors: ____

III. Hazard Evaluation

This section outlines the potential chemical, physical, and environmental hazards which workers may be exposed to during work on this project. MSDS for site contaminants are included in Appendix D.

Hazards: Chemical Hazards ☐ Yes ☐ No

Chemical Hazard:____

☐ Corrosive
☐ Poison
☐ Liquid
☐ Flammable
☐ Explosive/Reactive
☐ Dust/Solid
☐ Sensitizer
☐ Gas
☐ Oxidizer
☐ Irritant
☐ Vapor
☐ Carcinogenic
☐ Radioactive

Flammability: ________LEL ________UEL ________Flash Point ________N/A

Exposure Indices: ________PEL ________TLV or REL ______IDLH ________N/A

Chemical Hazard:____

☐ Corrosive
☐ Poison
☐ Liquid
☐ Flammable
☐ Explosive/Reactive
☐ Dust/Solid
☐ Sensitizer
☐ Gas
☐ Oxidizer
☐ Irritant
☐ Vapor
☐ Carcinogenic
☐ Radioactive

Flammability: ________LEL ________UEL ________Flash Point ________N/A

Exposure Indices: ________PEL ________TLV or REL ______IDLH ________N/A

Chemical Hazard:____

☐ Corrosive
☐ Poison
☐ Liquid
☐ Flammable
☐ Explosive/Reactive
☐ Dust/Solid
☐ Sensitizer
☐ Gas
☐ Oxidizer
☐ Irritant
☐ Vapor
☐ Carcinogenic
☐ Radioactive

Flammability: ________LEL ________UEL ________Flash Point ________N/A

Exposure Indices: ________PEL ________TLV or REL ______IDLH ________N/A

Use additional sheets as necessary found in Appendix E

Physical Hazards

☐ Traffic
☐ Water
☐ Fall
☐ Heavy Equipment
☐ Trains
☐ Heat/Cold Stress
☐ Electrical
☐ Cutting/Welding
☐ Slip/Trip
☐ Noise
☐ Lifting
☐ Confined Space

Environmental Hazards

☐ Heat Stress
☐ Ticks
☐ Cold Stress
☐ Snakes
☐ Poisonous Plants
☐ Water

Task Specific Hazards

This section provides a breakdown of the hazards and control measures for each principle task.

Task: _____ **Hazards:** _____

_____

Control Measures: _____

_____

Task: _____ **Hazards:** _____

_____

Control Measures: _____

_____

Task: _____ **Hazards:** _____

_____

Control Measures: _____

_____

Task: _____ **Hazards:** _____

_____

Control Measures: _____

_____

Task: _____ **Hazards:** _____

_____

Control Measures: _____

_____

Task: _____ **Hazards:** _____

_____

Control Measures: _____

_____

Use additional Task Control sheets as necessary found in Appendix E or refer to AHA's. Site Supervisors are responsible for preparing a field JSA as required by HS045 in Appendix F.

IV. Site Control

Work Zones
Site operations will be segregated in three work zones: an Exclusion Zone (EZ); where potential exposures to site contaminants exists; a Contamination Reduction Zone (CRZ) where personnel and equipment decontamination operations are performed; and a Support Zone (SZ) where site support facilities are located. The boundary of the EZ/CRZ will be marked with warning signs or barrier tape and access control points will be designated to restrict access to authorized personnel. A site map depicting these work zones will be developed during site mobilization and posted. The Buddy System will be implemented on-site for those tasks performed in the EZ.

Designation of zones (warning signs or barriers):

Exclusion Zone:_____

Contamination Reduction Zone:_____

Support Zone:_____

Site Communications

On-site communications will be established between site work zones and will consist of verbal communications, line of sight observations, or two-way radios. Off-site communications will be established in the support zone to summon off-site emergency services and will consist of either on-site cellular telephones or identifying the location of the nearest telephone to the site.

Safe Operating Procedures

Shaw E&I Health and Safety procedures apply to Shaw E&I hazardous waste and emergency response operations. These procedures are contained in Shaw E&I Health and Safety Procedures Manual that is reviewed with and provided to site supervisors during OSHA Supervisors Training. Questions on the applications of these procedures to site operations should be directed to the Health and Safety Manager. Project-specific procedures are found in the Shaw E&I Health and Safety Program Manual or attached to this plan in the appendices.

V. Personal Protective Equipment

The following Levels of Protection are designated for each task performed in site work zones, based on the hazard analysis conducted for each task. Modifications of these Levels of Protection are provided for those tasks with specific personal protective equipment (PPE) requirements. An upgrade/downgrade in the designated Level of Protection may only be instituted for those tasks where more than one level of protection is specified (i.e., Modified D/C) and only after air monitoring results justify the upgrade/downgrade, based on the action levels listed in this plan. For those tasks where more than one level of protection (Modified D) is the initial level of protection required for the task, with the second level (Level C) being either the downgrade or upgrade level of protection.

NO CHANGES TO THE DESIGNATED LEVEL OF PROTECTION BELOW WILL BE MADE FOR THOSE TASKS WHERE ONLY ONE LEVEL OF PROTECTION IS SPECIFIED WITHOUT AN AMENDMENT TO THIS PLAN AND THE APPROVAL OF THE SHAW E&I HEALTH AND SAFETY MANAGER/DIRECTOR.

Task: ______________________________
Level of Protection:
☐ Level A ☐ Level B ☐ Level C ☐ Level D Modified ☐ Level D

Task: ______________________________
Level of Protection:
☐ Level A ☐ Level B ☐ Level C ☐ Level D Modified ☐ Level D

Task: ______________________________
Level of Protection:
☐ Level A ☐ Level B ☐ Level C ☐ Level D Modified ☐ Level D

Task: ______________________________
Level of Protection:
☐ Level A ☐ Level B ☐ Level C ☐ Level D Modified ☐ Level D

Task: ______________________________
Level of Protection:
☐ Level A ☐ Level B ☐ Level C ☐ Level D Modified ☐ Level D

Task: ______________________________
Level of Protection:
☐ Level A ☐ Level B ☐ Level C ☐ Level D Modified ☐ Level D

Personal protective equipment requirements for the Levels of Protection listed are as follows:

Level A PPE

Respiratory Protection: ☐ SCBA ☐ SAR

Protective Clothing: Gas-tight, totally encapsulating suit: Manufacturer_____

Level B PPE

Respiratory Protection: ☐ SCBA ☐ SAR

Protective Clothing:

☐ Saran coated Tyvek	☐ Poly coated Tyvek	☐ Tyvek Hood	☐ Rainsuit
☐ Acid Suit	☐ Nomex Coveralls	☐ Cold Weather Clothing	
☐ Other_____			

Boots/Booties

☐ Steel Toed Work Boots/Shoes	☐ Vinyl Booties	☐ Poly Booties	☐ Duck Boots
☐ Tingley Boots	☐ Robar Boots	☐ Shin Guards	☐ Other

Gloves:

☐ Sample	☐ Nitrile	☐ PVC	☐ Neoprene/Acid
☐ Leather	☐ Silver Shield	☐ Cut Resistant	☐ Weather
☐ Other _____			

Other:

☐ Hard Hat	☐ Hearing Protection (As Required)	☐ Traffic Vest	☐ Face Shield
☐ Fall Protection		☐ Life Vest (water)	

Level C PPE

Cartridge: ☐ 1053 (OV/AG/P-100) ☐ P-100 (HEPA) ☐ 1058 (multi-contaminant)

Special Cartridge:_____

Cartridge Change Out Schedule ☐ Daily ☐ every 4 hours ☐ every 2 hours
Other period:_____

Protective Clothing:

☐ Saran coated Tyvek	☐ Poly coated Tyvek	☐ Tyvek Hood	☐ Rainsuit
☐ Acid Suit	☐ Nomex Coveralls	☐ Cold Weather Clothing	
☐ Other _____			

Boots/Booties

☐ Steel Toed Work Boots/Shoes	☐ Vinyl Booties	☐ Poly Booties	☐ Duck Boots
☐ Tingley Boots	☐ Robar Boots	☐ Shin Guards	☐ Other

Gloves:

☐ Sample	☐ Nitrile	☐ PVC	☐ Neoprene/Acid
☐ Leather	☐ Silver Shield	☐ Cut Resistant	☐ Weather
☐ Other _____			

Other:

☐ Hard Hat	☐ Hearing Protection (As Required)	☐ Traffic Vest	☐ Fall Protection
☐ Face Shield		☐ Life Vest	

Modified Level D (D+) PPE

Protective Clothing:

☐ Saran coated Tyvek	☐ Poly coated Tyvek	☐ Tyvek Hood	☐ Rainsuit
☐ Acid Suit	☐ Nomex Coveralls	☐ Cold Weather Clothing	
☐ Other _____			

Boots/Booties

☐ Steel Toed Work Boots/Shoes	☐ Vinyl Booties	☐ Poly Booties	☐ Duck Boots
☐ Tingley Boots	☐ Robar Boots	☐ Shin Guards	☐ Other

Gloves:

☐ Sample	☐ Nitrile	☐ PVC	☐ Neoprene/Acid
☐ Leather	☐ Silver Shield	☐ Cut Resistant	☐ Weather
☐ Other _____			

Other:

☐ Hard Hat	☐ Hearing Protection (As Required)	☐ Traffic Vest	☐ Fall Protection
☐ Goggles		☐ Life Vest (water)	☐ Safety Glasses
☐ Face Shield			

Level D PPE

Protective Clothing:

☐ Rainsuit ☐ Cold Weather Clothing
☐ Other_____

Boots/Booties

☐ Steel Toed Work Boots/Shoes ☐ Duck Boots
☐ Tingley Boots ☐ Robar Boots ☐ Shin Guards ☐ Other

Gloves:

☐ Sample ☐ Nitrile ☐ PVC ☐ Neoprene/Acid
☐ Leather ☐ Silver Shield ☐ Cut Resistant ☐ Weather
☐ Other _____

Other PPE:

☐ Hard Hat ☐ Hearing Protection (As Required) ☐ Traffic Vest ☐ Fall Protection
☐ Safety Glasses ☐ Life Vest (water)

Respiratory Protection

Shaw E&I's Respiratory Protection Health and Safety Procedures apply to the use, maintenance, and care of air-purifying and supplied air respirators. When specifying air-purifying respirators, the selection criteria for their use in Level C Protection must be met which includes: air contaminants with adequate warning properties; adequate cartridge adsorption efficiency; adequate oxygen atmosphere (20.9%) present; and non-IDLH concentrations present.
Respirator cartridges will be changed at least daily, by a calculated cartridge changeout schedule, or when personnel experience increased breathing resistance or chemical breakthrough when wearing the respirator.

Supplied-air respirators will only be used with Grade D breathing air. Airline respirator wearers will be connected to a bank of breathing air cylinders with the total length of airline hose no greater than 250 feet. The breathing air cylinder bank (six-pack) will be equipped with a pressure gauge/regulator and alarm.

Respirators will be cleaned and inspected by the wearer at least daily. Wearers are prohibited: from having facial hair that interferes with the respirator's fit; from wearing eyeglasses under the facepiece (spectacle inserts required for prescription glasses wearers); and from wearing contact lenses with respirators. Respirator wearers must be medically qualified and fit tested before being issued a respirator and annually thereafter.

VI. Decontamination Procedures

Personnel and equipment decontamination procedures will be developed, communicated to site personnel, and implemented on-site before work commences in the EZ. Standard work practices that minimize personnel and equipment contamination may include one or more of the following, where feasible: avoiding obvious areas of contamination on-site; using remote handling/sampling equipment; covering instruments/equipment; wearing disposable outer garments; and enclosing contaminant source with sheeting/overpacks.

All personnel exiting the EZ will perform personnel decontamination procedures. Contaminated disposable clothing will be bagged or drummed and disposed of accordingly. Contaminated equipment will be decontaminated using a high pressure washer, steam cleaner or other appropriate washing techniques. Wash water will be collected and

disposed of accordingly. The SSO will monitor these decontamination procedures to determine their effectiveness and will take corrective measures when warranted.

Level A: The following personnel decontamination sequence will apply for standard Level A PPE:

- Go to exit of the EZ.
- Step into the 1st decontamination pool.

  Wash outer chemical boots and outer gloves with a sodium bicarbonate/water solution.
- Step into 2nd decontamination pool.

  Wash exterior of suit with copious amounts of water until all apparent contamination is removed.
- Step into 3rd decontamination pool.

  Decontamination assistant will inspect suit and collect a pH paper swipe to determine if decontamination was effective. If additional decontamination is required, the person will be washed with a sodium bicarbonate/water solution in the 3rd pool until the pH swipe indicates a neutral or basic pH has been achieved.
- Step out of the 3rd pool.

  Decontamination assistant will unzip the suit and assist the person in the removal of the suit and outer chemical boots.
- Cross into the CRZ.
- Disconnect airline, remove SCBA/egress system, and disconnect egress from mask.
- Stage SCBA bottle for cleaning.
- Remove inner suit.
- Remove outer sample gloves and discard.
- Move to respirator wash area, and wash egress mask and related hose line:

  Soap and water solution

  First rinse

  Disinfect respirator (1 cap full of bleach to 1 gallon of water)

  Final rinse
- Hang egress mask (upside down) and line to dry.
- Remove inner sample gloves and discard.

- Wash face and hands.

Level B: The following personnel decontamination sequence will apply for standard Level B PPE:

- Cross into the CRZ.
- Step into the 1st decontamination pool. Wash outer chemical boots/boot covers and outer gloves.
- Step into the 2nd decontamination pool. Rinse outer chemical boots/boot covers and outer gloves.
- Remove and discard tape at wrist, boot and hood interface
- Remove outer boots/boot covers. Discard boot covers.
- Remove and discard outer gloves.
- Remove and clean hardhat.
- Disconnect airline and remove SCBA/egress system.
- Remove and discard chemical protective suit.
- Stage SCBA/egress system for cleaning.
- Move to respirator wash area, and wash egress mask and related hose line:

  Soap and water solution

  First rinse

  Disinfect respirator (1 cap full of bleach to 1 gallon of water)

  Final rinse
- Hang egress mask (upside down) and line to dry.
- Remove and discard inner sample gloves.
- Wash face and hands.

Level C: The following personnel decontamination sequence will apply for standard Level C PPE:

- Cross into the CRZ.
- Step into the 1st decontamination pool. Wash outer chemical boots/boot covers and outer gloves.
- Step into the 2nd decontamination pool. Rinse outer chemical boots/boot covers and outer gloves.

- Remove and discard tape at wrist, boot and hood interface
- Remove outer boots/boot covers. Discard boot covers.
- Remove and discard outer gloves.
- Remove hardhat and clean hardhat.
- Remove and discard chemical protective suit
- Remove APR. Discard cartridges.
- Move to respirator wash area, and wash egress mask and related hose line:

  Soap and water solution

  First rinse

  Disinfect respirator (1 cap full of bleach to 1 gallon of water)

  Final rinse
- Hang APR mask (upside down) to dry.
- Remove and discard inner sample gloves.
- Wash face and hands.

Level D+: The following personnel decontamination sequence will apply for modified Level D PPE:

- Cross into the CRZ.
- Step into the 1st decontamination pool. Wash outer chemical boots/boot covers and outer gloves.
- Step into the 2nd decontamination pool. Rinse outer chemical boots/boot covers and outer gloves.
- Remove and discard tape at wrist, boot and hood interface
- Remove outer boots/boot covers. Discard boot covers.
- Remove and discard outer gloves.
- Remove hardhat and clean hardhat.
- Remove chemical protective suit and discard.
- Remove inner sample gloves and discard.
- Wash face and hands.

VII. Air Monitoring

Air monitoring will be conducted to identify potential overexposure and IDLH conditions on-site and to document that the proper level of protection is worn by personnel during site operations. IDLH conditions will be monitored during initial entries and particularly through the course of the project, when the potential for an IDLH condition exist. Potential overexposure conditions will be periodically monitored through the course of the project when: work begins in a uncharacterized portion of the site; additional contaminants are identified on-site; initiating tasks posing an overexposure potential; handling leaking drums or working in areas of obvious liquid contamination.

Site personnel with the greatest overexposure potential will be monitored in applying action levels for upgrading/downgrading the level of protection worn by personnel performing similar tasks. Air monitoring instruments will be calibrated and operated according to the manufacturer's instructions by the SSO. Daily background reading will be taken before site operations begin. PID Action levels are readings above background in personnel breathing zone for a sustained 10 minute period of time. LEL/O2 Action Levels are readings taken inside confined spaces or tanks for the purpose of performing Hot Work or Confined Space Entries, with results recorded on the Hot Work/Confined Space Entry Permit. The following air monitoring procedures will be implemented on-site:

LEL/02:	☐ Continuous	☐ Hourly	☐ Every 2 Hours	☐ Every 4 Hours
Drager Tubes:	☐ Continuous	☐ Hourly	☐ Every 2 Hours	☐ Every 4 Hours
PID:	☐ Continuous	☐ Hourly	☐ Every 2 Hours	☐ Every 4 Hours
FID:	☐ Continuous	☐ Hourly	☐ Every 2 Hours	☐ Every 4 Hours
Mini Ram:	☐ Continuous	☐ Hourly	☐ Every 2 Hours	☐ Every 4 Hours
Other:	☐ Continuous	☐ Hourly	☐ Every 2 Hours	☐ Every 4 Hours

Action Levels:

_____ 10% LEL	Stop Work
_____ > 22% 0_2	Stop Work
_____ < 20% 0_2	Upgrade to Level B (Supplied Air)
_____ ppm Toxic	Upgrade to Next Level of Protection
_____ ppm Toxic	Stop Work
Unknown Concentration	Upgrade to Level B Protection
Eye, Nose, or Throat Irritation	Upgrade to Next Level of Protection

Task Monitored/Frequency:

Permits Required: ☐ Hot Work ☐ Crane/Lifting ☐ Line Breaking
☐ Confined Space ☐ Excavation

VIII. Emergency Response Plan

Pre-Emergency Planning

Before starting site operations, the SS/SSO will implement emergency procedures that include: identifying the location and route to emergency medical services; establishing site communications; designating emergency warning signal and evacuation routes; inventorying emergency equipment; and communicating emergency procedures to personnel.

Personnel Roles, Lines Of Authority and Communication

The SSO takes the lead during site emergencies until off-site emergency responders arrive on-site. In cases of major emergencies, SEI personnel will evacuate the site, contact local emergency responders, and rely on them to handle the emergency. Minor emergencies that are controllable on-site with emergency equipment located at the site will be addressed by SEI personnel with the approval of the SSO.

Emergency Recognition and Prevention

The SSO will conduct an initial site safety briefing to review the requirements of the site safety plan with site personnel. The HASP Acknowledgement form is in Appendix A. This briefing will include discussions on the recognition, prevention and control of emergencies anticipated on-site. Daily safety meetings will be held to emphasize emergency prevention and control measures. The Daily Safety Meeting form is in Appendix C.

Safe Distance and Places Of Refuge

The on-site assembly point will be located in the SZ where site personnel are accounted for and emergency services are contacted. The SSO will evaluate the emergency situation based on the hazards posed to site personnel remaining at the on-site assembly point, then determine the need and location of further off-site evacuation and assembly points.

Site Security and Control
Access to the site will be controlled by the SSO until local emergency responders arrive. The SSO will then relinquish site security/control to the authorized emergency response organization.

Evacuation Routes and Procedures
The emergency evacuation signal will be one long blast with an air horn. Evacuation routes will be designated that direct evacuation from the EZ in an upwind direction. In cases of uncontrollable emergencies such as fire, explosion, or toxic vapor release, a site evacuation shall be implemented as follows:

- Sound the emergency warning signal.
- Stop work activities and evacuate the EZ in an upwind direction.
- Assemble in the SZ and account for personnel. Dispatch a response team equipped with appropriate PPE (minimum Level B protection) and rescue unaccounted personnel.
- Contact off-site emergency response services.

Emergency Decontamination Procedures
Personnel will be decontaminated to the extent feasible (gross decon or deluge shower) but life saving and first aid procedures take priority over personnel decontamination efforts. Standard personnel decontamination procedures apply for those injuries deemed non-life threatening by the SSO.

Emergency Medical Treatment and First Aid
In the absence of reasonably accessible medical services, an SSO trained in first aid by the American Red Cross or the equivalent will be available on-site to render first aid. An industrial first aid kit available on-site, with its contents approved by SEI's consulting physician. The contents of the first aid kit will be checked by the SSO weekly with expendable items replaced when used.

Emergency Actions
If actual or suspected serious injury occurs on-site implement the following emergency actions:

- Remove the exposed/injured person(s) from immediate danger.
- Render first aid if necessary. Decontaminate injured after critical first-aid has been administered.
- Obtain paramedic services or ambulance transport to local hospital. This procedure shall be followed even if there is no visible injury.
- Other personnel in the work area shall be evacuated and assembled at the SZ until the SSO determines that it is safe to resume work.

Hospital Route and Emergency Telephone Numbers
A map showing the route to a hospital and local emergency telephone numbers are attached in Appendix G

Response Follow-Up

The SSO must complete an incident investigation form for site emergencies within 24 hours of the incident and submit/fax it to their Business Line Manager. Incidents involving potential Lost Time Accident (LTA) injuries, vehicle accidents, overexposure incidents, or emergencies causing site evacuations must be reported to:

David Mummert
Health and Safety Manger
Phone: 419/425-6129 (work)
419/387-7062 (home)
Fax:419/425-6039

The SSO will identify the cause(s) of the incident and take action to prevent reoccurrence. The SSO will also evaluate the effectiveness of the site's emergency response procedures and institute corrective actions when warranted.

Emergency Equipment On-Site

The following emergency equipment are located on-site:

- ☐ Fire Extinguishers at _____
- ☐ Industrial First Aid Kit at _____
- ☐ Portable Eye wash/Shower at _____
- ☐ E-Horn
- ☐ Cell Phone

Emergency Contacts

The following emergency contacts will be identified during project mobilization and conspicuously posted in the SZ. The emergency contact form is contained in Appendix G.

IX. Site Safety Plan Certifications

This site safety plan complies with the appropriate sections of 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response". Only site personnel meeting the training and medical surveillance requirements of 29 CFR 1910.120 are authorized to perform hazardous waste operations or emergency response at this site.

LIST OF APPENDICES

The SEI Health and Safety Procedure Manual supplements this ER HASP.

APPENDIX A
HEALTH AND SAFETY PLAN CERTIFICATION

HEALTH AND SAFETY PLAN CERTIFICATION

By signing this document, I am stating that I have read and understand the Site Specific Health and Safety Plan for Shaw personnel, subcontractors, and visitors entering the ____________________ site.

REPRESENTING	*NAME (PRINT)*	*SIGNATURE*	*DATE*

APPENDIX B
HEALTH AND SAFETY PLAN AMENDMENT DOCUMENTATION FORM

Site Specific Health & Safety Plan
Amendment Documentation

Project Name: _____ **Project No.** _____

Amendment No. _____ **Date:** _____

Amendment Revises: Page:_____ **Section:** _____

Task(s) Amendment Affects*: _____

_____

*(*Attach new/revised Job Safety Analyses*)

Reason For Amendment:

_____

_____

_____

_____

Amendment:
(Attach separate sheet(s) as necessary)

_____

_____

_____

_____

_____

_____

_____

_____

Completed by: _____ **Approved by:**_____

APPENDIX C
DAILY SAFETY MEETING FORM

DAILY SAFETY MEETING LOG

Date: _____ **Client:** _____

Location: _____ **Project No.:** _____

Meeting conducted by: _____ **Shift:** □ Day □ Night

SAFETY TOPICS PRESENTED:

1. _____
2. _____
3. _____
4. _____
5. _____

Additional Comments: _____

PERMITS REQUIRED THIS DATE:

□ Confined Space Entry □ Excavation

□ Hot Work □ Line Breaking

□ Other □ N/A

ATTENDEES:

Name Printed and Employee Number:	**Signature:**

DAILY SAFETY MEETING LOG

(Continuation Page)

Date: _____ **Project No.:** _____

ATTENDEES:

Name Printed and Employee Number:	**Signature:**

APPENDIX D
MATERIAL SAFETY DATA SHEETS

Appendix E
Task Hazard Forms and Activity Hazard Analysis

Chemical Hazard:____

☐ Corrosive
☐ Poison
☐ Liquid

☐ Flammable
☐ Explosive/Reactive
☐ Dust/Solid

☐ Sensitizer
☐ Gas
☐ Oxidizer

☐ Irritant
☐ Vapor
☐ Carcinogenic

☐ Radioactive

Flammability: ________LEL ________UEL ________Flash Point ________N/A

Exposure Indices: ________PEL ________TLV or REL ______IDLH ________N/A

Chemical Hazard:____

☐ Corrosive
☐ Poison
☐ Liquid

☐ Flammable
☐ Explosive/Reactive
☐ Dust/Solid

☐ Sensitizer
☐ Gas
☐ Oxidizer

☐ Irritant
☐ Vapor
☐ Carcinogenic

☐ Radioactive

Flammability: ________LEL ________UEL ________Flash Point ________N/A

Exposure Indices: ________PEL ________TLV or REL ______IDLH ________N/A

Chemical Hazard:____

☐ Corrosive
☐ Poison
☐ Liquid

☐ Flammable
☐ Explosive/Reactive
☐ Dust/Solid

☐ Sensitizer
☐ Gas
☐ Oxidizer

☐ Irritant
☐ Vapor
☐ Carcinogenic

☐ Radioactive

Flammability: ________LEL ________UEL ________Flash Point ________N/A

Exposure Indices: ________PEL ________TLV or REL ______IDLH ________N/A

Chemical Hazard:____

☐ Corrosive
☐ Poison
☐ Liquid

☐ Flammable
☐ Explosive/Reactive
☐ Dust/Solid

☐ Sensitizer
☐ Gas
☐ Oxidizer

☐ Irritant
☐ Vapor
☐ Carcinogenic

☐ Radioactive

Flammability: ________LEL ________UEL ________Flash Point ________N/A

Exposure Indices: ________PEL ________TLV or REL ______IDLH ________N/A

Task: _____ Hazards: _____

_____

Control Measures: _____

_____

PPE:

☐ Level A ☐ Level B ☐ Level C ☐ Level D

Task: _____ Hazards: _____

_____

Control Measures: _____

_____

PPE:

☐ Level A ☐ Level B ☐ Level C ☐ Level D

Task: _____ Hazards: _____

_____

Control Measures: _____

_____

PPE:

☐ Level A ☐ Level B ☐ Level C ☐ Level D

Task: _____ Hazards: _____

_____

Control Measures: _____

_____

PPE:

☐ Level A ☐ Level B ☐ Level C ☐ Level D

APPENDIX F
JOB SAFETY ANALYSES (HS045)

APPENDIX G
EMERGENCY TELEPHONE NUMBERS AND ROUTE TO HOSPITAL

Emergency Telephone Numbers and Route to Hospital

Fire Department _____

Police/Sheriff _____

Paramedics/EMS _____

Hospital Name:_____

Hospital Address _____

_____

Hospital Route Map:

Hospital Route Directions:_____

_____

_____

_____

_____

_____

APPENDIX H
SITE MAP

SITE MAP

DIRECT READING INSTRUMENT LOG

Date_____ Job Name:_____
Project #: _____ Operator_____
Instrument: PID 2020 # _____ Calibration: 100PPM Isobutylene
MSA Watchman # _____ Calibration check gas(LEl, O2, CO)

_____

Project
Activities:_____
_____
_____
_____

Background Reading_____

Weather Conditions_____

TIME	LOCATION	DURATION	PPM	O2%	LEL%	CO PPM

STANDARD OPERATING PROCEDURE

Subject: **Hazardous Waste Operations (RCRA)**

1. PURPOSE

The purpose of this procedure is to establish guidelines for developing and implementing a written health and safety program for Shaw employees involved in hazardous waste operations conducted at treatment, storage, and disposal (TSD) facilities.

2. SCOPE

This procedure applies to the facility manager, project manager, and Health and Safety personnel who develop and implement written Safety and Health Programs for employees involved in hazardous waste operations.

3. REFERENCES

- Title 29 Code of Federal Regulations Part 1910.1200, *Hazard Communication*
- Title 29 Code of Federal Regulations Part 1910.141, *Sanitation*

4. DEFINITIONS

- **Buddy System**—A system of organizing employees into work groups in such a manner that each employee of the work group is designated to be observed by at least one other employee in the work group. The purpose of the buddy system is to provide rapid assistance to employees in case of an emergency.
- **Clean-up Operation**—An operation where hazardous substances are removed, contained, incinerated, neutralized, cleared-up, or in any manner processed or handled with ultimate goal of making the site safer for people or the environment.
- **Decontamination**—The removal of hazardous substances from employees and their equipment to the extent necessary to preclude the occurrence of foreseeable adverse health affects.
- **Emergency Response or Responding to Emergencies**—A response effort by employees from outside the immediate release area or by designated responders to an occurrence which results, or is likely to result, in an uncontrolled release of a hazardous substance. Responses to incidental releases of hazardous substances where the substance can be absorbed, neutralized or otherwise controlled at the time of release by employees in the immediate release area, or by maintenance personnel are not considered emergency responses. Responses to releases of hazardous substances where there is no potential safety or health hazard are not considered to be emergency responses.
- **Facility**—Any building, structure, installation, equipment, pipe or pipeline, well, pit, pond, lagoon, impoundment, ditch, storage container, motor vehicle, rolling stock, or aircraft, or any site or area where a hazardous substance has been deposited, stored, disposed of, or placed, or otherwise come to be located; but does not include any consumer product in consumer use or any water-borne vessel.

- **Hazardous Substance**—A substance which results or may result in adverse affects on the health or safety of employees.
- **Health Hazard**—A chemical, mixture of chemicals or a pathogen for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. Health hazards include: chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system and agents which damage the lungs, skin, eyes, or mucous membranes.

5. RESPONSIBILITIES

5.1 Project Manager

The Project Manager is responsible for the following:

- Verifying compliance with U.S. Occupational Health and Safety Standards (OSHA) Standard(s)
- Ensuring project-specific Health and Safety Program (HASP) documents all applicable health and safety requirements

5.2 Health and Safety Representative

The Health and Safety Representative is responsible for the following:

- Verifying compliance with OSHA Standard(s)
- Ensuring project-specific HASP documents all applicable health and safety requirements

6. PROCEDURE

6.1 General

The facility manager shall develop and implement a written safety and health program for employees involved in hazardous waste operations. The program shall be designed to identify, evaluate and control safety and health hazards in the facility for the purpose of employee protection. The program shall provide for emergency response (reference HS061), and shall address, as appropriate, site analysis, engineering controls, maximum exposure limits, hazardous waste handling procedures and the use of new technologies.

6.2 Hazard Communication

The safety and health program shall contain a hazard communication program, which meets the requirements of 29 Code of Federal Regulations (CFR) 1910.1200.

6.3 Medical Surveillance

A medical surveillance program meeting requirements of 29 CFR 1910.120 (f) shall be developed and implemented. All employees who are or may be exposed to health hazards or hazardous substances at or above the permissible exposure limits or, if there is no permissible exposure limit, above the published exposure levels, without regard to the use of respirators, for 30 days or more in a calendar year shall be included in the program at no cost to the employee.

6.4 Decontamination

A decontamination program meeting requirements of 29 CFR 1910.120 (k) shall be developed, communicated to employees and implemented before any employees or equipment enter an area on site where potential exposure to hazardous substance(s) exist.

1. All employees leaving a contaminated area shall be appropriately decontaminated all contaminated clothing and equipment leaving a contaminated area shall be appropriately disposed of or decontaminated.

2. Decontamination shall be preformed in geographical areas that will minimize cross contamination or the exposure of uncontaminated employees or equipment.

3. The Site Safety Officer shall monitor all methods of decontamination and determine their effectiveness. If methods are found to be ineffective, appropriate steps will be taken to correct the deficiencies.

4. Regular showers, and changing rooms shall be provided outside the contaminated area and meet the requirements of 29 CFR 1910.141

6.5 New Technology

A program meeting the requirements of 29 CFR 1910.120 (o) shall be developed and implemented to introduce new and innovative equipment for employee protection into the work place.

6.5 Material Handling

Where employees handle drums or containers, procedures meeting the requirements of 29 CFR 1910.120 (j)(1) (ii) - (viii), (xi), (j) (3) and (j) (8) shall be developed and implemented prior to starting such work.

6.6 Engineering Controls

Engineering controls work practices, personal protective equipment, or a combination of these shall be implemented in accordance with 29 CFR 1910.120 (g) to protect employees from exposure to hazardous substances and safety and health hazards.

7. MONITORING

7.1 General

Monitoring shall be performed in accordance with 29 CFR 1910.120 (h) to prevent employee exposure to hazardous concentrations of hazardous substances and to assure proper selection of engineering controls, work practices and personal protective equipment.

7.2 Air Monitoring

Air monitoring shall be used to identify and quantify airborne levels of hazardous substances and safety and health hazards in order to determine the appropriate level of employee protection.

7.3 Initial Entry

Upon initial entry, representative air monitoring shall be conducted to identify any immediately dangerous to life and health (IDLH) condition, exposure over PELs or if other dangerous condition(s) exist (i.e., the presence of flammable atmosphere or oxygen deficient environments).

7.4 Periodic Monitoring

Periodic monitoring shall be conducted when the possibility of an IDLH condition or flammable

atmosphere has developed, or when there is indication that exposure may have risen over PELs. Periodic monitoring shall be considered when the PELs have risen and one or more of the following scenarios occur:

- Beginning of new work on a different portion of the site
- Contaminates other than those previously identified are being handled
- When a different type of operation is initiated
- When obvious liquid contamination is present

8. TRAINING

All employees working on sites or at TSD operations where they may be exposed to health hazards or hazardous substances must receive training to enable the employees to perform their assigned duties and functions in a safe and healthful manner so as not to endanger themselves or other employees..

8.1 New Employees

Employees engaged in hazardous substance removal or other activities, which expose or potentially expose them to hazardous substances and health hazards shall receive initial training which consists of a minimum of 40 hours of instruction off-site and three days of field experience, under direct supervision of a trained, experienced supervisor.

8.2 Current Employees

Current employees whose previous work experience and/or training are equivalent to the initial training requirement shall be considered as having met the initial training requirements. The Training Manager or his/her designee shall make the determination of equivalency. Current employees shall receive 8 hours of refresher training annually.

8.3 Trainers

Trainers shall be qualified to instruct employees on the subject matter presented in training. Such trainers shall have satisfactorily completed a training program for teaching their subjects, or they shall have the academic credentials and instructional experience necessary to teach.

9. EXCEPTION PROVISIONS

None.

10. ATTACHMENTS

None.

11. FORMS

None.

PROCEDURE

Subject: **OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) REGULATORY INSPECTIONS**

1.0 PURPOSE AND SUMMARY

This procedure prescribes the steps to be taken in the event an OSHA regulatory inspection occurs at any of Shaw Environmental & Infrastructure, Inc. (Shaw E & I) field or office locations.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITIES

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The responsibility matrix is Attachment 1.

4.0 DISCUSSION

Generally, OSHA inspections occur without any advance notice. In order for the OSHA inspector to conduct an inspection, he/she must obtain the employer's consent. If the inspector fails to produce credentials or disclose the nature of his visit, a warrant can be requested. As a general rule, the fact that a warrant is required should not be enforced by Shaw E & I associates. We should cooperate with the OSHA inspector but in accordance with these guidelines.

5.0 PROCEDURE

5.1 Arrival of OSHA Inspector(s)

5.1.1 Site Representative. All Shaw E & I projects and locations will have a health and safety representative or an assigned individual that is responsible for interaction with the OSHA inspector(s). This individual will be summoned immediately upon arrival of the inspector(s). The designated Shaw E & I site representative will be responsible for completing the attached OSHA inspection report form Shaw E & I-HS090.1 (Attachment 2) and forwarding it to the National Director of Health and Safety as soon as reasonably possible. In a unionized workplace, dependent upon the scope of the inspection, the lead site union official may select a representative to accompany the inspector(s) and the Shaw E & I site representative during the inspection.

5.1.2 Credential Verification. Immediately upon arrival of the OSHA inspector(s), Shaw E & I=s site representative will request the inspector=s identification and will record the appropriate information on Shaw E & I-HS090.1. If the identity of the inspector(s) is in question, a call to his/her home office is an acceptable practice in order to verify authenticity of credentials and assignment to your location.

5.2 Opening Conference

The typical inspection will begin with the inspector(s) initiating an opening conference. The inspector(s) should explain the nature, purpose, and scope of the inspection, and the records that will be reviewed. The Shaw E & I site representative will ask the following questions and record all replies on Shaw E & I-HS090.1:

- What type of inspection is going to be completed (i.e., employee complaint, accident, etc.)?
- Is the inspector(s) a safety or industrial hygiene compliance officer?
- Which area(s) of the site is going to be inspected?
- What type of industrial hygiene monitoring will be performed?
- Does the inspector(s) meet the training and medical requirements relevant to the site?

5.2.1 Site-Specific Training. The inspector(s) must be given an overview of any site-specific training applicable to the areas of the site in which they will be inspecting. The inspector(s) will be given the opportunity to read the Site Health and Safety Plan (SHSP) and should agree to abide by the provisions of the plan. The inspector(s) is to be informed that, in the interest of safety, you will continue to enforce the established health and safety rules during the inspection and that you would like for them to comply as well.

5.2.2 Notification. The site representative will contact the the National Director of Health and Safety or his designee and give a short briefing on the events taking place. This notification should occur after the opening conference, but before the initiation of the actual inspection.

5.3 Inspection

The site representative will accompany the inspector(s) at all times during the visit. All photos, samples, or notes will be replicated, paying special attention to where the inspector goes, who is talked to, what sampling is done, which instruments are used, and any specific comments that are made.

5.3.1 Employee Interviews. All site personnel approached by the inspector(s) for the purpose of interviewing, must be made aware of the three options that they may exercise. This decision must be made solely by the individual employee that is going to be interviewed. The site representative or other site personnel will in no way influence the decision of the employee. The employee=s choices are:

1. Interview in private with inspector;
2. Interview with the Shaw E & I site representative present; or
3. Refuse to interview.

5.3.2 Personnel Protective Equipment (PPE). The inspector will be offered the PPE required for the area he wishes to inspect and will be asked to follow the safety and health rules in place for the site. Any deviations from established rules should be brought to the attention of the inspector and documented on the OSHA inspection report.

5.3.3 Conduct. As always it is very important that site personnel conduct themselves in a professional manner when interacting with regulatory officials. The following guidelines should be adhered to during the inspection:

- Keep all responses short and to the point without elaboration. Personnel should not volunteer information not specifically asked for by the inspector(s), and should avoid statements that might be construed as an admission of noncompliance.

- Do not demonstrate any operations for the inspector(s) that are not part of the days normal planned activities. OSHA requires that inspections be conducted in a manner that avoids disrupting the normal activities of the site.

- If possible immediately remedy any alleged violation(s) identified by the inspector(s). If an employee violates a work rule during an inspection the same disciplinary action will be taken as if the inspector(s) was not present. Failure to correct a violation noticed during the inspection may itself result in a citation.

- Federal law and OSHA regulations require the maintenance of certain safety and health records. If the inspector requests to review records we are under no obligation to provide these records without a subpoena. It should be noted that it is unlikely that a subpoena will be denied for pertinent documents and therefore any benefit derived from a temporary delay gained by insisting on a subpoena should be weighed against the goodwill generated with the inspector from prompt disclosure. Therefore, under most circumstances we should grant access to the documents.

5.4 Closing Conference

The inspector(s) will typically initiate a closing conference after all inspection activities have been completed. It is important for the site representative to clarify with the inspector that the inspection is over. If not, the specific areas which are left to inspect and the anticipated time of inspection will be discussed.

5.4.1 Attendees. The national director of health and safety or his designee will be present or connected via telephone during closing conference discussions. The Shaw E & I site representative will be responsible for taking detailed notes and recording them on Shaw E & I-HS090.1. A representative of Shaw E & I=s legal department may also participate and/or be available for telephone consultation.

5.4.2 Citations. The closing conference can be used as a method to obtain information from the inspector on possible citations. The site representative should ask for precise areas in which the inspector is going to recommend for citation, and any other information pertaining to the inspection results. Request a copy of inspector=s notes, even though they are not required to provide them. At no time during the closing conference should the site representative or anyone else make any admissions of noncompliance even if they think the inspector is correct.

6.0 EXCEPTION PROVISIONS

Variances may be requested as described in procedure HS013; Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

(Not Applicable)

8.0 ATTACHMENTS

1. Responsibility Matrix
2. OSHA Inspection Report (Form Shaw E & I-HS090.1)

ATTACHMENT 1
POLICIES AND PROCEDURES
for
OCCUPATIONAL HEALTH AND SAFETY AGENCY (OSHA)
REGULATORY INSPECTIONS

Responsibility Matrix

Action	*Resposible Party*			
	Procedure Section	**Location/Project Manager**	**Site Representative**	**Director of HS**
Issuance, revision and maintenance of this procedure	3.1			X
Designate site representative	5.1.1	X		
Complete OSHA Inspection Report form	5.1.1		X	
Verify inspector=s credentials	5.1.2		X	
Provide site-specific training	5.2.1		X	
Notification of National Director of H&S	5.2.2		X	
Accompany inspector	5.3		X	X[1]
Participate in closing conference	5.4.1			

[1] After notification is made, the National Director of H&S may wish to participate in inspections or conferences.

ATTACHMENT 2

OSHA INSPECTION REPORT
FORM Shaw E & I-HS090.1

GENERAL INFORMATION:

Division/Subsidiary _____ Facility_____
Date_____ Time_____ Job Number _____

Customer _____ Address _____

Specific Location _____

Site Representative_____

OSHA INSPECTOR INFORMATION:

Name _____

Office _____

Address _____

_____

Phone Number _____

Identification Number_____

Date and Time of first appearance_____

First Person Contacted_____

REASON FOR INSPECTION:

Complaint _____ Accident/fatality_____
(obtain copy)

Referral _____ General Programmed Schedule_____

_____

Imminent danger _____

Specific location(s) of inspection_____

Was the inspector asked to wait for the health and safety representative? _____ yes _____ no_____

OSHA INSPECTION REPORT
FORM Shaw E & I-HS090.1

INSPECTION:

Opening Conference Held? (check one) ____ Yes ____ No

Persons present at Opening Conference (no employee representatives permitted):

Name	Company

Does the OSHA Inspector comply with all site training and medical requirements? ____ Yes ____ No

Has the OSHA Inspector been given site specific training? ____ Yes ____ No

Employees Interviewed:

Name	Company

Witnesses to Violations (list of violations follows names):

OSHA INSPECTION REPORT

FORM Shaw E & I-HS090.1

ALLEGED VIOLATIONS NOTED FOR POSSIBLE CITATION (type *and* location):

1.

2.

3.

4.

5.

OSHA INSPECTION REPORT
FORM Shaw E & I-HS090.1

Did the inspector take photos? ____ Yes ____ No

Did you take the same photos? ____ Yes ____ No

Did the inspector take industrial hygiene samples? ____ Yes ____ No

Did you replicate these samples? ____ Yes ____ No

Results of the Closing Conference:

FOLLOW-UP:

Comments on alleged violations:

1.

2.

OSHA INSPECTION REPORT
FORM Shaw E & I-HS090.1

3.

4.

5.

PERSONAL INFORMATION:

This form was completed by: _____ _____
(Print name) (Print Title)

_____ _____
(Signature) (Date)

Distribution: National Health and Safety Director

PROCEDURE

Subject: REPORTING OF FATALITY OR MULTIPLE HOSPITALIZATION INCIDENTS TO OSHA

1.0 PURPOSE AND SUMMARY

This procedure identifies the OSHA reporting requirements for workplace incidents resulting in the death or in-patient hospitalization of any associate.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The National Director, Health & Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

(Not Applicable)

5.0 TEXT

Reporting of fatal incidents, or incidents resulting in the in-patient hospitalization of associates is required by OSHA. Such incidents shall be reported immediately to the HS professional and project manager for the project/site, who must then notify the following on an immediate basis:

- Region/Division HS Manager
- National Director HS
- Division Vice President

The National Director of Health & Safety and/or Division Vice President shall notify the Chief Operating Officer, President, and the Legal Department.

Applicable provisions of procedures HS020, Accident Prevention Program: Reporting, Investigation and Review; and HS105, Occupational Injury/Illness Procedures, also apply.

5.1 **Agreement States**

Agreement states operating their own occupational safety and health programs each establish their own reporting requirements which are "at least as effective" as the requirements of the U.S. Department of Labor OSHA regulations. When an incident involving fatal injuries or hospitalization of associates occurs in an agreement state, reports shall be made in accordance with the state requirements by the HS Manager responsible for the site.

5.2 **U. S. Department of Labor OSHA Jurisdiction**

Within 8 hours after the death of any associate from a work-related incident or the in-patient hospitalization of three or more associates as a result of work-related incident, the HS professional responsible for the site, after consulting with the National Director HS and the Legal Department, shall orally report the fatality/multiple hospitalization by telephone or in person to the Area Office of the Occupational Safety and Health Administration (OSHA), U.S. Department of Labor, that is nearest to the site of the incident, or by using the **OSHA toll-free central telephone number (800) 321-OSHA.**

This requirement applies to each such fatality or hospitalization of three or more associates which occurs within thirty (30) days of an incident.

Each report required by this procedure shall relate the following information: company name, location of incident, time of the incident, number of fatalities or hospitalized associates, contact person, phone number, and a brief description of the incident.

6.0 EXCEPTION PROVISIONS

(None permitted)

7.0 CROSS REFERENCES

HS020 Accident Prevention Program: Reporting, Investigation and Review
HS105 Occupational Injury/Illness Procedures

8.0 ATTACHMENTS

1. Responsibility Matrix

ATTACHMENT 1
REPORTING OF FATALITY OR MULTIPLE HOSPITALIZATION INCIDENTS TO OSHA

Responsibility Matrix

Action	Procedure Section	*Responsible Party*				
		Site Supervisor	**Project Manager**	**HS Manager**	**Division VP**	**National HS Director**
All fatal incidents, or incidents resulting in the in-patient hospitalization of associates, shall be immediately reported to the local HS professional.	5.0	X				
Notify Region/Division HS Manager, National HS Director, and Division VP.	5.0		X	X		
Notify Chief Operating Officer, President, and Legal Department.	5.0				X	X
When such incidents occur in Agreement States, reports shall be made in accordance with the applicable state requirements.	5.1			X		
Within 8 hours of such incidents, oral report must be made by telephone or in person to the Area Office of OSHA, U.S. Department of Labor, nearest to the site, or by using the OSHA toll-free central telephone number: 800-321-OSHA.	5.2			X		
The above requirement also applies to each such fatality or hospitalization of three or more associates which occurs within 30 days of an incident.	5.2			X		

PROCEDURE

Subject: MEDICAL POLICIES AND PROCEDURES

1.0 PURPOSE AND SUMMARY

An effective medical surveillance program is a key element in the company's overall program to protect the health and safety of all employees and personnel working with us. Provisions are made for the following:

- Baseline exams
- Annual exams
- Biennial Exams
- Exit exams
- Disability/Medical Limitation Follow-up/Not Medically Cleared
- Re-hiring former employees; and
- Temporary, contractor, and subcontractor personnel.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health & Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix can be found as Attachment 1 in Section 8.0.

4.0 DEFINITIONS

Company –Shaw Environmental & Infrastructure, Inc. (Shaw E & I) and all wholly-owned subsidiaries thereof.

5.0 TEXT

The purpose of a medical surveillance program is to protect the health of the employee, by working in conjunction with an effective hazard recognition and control program. A common misconception is that a medical surveillance examination should be the equivalent of an examination by one's private physician. This is incorrect. The medical surveillance exam focuses on health effects related to the workplace and applicable job requirements.

Health Resources (1-800-350-4511) has been selected to manage the delivery of medical surveillance services. Jerry Berke, M.D., M.P.H. has been designated as the company's consulting Medical Director.

5.1 Medical Protocols

The company's Medical Surveillance Program consists of various examination modules which differ based upon each employee's job duties and whether it is for baseline, annual update, biennial update, or exit examination purposes. (See Tabular Protocol, Attachment 2).

The company's examination modules include Administrative, Pre-placement, Laboratory, Field Exposure, Field Exposure (Transportation) - for DOT Drivers, Field Exposure/Asbestos, Asbestos, Clean Construction-Fit for Duty, and Professional Non-Exposed. All employees are subject to the specified Baseline examination based on a provided job requirement of their duties. Baseline examinations are administered on a conditional post offer of employment/pre-placement basis. All incumbent employees whose duties involve potential exposure to safety or health hazards are subject to the specified Annual Update examination and to the specified Exit examination. (Note: The Exit exam may be waived if the most recent exam on file is less than 6 months old.). Medical exam clearances can be extended for one year pending Health Resources review

of the medical extension form. Incumbent Fit for Duty exam employees will have a Biennial Update examination.

All employees entering the asbestos-monitoring program must remain in the program while employed by the company or until such time as a Health & Safety professional has documented the employee was never exposed to asbestos in excess of the Permissible Exposure Limit (PEL) during his/her employment with the company.

All employees are subject to drug/alcohol testing for pre-hire, whenever "reasonable suspicion" of substance abuse exists, when the employees consent to participate in client-specific programs, after an accident or near miss incident and wherever random testing is required either by client-specific programs, company policy, or federal programs, as applicable by federal, state and local laws. (See Procedure HS101 for more information.)

5.1.1 Temporary, Contractor and Subcontractor Personnel.

All employees in this category are subject to the same medical surveillance and drug/alcohol testing requirements that would be applicable if a company employee were doing the work.

5.2 Local Administration

The local management of the medical surveillance program is the responsibility of the Health & Safety Assistant serving each region. This person will work at the direction of the Health & Safety professional for purposes of medical surveillance administration. They are responsible for scheduling medical examinations requested by the Human Resource department and identified personnel on the Health Resources notification lists, receiving medical clearances, communicating medical status information to management and obtaining management and employee signatures on each medical clearance which identifies restrictions.

5.3 Scheduling

5.3.1 Baseline.

All baseline examinations are conducted strictly upon a post-offer of employment/pre-placement basis. In order to verify that the Human Resource department has made a formal offer of employment, the Health & Safety Assistant is to accept requests for baseline examinations only from the Human Resource department. (Note: The offer letter from Human Resources must be conditional upon a negative drug/alcohol test and being found medically fit to perform job requirements for the offered position.)

Baseline examinations done at the inception of employment, with the company, which result in a positive drug/alcohol test, shall result in the immediate withdrawal of the conditional offer of employment.

Health & Safety Assistants are required to keep a supply of examination and job requirement forms appropriate for the type(s) of employee classifications at their location. Health Resources can be contacted at 1-800-350-4511 to replenish examination forms only.

5.3.2 Annual Updates.

Each month, Health Resources will provide each Health & Safety Assistant with a "notification" list of employees due for annual update exams during the coming month and those employees due from previous periods who have not yet completed their examination. Except to the extent otherwise required by law, continued employment will be conditional based upon employee's exam and their being found medically fit to perform job requirements.

5.3.3 Exit.

Exit examinations are required for all employees leaving the company, except those classified "administrative" unless their most recent exam is less than six months old.

5.3.4 Examinations Conducted Away from the Employees Home Base.

Health Resources Customer Service Department must be contacted to identify the nearest available clinic in their network to service our needs. If there is not a nearby clinic available, Health Resources can be asked to locate and prepare a nearer clinic to serve the company (there may be an added charge for this service).

5.3.5 Biennial Updates.

Biennial Fit for Duty Update examinations will be provided from Health Resources to the Health & Safety Assistant with a "notification" list of employees due for Biennial Fit for Duty Update exams during the coming month, and those employees due from previous periods who have not yet completed their examinations.

5.4 Medical Clearance

Fit for Duty clearances will be issued, by Health Resources, within three business days following the examination. All other clearances will be issued, by Health Resources, within approximately five business days post examination. The clearance will be sent directly to the local Health & Safety Assistant. The Health & Safety Assistant is responsible for coordinating requests for retesting or additional testing, for obtaining the signatures of the employee on the clearance and manager, and placing the document in the employee's Medical/Exposure Monitoring file.

It is important to note that medical clearances are not confidential medical records. They are designed and intended to communicate employee medical status to management.

5.4.1 Medical Restrictions Issued.

Whenever a restricted medical clearance is issued, the Health & Safety Assistant shall advise the location Health & Safety professional and Human Resources representative. The Health & Safety and Human Resources representatives will meet with the manager to determine if the medical restriction will have an impact on the employee's ability to perform the essential duties of the intended job.

5.4.1.1 No Impact on Job Duties.

If the medical limitation is found not to have an impact on the ability to meet essential job functions, the procedures in section 5.4.1 are followed.

5.4.1.2 Job Duties Impacted.

If a preliminary review indicates that the individual's medical status, as reflected in prescribed medical limitations, will negatively impact their ability to perform the intended job, then the steps listed below must be taken:

1. Consult with Dr. Jerry Berke (the company's Consulting Medical Director) regarding the individual's specific medical status and the essential functions of their job (reference the company's job description).

   If it appears initially that the individual is medically not fit to perform the essential functions of the job, an evaluation of whether the person can perform the essential functions with a reasonable accommodation, pursuant to step 2 shall be made.

   If after evaluation of reasonable accommodations/alternatives, the individual cannot perform the essential functions of the job, placement or continued work in that position is prohibited. Go to step 3.

2. Reasonable Accommodation Evaluation
   When an individual is qualified to perform the essential functions of the job, but requires an accommodation (e.g. job restructure, facility changes, provide special equipment, provision of interpreters, etc.) to safely enter the workplace and perform, the manager with the Health & Safety and Human Resource representatives will meet with the individual to discuss their specific physical and/or mental limitations and abilities. The purpose is to identify specific potential accommodations that could be made.

Once potential accommodations have been identified, they must be evaluated to determine whether they enable the individual to perform essential job functions, without requiring the company to incur an undue hardship. Following this evaluation, the most promising accommodation(s) must be subjected to a safety review. **Before implementation of any accommodation it must be determined that it will not create a current specific threat of substantial harm to any employee or other work associate.** The safety review shall include reasonable medical judgement that relies on the most current medical knowledge and/or the best objective evidence.

3. Alternate Position Evaluation
When an acceptable reasonable accommodation cannot be identified for the individual to perform the essential functions of their job, the Human Resources Department will seek to identify alternate available positions for which the individual is qualified. The Health & Safety staff will be responsible for reviewing the essential functions of any new position with the company's Medical Director to verify that the individual is capable of performing them, and to verify that safety requirements can be met.

5.4.1.3 Not Medically Cleared.

In those cases whereby Health Resources has provided documentation that an employee is reported as not medically cleared for their job duties, the company shall evaluate other alternatives in an effort to offer the employee placement in any open positions that the subject employee may qualify. Should the employee's qualifications not satisfy the job requirements of any available positions, the subject employee will be released from employment.

5.5 Disability Confirmation

When an individual claims to have a disability and requests accommodation, the company is entitled to have the individual examined by a physician to confirm the disability and to evaluate its impact on the ability to perform essential job functions. This examination shall be coordinated by the company's Medical Director to verify that authorized scope is not exceeded.

5.6 Re-hiring Former Employee

When a former employee is being re-hired, if the most current company medical examination is less than six months old *and* the location Health & Safety professional can confirm that the individual was not subject to hazardous exposures during the non-company employment, the Health & Safety professional can choose to waive a new Baseline exam. Annual update will be based on the most recent exam date, not hire date.

All returning former employees shall be subject to drug and alcohol testing at the time of re-hire.

6.0 EXCEPTION PROVISIONS

(None Permitted)

7.0 CROSS REFERENCES

HS101:Drug and Alcohol Testing
HS102:Access to Employee's Exposure and Medical Records
HS105:Occupational Injuries/Illnesses Procedures

Technical Assistance Manual for the Americans With Disabilities Act by the Equal Opportunity Employment Commission.

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Health Resources Tabular Protocol
3. Request for Extension of Medical Surveillance Requirements
4. Exit Examination Acceptance/Declination Form

ATTACHMENT 1

Responsibility Matrix

Action	Procedure Section	*Responsible Party*						
		Employee	**HS Professional**	**HS Asst.**	**Medical Director**	**Health Resources**	**HR**	**Mgr.**
Submit to required medical evaluations	5.1	X						
Require temporary, contractor, subcontractor personnel to meet company's medical requirements	5.1.1							X
Local medical surveillance coordination/ Administration	5.2		X	X				
Schedule examinations	5.3 - 5.4			X				
Issue medical clearances	5.4					X		
Obtain management/associate signatures	5.4			X				
Investigate disability claims, medical restrictions, transfers, accomodations	5.4.2	X	X		X		X	X
Confirm disabilities (medically)	5.5		X		X			
Decide on exam waiver for re-hires	5.6		X					

ATTACHMENT 2
TABULAR PROTOCOL - EXHIBIT A

Module	Hst. & Phys. w/dipstick UA, Vision, Vital Signs	Spiro	Audio	EKG	Chest X-Ray	Bio Chem	Bio Tox	Drug Screen
BASELINE								
Administrative/Executive								**DS 10**
Professional (non-exposed)	∃	∃	∃	∃	∃	∃		**DS 10**
Laboratory	∃					∃		**DS 10**
Laboratory (Neg. Pres. Respirator)	!	!				!		
Field Exposure	∃	∃	∃	*	∃	∃		**DS 10**
Field Exposure (Trans)	∃	∃	∃	*	∃	∃		**N**
Field Exposure/Asbestos	∃	∃	∃	*	∃#	∃		**DS 10**
Field Exposure/Asbestos/Lead	∃	∃	∃	*	∃#	∃	**6014**	**DS 10**
Asbestos	∃	∃	∃	*	∃#	∃		**DS 10**
Six Months								
Blood Lead							**6014**	
Annual								
Laboratory	∃		**2Y**	*	**5Y**	∃		
Laboratory (Neg. Pres. Respirator)	!	!				!		
Manufacturing (no respirator use)	∃	∃	∃		**5Y**	∃		
Field Exposure	∃	∃	∃	*	**5Y**	∃		
Field Exposure (Trans)	∃	∃	∃	*	**5Y**	∃		**N/R**
Field Exposure/Asbestos	∃	∃	∃	*	**See #**	∃		
Field Exposure/Asbestos/Lead	∃	∃	∃	*	**See #**	∃	**6014**	
Asbestos	∃	∃	∃	*	**See #**	∃		
EXIT								
Professional (non-exposed)	∃	∃	∃		**1Y**	∃		
Laboratory	∃	∃			**1Y**	∃		
Manufacturing	∃	∃	∃		**1Y**	∃		
Field Exposure	∃	∃	∃		**1Y**	∃		
Field Exposure (Trans)	∃	∃	∃		**1Y**	∃		
Field Exposure/Asbestos	∃	∃	∃		**1Y#**	∃		
Field Exposure/Asbestos/Lead	∃	∃	∃		**1Y#**	∃	**6014**	
Asbestos	∃	∃	∃		**1Y#**	∃		

[1]Certain exam categories may be eligible for one year clearance extensions.

TABULAR PROTOCOL
EXHIBIT A-2

ASBESTOS CXR SCHEDULE				
	Age 6	15-35	35-45	45+
Years of 9 *Exposure*	0-10	5Y	5Y	5Y
	10+	5Y	2Y	1Y

CALOSHA ASBESTOS CXR SCHEDULE			
	Age 6	< 40	> 40
Years of Exposure 9	0-10	3Y	1Y
	10+	1Y [x]	1Y [x]

NOTE: CALOSHA requires a three (3) view CXR for asbestos clearance
[x] Oblique view every three years

LEGEND

!	At MD discretion
#	X-Ray film sent to Health Resources for ILO reading
Y	Yearly frequency
N	NIDA drug screen
NL	NIDA-Like drug screen (5 drugs only)
N/R	NIDA Random drug screen
DS 10	10 drugs

NOTE: All non-NIDA drug and alcohol tests shall follow the protocols in Shaw E & I procedure HS 101 (Exhibit E).

TABULAR PROTOCOL
EXHIBIT A-3

DRUG SCREENS

NIDA-LIKE DRUG SCREEN

- Marijuana
- Amphetamines
- PCP
- Cocaine
- Opiates

Includes the NIDA chain of custody procedures and all of the guidelines of the Department of Health and Human Services. The Medical Review Officer (MRO) services are included.

DS 10 DRUG SCREEN

- Amphetamines
- Barbiturates
- Benzodiazepines
- Cocaine Metabolites
- Marijuana metabolites
- Methadone
- Methaqualone
- Opiates
- Phencyclidine
- Propoxyphene

REASONABLE CAUSE DRUG SCREEN

- Amphetamines
- Ethanol
- Marijuana metabolites
- Methadone
- Methaqualone
- Opiates
- Phencyclidine

BIOTOX PANEL 6014

- Lead
- Zinc Protoporphyrin

ATTACHMENT 3
REQUEST FOR EXTENSION OF MEDICAL REQUIREMENTS

Employee Name (print):		Date:	
Social Security Number:		Date of Birth:	
Date of Last Physical:		SITE Code:	
Health & Safety Assistant:		VISION Code:	

Please answer each question below and obtain the indicated signatures. The completed form MUST be faxed to Health Resources, Shaw E & Iσ medical services provider, at (800) 853-2641 prior to your next scheduled annual physical exam.

		YES	NO	UNSURE
1.	I have spent 30 days or more in the field within the past year on hazardous waste contaminated sites or in a laboratory with exposure, with potential exposure above permissible exposure limits.			
2.	I expect to work 30 days or more in the field in the upcoming year on hazardous waste contaminated sites or in the laboratory.			
3.	As a result of work activities in the past twelve months, I was required to wear a respirator for 30 days or more.			
4.	As a result of scheduled work activities, I anticipate being required to wear a respirator for 30 days or more during the next twelve months.			
5.	I have worked on a project site during the last year where the health and safety plan required the use of hearing protection.			
6.	I have had a change in my medical status in the last year (e.g. surgery, medical treatment, medical diagnosis, etc.)			

If you answered YES to any of the above, please explain details below, or on back of page (i.e., chemical, physical, biological, or ergonomic exposures):

_____

_____

_____

_____ _____
Employee Signature Date

_____ _____
Health and Safety or Supervisor Signature Date

_____
Health and Safety or Supervisor Name (please print)

ATTACHMENT 4
EXIT EXAMINATION ACCEPTANCE/DECLINATION FORM

I, _____, am an employee of Shaw Environmental & Infrastructure.
(Print Name)

I understand that due to my occupational exposure, I may be at risk to exposure to hazardous materials and are required to submit to an exit examination before leaving the company, unless it has been less than six months since my last physical. I have been offered an Exit Examination, at no charge to myself.

(Please check appropriate box.)

☐ I accept to submit to the offered no charge Exit Examination.

However, ☐ I decline to submit to the required Exit Examination.

☐ I waive an Exit Examination because it has been less than six months since my last physical.

If I want to request a copy of my Exit Examination, I may contact Health Resources @ 800-350-4511.

_____ _____
Employee Signature Date

_____ _____
Human Resource Representative (Print Name) Date

_____
Signature of Human Resource Representative

STANDARD OPERATING PROCEDURE

Subject: Drug and Alcohol Testing

UNCONTROLLED WHEN PRINTED

1. PURPOSE

Shaw Environmental & Infrastructure (hereinafter referred to as collectively as "Shaw E & I") has established this Drug and Alcohol procedure to maintain a work environment free from substance abuse; provide a safe and healthy environment for our Employees and the general public; maintain the quality and integrity of Shaw E & I's products and services; preserve Shaw E & I's reputation in the communities where Shaw E & I operates; and protect and secure our property and information.

The purpose of this procedure is to provide guidelines for all "Employees" (hereinafter referred to collectively as, and inclusive of: applicants, prospective employees, existing employees and employees working for Shaw E & I through temporary staffing agencies) regarding substance use and abuse and to provide supervisors with practical procedures for its administration. Subcontractors and lower tier subcontractors (a lower tier subcontractor is any subcontractor at any level working on any Company project whether directly with Shaw E & I or through a third party) are required to document that they maintain a substance abuse prevention program comparable to this program. Shaw E & I reserves the right to modify this procedure at any time consistent with changes in medical procedures, technologies, the law, or Shaw E & I's operational needs. This procedure shall not, in any event, alter the basic "at will" status of any Employee, nor shall it create any expressed or implied contractual rights relative to employment with Shaw E & I.

2. SCOPE

This procedure applies to all applicants applying for positions in the United States, all Employees working in the United States, and all international Employees testing in the United States prior to deployment including but not limited to officers, directors, and supervisors. Subcontractors and lower tier subcontractors are required to document that they maintain a substance abuse prevention program comparable to this program.

An applicant or prospective Employee of Shaw E & I who refuses a post-offer, pre-employment drug or alcohol test will not be considered for a position with Shaw E & I.

This procedure applies to all Company work locations except when state restrictions apply. For the purpose of this procedure, and as a result of the nature of work in which Shaw E & I performs for our customers, we often employ individuals that actually work at a location that is neither owned or otherwise leased / rented by Shaw E & I. Accordingly, we define these customer job site work locations as being "Host Employer" premises.

An existing Employee who refuses to submit to a drug/alcohol test is subject to disciplinary action, up to and including termination, pursuant to Shaw E & I's guidelines and applicable Federal and state laws. "Company or Host Employer's Premises" are defined as: all areas or locations in which work is performed, including but not limited to Employee's lockers, lunch boxes, personal bags and effects, clothing, furniture, desks, drawers, containers, tool boxes, storage facilities, work areas and personal vehicles parked on Company property or job site locations and equipment, either owned, borrowed, leased or operated by Shaw E & I or Host Employer.

2.1 Table of Contents

3. REFERENCES

3.1 Internal References

- HS800 Motor Vehicle Operation and Maintenance
- HS020 Accident Prevention Program: Reporting, Investigation, and Review

3.2 External References

- Title 10 Code of Federal Regulations (10 CFR) Part 707
- 49 CFR Part 40
- 49 CFR Part 40, Part 199

4. DEFINITIONS

None.

5. RESPONSIBILITIES

5.1 Vice President of Health and Safety

The Vice President of Health & Safety is responsible for issuing, revising, and maintaining this procedure.

5.2 Director of Health and Safety

The Director of Health and Safety is responsible for the following:

- Contacting collection facilities, approved laboratories, and the medical review officer (MRO)
- Verifying that subcontractor programs meet the intent of this procedure

5.3 Project/Office Manager

The project/office manager is responsible for the following:

- Providing a copy of this procedure to covered non-DOT employees
- Contacting collection facilities, approved laboratories, and the MRO
- Handling positive (failed) test results
- Verifying that subcontractor programs meet the intent of this procedure
- Coordinating local testing program

5.4 Health and Safety Representative

The health and safety representative is responsible for the following:

- Providing a copy of this procedure to covered non-DOT employees
- Contacting collection facilities, approved laboratories, and the MRO
- Verifying that subcontractor programs meet the intent of this procedure
- Coordinating local testing program

5.5 Substance Abuse Program Administrator

The substance abuse program administrator is responsible for the following:

- Issuing, revising, and maintaining this procedure

- Contacting collection facilities, approved laboratories, and the MRO
- Handling positive (failed) test results
- Verifying that subcontractor programs meet the intent of this procedure
- Coordinating local testing program

5.6 Medical Review Officer

The MRO is responsible for the following:

- Handling positive (failed) test results
- Evaluating test results

5.7 Employee

Employees are responsible for the following:

- Complying with Shaw E & I's Drug and Alcohol testing policy and this procedure
- Providing test specimens when requested.

6. PROCEDURE

All employees should read and sign Form HS101.01r4, The Shaw Drug and Alcohol Policy, prior to submitting to drug and alcohol testing. Additional provisions that consider non-DOT regulations and drug and alcohol laws of Puerto Rico are contained in Attachment 1. The following sections describe Shaw's drug and alcohol testing program.

6.1 Illegal Drugs

The use, possession, concealment, manufacturing, promotion, transportation, distribution or sale of illegal drugs by any Employee or any employee of any subcontractor or lower tier subcontractor of Shaw E & I is strictly prohibited on all Company and Host Employer Premises and during Company working hours at any location and is grounds for disciplinary action up to and including termination.

Illegal drugs are defined as any drug (or the synthetic or generic equivalents of such drugs) that is illegal under Federal, state, or local laws. This includes but is not limited to marijuana, heroin, hashish, opiates, cocaine, hallucinogens, methamphetamine, depressants, and stimulants not prescribed for current medical treatment by a licensed physician.

6.2 Alcohol

Possession or consumption of alcohol on Company or Host Employer's Premises or unauthorized consumption while on the job is a violation of this procedure and is grounds for disciplinary action up to and including termination. Alcohol or alcoholic beverages means any beverage that has an alcoholic content and that is subject to state regulatory control for distribution as an alcoholic beverage.

6.3 Prescribed Medications

Any Employee undergoing medical treatment by a physician, dentist or other medical professional that includes the use of any drug or medication capable of affecting the Employee's mental or physical abilities is required to communicate to his/her supervisor that he/she is taking the medication.

In any situation whereby an Employee's medications are capable of affecting the Employee physically or mentally and thus affecting his/her ability to work safely, the Employee is required to consult with their physician and explain their job requirements. The Employee must provide a release to work to their supervisor from the treating physician prior to returning to work.

It is the responsibility of an Employee to communicate to his/her supervisor if he/she is taking medication that is capable of affecting the Employee mentally or physically. If the Employee fails to do so it is a violation of this procedure and is grounds for disciplinary action up to and including termination.

Any questions concerning this section of the procedure should be directed to Shaw E & I's Human Resources Department or Shaw E & I's Substance Abuse Program Administrator.

6.4 Drug and Alcohol Testing

Shaw E & I may utilize any type of drug or alcohol test allowed by both Federal laws and the laws of the state in which an Employee is employed to help in the control of or in the detection of drug or alcohol usage that violates this procedure. Drug and alcohol tests will be conducted for job related purposes and be consistent with business necessity.

Drug and alcohol tests may be utilized in, but are not limited to, the following circumstances, as may be allowed under the laws of the jurisdiction in which the Employee is employed:

- Post-offer, pre-employment examinations
- Random/Unannounced sampling
- Post-accident
- Reasonable cause or suspicion
- Post rehabilitation
- When otherwise requested or required by the client or by contract and pursuant to applicable law.

Employees agree to comply with drug testing facilities and sign all consent forms needed by the drug testing facilities.

Employees assigned to U.S. Department of Energy (DOE) sites may be required to participate in facility-specific drug and alcohol screening pools meeting the requirements of Title 10 Code of Federal Regulations (10 CFR) Part 707.

6.4.1 Post offer Pre-Employment Drug Testing

This section applies to all states except Montana which has restrictions in place where certain additional requirements should be followed pursuant to state legislation. Call the Medical Services Department for additional guidance on drug testing in the state of Montana.

Following an employment offer and prior to becoming an active Employee, the applicant/prospective Employee will be tested to determine use of illegal drugs. No Employee will begin work on any project or at any subcontractor location without submitting to and successfully passing an approved, pre-employment drug testing method pursuant to the requirements set forth in this procedure.

In circumstances where an Employee has been laid-off or terminated from Shaw E & I and subsequently re-hired by Shaw E & I within a 30 day period, the Employee will not be required to submit to a post-offer, pre-employment drug test before beginning work on a project as long as the Employee has submitted to a drug test with Shaw E & I within one calendar year. In cases where the Employee is re-hired within 30 days and has not been drug tested with Shaw E & I within one calendar year, the Employee will be required to submit to a post-offer, pre-employment drug test before beginning work on any project or at any location.

In circumstances where an Employee has been laid-off or terminated from Shaw E & I and subsequently re-hired with Shaw E & I after a 30 day time period, the Employee will be required to submit to a post-offer, pre-employment drug test before beginning work on any project or at any location.

In circumstances where an Employee was terminated for a positive drug test, including refusing to take a drug test (which is assumed positive by Shaw E & I) and that Employee is re-applying for employment, the prospective Employee will have to take a pre-employment, post-offer drug test, as well as fulfill all of the requirements of Section 6.6.3 of this procedure.

6.4.2 Random/Unannounced Drug Testing

This section applies in all states and/or cities, except; Rhode Island; Vermont; San Francisco, California; and Boulder, Colorado. There are restrictions in Massachusetts, New Jersey, New York, West Virginia, Connecticut, Maine, Minnesota, Montana, and California where certain additional requirements should be followed pursuant to state legislation. Call the Medical Services Department for guidance.

A mandatory random/unannounced drug testing program is in effect and all Employees are subject to a random/unannounced drug testing program unless prohibited by state or local law. Accordingly, due to certain state and local law exclusions, certain offices, sites, or project locations may not be included in the random/unannounced drug testing program. Employees at locations whereby random/unannounced drug testing is allowed will be included in the selection process for random/unannounced drug testing by using a computer based random number generator that is matched to an Employee's I.D. or reference number. These tests shall be random, unannounced, and conducted in the concurrent quarter with the quarterly random selection process. The goal of the program shall be to randomly test a minimum of ten percent of the affected work force not covered by DOT or different contract requirements, on a quarterly basis.

6.4.3 Post-Accident Drug/Alcohol Testing

This section applies in all states, except in San Francisco, California. There are restrictions in Boulder, Colorado; Connecticut; Iowa; Maine; Vermont; Rhode Island; Mississippi; and Oklahoma where certain additional requirements should be followed pursuant to state legislation. Call the Medical Services Department for additional guidance.

Subject to Federal and state laws, Shaw E & I will conduct post accident/injury drug and/or alcohol tests on any Employee receiving medical care for a work-related injury. This post-accident testing shall be performed as soon as practicable following work-related accidents or incidents. Additionally, Shaw E & I shall require a drug/alcohol test for any Employee Shaw E & I reasonably believes contributed or caused the accident or incident. A drug/alcohol test may be performed in the following situations:

1. Any incident or accident that causes the Employee or third party affected by an Employee's actions to seek medical care for work-related injuries.

2. Any incident or accident resulting in serious personal injury or death.

3. Any property/equipment damage equal to or exceeding $2,500.00 or any property/equipment damage considered to be significant by Shaw E & I representative.

4. Any Chargeable Vehicle Accident (see HS800).

6.4.4 Reasonable Cause Drug/Alcohol Testing

This section applies in all states, except in Vermont and Rhode Island.

Reasonable cause drug/alcohol testing will be performed when an Employee is observed by at least two trained Company representatives displaying symptoms or behavior that he/she is using drugs or alcohol or is under the influence of a substance prohibited by this procedure. The two Company representatives shall complete Form HS101.02r4 of this procedure describing their observations. For training opportunities in reasonable suspicion drug testing, the Medical Services Department should be contacted. Such symptoms or behaviors include, but are not limited to, the following:

- Extreme drowsiness, respiratory depression, large pupils, constricted pupils, and slurred speech
- Disorientation
- Drunken behavior with or without the use of alcohol
- Admission by Employee of hallucinations or drug/alcohol use on the job
- Unexplained tremors, convulsions, or violent behavior
- Excessive absenteeism/tardiness, including established absentee patterns
- Significant decline in job performance
- Significant change in personality (misconduct, insubordination)
- Unexplained absences from workstation
- Information from credible source(s) indicating possible substance abuse
- Changes in personal hygiene
- Difficulty in motor coordination

A reasonable cause drug/alcohol test will also be performed on an Employee that is arrested during non-work hours for a drug/alcohol offense as soon as practical when he/she returns to the jobsite to the extent permitted by Federal, state, and local law.

The Employee suspected will not be allowed to operate any equipment. If an on-site collection is not available the Employee suspected will be driven by a Company representative for testing. The Employee suspected will not be allowed to return to work until receipt of a negative test.

6.4.5 Post-Rehabilitation Drug/Alcohol Testing

This section applies in all states. There are restrictions in Maine and Vermont where certain additional requirements should be followed pursuant to state legislation. Call the Medical Services Department for additional guidance.

Subject to applicable Federal and state laws, any Employee who is eligible to return to work after receiving counseling/rehabilitation, as recommended by a state-certified substance abuse professional, will be required to sign a return to work agreement (Form HS101.03r4), pass a drug/alcohol test before returning to duty, and is subject to periodic unannounced drug/alcohol tests for a period of 24 months after returning to duty.

6.5 DRUG/ALCOHOL TESTING PROCEDURES

Shaw E & I has in place specific written procedures for specimen collection, testing, storage and laboratory urinalysis. These procedures are available for review and can be requested from your supervisor, Shaw E & I's Human Resources Department or Shaw E & I's Substance Abuse Program Administrator.

6.5.1 Collection Sites/Laboratories

Shaw E & I will select collection sites and/or laboratories, certified by the U.S. Department of Health and Human Services and/or appropriate state agencies, to conduct drug/alcohol tests. The collection sites and/or laboratories will agree to conduct tests in accordance with applicable state and Federal laws and regulations.

6.5.2 Medical Review Officer

The MRO is a licensed physician with knowledge of substance abuse disorders. The MRO will receive all dilute specimen reports, all positive drug test results, and certain pre-employment tests from the laboratory and will verify the test result. Pre-employment test results that are reported as positive will not be reviewed by the MRO except in situations where it is required by local or state law.

6.5.3 Cost of Testing

All costs of drug/alcohol tests required by Shaw E & I are paid for by Shaw E & I.

6.5.4 Time of Testing

Employees are required to report to the drug/alcohol testing location designated by Shaw E & I immediately after notification from Shaw E & I. Generally, drug/alcohol tests are scheduled immediately before, during or immediately after an Employee's work hours, and Employees will be given a maximum of two hours after notification to report to the testing facility. If the Employee requires additional time, he/she is required to provide the reason for the request for the time extension immediately, which will be considered by Shaw E & I's Substance Abuse Program Administrator (by calling the EH&S department in Baton Rouge, LA at 225-932-2500). Requests should be presumed denied unless specifically granted by the Substance Abuse Prevention Administrator within the two hour time frame.

6.5.5 Inability to Provide Drug Screen Sample

Any Employee who is unable to provide a specimen sample within three hours of the first attempt to provide such specimen for a drug/alcohol test will be treated as refusing to cooperate with this procedure and will not be considered for employment or be subject to disciplinary action, up to and including termination. However, an applicant/prospective Employee or Employee who is unable or cannot provide a sample specimen within three hours due to a medical condition or illness must notify Shaw E & I's Substance Abuse Program Administrators immediately (by calling the EH&S department in Baton Rouge, LA at 225-932-2500.)

6.5.6 Pending Test

Any Employee whose test result is pending final analysis confirmation by the MRO may immediately be removed from the work site until final results are available.

6.5.7 Rapid Drug Testing Cups

This section applies in all states except for on-site purposes in Minnesota and Vermont. There are restrictions in Puerto Rico and New York where certain additional requirements should be followed pursuant to state legislation. Call the Medical Services Department for guidance.

Rapid drug testing cups/dipsticks should only be used when authorized by state law and/or local legislation and when proper written approval is received from the Substance Abuse Program Administrator.

If a rapid drug testing cup is used, the following will apply:

- A result from a rapid drug testing cup is never considered positive; if there is a presence of drugs detected the result is considered non-negative.
- Non-negative specimens must be sent to the lab for GC/MS confirmation and MRO evaluation (if confirmed positive).
- A third party specimen collector must be utilized unless written approval is obtained from the Substance Abuse Program Administrator.
- If a rapid drug testing cup is non-negative then an Employee may be suspended pending confirmation result from the lab. An Employee will not proceed in the hiring process with a non-negative rapid drug testing cup result until a confirmed negative result is received. An Employee can proceed in the hiring process if a negative rapid drug testing cup result is received.
- All specimens from a rapid drug testing cup, whether negative or non-negative, must be sent to the lab for analysis.

6.5.8 Procedure for Rebutting and/or Appealing a Positive Drug or Alcohol Test Result

If an Employee rebuts and/or appeals a positive drug or alcohol test result; Section 6.6.5 of this procedure will be followed.

6.5.9 Procedure for Post-Accident Drug Testing

To determine if a post accident drug test is required, see Section 6.4.3 of this procedure. If a post-accident drug test is required, the following will apply:

- The drug test must have a completed chain-of-custody.
- In the event of a non-negative drug test result, the Employee will be suspended pending the GC/MS confirmation and MRO evaluation (if needed).
- The specimen collection will be administered by a third party.
- In the event a medical provider does not provide drug testing services, the Substance Abuse Program Administrator should be called immediately.
- A refusal to submit to a post-accident drug test will be considered a positive drug test/refusal to comply with this procedure (refer to Section 6.5.5) and is grounds for disciplinary action up to and including termination.

6.5.10 Procedure for Observed Specimen Collection

This section applies in all states except: Boulder, Colorado; Connecticut; Oklahoma; California; Maine; and Rhode Island.

An observed specimen collection will be allowed under the following circumstances:

- A person provides a specimen and the temperature is out-of-range.
- An Employee that leaves the testing area without the approval from Shaw E & I representative.
- There is clear and convincing evidence that a person is trying to substitute a specimen sample with another sample.

- A person gives a sample that is too dilute to test.
- A client requests that all drug test collections be witnessed.
- An adulterant is detected in a person's specimen.
- A third party observer of the same sex as the Employee must be utilized unless written approval is obtained from the Substance Abuse Program Administrator.

Specimens will be collected per the guidance in Attachment 2.

6.6 Results of Drug/Alcohol Screen

Compliance with the Drug and Alcohol Program is a condition of employment. Employees who violate any provision in this procedure will not be considered for employment or are subject to disciplinary action, up to and including termination, pursuant to Shaw E & I's guidelines and applicable Federal and state laws.

6.6.1 Positive Drug and Alcohol Tests

Any Employee who has a positive drug/alcohol test result (pursuant to the minimum cutoffs designated by Shaw E & I, client or otherwise provided by applicable state law) will be notified of a positive test result. The consequences of a positive test result and procedures for appealing the positive test result will be explained prior to any disciplinary or adverse action being taken. Every Employee has the right to inspect and/or obtain a copy of the positive drug/alcohol test. If, after a conditional offer of employment, an Employee tests positive, the offer of employment will be withdrawn.

6.6.2 Positive Drug Tests

Any existing Employee who tests positive is subject to disciplinary action, up to and including termination, pursuant to Shaw E & I's guidelines and applicable Federal and state laws. An Employee denied employment or an existing Employee whose employment has been terminated as a result of a positive drug test may re-apply for employment within Shaw E & I after:

- Waiting at least 30 days after the date that the positive drug test was reported.
- Successfully completing an evaluation by a state-certified substance abuse professional and successfully completing or in the process of completing all recommended courses of treatment established by the substance abuse professional and providing documentation from the substance abuse professional to Shaw E & I.
- Completing Form HS101.03r4.

Shaw E & I will require any such individual to comply with the provisions of this procedure and to be subject to periodic unannounced drug testing for 24 months as is allowed under Federal and/or state laws.

6.6.3 Positive Alcohol Tests

Any existing Employee who has a breath alcohol level of 0.02 through 0.039 will be immediately suspended from any work duties with Shaw E & I unless he/she works in Montana where the breath alcohol level has to be greater than 0.04 to be recognized as positive. An Employee may return to work at his or her next scheduled shift as long as his or her breath alcohol level is below 0.02. All breath alcohol tests must be administered by a certified technician. Any existing Employee who has a breath alcohol level of 0.04 or higher will be subject to disciplinary action, up to and including termination, pursuant to Shaw E & I's guidelines and applicable Federal and state laws.

An Employee denied employment or an existing Employee of Shaw E & I whose employment has been terminated as a result of a positive breath alcohol test of 0.04 or higher may re-apply for employment within Shaw E & I after:

- Waiting at least 30 days after the date of the positive breath alcohol test.
- Successfully completing an evaluation by a state-certified substance abuse professional and successfully completing or in the process of completing all recommended courses of treatment established by the substance abuse professional and providing documentation from the substance abuse professional to Shaw E & I.
- Completing Form HS101.03r4.

Shaw E & I will require any such individual to comply with the provisions of this procedure and to be subjected to periodic unannounced alcohol testing for 24 months as is allowed under Federal and/or state laws.

6.6.4 Rebutting and/or Appealing a Drug or Alcohol Test Result

Any Employee may rebut the drug or alcohol test results to the extent an opportunity to rebut is provided under applicable state or local law. The Employee should contact the MRO to discuss, explain or contest the test results within the appropriate time period under state or local law.

Any Employee that desires to appeal a drug or alcohol test result can have the original specimen re-tested. Employee must request re-test within 72 hours (or the specific time period pursuant to local or state law if different) of receiving initial notice of test result from the MRO. All requests for a re-test must be submitted to the MRO within the 72 hours after initial notification of result. The Employee will pay for the re-test of the original specimen unless prohibited by law. Payment for the re-test will be made to the appropriate clinic/MRO. The procedure of appealing a drug test result includes:

- The re-test will only be completed on the original specimen that yielded the positive result. A second specimen will not be collected.
- The cost of the re-test has to be paid by the Employee to the clinic/MRO before the specimen can be re-tested.
- The re-test will be completed at a SAMSHA certified lab of the Employee's choice. The Employee will send the name and address of the SAMSHA certified lab along with the payment to the clinic before the specimen can be re-tested.
- The result of the re-test will serve as the final determining result regarding the appeal process. No further retesting is allowed.

6.6.5 Adulterated, Unsuitable or Diluted Samples

Existing Employees:

Adulterated, unsuitable, or diluted urine samples, as determined by the MRO and in accordance with state and Federal guidelines, will be treated as positive samples. Employees who furnish adulterated, unsuitable, or diluted urine samples may be required to submit to a second drug screen and/or are subject to disciplinary action, up to and including termination pursuant to Shaw E & I's guidelines and applicable Federal and state laws. Any re-testing of an Employee, because of an adulterated, unsuitable, or diluted urine sample submission shall be done in accordance with the time of submission requirements outlined in Section 6.5 and may require direct observation of collection. In the event that a specimen's temperature is out-of-range, an observed recollection will administered when allowed by Federal, state and local law. If the specimen's temperature is out-of-range after the observed recollection, it will be considered as a refusal to provide a valid specimen.

Applicants / Prospective Employees:

If, after a conditional offer of employment, it is determined that an applicant/prospective Employee provided an adulterated or unsuitable urine sample, as determined by the MRO and in accordance with state and Federal guidelines, that individual will not be considered for a position with Shaw E & I. The applicant may re-apply for employment with Shaw E & I after waiting at least 30 days after the date of the adulterated or unsuitable urine sample.

If an applicant provides a diluted urine sample, as determined by the testing laboratory, the sample will be analyzed and measured to level of detection as to determine if the sample contains any trace amounts of illegal drugs (as described in Section 6.1). If it is then determined that the dilute sample contains any trace amounts of illegal drugs, the employment process will be terminated and the applicant will not be allowed to re-apply for employment until after 30 days following the date of the test and completing the provision in Section 6.6.5. However, if it is determined that the original dilute sample does not contain any trace amounts of illegal drugs, the specimen will be reported out as a negative drug test and the applicant will be eligible for employment.

6.7 Privacy and Confidentiality

Individual privacy and confidentiality will be carefully respected in maintaining a record retention program. Any information obtained through drug/alcohol testing unrelated to the use of drugs and/or alcohol will be held in strict confidence by the MRO and not released to Shaw E & I. With the exception of the testing laboratory, the MRO, and the Substance Abuse Program Administrator (or other individuals designated by Shaw E & I to receive and evaluate test results and resulting employment decisions), the results of individual drug tests will not be released to anyone without the express written authorization of the tested individual, except as ordered by a Court or governmental agency. Results that are reported to Shaw E & I by the MRO as positive will also be held in strict confidence with individual privacy and confidentiality being carefully respected.

Written records will be stored in locked containers or in a secured location. Such records will not be made a part of individual personnel files. Unless an Employee gives his or her written consent, the Employee's drug/alcohol test records will not be released to a subsequent employer absent a court order or unless required by Federal or state law.

6.8 Searches and Inspections

Shaw E & I may at any time conduct searches and inspections where there is reason to believe that an Employee may be in possession of substances which are prohibited under this Policy. Shaw E & I has the right to inspect an Employee's personal property on Company or Host Employer Premises. This search will be for the purpose of determining if such Employees are in possession, use, transportation or concealment of any prohibited items or substances. Searches and inspections may be conducted without prior announcement. Submission to a search or inspection is a condition of employment. Failure to cooperate and not signing the consent form (HS101.01r4) shall result in immediate suspension and is grounds for disciplinary action up to and including termination. Employees acknowledge and agree that they have no expectation of privacy in any space, item, locker, property, or equipment located on Company or Host Employer Premises or equipment owned, operated, leased, provided, or controlled by Shaw E & I or a Host Employer.

If an illegal substance is found Company or Host Employer Premises, a phone call to the authorities, the Substance abuse program administrator or the Human Resource Business Unit Director should be made immediately. The person that discovered the illegal substance should document his/her findings thoroughly.

6.9 Criminal Drug Conviction

Any Employee who has had a criminal drug conviction for a drug offense must notify Shaw E & I within five (5) days of that conviction. When an Employee has been convicted (meaning a finding of

guilt or imposition of sentence, including a plea of *nolo contendre*) of a drug offense fails to notify Shaw E & I of such conviction, Shaw E & I will either pose a sanction on the Employee, up to and including termination, or require the Employee to satisfactorily complete a drug-abuse rehabilitation program before returning to work.

6.10 Drug and Alcohol Education/Employee Assistance Program (EAP)

Drug and alcohol use awareness education will assist Company representatives and Employees to recognize individuals who may be abusing drugs or alcohol. The purpose of drug and alcohol awareness education is to:

- Provide Employees with an awareness of alcohol and drug use problems concerning the health and safety aspects of such use.
- To help Employees recognize symptoms of abuse.
- To help Employees recognize drugs and drug paraphernalia.
- To help Employees understand this procedure and penalties for violating this procedure and to outline procedures for handling situations related to this procedure.
- To reinforce Employee awareness of Shaw E & I's work rules on this subject.
- To reinforce the dangers of drug and alcohol abuse in the workplace.
- Provide information on the availability of drug and alcohol counseling, rehabilitation and Employee assistance.

Any Employee desiring information on substance use and abuse or a list of Employee Assistance Programs available in your area should contact Shaw E & I's Human Resources Department or Shaw E & I's Substance Abuse Program Administrator.

7. ATTACHMENTS

- Attachment 1, The Shaw Group Inc. Drug and Alcohol Non-DOT Policy Puerto Rico Addendum
- Attachment 2, Specimen Collection Procedure

8. FORMS

- HS101.01r4, The Shaw Drug and Alcohol Policy
- HS101.02r4, Reasonable Suspicion Documentation Form
- HS101.03r4, Re-Hire Certification and Agreement Employees Returning from a Substance Abuse Counseling/Rehabilitation Program

Attachment 1
The Shaw Group Inc. Drug and Alcohol Non-DOT Policy
Puerto Rico Addendum

I. Puerto Rico Law

A. Possession

Under Puerto Rico law, **24 L.P.R.A. § 2404,** it is unlawful for any person knowingly or intentionally, to possess any controlled substance, unless such substance was obtained directly or pursuant to a valid prescription or order from a practitioner, while acting in the course of his professional practice.

Any person who violates Puerto Rico law shall be guilty of a felony and upon conviction thereof, shall be punished by imprisonment for a fixed term of three (3) years. Should there be aggravating circumstances, the fixed penalty established may be increased to a maximum of five (5) years; if there should be extenuating circumstances, it may be reduced to a minimum of two (2) years. The court, in its discretion, in addition to imprisonment, may impose a fine that shall not exceed five thousand (5,000) dollars and an administrative fee.

If such person commits the said offense after one or more previous convictions under this subsection are final, he shall be guilty of a felony and, upon conviction thereof, shall be sentenced to imprisonment for a fixed term of six (6) years. Should there be aggravating circumstances, the fixed penalty established may be increased to a maximum of ten (10) years; if there should be extenuating circumstances, it may be reduced to a minimum of four (4) years.

If any person who has not been previously convicted of violating Puerto Rico law or any other law of the United States, related to narcotic drugs, marijuana or stimulant or depressant substances, is found guilty of violating subsection (a) of this section, be it after a trial or entering a plea of guilty, the court, without entering a verdict of guilty and with the consent of said person, may defer further proceedings and place said person on probation under such reasonable terms and conditions as it may require and for a fixed term of three (3) years. Should there be aggravating circumstances, the fixed penalty established may be increased to a maximum of five (5) years; should extenuating circumstances exist, it may be reduced to a minimum of two (2) years. The court shall advise the defendant that should he/she abandon the treatment and rehabilitation program, he/she shall be sanctioned pursuant to the provisions of § 4428 of Title 33.

B. Manufacture and Distribution

Under Puerto Rico law it is unlawful for any person knowingly or intentionally:

(1) To manufacture, distribute, dispense, transport or conceal or possess with the intent to manufacture, distribute, dispense, transport or conceal a controlled substance; or
(2) To produce, distribute or dispense, transport or conceal or possess with the intent to distribute or dispense, transport or conceal an adulterated substance.

Any person who violates this Puerto Rico law will be convicted of a felony and punished in accordance with the type of drug involved. Such punishment ranges from a sentence of a minimum of a fixed term of ten years to a maximum of a fixed term fifty years in prison. In addition, the court, in its discretion, may impose a fine, not to exceed fifty thousand (50,000) dollars and an administrative fee.

II. United States Law

Under the laws of the United States of America, it is unlawful for any person knowingly or intentionally:

(1) To manufacture, distribute or dispense or possess with intent to manufacture, distribute or dispense, a controlled substance; or
(2) To import or export a controlled substance.

Any person who violates this law will be sentenced to a term of imprisonment ranging from 5 years to 40 years and a fine of up to $20,000,000, depending on the type and quantity of the controlled substance or drug involved.

Attachment 2
Specimen Collection Procedures

Subject to laws and regulations of the jurisdiction in which the Employee may be employed, the specimen collection shall be conducted in the following manner. Specimens used in testing shall be collected by a certified laboratory or their agents in a manner in compliance with applicable state and Federal laws and regulations.

Drug Screen Specimen Collection

A. Scope

1. The drug testing custody and control form is to be used as a permanent record on which identifying data on the Employee and on the specimen collection and transfer process are retained. The drug-testing plan requires testing for at least marijuana, cocaine, opiates, amphetamines, and phencyclidine.

2. Urine Drug Screen specimens collected under this plan may be used only to test for controlled substances designated or approved for testing as described in this procedure and shall not be used to conduct any other analysis or test.

3. This plan does not prohibit procedures reasonably incident to the analysis of the specimen for controlled substances (e.g., determination of pH or tests for specific gravity, creatinine concentration, or presence of adulterants).

B. Procedures

1. The collection site person shall utilize the drug testing custody and control form provided by company; this form must address the requirements as contained in § 40.23. The custody and control form must comply with the provisions as contained in 49 CFR Part 40 with regard to the information that must be contained on the form. (Standard Form #DOT, 3900.0 or equivalent).

2. The drug testing custody and control form may include such additional information as may be required for billing or other legitimate purposes necessary to the collection.

3. A clean, single-use specimen bottle that is securely wrapped until filled with the specimen and use of a tamper proof sealing system, designed in a manner such to ensure against undetected opening shall be utilized.

4. Written procedures, instructions, and training shall be provided as follows:

   a. Shaw E & I may contract for and utilize when possible, an independent collection Site. The independent collection site shall abide by all procedures, techniques and methods outlined in 49 CFR Part 40, Part 199 and any DOT agency regulation, as well as those outlined in this document.

   b. Company collection procedures and training shall clearly emphasize that the collection site person is responsible for maintaining the integrity of the specimen collection and transfer process, carefully ensuring the modesty and privacy of the donor and is to avoid any conduct or remarks that might be construed as accusatorial or otherwise offensive or inappropriate.

c. The collection site person shall have successfully completed training to carry out this function or shall be a licensed medical professional or a technician who has been provided instructions for collection and certifies completion as required.

d. Unless it is impracticable for any other individual to perform this function, a direct supervisor of an Employee shall not serve as the collection site person for a test of the Employee.

5. The collection individual shall use a shipping container in which the specimen and associated paper work may be transferred and which can be sealed and initialed to prevent undetected tampering.

C. Security

1. The purpose of this section is to prevent unauthorized access, which could compromise the integrity of the collection process of the specimen.

2. The designated collection site is to be secure. If a collection site facility is dedicated solely to urine collection, it shall be secure at all times. If a facility cannot be dedicated solely to drug testing, the portion of the facility used for testing shall be secure during drug testing.

3. A facility normally used for other purposes, such as a public rest room or hospital examining room, may be secured by visual inspection to ensure other persons are not present and undetected access (e.g., through a rear door not in the view of the collection site person) is not possible. Security during collection may be maintained by effective restriction of access to collection materials and specimens. In the case of a public rest room, the facility must post and secure against access during the entire screen collection procedure to avoid embarrassment to the Employee or distraction of the collection site person.

4. If it is impractical to maintain continuous physical security of a collection site from the time the specimen is presented until the sealed mailer is transferred for shipment, the following minimum procedures shall apply:

a. The specimen shall remain under the direct control of the collection site person from delivery to its being sealed in the mailer.

b. The mailer shall be immediately mailed, maintained in secure storage, or remain until mailed under the personal control of the collection site person.

D. Chain-of-Custody

1. The chain-of-custody block, of the drug testing custody and control form, shall be properly executed by authorized collection site personnel upon receipt of specimens.

2. Handling the transportation of urine specimens from one authorized individual or place to another shall always be accomplished through chain-of-custody procedures. Every effort shall be made to minimize the number of persons handling specimens.

E. Access to Authorized Personnel Only

1. No unauthorized personnel shall be permitted in any part of the designated collection site when urine specimens are collected or stored. Only the collection site person may handle specimens prior to their sealing in the mailing container or monitor or observe a specimen collection (under the conditions specified in this section).

2. To promote security of specimens, avoid distraction of the collection site person and ensure against any confusion in the identification of specimens, the collection site person shall have only one donor under supervision at anytime.

3. For this purpose, a collection procedure is complete when the urine bottle has been sealed and initialed, the drug testing custody and control form has been executed and the Employee has departed the site (or, in the case of an Employee who was unable to provide a complete specimen, has entered a waiting area).

F. Privacy

1. Procedures for collecting urine specimens shall allow individual privacy unless there is a reason to believe that a particular individual may alter or substitute the specimen to be provided, as further described in this section.

2. For purposes of this procedure, the following circumstances are the exclusive grounds constituting a reason to believe that the individual may alter or substitute the specimen:

   a. The Employee has presented a urine specimen that falls outside the normal temperature range (32.0_C/90_F – 38_C/100_F), &

      (1) The Employee declines to provide a measurement of oral body temperature, as provided in paragraph G.14. of this section; or

      (2) Oral body temperature varies by more than 1_C/1.8_F from the temperature of the specimen.

   b. The last urine specimen provided by the Employee (i.e., on a previous occasion) was determined by the laboratory to have a specific gravity of less than 1.003 and a creatinine concentration below 0.2g/L.

   c. The collection site person observes conduct clearly and unequivocally indicating an attempt to substitute or adulterate the sample (e.g., substitute urine in plain view, blue dye in specimen presented); or

   d. The Employee has previously been determined to use a controlled substance without medical authorization or the particular test was being conducted under a DOT regulation providing for follow-up testing upon or after return to service.

3. A higher-level supervisor of the collection site person or a designated employer representative shall review and concur in advance with any decision by a collection site person to obtain a specimen under the direct observation of a same gender collection site person based upon the circumstances described in paragraph 2 above.

G. Integrity and Identity of the Specimen

The collection site person shall take precautions to ensure that a urine specimen is not adulterated or diluted during the collection procedure and that information on the urine bottle and on the urine custody and control form can identify the individual from whom the specimen was collected. The following minimum precautions shall be taken to ensure that unadulterated specimens are obtained and correctly identified:

1. To deter the dilution of specimens at the collection site, toilet-bluing agents shall be placed in toilet tanks wherever possible, so that reservoir of water in the toilet bowl always remains blue. Where practicable, there shall be no other source of water (e.g., no shower or sink) in the enclosure where urination occurs. If there is another source of water in the enclosure, it shall be effectively secured or monitored to ensure it is not used as a source for diluting the specimen.

2. When an individual arrives at the collection site, the collection site person shall ensure that the individual is positively identified as the Employee selected for testing (e.g., through presentation of photo identification or identification by the employer's representative). If the

individual's identity cannot be established, the collection site person shall not proceed with the collection. If the Employee requests, the collection site person shall show proper identification to the Employee. The Employee shall complete any required registration/consent form at collection site.

3. If the individual fails to arrive at the assigned time, the collection site person shall contact the appropriate authority to obtain guidance on the action to be taken.

4. The collection site person shall ask the individual to remove any unnecessary outer garments such as a coat or jacket that might conceal items or substances that could be used to tamper with or adulterate the individual's urine specimen. The collection site person shall ensure that all personal belongings such as a purse or briefcase remain with the outer garments. The individual may retain his or her wallet. If the Employee requests it, the collection site person shall provide the Employee a receipt for any personal belongings.

5. The individual shall be instructed to wash and dry his or her hands prior to urination.

6. After washing hands, the individual shall remain in the presence of the collection site person and shall not have access to any water fountain, faucet, soap dispenser, cleaning agent, or any other materials which could be used to adulterate the specimen.

7. The individual may provide their specimen in the privacy of a stall or otherwise partitioned area that allows for individual privacy. The collection site person shall provide the individual with a specimen bottle or collection container, if applicable, for this purpose.

8. The collection site person shall note any unusual behavior or appearance on the urine custody and control form.

9. In the exceptional event that an employer-designated collection site is not accessible and there is an immediate requirement for specimen collection (e.g., circumstances require a post-accident test), a public restroom may be used according to the following procedures: A collection site person of the same gender as the individual; shall accompany the individual into the public restroom this shall be secured during the collection procedure. If possible, a toilet bluing agent shall be placed in the bowl and any accessible toilet tank. The collection site person shall remain in the restroom, but outside the stall, until the specimen is collected. If no bluing agent is available to deter specimen dilutions the collection site person shall instruct the individual not to flush the toilet until the specimen is delivered to the collection site person. After the collection site person has possession of the specimen, the individual will be instructed to slush the toilet and to participate with the collection site person in completing the chain-of-custody procedures.

10. If Shaw E & I is using the single collection method then the following procedures shall be used:

    a. The collector may choose to direct the Employee to urinate either directly into a specimen bottle or into a separate collection container.

    b. If a separate collection container is used, the collection site person or the Employee shall pour at least 30 ml of the urine from the collection container into the specimen bottle in the presence of the Employee.

11. Collection Methodology

    a. In either collection methodology, upon receiving the specimen from the individual the collection site person shall determine if it has at least 30 ml of urine for a single specimen collection or 45 ml of urine for a split specimen collection.

b. If the individual has not provided the required quantity of urine, the specimen shall be discarded. The collection site person shall direct the individual to drink up to 40 ounces of fluid, distributed reasonably through a period of up to three hours or until the individual has provided a new urine specimen, whichever occurs first. If the Employee refuses to drink fluids as directed or to provide a new urine specimen, the collection site person shall terminate the collection and notify the employer that the Employee has refused to submit to testing. If the Employee has not provided a sufficient specimen within three hours of the first unsuccessful attempt to provide the specimen, the collection site person shall discontinue the collection and notify the employer.

12. After the specimen has been provided and submitted to the collection site person, the individual shall be allowed to wash his or her hands.

13. Immediately after the specimen is collected, the collection site person shall measure the temperature of the specimen. The temperature-measuring device used must accurately reflect the temperature of the specimen and not contaminate the specimen. The time from urination to temperature measure is critical and in no case shall exceed 4 minutes.

14. A specimen temperature outside the range of 32.0_C90_F - 38_C/100_F, constitutes a reason to believe that the individual has altered or substituted the specimen (See Section F.2.a.). In such cases, the individual supplying the specimen may volunteer to have their temperature taken to provide evidence to counter the reason to believe the individual may have altered or substituted the specimen.

15. Immediately after the specimen is collected, the collection site person shall also inspect the specimen to determine its color and look for any signs of contaminants. Any unusual findings shall be noted on the urine custody and control form.

16. All specimens suspected of being adulterated shall be forwarded to the laboratory for testing.

17. Whenever there is reason to believe that a particular individual has altered or substituted the specimen as described in Section F.2.a. and c., a second specimen shall be obtained as soon as possible under the direct observation of a same gender collection site person.

18. Both the individual being tested and the collection site person shall keep the specimen in view at all times prior to its being sealed and labeled. As provided below, the specimen shall be sealed by placement of a tamper-proof seal over the bottle cap and down the sides of the bottle and labeled in the presence of the Employee. If the specimen is transferred to a second bottle, the collection site person shall request the individual to observe the transfer of the specimen and the placement of the tamper-proof seal over the bottle cap and down the sides of the bottle.

19. The collection site person and the Employee shall be present at the same time during procedures outlined in items 20 through 24 of this section.

20. The collection site person or Employee shall place securely on the bottle an identification label, which contains the date, the individual's specimen number and any other identifying information provided or required by the employer. If separate from the label, the tamper-proof seal shall also be applied.

21. The specimen donor shall initial the identification label on the specimen bottle for the purpose of certifying that it is the specimen collection from the donor.

22. The collection site person shall enter on the drug testing custody and control form all information identifying the specimen. The collection site person shall sign the drug testing custody and control form, certifying that the collection was accomplished according to the applicable Federal requirements.

23. The individual shall be asked to read and sign a statement on the drug testing custody and control form that the specimen collected from him/her is in fact that specimen he/she provided.

24. The collection site person shall complete the chain-of-custody portion of the drug testing custody and control form to indicate receipt of the specimen from the Employee and shall certify proper completion of the collection.

25. The urine specimen and chain-of-custody form are now ready for shipment. If the specimen is not immediately prepared for shipment, the collection site person shall ensure that it is appropriately safeguarded during temporary storage.

26. Control of Specimen

    a. While any part of the above chain-of-custody procedures is being performed, it is essential that the urine specimen and custody documents be under the control of the involved collection site person.

    b. If the involved collection site person leaves their workstation momentarily, the collection site person shall take the specimen and drug testing custody and control form with them or shall secure them. After the collection site person returns to the workstation, the custody process will continue. If the collection site person is leaving for an extended period of time, they shall package the specimen for mailing before leaving the site.

    c. The collection site person shall not leave the collection site in the interval between presentation of the specimen by the Employee and secure the sample with an identifying label bearing the Employee's specimen identification number and seal initialed by the Employee. If it becomes necessary for the collection site person to leave the site during this interval, the collection shall be nullified and at the election of Shaw E & I a new collection may be begun.

27. Collection Control

    a. To the maximum extent possible, collection site personnel shall keep the individual's specimen bottle within sight both before and after the individual has urinated. After the specimen is collected, it shall be properly sealed and labeled.

28. Transportation to Laboratory

    a. Collection site personnel shall arrange to ship the collected specimens to the drug testing laboratory. The specimens shall be placed in shipping containers designed to minimize the possibility of damage during shipment (e.g., specimen boxes and/or padded mailers); and those containers shall be securely sealed to eliminate the possibility of undetected tampering. On the tape sealing the container, the collection site person shall sign and enter the date specimens were sealed in the containers for shipment. The collection site person shall ensure that the chain-of custody documentation is attached to each container sealed for shipment to the drug-testing laboratory.

29. Failure to Cooperate

    a. If the Employee refuses to cooperate with the collection process, the collection site person shall inform the designated company representative and shall document the non-cooperation on the drug testing custody and control form.

30. Employee Requiring Medical Attention

    a. If the sample is being collected from an Employee in need of medical attention part of a post-accident test given in an emergency medical facility, necessary medical attention shall not be delayed in order to collect the specimen.

31. Use of Chain-of-Custody Forms

    a. A chain-of-custody form shall be used for maintaining control and accountability of each specimen form the point of collection to final disposition of the specimen. The date and purpose shall be documented on the form each time a specimen is handled or transferred and every individual in the chain shall be identified. Every effort shall be made to minimize the number of persons handling specimens.

Evidential Breath Testing (EBT) for Alcohol

A. Scope

1. The evidential and non-evidential testing procedures set forth in this section was developed from utilizing, a guidance document, the requirements as set forth in 49 CFR Part 40 and specifies the required form and disposition of such testing forms.

B. Alcohol Testing Form

1. Shaw E & I may utilize a form similar to that of a DOT Breath Alcohol Testing form or a form that is directly generated by an EBT and may omit the space for affixing a separate printed result to the testing form. In all cases, the form shall provide triplicate or three consecutive identical copies with copy 1 being retained by Shaw E & I, copy 2 shall be provided to the Employee and copy 3 shall be retained by the BAT/STT.

2. The Breath Alcohol Testing form may include such additional information as may be required for billing or other legitimate purposes necessary to the testing, provided that personal identifying information on the individual (other than the social security number or Employee identification number) may not be provided.

C. Breath Testing Locations

1. Shaw E & I shall ensure that there are sufficient breath testing sites or the availability of BAT's/STT's located within a reasonable proximity to each of Shaw E & I's work locations.

2. Shaw E & I shall conduct the testing in a location that affords visual and aural privacy to the Employee being tested. All necessary equipment, personnel, and materials for conducting the alcohol testing shall be provided at the testing site.

3. A mobile collection facility, such as a van that is equipped for alcohol testing, that meets the requirements set forth in this procedure may be utilized.

4. No unauthorized persons shall be permitted access to the testing site when the EBT remains unsecured or to prevent such individuals from seeing or hearing a test result.

5. In some circumstances Shaw E & I may have to conduct such alcohol testing outdoors at the scene of an accident that does not meet the requirements as specified in post-accident provisions of the procedure. In these situations the BAT/STT shall provide the necessary visual and aural privacy to the Employee to the greatest extent practicable.

6. The BAT/STT shall supervise only one Employee's use of the EBT at a time. The BAT/STT shall not leave the alcohol testing site while the testing process is in progress.

D. Alcohol Testing Equipment

1. General

   a. Shaw E & I shall use only approved evidential breath testing (EBT) devices and non-evidential devices for conducting the alcohol testing provisions required in the program. These devices are listed on NHTSA's conforming products list (CPL).

2. Screening Devices

   a. Shaw E & I shall utilize either non-evidential devices or EBTs listed on the CPL for screening tests.

3. Confirmation Devices

   a. Shaw E & I shall utilize an EBT listed on the CPL for confirmation testing.

4. NHTSA Conforming Products List (CPL)

   a. All devices that will be used by Shaw E & I for alcohol testing are NHTSA approved evidential breath alcohol testing devices. NHTSA has model specifications for evidential breath testing devices. NHTSA periodically publishes an updated Conforming Products List, which states which devices have met NHTSA standards.

5. Quality Assurance Plans for Evidential Breath Testing Devices. Each EBT used shall have an approved quality assurance plan (QAP) to include the following:

   a. Methods for conducting external calibration.

   b. Minimum intervals for performing external calibrations.

   c. Tolerance on an external calibration check.

   d. Inspection, maintenance and calibration requirements. Each QAP is submitted to NHTSA for approval. Records demonstrating that the EBTs are subject to required external calibration checks will be maintained. An EBT will be taken out of service if any external calibration check results in a reading outside the tolerance for the EBT set forth in the QAP. The EBT will not be used again until it has been serviced and has had an external calibration check resulting in a reading within the tolerance for the EBT. This company will ensure that required inspections, maintenance and calibration checks are conducted. When the EBT is not being used it will be stored in a secure location.

6. Quality Assurance Plans for Non-Evidential Screening Devices. Each Non-Evidential Screening Device used shall have an approved quality assurance plan (QAP) to including the following:

   a. The plan shall designate the method or methods to be used to perform quality control checks; the temperatures at which the non-evidential screening device shall be stored and used, as well as other environmental conditions (e.g., altitude, humidity) that may affect the performance of the device; and, where relevant, the shelf life of the device.

   b. The QAP shall prohibit the use of any device that does not pass the specified quality control checks or that has passed its expiration date. The manufacturers' instructions on or included in the package for each saliva testing device shall include directions on the proper use of the device, the time frame within which the device must be read and the manner in which the reading is made. The employer and its agents shall comply with the QAP and manufacturer's instructions for each non-evidential screening device it uses for alcohol screening tests.

E. Breath Alcohol Testing Preparations

1. When an Employee arrives at the alcohol testing site, the BAT/STT shall ensure that the individual is positively identified as the Employee selected for alcohol testing (e.g., through presentation of photo identification or identification by Shaw E & I's representative). If the Employee's identity cannot be established, the BAT/STT shall not proceed with the alcohol test. If the Employee requests, the BAT/STT shall show proper identification to the Employee.

2. The BAT/STT shall explain the alcohol testing process to the Employee.

3. If the Employee fails to arrive at the assigned time, the BAT/STT should contact the appropriate company authority to obtain guidance on any action to be taken.

F. Screening Test Procedures for Evidential Breath Testing and Non-Evidential Breath Testing Devices.

1. The BAT shall begin the alcohol testing process by completing Step 1 on the Alcohol Breath Testing form. The Employee shall then complete Step 2 by signing the certification. Refusal by the Employee to sign the certification shall be regarded as a refusal to take the alcohol test.

2. The BAT shall select an individually sealed mouthpiece. It shall be opened in full view of the Employee and attached to the EBT in accordance with the manufacturer's instructions.

3. The BAT shall instruct the Employee to blow forcefully into the mouthpiece for at least 6 seconds or until the EBT instrument indicates that an adequate amount of breath has been obtained.

4. The BAT shall show the Employee the result displayed on the EBT. The BAT shall record the displayed result, testing device, serial number of the testing device, time and quantified result in Step 3 of the form.

5. If the EBT prints the test result directly onto the alcohol form, then the BAT shall show the Employee the result displayed on the EBT.

6. If the EBT does not provide a printed result, the BAT shall show the Employee the result displayed on the EBT. The BAT shall then record the test result onto the breath alcohol test form in the designated space and the Employee will sign the form as to acknowledge the results. The result shall be entered in such a manner that will provide clear evidence as to the results that were displayed by the EBT.

7. If the result of the screening alcohol test is a breath alcohol concentration of less than 0.04, the BAT shall date the form and sign the certification in Step 3 of the form. The Employee shall then sign the certification and fill in the date in Step 4 of the form. If the Employee does not sign the certification in Step 4, it shall not be considered a refusal to be tested. In this event, the BAT shall note the Employee's failure to sign in the "Remarks" section of the form.

8. If the EBT has printing capabilities and the test result printed by the EBT does not match the displayed result, the BAT shall note the disparity in the "Remarks" section. Both the BAT and the Employee shall initial or sign the notation. The alcohol test is invalid and Shaw E & I representative and the Employee shall be so advised.

9. At this point, no further testing is authorized. The BAT shall transmit the result of less than 0.04 to the appropriate company representative in a confidential manner. Shaw E & I shall receive and store the information so as to ensure that confidentiality is maintained as required in the procedure.

10. If the result of the screening test is an alcohol concentration of 0.04 or greater, then the BAT shall perform a confirmation test. If a different BAT will conduct the confirmation test, then the BAT who conducts the screening test shall complete and sign the form and log entry. The BAT will upon completion of the alcohol test provide the Employee with Copy 2 of the Breath Alcohol Testing form.

G. Confirmation Test Procedures.

1. When a BAT other than the one who conducted the screening test is required to conduct the confirmation test, the new BAT will require the Employee to provide positive identification such as photo ID card or identification by a company representative. The BAT will, upon request of the Employee being tested, provide such identification.

2. The BAT shall instruct the Employee not to eat, drink, put any object or substance in his/she mouth and, to the extent possible, not belch during the waiting period just prior to the confirmation test being conducted. This waiting period shall begin with the completion of the screening test and shall not be less than 15 minutes, but must be within 30 minutes of the completion of the screening test. The time the Employee spends in transit between the screening test and confirmation test, the Employee is under direct observation, counts toward the mandatory 15 minute deprivation period. If the BAT conducts the confirmation test more than 30 minutes after the result of the screening test has been obtained the BAT shall note in the “Remarks” section of the form the time that elapsed between the screening and the confirmation test and the reason why the confirmation test could not be conducted within 30 minutes of the screening test. The BAT shall explain to the Employee that the reason for this is to prevent any accumulation of mouth alcohol leading to an artificially high reading and that it is for the benefit of the Employee to comply with these instructions. The BAT shall also explain that the test will be conducted at the end of the required waiting period, even if the Employee has disregarded the instructions. If the BAT becomes aware that the Employee has not complied with the provided instructions; the BAT shall note the observations in the "Remarks" section of the form.

3. When a BAT other than the one who conducted the screening test is required to conduct the confirmation test, the new BAT shall initiate a new breath alcohol testing form. The BAT shall then complete step 1 on the form and the Employee shall then complete Step 2 by signing the certification. If the Employee should choose not to sign the certification, the BAT shall then make an appropriate notation in the "Remarks" section indicating the Employee's refusal to take the alcohol test. The BAT shall note in the "Remarks" section that a different BAT conducted the screening test.

4. The BAT shall open, in the presence of the Employee, a new individually-sealed mouthpiece and attach the mouthpiece to the EBT in accordance with the manufacturer's instructions. The BAT will then instruct the Employee to blow forcefully into the mouthpiece for at least 6 seconds or until the EBT indicates that an adequate amount of breath has been obtained.

5. In the event that the screening and confirmation test results are not identical, the confirmation test result shall be deemed to be the final result on which any action by Shaw E & I may be taken in order to comply with the requirements of the AMPP and any applicable Federal requirements.

6. If the EBT prints the test result directly onto the alcohol form, then the BAT shall show the Employee the result displayed on the EBT.

7. If the EBT does not provide a printed result, the BAT shall show the Employee the result displayed on the EBT. The BAT shall then record the test result onto the breath alcohol test form in the designated space and the Employee will sign the form as to acknowledge the results. The result shall be entered in such a manner that will provide clear evidence as to the results that were displayed by the EBT.

8. After the confirmation test is completed, the BAT shall date the form and sign the certification in Step 3 of the form. The Employee shall then be instructed to sign the certification and fill in the date in Step 4. If the Employee should elect to not sign the certification or to provide his/her initials in the log book entry for the test conducted, it shall not be considered as a refusal to be tested. The BAT shall then note the Employee's failure to sign or initial the log book entry in the "Remarks" section of the testing form.

9. The BAT shall transmit all alcohol testing results to the APM (Alcohol Program Manager) or other designated company representative in a confidential manner. All communications by BAT's shall be to the APM or designee only and may be provided in writing, in person or by telephone or electronic means. The BAT shall ensure that immediate transmission of test results to Shaw E & I is conducted in order for Shaw E & I to prevent the Employee from performing any covered functions.

10. Should the initial transmission not be accomplished in writing, but via telephone notification, Shaw E & I designee shall establish a mechanism to verify the identity of the BAT providing the information. The BAT shall follow the initial transmission by providing to Shaw E & I designee Shaw E & I's copy of the Breath Alcohol Testing form. The test results shall be stored in such a manner so as to protect the confidentiality of the results and to eliminate the disclosure of information to unauthorized persons.

H. Refusals to Test and Uncompleted Tests.

1. Refusal by an Employee to complete and sign Step 2 of the Breath Alcohol Testing form, to provide breath, to provide an adequate amount of breath or otherwise to cooperate with the testing process in a way that prevents the completion of the test shall be noted by the BAT in the "Remarks" section of the form. The testing process shall be terminated and the BAT shall immediately notify Shaw E & I representative/designee.

2. If a screening or confirmation test cannot be completed or if an event occurs to invalidate the test, the BAT/STT shall, if practicable, begin a new screening or confirmation test using a new Breath Alcohol Testing form with a new sequential test number.

I. Inadequate Amount of Breath for EBT Devices

1. If the Employee is unable or alleges that he/she is unable, to provide a sufficient amount of breath to permit a valid breath test because of a medical condition, the BAT or STT shall again instruct the Employee to attempt to provide an adequate amount. If the Employee refuses to make the attempt, the BAT or STT shall immediately inform Shaw E & I.

2. If the Employee attempts and fails to provide an adequate amount of breath, the BAT or STT shall so note in the "Remarks" section of the testing form and shall immediately inform Shaw E & I. Shaw E & I shall direct the Employee to obtain, as soon as practical after the attempt, an evaluation from a licensed physician, who is acceptable to Shaw E & I, concerning the Employee's medical ability to provide an adequate amount of breath for the screen.

3. If the physician determines, in his/her reasonable medical judgment, that a medical condition has or could have precluded the Employee from providing an adequate amount of breath, the Employee's failure to provide an adequate amount of breath shall not be deemed as a refusal to take an alcohol test. The physician shall provide to Shaw E & I representative a written statement of the basis of his/her conclusion.

4. If the physician, in his/her reasonable medical judgment, is unable to make the determination that a medical condition has precluded the Employee from providing an adequate amount of breath, the Employee's failure to provide an adequate amount of breath shall be regarded as a refusal to take a test. The physician shall provide a written statement of the basis for his/her conclusion to Shaw E & I.

J. Invalid Tests

1. An evidential breath alcohol test shall be invalid under the following circumstances:

   a. The EBT does not pass its next external calibration check. This invalidates all test results of 0.04 or greater on tests conducted since the last valid external calibration test. This would not invalidate any negative tests conducted.

   b. The BAT does not observe the minimum 15-minute waiting period prior to conducting the confirmation test.

   c. The BAT does not sign the Breath Alcohol Testing form.

   d. The BAT fails to note in the remarks section of the form that the Employee has failed or refused to sign the form following the recording or printing on or attachment to the form of the test results.

Shaw® Shaw E & I

The Shaw Drug and Alcohol Policy

Acknowledgment

I have read, understand and am responsible for the drug and alcohol Policy presented to me by The Shaw Group Inc. I understand that the drug and alcohol Policy that has been provided to me is a summary of Shaw's Policy and does not include the specimen collection and laboratory analysis procedures; however, the complete Policy and procedures are available to me for review by requesting same from my supervisor, Human Resources or Shaw's Substance Abuse Program Administrator. I agree to submit to all of its requirements of this Policy and I understand the disciplinary action that will be taken if I am found in violation of this Policy. **I understand that compliance with this Policy is a condition of my employment with this Company. Additionally, I understand that compliance with this Policy does not guarantee continued employment and shall not alter the basic "at will" status of my employment.**

Employment Consent Form

Laboratory Testing: I hereby give my voluntary consent for a urine and/or blood sample to be collected from me and submitted for alcohol and/or drug testing. The Shaw Group Inc. may be required to provide test results to other companies with whom The Shaw Group Inc. has contracts to undertake certain work. I hereby further consent to the release of testing results to any such company or companies or their agents or designees, where release of this information has been requested by said companies of their agents with respect to work undertaken by The Shaw Group Inc. I hereby understand and agree that the companies and agents to whom this information may be provided are designated as agent of The Shaw Group Inc. with respect to receipt of this information, only.

Search: I hereby give my consent for The Shaw Group Inc. to search my personal effects, locker, lunch box, purses, parcels, personal vehicles and other property located on Company premises, work areas, parking lot or storage area.

I understand that my consent to this procedure is a condition of employment and that refusal to consent will result in my discharge from employment. I further agree to hold The Shaw Group Inc., its agents, directors, officers and Employees harmless from any and all liability in connection with search and investigation.

Do not sign below if you have not received the Drug and alcohol Policy that has been provided to you.

Employee Signature Date Company Representative Signature

Please Print Your Name Here

This original of this form must be maintained at the Regional Human Resource office and filed within the subject Employee's Human Resource file.

Shaw® Shaw E & I

Reasonable Suspicion Documentation Form

☐ Employee is reporting for duty ☐ Employee is already on duty:

EMPLOYEE NAME:	**DATE OF OBSERVATION:**
LOCATION:	**TIME OF OBSERVATION:** FROM: AM/PM TO: AM/PM

OBSERVED PERSONAL BEHAVIOR (CHECK ALL APPROPRIATE ITEMS)

BREATH: (Odor of alcoholic beverage)	☐ STRONG ☐ NONE	☐ FAINT	☐ MODERATE
EYES:	☐ BLOODSHOT ☐ CLEAR ☐ DILATED PUPILS	☐ GLASSY ☐ HEAVY EYELIDS ☐ FIXED PUPILS	☐ NORMAL ☐ CONSTRICTED PUPILS
SPEECH:	☐ CONFUSED ☐ ACCENT ☐ SLURRED ☐ NOT ABLE TO UNDERSTAND	☐ STUTTERED ☐ MUMBLED ☐ GOOD ☐ COTTON MOUTHED	☐ THICK TONGUED ☐ FAIR ☐ MUSH MOUTHED ☐ OTHER:_____
ATTITUDE:	☐ EXCITED ☐ INDIFFERENT ☐ CARE FREE ☐ COOPERATIVE ☐ POLITE	☐ COMBATIVE ☐ TALKATIVE ☐ COCKY ☐ PROFANE	☐ HILARIOUS ☐ INSULTING ☐ SLEEPY ☐ OTHER:_____
UNUSUAL ACTION:	☐ HICCOUGHING ☐ FIGHTING ☐ LAUGHING	☐ BELCHING ☐ CRYING	☐ VOMITING ☐ OTHER:_____
BALANCE:	☐ FALLING ☐ SWAYING	☐ NEEDS SUPPORT ☐ WOBBLING	☐ OTHER:_____
WALKING:	☐ FALLING ☐ SWAYING	☐ STAGGERING ☐ STUMBLING	☐ OTHER:_____
TURNING:	☐ FALLING ☐ SWAYING	☐ STAGGERING ☐ HESITANT	☐ OTHER:_____ ☐ STUMBLING

Check All That Apply: ☐ Significant decline in job performance; ☐ Unexplained absences from work station; ☐ Significant change in personality; ☐ Changes in personal hygiene; ☐ Excessive absenteeism/tardiness; ☐ Operates equipment

ANY OTHER UNUSUAL OBSERVED ACTIONS OR STATEMENTS BY THE EMPLOYEE:

Reasonable Suspicion Test Performed? Yes ☐ No ☐ Reason Not Performed: _____

Signature of Supervisor: _____ **Date** ____/____/____ **Time** _____

Signature of Witness: _____ **Date** _____/____/____ **Time**_____

Shaw® Shaw E & I

Re-Hire Certification and Agreement
Employees Returning from a Substance Abuse Counseling/Rehabilitation Program

I have completed a substance abuse evaluation or rehabilitation program from a state-certified substance abuse professional and/or program on _____ [date of completion]. I seek re-employment with Shaw and agree that if I am re-hired, I will be subject to periodic unannounced testing for a period of twenty-four (24) months as a condition of my employment.

_____

Print Name Date

_____

Employee's Signature Date

_____

Employee's Social Security Number

_____

Shaw Human Resources Date

_____

Date of Policy Violation (to be completed by H.R.)

PROCEDURE

Subject: MANAGEMENT OF EMPLOYEE EXPOSURE AND MEDICAL RECORDS

1.0 PURPOSE AND SUMMARY

This procedure specifies the preservation and maintenance requirements for all employee exposure and medical records. It also establishes procedures for employees, or their authorized representatives, to access copies of these records. The time frame in which the company must respond to a request for records is also set.

2.0. TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Vice President, Health & Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1 in Section 8.0.

4.0 DEFINITIONS

4.1 **Company** – all wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

4.2 **Employee exposure record** means a record containing any of the following kinds of information:

- Environmental (workplace) monitoring or measuring of a toxic substance or harmful physical agent, including personal, area, grab, wipe, or other form of sampling, as well as related collection and analytical methodologies, calculations, and other background data relevant to interpretation of the results obtained;

- Biological monitoring results which directly assess the absorption of a toxic substance or harmful physical agent by body systems (e.g., the level of a chemical in the blood, urine, breath, hair, fingernails, etc.);

- Material safety data sheets indicating that the material may pose a hazard to human health; or

- In the absence of the above, a chemical inventory or any other record which reveals where and when used and the identity (e.g., chemical, common, or trade name) of a toxic substance of harmful physical agent.

- This does not include area measurements or data collected with survey-type instrumentation.

4.3 **Employee medical record** means a record concerning the health status of an employee which is made or maintained by a physician, nurse, or other health care personnel, or technician, including:

- Medical and employment questionnaires or histories (including job description and occupational exposures);
- The results of medical examinations (pre-employment, pre-assignment, periodic, episodic or exit), laboratory tests (including chest and other x-ray examinations taken for the purposes of establishing a base-line or detecting occupational illness, and all biological monitoring not defined as an "employee exposure record"), and support documentation for such examinations and tests;
- Drug and Alcohol Test Results;
- Medical opinions, diagnoses, progress notes, and recommendations;
- First-aid records;

- Descriptions of treatments and prescriptions; and
- Employee medical complaints.

4.4 **Employee** means any full-time, part-time, site hire, intern, or other person paid salary or wages by the company.

5.0 TEXT

5.1 Preservation of Records

All employee medical and exposure records shall be preserved and maintained for at least the duration of employment plus thirty (30) years. Such records shall be held by the company's contracted medical provider or the Health & Safety Department, and shall be secured against unauthorized access.

Chest x-ray films shall be preserved in their original state for employment plus thirty (30) years.

5.1.1 **Terminations Prior to December 17, 1994.** Medical and exposure records for employees leaving the company prior to this date are retained in microfilm archives by the Corporate Health and Safety office.

5.1.2 **Active Employees as of December 17, 1994**

5.1.2.1 Medical Records. Medical records for all employees are preserved and maintained by Health Resources, 600 West Cummings Park, Suite 3400, Woburn, Massachusetts 01801 under contract to the company. Such records will be retained by Health Resources for the duration of employment plus thirty (30) years.

5.1.2.2 Exposure Records. Exposure records for all active employees shall be retained and secured by the Health & Safety Department. The local Health & Safety Department shall retain these records until the employment relationship is terminated. When an employee terminates, records will be forwarded to the Corporate Health & Safety office and retained there for a minimum of thirty (30) years.

5.1.3 **Analyses Using Exposure or Medical Records.** Each analysis using exposure or medical records shall be preserved and maintained by the HS office conducting the analysis for at least thirty (30) years.

5.1.4 **Transfer of Records - OSHA Requirements.** Whenever an employer is ceasing to do business, the employer shall transfer all records subject to this section to the successor employer. The successor employer shall receive and maintain these records.

Whenever an employer is ceasing to do business and there is no successor employer to receive and maintain the records subject to this standard, the employer shall notify affected current employees of their rights of access to records at least three (3) months prior to the cessation of the employer's business.

Whenever an employer is ceasing to do business and there is no successor employer to receive and maintain the records, or intends to dispose of any records required to be preserved for at least thirty (30) years, the employer shall:

- Transfer the records to the Director of the National Institute for Occupational Safety and Health (NIOSH) if so required by a specific occupational safety and health standard; or

- Notify the Director of NIOSH in writing of the impending disposal of records at least three (3) months prior to the disposal of the records.

Whenever an employer regularly disposes of records required to be preserved for at least thirty (30) years, the employer, may, with at least three (3) months notice, notify the Director of NIOSH on an annual basis of the records intended to be disposed of in the coming year.

5.1.5 Transfer of Records - Business cessation by wholly owned subsidiaries. All medical and exposure records shall be forwarded to the local Health & Safety Department.

5.2 Access to Employee Medical and Exposure Records

The attached "NOTICE" poster (Attachment 2) shall be permanently posted in a conspicuous place available to all employees.

Each current employee shall be notified at least annually of the following:

- The existence, location, and availability of any records;

- The person responsible for maintaining and providing access to records; and

- Each employee's right of access to these records.

Access to records beyond the individual employee and the local Health & Safety Department shall be limited to non-company entities with regulatory authority for access, and staff with a need-to-know meeting 29 CFR 1910.1020 requirements.

5.2.1 Request for Records Held By the Company

The employee, or his/her authorized representative, shall complete Form HS102A (Attachment 3) and present it to the Health & Safety Department.

5.2.2 Request for Records Held By Contracted Provider. The employee, or his/her authorized representative, shall complete Release Form (Attachment 4) and present it to the Health & Safety Department. The Health & Safety Department shall forward the form to the medical provider.

5.2.3 Timeliness. All employee requests for records accompanied by an executed request form shall receive a response within fifteen (15) business days. This response shall be either delivery of requested records, or an explanation of the delay and an expected delivery date. All request forms shall be retained in the employee's file.

5.3 Subcontractor and Temporary Personnel

For subcontractor and temporary personnel, the company is not the employer, but may generate medical or exposure information about these individuals on a project basis. It is important that the company convey this information to the employer in a timely manner so that the employee can be notified and proper record keeping accomplished.

Whenever the company generates or receives medical or exposure monitoring data for a subcontractor or temporary personnel, the site safety officer or HS professional shall complete the Employer Notification (Subcontractor and Temporary Personnel) form (Attachment 5) and forward it to the employer with a copy of the record in question attached. This shall be done within 15 days of receipt of said information. A copy of this correspondence shall be retained in the company project or location HS records.

6.0 EXCEPTION PROVISIONS

Variances to this procedure shall be requested in accordance with procedure HS013 Health & Safety Procedure Variance.

7.0 CROSS REFERENCES

(Not Applicable)

8.0 ATTACHMENTS

1. Responsibility Matrix
2. NOTICE
3. Form HS102A
4. Health Resources Release Form
5. Employer Notification (Subcontractor and Temporary Personnel)

ATTACHMENT 1
MAINTENANCE AND ACCESS TO EMPLOYEE MEDICAL AND EXPOSURE RECORDS

Responsibility Matrix

Actions	Procedure Section	*Responsible Party*			
		HS	**Corporate HS**	**Employee**	**Medical Provider**
Preserve and maintain records	5.1 - 5.3	X	X		X
Business cessation records transfer	5.1.5	X	X		
Complete records request form and give to HS	5.2			X	
Notify associate yearly regarding right to access records	5.2	X			
Deliver records promptly upon documented request	5.2.3	X	X		X
Notify subcontractor and/or temporary agency whenever the company project/location generates medical/exposure data for their respective personnel.	5.3	X			

ATTACHMENT 2

NOTICE

As a component of the company Corporate Health & Safety Policy to provide our employees with a safe and healthful workplace, many of our employees participate in our programs for occupational medicine and exposure monitoring.

If you wish to exercise your right of access to your records, or wish to review any health and safety regulation which pertains to your job, contact your local Health & Safety professional.

NOTICIA

Como un componente de las reglas del Seguro de la Salud en la Corporacion IT, para proveer a nuestros empleados un lugar de trabajo Seguro y Saludable, muchos de nuestros empleados participan en nuestros programas de medicina ocupacional y expocision monitorial (analisis).

Si desea ejercer su derecho o acceso a su archivos o desea revisar qualquier cuidado de la Salud que ocupe en su trabajo, comuniquese con su Seguro de Salud profesional mas cercano.

ATTACHMENT 3
REQUEST FOR RECORDS HELD BY THE COMPANY

Vice President, Health & Safety
Shaw E & I
2790 Mosside Boulevard
Monroeville, PA 15146

Dear Sir:

This document authorizes the company to release copies of my medical records to:

Name (Print):

Address:

City: _____ State: _____ Zip Code:

I understand that no x-rays will be sent as part of this record. I also appreciate that there is no charge for this service and that the records requested will be mailed within 15 days of receipt of this request by the company

Name (Print):

Social Security Number:

Signature: _____ Date:

Company Manager Authorizing Record Release

Name (Print): _____

Title:

Signature: _____ Date:

ATTACHMENT 4
REQUEST FOR RECORDS HELD BY CONTRACTED PROVIDER

Medical Director
Health Resources
600 West Cummings Park
Suite 3400
Woburn, Massachusetts 01801

Dear Sir:

This document authorizes Health Resources to release copies of my medical records to:

Name (Print):

Address:

City: _____ State: _____ Zip Code:

I understand that no x-rays will be sent as part of this record. I also appreciate that there is no charge for this service and that the records requested will be mailed within 15 days of receipt of this request by Health Resources.

Name (Print):

Social Security Number:

Signature: _____ Date:

Company Manager Authorizing Record Release

Name (Print):

Title:

Signature: _____ Date:

ATTACHMENT 5
EMPLOYER NOTIFICATION FORM

Employee Name:

Employee Address:

Attention: Health & Safety or Human Resources Manager

Dear Sir:

Shaw E & I has generated medical or exposure monitoring information about your employee(s) listed below, relating to their work for the company project/location shown. You have obligations under the Code of Federal Regulations 29 CFR 1910.1020, or equivalent State regulations, for employee notification and long term record keeping.

The Company has not and will not undertake actions to meet your obligations under this standard. The attached information is provided so that you can meet your employer obligations.

Company Project/Location:

Contact Name:

Employee(s):

Company HS Officer Name (Print):

Signature: _____ Date:

cc: Complete copy to Company Project/Location HS File

PROCEDURE

Subject: EMPLOYEE NOTIFICATION OF INDUSTRIAL HYGIENE MONITORING RESULTS

1.0 PURPOSE AND SUMMARY

Regulations promulgated by Federal and various state Occupational Safety and Health Administrations require workplace industrial hygiene monitoring for hazardous substances. In many instances Shaw Environmental & Infrastructure, Inc. (Shaw E & I) will perform this monitoring for substances not specifically regulated by one of these standards. This procedure prescribes the steps to be taken to notify employees of industrial hygiene monitoring results for either regulated or non-regulated substances.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Vice President of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The responsibility matrix is Attachment 1.

4.0 DEFINITIONS

Company- Any wholly-owned subsidiaries of the Shaw Environmental & Infrastructure, Inc. (Shaw E & I)

5.0 DISCUSSION

There are various state and federal regulations which govern employee exposure to specific toxic and hazardous substances. These substance specific regulations differ in the number of days required for the notification of individual employee exposures once monitoring results have been received. Due to this inconsistency, the company has adopted a standard five-day time frame

between the receipt of results and the notification of employees. This standard time frame is to be applied to all employee exposure monitoring results, regardless if the substance is regulated or not. In the event of changes to current regulatory requirements or when specific standards allow for longer periods of time, the requirements of the individual state or federal standard may be applied in lieu of the five-day period. The decision to use a time frame longer than five days must first be approved by the Vice President of Health and Safety.

6.0 TEXT

Within five (5) working days after the receipt of industrial hygiene monitoring results, the health and safety representative must notify each employee, in writing, of the results which represent that employee's exposure. Monitoring results representative of an employee's exposure will be reported to the affected employee on the attached notification form.

Whenever the results indicate that the representative employee exposure exceeds an established exposure limit, the health and safety representative will state that the exposure limit was exceeded and will provide a description of the corrective action taken to reduce exposures acceptable concentrations. The health and safety representative will also address respirator protection factors and will provide assurances to the employee when protection factor calculations indicate that the use of a respirator has reduced the actual employee exposure to a level below the exposure standard. Results of monitoring for substances which are not covered by a specific regulation will also be reported to employees in the same manner.

In those cases where concentrations exceed the exposure standard, the health and safety representative will indicate what corrective action steps, beyond the use of personnel protective devices, will be taken to maintain concentrations to a level below the exposure standard, e.g., engineering controls, administrative controls, work practices, isolation, etc. The monitored employee will acknowledge the receipt of personal exposure sampling results by signing the attached form.

7.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

8.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS102 Management of Employee Exposure and Medical Records

9.0 ATTACHMENTS

1. Responsibility Matrix
2. Employee Notification of Industrial Hygiene Monitoring Results

ATTACHMENT 1
EMPLOYEE NOTIFICATION OF INDUSTRIAL HYGIENE MONITORING RESULTS

Responsibility Matrix

Action	Procedure Section	*Responsible Party*		
		Employee Monitored	**HS Representative**	**Vice President of HS**
Issue, Revise, and Maintain this procedure	3.1			X
Complete Attachment 2	6.0		X	
Notify employee of monitoring results	6.0		X	
Acknowledge receipt of Attachment 2	6.0	X		
Distribute form Attachment 2	6.0		X	
Maintain permanent record	6.0			X

ATTACHMENT 2

Employee Notification of Industrial Hygiene Monitoring Results

Employee Name _____ SS#_____

Project Name _____ Project No. _____

Project Manager _____

Substance Monitored _____ Date Monitored_____ Sample Number_____

Results: _____mg/m^3 _____ppm Other_____

Exposure Standard: _____mg/m^3 _____ppm Other _____

Protective Equipment Used

For instances where exposures were found to be in excess of an exposure limit, the following corrective action steps (engineering, administrative, job techniques, etc.) Are being taken to reduce potential future exposures:

H&S Representative: _____ _____ _____

Name Printed Signature Date

Employee monitored: _____ _____ _____

Name Printed Signature Date

Distribution: Employee
Employee's H&S Representative
Vice President of Health and Safety

PROCEDURE

Subject: MEDICAL SERVICES AND FIRST AID

1.0 PURPOSE AND SUMMARY

This procedure specifies the requirements for medical services at project locations and recommends the contents, use, restocking, inspection, and personnel qualification requirements for first aid kits in Shaw Environmental & Infrastructure, Inc.(Shaw E & I).

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The EH&S Operations Manager is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1 in Section 8.0.

4.0 DEFINITIONS

(None)

5.0 TEXT

In accordance with the requirements established in 29CFR1926.50, employers are required to arrange for prompt medical attention and to maintain easily accessible first aid supplies at all locations.

5.1 Medical Services

Prior to start of work at each project site, arrangements shall be made for medical facilities and personnel to provide prompt attention to injured personnel and for consultation on occupational safety and health matters. The Site Supervisor is responsible for establishing the following prior to start or work:

- Obtaining proper equipment for prompt transportation of the injured person or an effective communication system for contacting an ambulance service.
- Posting telephone numbers of physicians, hospitals, or ambulances at the on-site project office.

When any part of the body may be exposed to toxic or corrosive materials, drenching and/or flushing facilities, e.g., eye wash/safety shower, shall be provided in the work area for immediate emergency use.

5.2 First Aid

First aid kits in weatherproof containers with individual sealed packages for each type of item are recommended in all locations when Shaw E & I employees will be working. All over-the counter medications are to be removed from purchased first aid kits.

5.2.1 Kit Selection

5.2.1.1 Type I Kit

At Shaw E & I fixed facilities, field offices, shops, storerooms, field jobs, etc., it is recommended that a minimum of one (1) Type I First Aid Kit (Attachment 2) be present. Additional kits may be provided based on the number of personnel at the location.

5.2.1.2 Type II Kit

It is also recommended that all owned or leased vehicles used on field projects and/or shops be equipped with a Type II First Aid Kit (Attachment 3).

5.2.2 Issuance/Placement of Kits

Kits must be located in a visible location readily accessible in the event of an injury or emergency. Kits located in fixed facilities or field offices shall be securely mounted on a wall or other appropriate surface.

5.2.3 Usage

Usage of any item from a first aid kit requires the completion of a Supervisor's Employee Injury Report (Attachment 4), which must be reported as noted in EH&S-020 Accident Prevention Program Investigation & Review. This includes "first aid only" or "non-occupational" incidents, which should be so noted on the SEIR.

5.2.4 Inspection and Restocking

The Site Supervisor is responsible for inspection and restocking of first aid kits at project locations. All Type I kits located in a permanent or semi-permanent facility shall be inspected weekly. They may either be set-up for monthly restocking by an outside vendor or restocked weekly from on-hand supplies. Note that any kit set-up for monthly restocking, but that is found seriously depleted when inspected, must be restocked immediately.

All Type II kits, and those Type I kits used for field job support shall be checked before being sent out to each job and restocked after every use. Field kits should be inspected weekly, and vehicle kits should be checked by the driver as part of his pre-trip checkout. Deficiencies are to be corrected immediately.

5.2.5 Personnel Qualifications

Other than for self-administration to the user, all first aid kits users shall possess a valid first aid card.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure EH&S013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

EH&S020: Accident Prevention Program: Investigation and Review

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Type I First Aid Kit Inventory
3. Type II First Aid Kit Inventory
4. Supervisor's Employee Injury Report

ATTACHMENT 1

MEDICAL SERVICES & FIRST AID

RESPONSIBILITY MATRIX

Action	Procedure Section	*Responsible Party*	
		Location Manager	**Site Supervisor**
Arrange for medical facilities at project sites, communication or transportation and post telephone numbers.	5.1		X
Provide eye wash/safety shower in work areas where personnel may be exposed to toxic or corrosive materials.	5.1		X
Provide approved kits for facilities, projects, vehicles	5.2.1	X	X
Properly/visibly place kits	5.2.2	X	X
Complete SEIR when kit used, and submit to EH&S	5.2.3		X
Establish inspection and restocking procedures	5.2.4	X	X
Train personnel in FA/CPR to meet kit use criteria	5.2.5	X	

ATTACHMENT 2

FIRST AID KIT INVENTORY LIST: TYPE I

Contents

Woven Adhesive Bandages (1” x 3”)
Plastic Adhesive Bandages (1” x 3”)
Adhesive Tape
Alcohol Wipes
Antiseptic Spray
Antiseptic Towelettes
Biohazard Bags
Burn Spray
Cold Packs
Cotton (3 oz)
Cotton Swabs
CPR Protector (Mouth to mouth protector)
Elastic Bandage (2” x 5 yd)
Eye Pads
Eye Wash w/Eye Cup
Finger Splints
Forceps
Gauze Pads (2” x 2” & 3” x 3”)
Gauze Roll Bandages (2” x 6 yd & 2” x 4.1 yd)
Latex Gloves
Non Stick Pads (2” x 3” & 3” x 4”)
Scissors
Splinter Removers
Triangular Bandages w/pins
Triple Antibiotic Ointment
Trauma Dressings
Skin Closures
Ammonia Inhalants
Absorbent Compress
Insect Sting Wipe Ups
PVP Wipe Ups
First Aid Book

ATTACHMENT 3

FIRST AID KIT INVENTORY LIST: TYPE II

Contents

Plastic Adhesive Bandages

Woven Adhesive Bandages

Adhesive Tape

Antiseptic Towelettes

Biohazard Bags

Burn/First Aid Cream

Cold Packs

CPR Protector (Mouth to mouth barrier)

Gauze Bandage (2” x 6 yd)

Eye Pads

Eye Wash

Forceps

Gauze Pads (2” x 2” & 3” x 3”)

Latex Gloves

Non Stick Pads (2” x 3” & 3” x 4”)

Scissors

Splinter Removers

Triangular Bandage w/pins

Ammonia Inhalant

Insect Sting Wipe Ups

Absorbent Compress (32 sq. in)

ATTACHMENT 4
Supervisor's Employee Injury Report

EMPLOYEE INFORMATION

Employee's Social Security Number:			Claim Number:
Employee's Full Name:			Case Number from Log:
Home Address:			Home Phone Number:
Male:	Female	Date of Birth:	Hire Date:
Dependents:		Dependents Under 18:	Marital Status:
Occupation:			Department Name:
State Hired:	Currently Weekly Wage:		Hourly Wage:
Hours/Days Worked Per Week:	Days Per Week		Hours Worked Per Day:
Employment Stats:			Employee ID No.: N/A
Salaried Continued:		Paid For Date of Injury:	
Ever Injured on the Job:		Supervisor Name & Phone:	

EMPLOYER INFORMATION

Employer Name:	The Shaw Group, Inc.		
Work Location:		Project Number:	
Contact Name:	John Mollere	Telephone Number:	(800) 747-3322, Ext.572
Employer SIC:		Employer Location Code:	
Employer FED ID:		Employer Code:	N/A
Nature of Business:			
Policy Number:			

ACCIDENT INFORMATION

Date and Time of Injury:	Time Employee Began Work:
Person Accident Reported to:	Date and Time Reported to Employer:
Did the Accident Occur at the Work Location:	If no, where did the accident occur?
Accident Address:	
What was the Employee doing just before the Incident Occurred?	
Give a Full Description of the Accident: (Be as Complete As Possible)	
What object or substance directly harmed the employee?	
Are Other WC Claims Involved?	

INJURY INFORMATION

Which Part of the Body Was Injured? (e.g. Head, Neck, Arm Leg)?

What Was the Nature of Injury? (e.g. Fracture, Sprain, Laceration)?

Part of Body Location: (e.g. Left, Right, Upper, Lower)?

Injury Description:

Source of Injury:	Is Employee Hospitalized?
Lost Time: If Yes, What was First Full Day Out:	
Date Last Day Worked:	Date Disability Began: N/A
Date Returned to Work:	Estimated Return Date: N/A

If the Employee Died, When did Death Occur? (Date)

MEDICAL INFORMATION

Initial Medical Treatment:	ER Treated & Released: Y or N	Hospitalized Overnight as In Patient: Y or N

Hospital - Name, Address, Phone Number:

Clinic - Name, Address, Phone Number:

Name of Physician or Health Care Professional?

WITNESS INFORMATION

Were There Any Witnesses?

If Yes, List Names and How to Contact Them:

ADDITIONAL COMMENTS & INFORMATION

REPORT PREPARED BY

Name:		Title:
Signature:	Date:	Phone:

REPORT ALL WORKER'S COMPENSATION INJURIES TO SHAW CLAIMS DEPARTMENT

FAX REPORT WITHIN 24 HOURS OF INCIDENT TO 225-932-2636.

STANDARD OPERATING PROCEDURE

Subject: Confined Spaces

UNCONTROLLED WHEN PRINTED

1. PURPOSE

This procedure describes the requirements for identifying and working within confined spaces. It has been developed to ensure compliance with the Occupational Safety and Health Administration (OSHA) permit-required confined spaces regulation. Key provisions of this procedure include:

- Workplace Evaluation
- Permit-Required Confined Spaces (PRCS)
  - Duties of PRCS Participants
  - Permit System
  - Training
- Non-Permit-Required Confined Spaces
- Rescue and Emergency Services
- Employee Access to Documentation
- Retention of Inspection and Test Logs
- Program Review

2. SCOPE

This procedure contains the requirements to perform work in PRCS and is applicable to all company activities, including construction.

3. TABLE OF CONTENTS

4. REFERENCES

- HS013, Health and Safety Procedure Variances
- HS052, Health and Safety Plans
- HS314, Hot Work in Hazardous Locations
- HS315, Control of Hazardous Energy Sources
- HS601, Respiratory Protection Program

5. DEFINITIONS

Acceptable Entry Conditions—The conditions that must exist in a permit space to allow entry so that employees involved with a PRCS entry can safely enter into and work within the space.

Attendant—An individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all attendant's duties described in this procedure.

Authorized Entrant—An employee who is authorized to enter a PRCS.

Blanking or Blinding—The absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

Company—Shaw Environmental & Infrastructure, Inc. (Shaw E & I) and all wholly-owned subsidiaries there of.

Confined Space—A space that:

- Is large enough and so configured that an employee can bodily enter and perform assigned work; and
- Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry); and
- Is not designed for continuous employee occupancy.

Double Block and Bleed—The closure of a line, duct, or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

Emergency—Any occurrence (including any failure of hazard control or monitoring equipment) or event, internal or external, to the permit-required confined space that could endanger entrants.

Engulfment—The surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

Entry—The action by which a person passes through an opening into a PRCS. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

Entry Permit—The written or printed document that is provided by the company to allow and control entry into a permit space.

Entry Supervisor—The person responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by this section. An entry supervisor may also serve as an attendant or as an authorized entrant; as long as that person is trained and equipped for each role he/she fills.

Hazardous Atmosphere—An atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (that is, escape unaided from a permit space), injury, or acute illness from one or more of the following causes:

- Flammable gas, vapor, or mist in excess of 10 percent of its lower explosive limit (LEL).
- Airborne combustible dust at a concentration that meets or exceeds its LEL.
- NOTE: This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet or less.
- Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent.
- Atmospheric concentration of any substance for which a dose or a published exposure guideline is available and which could result in employee exposure in excess of its dose or permissible exposure limit.
- Any other atmospheric condition that is immediately dangerous to life or health (IDLH).

Hot Work Permit—Written authorization to perform hot operations (for example, riveting, welding, cutting, burning, and heating) capable of providing a source of ignition. Refer to Procedure HS314.

Immediately Dangerous to Life or Health (IDLH)—Any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a confined space.

Inerting—The displacement of the atmosphere in a confined space by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible.

Isolation—The process by which a permit required confined space is removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages.

Line Breaking—The intentional opening of a pipe, line, or duct that is or have been carrying flammable, corrosive, or toxic material; an inert gas; or any fluid at a volume, pressure, or temperature capable of causing injury.

Non-Permit-Required Confined Space—A confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

Oxygen-Deficient Atmosphere—An atmosphere containing less than 19.5 percent oxygen by volume.

Oxygen-Enriched Atmosphere—An atmosphere containing more than 23.5 percent oxygen by volume.

Permit-Required Confined Space (PRCS)—A confined space that has one or more of the following characteristics:

- Contains or has a potential to contain a hazardous atmosphere.
- Contains a material that has the potential for engulfing an entrant.
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross section.
- Contains any other recognized serious safety or health hazard.

Prohibited Condition—Any condition in a PRCS that is not allowed by the permit during the period when entry is authorized.

Rescue Service—The personnel designated to rescue employees from PRCSs.

Retrieval System—The equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor) used for non-entry rescue of persons from PRCSs.

Testing—The process by which the hazards that may confront entrants of a confined space are identified and evaluated. Testing includes specifying the tests that are to be performed in the confined space.

6. RESPONSIBILITIES

6.1 Director of Health and Safety

The Director of Health and Safety is responsible for the following:

- Issuing, revising, and maintaining this procedure
- Approving IDLH or Level A entries

6.2 Health and Safety Representative

The Health and Safety Representative is responsible for the following:

- Conducting work place evaluations and posting all PRCSs
- Providing PRCS Training
- Evaluating rescue service provider capabilities

6.3 Entry Supervisor

The Entry Supervisor is responsible for the following:

- Conducting work place evaluations and posting all PRCSs
- Completing the PRCS Entry Permit
- Cancelling PRCS Entry Permits
- Providing PRCS Training
- Reclassifying PRCS as non-permit required entries
- Evaluating rescue service provider capabilities

Authorized Entrants/AttendantsAuthorized Entrants and Attendants are responsible for the following:

- Receiving training on the hazards of confined spaces and the PRCS duties they are expected to perform.
- Reviewing and signing the PRCS entry permit prior to performing or supporting entry activities.

6.4 Training Department

The Training Department is responsible for the following:

- Providing PRCS Training
- Completing the PRCS Entry Permit

7. PROCEDURE

7.1 Workplace Evaluation

All company facilities or project locations will be evaluated by a health and safety representative or an entry supervisor to identify the presence of PRCS's. All such spaces will be posted with a sign bearing the following or similar warning: "DANGER - PERMIT-REQUIRED CONFINED SPACE. DO NOT ENTER." This workplace evaluation will be documented using Form HS300.1.

Entry into confined spaces that are determined not to be permit-required need not comply with the requirements of this procedure. However, these confined spaces must be re-evaluated whenever the use or configuration of the space changes in any way that might change its classification.

7.2 Permit-Required Confined Spaces

Prior to beginning any PRCS entry operation, a PRCS entry permit will be completed by the entry supervisor. Form HS300.2 contains a blank entry permit. All such entries will be considered permit-required until/unless the space meets the requirements specified in Section 7.7. The following guidelines are to be followed for each PRCS entry:

- Combustible vapors will not exceed 10.0 percent of the LEL and oxygen levels must be between 19.5 and 23.5 percent by volume for entry to be allowed. Appropriate toxic gas/vapor action levels will also be established and documented in the acceptable entry condition section of the permit. Entries requiring Level A protection or where IDLH conditions exist require Director of Health and Safety approval.
- Lockout, tagout, tryout, and return to service procedures for potential sources of hazardous energy must be completed (see Procedure HS315, Control of Hazardous Energy Sources).
- As necessary, purging, inerting, flushing, or ventilating the space may be used to control hazardous atmospheres. Continuous mechanical ventilation will be used whenever entrants are in PRCSs that have or that can be expected to have a hazardous atmosphere.
- Inspecting, monitoring, and testing the PRCS to verify that acceptable conditions exist prior to and throughout the entry operation must be conducted. This includes:
  - Conducting specific atmospheric tests as described on the entry permit. PRCSs will be tested as often as necessary to verify entrant safety, whenever operations or conditions change (e.g., temperature change or product agitation, etc.), and no less often than hourly.
  - For confined spaces that cannot be completely isolated (e.g., sewers, etc.), continuous testing with real-time direct reading instruments is required.
  - Testing for oxygen will occur first, followed by combustible gases, then toxic gases and vapors.
- Personal protective equipment will be used as specified on the entry permit and will include:
  - Type of protective suits, boots, and gloves.
  - Type of face, head, and foot protection.

  - Specify type of harness (chest or full-body) with approved lifelines at least one-half inch in diameter, 2,000 pounds test and meeting ANSI A10.14 requirements. The lifeline is to be attached at the center of the entrant=s back near shoulder level, above the entrant=s head, or at another point which presents a profile small enough for the successful removal of the entrant. (NOTE: Wristlets may be used only when a health and safety representative finds that a harness presents a greater hazard to the employee and wristlets are the safest, most effective alternative.) All lifelines will be secured to a mechanical extraction device or fixed point outside the PRCS. Mechanical extraction devices will be used for all vertical entries greater than five (5) feet deep.
  - Type of respiratory protection will be specified, per the requirements of Procedure HS601.

- Material Safety Data Sheets (MSDS) will be readily available and provided to the medical facility when treating injured/exposed entrants.

- Lighting equipment required to safely illuminate the work will be utilized. NOTE: All lighting and electrical equipment used inside a PRCS will be of the appropriate National Electrical Code (NEC) rating. Rating should be Class I, Division I unless the space specifically meets other rating class requirements.

- Protective barriers will be used to protect entrants from external pedestrian, vehicle, or equipment hazards.

- Ingress and egress equipment such as ladders or mechanical extraction devices will be used as necessary.

- Rescue and emergency services, procedures, and equipment will be determined prior to entry. The permit must specify whether the company or another source will provide these services and equipment, and how to summon them. The company will provide rescue services unless a qualified outside rescue service is available (see Section 7.8).

- Communication methods will be used that will provide continuous communication between entrants and attendants. This can be done using the standard system of lifeline "tugs" below, so long as the attendants continuously hold the lifelines in their hands:

Lifeline "Tug" Signals

1 Tug = Are you OK?

2 Tugs = Yes, I am OK.

3 Tugs = Exit the confined space immediately.

An alternative communication system would be to provide all entrants and attendants with an air-powered horn. Substituting horn blasts for tugs, equivalent signals to the lifeline "tug" signals, would be used. Any other or uncertain signals would require immediate exit.

If these methods are not practical or possible, appropriately rated powered communication equipment will be provided.

- The number of attendants and other outside support personnel will be determined prior to entry. Each PRCS being entered will have a minimum of one (1) dedicated attendant and one other support person (who may have other duties) within sight or call.

7.3 Duties of PRCS Participants

7.3.1 Authorized Entrant(s)

Authorized Entrants will:

- Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of potential exposures.
- Communicate with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space.
- Alert the attendant whenever the entrant recognizes any warning sign or symptom of exposure to a dangerous situation, or if the entrant detects a prohibited condition.
- Exit from the permit space as quickly as possible whenever:
  - An order to evacuate is given by the attendant or the entry supervisor;
  - The entrant recognizes any warning sign or symptom of exposure to a dangerous situation;
  - The entrant detects a prohibited condition; or
  - An evacuation alarm is activated.

7.3.2 Attendant(s)

Attendants will:

- Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of potential exposures.
- Be cognizant of possible behavioral effects of hazard exposure in authorized entrants.
- Continuously maintain an accurate count of authorized entrants in the PRCS so that the means used to identify authorized entrants accurately identifies who is in the permit space.
- Remain outside the PRCS during entry operations until relieved by another attendant.
- Communicate with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space.
- Monitor activities inside and outside the space to determine if it is safe for entrants to remain in the space, and orders the authorized entrants to evacuate the PRCS immediately under any of the following conditions:
  - If the attendant detects a prohibited condition;
  - If the attendant detects the behavioral effects of hazard exposure in an authorized entrant;
  - If the attendant detects a situation outside the space that could endanger the authorized entrants; or
  - If the attendant cannot effectively and safely perform all prescribed duties.
- Summon rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from the PRCS.
- Take the following actions when unauthorized persons approach or enter a PRCS while entry is underway:
  - Warn the unauthorized persons that they must stay away from the PRCS.
  - Advise the unauthorized persons that they must exit immediately if they have entered the PRCS.
  - Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the PRCS.

- Perform non-entry rescues.
- Perform no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.

7.3.3 Entry Supervisor(s)

Entry Supervisors will:

- Remain immediately available on site throughout entry operations.
- Know the hazards that may be faced during entry, including information on the mode, signs and symptoms, and consequences of potential exposures.
- Verify, by checking that the appropriate entries have been made on the permit, that all tests specified by the permit have been conducted and that all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin.
- Terminate the entry and cancel the permit as required.
- Verify that qualified rescue services are available and that the means for summoning them are operable. Evaluate capabilities of service prior to entry (see Section 7.8).
- Arrange for the removal of unauthorized individuals who enter or who attempt to enter the permit space during entry operations.
- Determine when responsibility for a permit space entry operation is transferred and at intervals dictated by the hazards and operations performed within the space, that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained.
- Document on the entry permit any incidents or circumstances requiring review of the confined space entry program. Such incidents may include:
  - Unauthorized entry.
  - The detection of a condition/hazard not authorized by the permit.
  - The occurrence of an injury or near-miss during entry.
  - A change in use or configuration of the space.
  - Employee complaints about the program.
- Dictate procedures for coordination of entry when personnel from multiple employers will work simultaneously within a PRCS.

7.4 Permit System

Before entry can be authorized, the entry supervisor must complete and sign an entry permit (Form HS300.2) to document that all pre-entry requirements have been met and that acceptable entry conditions exist. The completed permit will be posted at the primary entrance to the PRCS, and made available to each employee entering the space or to that employee's authorized representative.

All entry permits are valid for a maximum of one (1) work shift, and will be canceled by the entry supervisor when the shift ends, PRCS operations are complete, or whenever a prohibited condition arises in or near the space. All PRCSs will be securely closed or barricaded whenever the entry permit is canceled.

The current entry status of all entrants will be logged, with new entries made whenever the entry status of an entrant changes.

7.5 Training

Prior to assignment to PRCS entry work, all affected employees will receive training in the hazards of confined spaces, work practices to control these hazards, and duties to be performed. Training will consist of a detailed review of this procedure as well as the hazards inherent with the particular PRCS that will be entered.

There are two types of training modules that have been developed for PRCS participants. The first is designed for either entrants or attendants and can be conducted by a qualified entry supervisor or a health and safety representative. The second is for entry supervisors and must be conducted by a health and safety representative. Copies of these training modules can be obtained from the company Training Department.

The company Training Department will also maintain training records to include employee name and signature, date of training, and signature of the trainer.

7.6 Alternate PRCS Entry Procedure

Under limited conditions alternate procedures can be used to govern the entrance of personnel into PRCS's. Required conditions include:

- It can be demonstrated that the only hazard posed by the PRCS is an actual or potential hazardous atmosphere.
- Continuous forced air ventilation alone is sufficient to maintain the PRCS safe for entry.

In order to establish data to support the above conditions, monitoring and inspection information must be collected and attached to the Alternate Procedure PRCS Entry Certification Form found in Form HS300.3. If the PRCS must first be entered to collect supporting data, it must be done so in accordance with the requirements for entry into a PRCS. Alternate procedure spaces do not require a permit be completed prior to entry, or specific rescue procedures to be in place. In addition to a completed Form HS300.3, the following requirements must be satisfied for entry into a PRCS utilizing this alternate procedure:

- Any conditions making it unsafe to remove an entrance cover must be eliminated before the cover is removed.
- When entrance covers are removed, the opening must be promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening and that will protect each employee working in the space from foreign objects entering the space.
- Prior to any employee entering the space, the internal atmosphere must be tested, with a calibrated direct-reading instrument for the following conditions, in order:
  - Oxygen content;
  - Flammable gases and vapors; and
  - Potential toxic air contaminants
- There can not be any hazardous atmosphere within the space while employees are inside.
- Continuous forced air ventilation must be used as follows:
  - Employees must not enter the space until the forced air ventilation has eliminated any hazardous atmosphere.
  - The forced air ventilation must be directed so as to ventilate the immediate areas where employees are, or will be present within the space and must continue until all employees have left the space; and.
  - The air supply for the forced air ventilation must be from a clean source and not increase the hazards in the space.

- The atmosphere within the space must be periodically tested as necessary to ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere. If a hazardous atmosphere is detected during entry, the following must occur:
  - Employees must leave the space immediately
  - The space must be evaluated to determine how the hazardous atmosphere developed; and,
  - Measure must be implemented to protect employees from the hazardous atmosphere before subsequent entry takes place.

7.7 Non-Permit-Required Confined Spaces

All confined spaces initially considered PRCSs can be reclassified as non-permit-required confined spaces by the entry supervisor only under the following conditions:

- All contaminants have been isolated or removed.
- All actual or potential atmospheric hazards have been eliminated, with testing verification.
- Ventilation is not required to maintain control of atmospheric hazards.
- All recognized hazards, including engulfment, within the space have been eliminated.
- The space will be re-evaluated (and reclassified to permit-required, if needed) whenever the use or configuration of the space changes in any way that might increase the hazards to the entrants. All entrants will exit the space immediately when hazards are noted.
- The entry supervisor will make the certification that all hazards have been removed on the entry permit.
- The entry permit will be maintained near the entrance to the confined space.

7.8 Rescue and Emergency Services

The company recommends the use of non-company rescue services whenever possible. In certain instances, such as unavailability of a qualified outside provider, company employees can participate in rescues if they have been provided the required equipment and training.

7.8.1 Outside Rescue Services

Prior to designating a non-company rescue service, an evaluation of their capabilities must be conducted. This documented evaluation can be conducted by an entry supervisor or a health and safety representative. Form HS300.4 can be used to document this evaluation. The rescue service must be certified by the evaluator as capable of performing rescues prior to being identified as the rescue service provider.

Each selected rescue service will be informed of the hazards they may encounter at the location. They will also be provided access to all PRCSs from which a rescue may be necessary.

7.8.2 Company Rescue Services

Company personnel assigned to provide emergency entry and rescue services will be trained annually in the proper use of personal protective and rescue equipment. Such training will include a simulated rescue exercise. Company rescue services will be evaluated using Form HS300.4 and must be certified by the evaluator as capable of performing rescues prior to being identified as the rescue service provider.

7.9 Employee Access to Documentation

Each employee participating in a PRCS entry, or that employee's authorized representative, will be provided an opportunity to observe all testing and be provided a copy of the testing results. Each employee, or that employee's authorized representative, may also request the company to re-evaluate the

PRCS because the employee or representative has reason to believe that the evaluation of the space may not have been adequate.

7.10 Retention of Inspection and Test Logs

A copy of all entry permits and other documents related directly to the PRCS entry (e.g., hot work permits, etc.) will be maintained in project files. If requested, these documents will also be made available to all employees participating in a PRCS entry or their authorized representatives.

7.11 Program Review

Annually in January, the health and safety representative responsible for each location performing PRCS operations will review all entry permits for incidents or problems occurring during entry. Incidents or problems may include injuries, accidents, unauthorized entries, or any other event which indicates that improvements can be made in the PRCS program. After review with appropriate operations personnel, recommendations for program revision will be forwarded to the Director of Health and Safety for review.

7.12 Exception Provisions

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

8. ATTACHMENTS

None.

9. FORMS

- HS300.1, Workplace Evaluation Form
- HS300.2, Entry Permit for Permit-Required Confined Space (PRCS) Form
- HS300.3, Alternate Procedure Confined Space Certification Form
- HS300.4, Rescue Service Evaluation Form

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Workplace Evaluation Form

This evaluation is to be conducted at all company locations known to have confined spaces. Confined spaces are those spaces large enough and so configured that an employee can bodily enter and perform assigned work; and has limited or restricted means for entry or exit; and is not designed for continuous employee occupancy. Reevaluation is to occur whenever the use or configuration of the confined space changes in any way that might change its classification.

Project/Location _____ Project No. _____

Identity of Confined Space	Location of Confined Space	Permit Required (Y or N)	Re-evaluation Necessary (Y or N)	Evaluator Signature	Date of Evaluation

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Entry Permit for Permit-Required Confined Space (PRCS) Form

Project/Location _____ Project No. _____

Location of PRCS _____ Identity PRCS _____

Describe PRCS Hazards (Chemical and Physical) _____

_____

Purpose This Permit Authorized _____

Authorized Date/Shift Of Permit _____

CHECKLIST	***YES***	***NO***	***N/A***
All lines leading to and from the space have been evaluated and controlled as necessary.			
Electrical service disconnected or locked out.			
All grounding and bonding cables in place.			
All lighting, fittings, power equipment, and extension cords are rated for anticipated atmosphere.			
Ground Fault Circuit Interrupter (GFCI) checked and functioning.			
All ignition sources have been isolated.			
All respiratory equipment and alarms checked and functional.			
All safety harnesses and lifelines checked.			
All required PPE checked and in use.			
Have all entrants, attendants, and entry supervisors received appropriate training?			
Attendant(s) trained in non-entry rescue procedures.			
Rescue service has been identified and will be available for entry rescue during entries made under this permit.			
Has rescue service passed evaluation?			
Appropriate rescue equipment available and checked.			
Mechanical ventilation system in use and effective.			
All tests have been completed and indicate that entrance requirements have been met.			
Appropriate warning signs have been posted and unauthorized personnel have been excluded from the PRCS.			
IF ANSWER TO ANY OF THE ABOVE QUESTIONS IS *NO*, ENTRY IS NOT PERMITTED.			

PERSONAL PROTECTIVE EQUIPMENT

EYE/FACE

☐Chemical Goggles ☐ Face Shield ☐ Safety Glasses

EXTREMITIES

☐ Hard Hat ☐ Hoods ☐ Boot Covers

☐ Gloves (Material _____)

☐ Boots (Material _____)

BODY

Level ☐ B ☐ C ☐ D

Material _____

RESPIRATORY

Supplied Air Type ☐ SCBA ☐ Airline ☐ Escape

Air Purifying ☐ Half-Face ☐ Full-Face

Cartridge Type _____

Powered Air Purifying (Cartridge _____)

OTHER

☐ Hearing Protection

☐ Harness & Lifeline (Required for all PRCS

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RESCUE SERVICE: ☐ External ☐ Internal/Company

SERVICE PROVIDER: _____

METHOD USED TO SUMMON SERVICE: _____

RESCUE PROCEDURES: _____

_____

_____

_____

Entries)

☐ _____

RESCUE EQUIPMENT

☐ Mechanical Extraction Device

☐ First Aid Kit

☐ SCBA

☐ Other (Specify) _____

_____

_____

COMMUNICATION METHOD

☐ Lifeline A (Tug Signals)

☐ Air Powered Horn

☐ Other _____

OTHER PERMITS ISSUED FOR WORK IN PRCS:

☐ Lockout/Tagout

☐ Hot Work

☐ Other _____

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Atmospheric Monitoring

Time	*Percent Oxygen*	*Percent LEL*	*(Other)*	*(Other)*	*(Other)*	*(Other)*	*Tester Name*	*Tester Initials*	*Comments*

AUTHORIZED ENTRANT(S)		*AUTHORIZED ATTENDANT(S)*	
Print Name	**Initials**	**Print Name**	**Initials**

Diagram the PRCS, indicating the location of entry/egress, ventilators, and where air monitoring was conducted.

) (	Entry/Egress Route
*	Ventilator
X	Air Monitoring Location

ACCEPTABLE ENTRY CONDITIONS

☐ Completed Entry Permit ☐ Oxygen between 19.5 and 23.5% ☐ Combustible gases below 10% LEL

☐ Permissible Levels of toxic gases ☐ Other _____

☐ No other identified uncontrolled hazards _____

☐ Rescue Service available and notified _____

PRCS ENTRY SUPERVISOR AUTHORIZATION

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Date/Time Authorized _____/_____ Entry Permit Expires (no longer than 1 shift): Date/Time _____/_____

Entry Supervisor Name _____ Signature _____

ENTRY PERMIT CANCELED

Date/Time _____/_____ Cancelled By: _____

Reason: ☐ Work Complete ☐ Authorized Conditions Not Met ☐ Incident ☐ End of Shift

PROBLEMS DURING ENTRY AND RESOLUTION(S). Please Describe:_____

_____

_____

_____

_____

RECLASSIFICATION TO NON-PERMIT-REQUIRED CONFINED SPACE

☐ All hazards of space have been eliminated

☐ No actual or potential atmospheric hazards

☐ All lines leading to/from space have been blanked, blinded, or disconnected

ENTRY SUPERVISOR SIGNATURE _____ Date/Time: _____/_____

REVIEWED BY:

_____ _____

Health and Safety Representative Signature Date

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Alternate Procedure Confined Space Certification Form

Project/Location _____ Project Number_____

Location of Confined Space_____

Methods taken to eliminate the potential for a hazardous atmosphere:

_____
_____
_____
_____
_____

Due to the methods described above, I,_____certify that the confined space listed herein is safe for entry. To ensure the above identified space remains safe during entry operation the atmosphere within the space will be periodically tested to ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere. If a hazardous atmosphere is detected during entry the following will occur:

Entrants will leave the space immediately

The space will be evaluated to determine how the hazardous atmosphere developed; and

Measures will be implemented to protect entrants from then hazardous atmosphere before any subsequent entry takes place.

Qualified Entry Supervisor Signature_____Printed Name_____

Date_____

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Rescue Service Evaluation Form

INITIAL EVALUATION
Project/Location _____ Project No. _____
Identity of PRCS _____
Name of Rescue Service _____
Address _____
Contact Person/Phone Number _____
Required Response Time _____ Estimated Response Time _____
Availability of Rescue Service _____

PERFORMANCE EVALUATION (Observe Test Rescue and Answer Following Questions)	YES	NO
Have all members of the service been trained in the potential hazards of the permit space(s), or of a representative permit space(s) from which rescue may be needed?		
Can team members recognize the signs, symptoms, and consequences of exposure to any hazardous atmospheres that may be present in the permit space(s)?		
Is every team member provided with, and properly trained in, the use and need for PPE which may be required to perform permit space rescues?		
Is every team member properly trained to perform his/her functions and make rescues, and to use any rescue equipment, such as ropes and backboards, that may be needed in a rescue attempt?		
Are team members trained in the first aid and medical skills needed to treat victims overcome or injured by the types of hazards that may be encountered in the permit space(s)?		
Do all team members perform their functions safely and efficiently?		
Do rescue service personnel focus on their own safety before considering the safety of the victim?		
Can the rescue service properly test the atmosphere of the identified PRCS?		
Can the rescue personnel identify information pertinent to the rescue from entry permits, hot work permits, and MSDSs?		
Has the rescue service been informed of any hazards to personnel that may arise from outside the space, such as those that may be caused by future work near the space?		
Can the rescue service safely perform rescue(s) from the identified PRCS?		
Does the rescue service have a plan for rescue from the identified PRCS?		
Is the plan adequate for all types of rescue operations that may be needed?		

I certify that the evaluated rescue service is equipped and capable of providing rescue services during entry activities for the identified PRCS.

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Evaluator:

Print Name	Signature	Date

I acknowledge our responsibility to provide rescue services during entry activities for the identified PRCS. (For use by non-company rescue services)

Rescue Service Representative:

Print Name	Signature	Date

PROCEDURE

Subject: FALL PROTECTION

1.0 PURPOSE AND SUMMARY

This procedure establishes the fall protection requirements for Shaw Environmental & Infrastructure, Inc. (Shaw E & I) company employees, subcontractors, and visitors. Shaw E & I has adopted a "Continual Tie Off" policy for employees exposed to unguarded elevated work locations that are six feet or more above floor or grade level and whenever working above dangerous equipment. State OSHA programs and some clients may impose more stringent fall protection requirements.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The EH&S Operations Manager is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is provided in Attachment 1.

4.0 DEFINITIONS

Anchorage/Tie-Off Point. A secure point of attachment for lifelines, lanyards, or deceleration devices which must have 5,000 pounds tensile strength per employee. Acceptable anchorage points should be selected under the advice of the site competent person. The site competent person must seek the advice of a structural engineer in any situation where the anchor point strength is in question.

Body Harness. Straps that can be secured around the employee to distribute the fall arrest forces over the thighs, pelvis, waist, chest, and shoulders with a dee-ring in the middle of the back to attach it to other components of a personal fall arrest system.

Company. Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Competent Person. An individual who is capable of identifying existing and predictable hazards or working conditions that are hazardous, unsanitary, or dangerous to employees, and who has authority to take prompt corrective measures to eliminate or control these hazards and conditions.

Continual Tie Off. Means that employees utilizing a personal fall arrest system must remain anchored with at least one lanyard at all times (i.e. when moving about on an unguarded elevated work location, at least one lanyard must be connected to an employee's harness at all times).

Dangerous Equipment. Equipment (such as pickling or galvanizing tanks, degreasing units, machinery, electrical equipment, and other types) which, as a result of form or function, may be hazardous to employees who fall onto or into such equipment. Also includes structures or equipment that present an impalement hazard.

Deceleration Device. means any mechanism, such as a rope grab, rip-stitch lanyard, specially-woven lanyard, tearing or deforming lanyards, automatic self-retracting lifelines/lanyards, etc., which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limit the energy imposed on an employee during fall arrest.

Guardrail System. A fixed barrier erected in compliance with Section 5.2 of this procedure as an engineering control to prevent employees from falling to a lower level.

Lanyard. A flexible line of rope, wire rope, or synthetic web with a connector at each end to connect a body belt or harness to a deceleration device, lifeline, or anchorage. Lanyards must have double-locking snaphooks, 5,000 pounds of tensile strength, and are usually limited to 6 feet in length.

Leading Edge. The edge of a floor, roof, or framework that changes location as additional material is formed/constructed. The edge is considered an unprotected or leading side/edge when not actively and continuously under construction. The wall or bank of an excavation can be considered a leading edge during periods of non-activity. An acceptable anchorage point (5,000 pounds of tensile strength) is not required if personnel are not exposed to a fall hazard.

Low Sloped Roof. A roof having a slope less than or equal to 4:12 (vertical to horizontal).

Personal Fall Arrest System. A system used to arrest an employee in a fall from a working level. A complete system consists of an anchorage, connectors, body harness, and may include a lanyard, deceleration device, lifeline, or a combination of these. **The use of body belts as components of personal fall arrest systems is prohibited.**

Positioning Device System. A body belt/positioning belt or harness used in combination with an anchorage and connectors to support an employee on an elevated surface with both hands free and/or prevent an employee from approaching a leading edge. A positioning device system must limit employee free fall to 2 feet or less. A positioning device must not be used as part of a fall arrest system.

Rope Grab. A deceleration device that travels on a lifeline and automatically engages the lifeline and locks to arrest the employee's fall. Operates by friction and employs the principle of inertial locking and/or cam/lever locking.

Safety Monitoring System. A safety system that employs a competent person, the "safety monitor", to monitor the safety of employees during leading edge work at elevated heights. This system is administered as part of a fall protection plan, to be implemented **only** when the use of conventional fall protection equipment would create a greater hazard for the existing situation. Only personnel covered under the fall protection plan are allowed in an area where a safety monitoring system is being used.

Swing Fall. A pendulum-type swing resulting from a fall. A large swing arc is produced from lateral movement away from the anchorage point, momentum builds and the victim usually strikes an obstruction or sharp object, which stops the swing fall. Swing fall hazards can be controlled by maintaining an anchorage point, which at a minimum is at or above the employee's shoulders.

Walking/Working Surface. Any surface, whether horizontal or vertical on which an employee walks or works, including but not limited to, floors, roofs, ramps, bridges, runways,

formwork and concrete reinforcing steel, but not including ladders, vehicles, or trailers, on which employees must be positioned to perform their job duties.

Warning Line System. A barrier erected on a roof to warn employees that they are approaching an unprotected roof side or edge, and which designates an area where roofing work may take place without the use of a guardrail, safety net, or fall arrest system to protect employees in the area.

5.0 TEXT

5.1 RECOGNIZING FALL HAZARDS

Fall hazards and falling object hazards may be encountered by Shaw E & I personnel in the following situations:

- Working on levels 6 feet or more above the next lower level/ground with an open side. Common situations might include work on top of frac tanks, carbon cells, pipe racks, open floors, excavations, wells, shafts, pits, intermodal containers, tank trucks, rail cars, manlifts or other elevated platforms.

- Falling object/overhead hazards may be encountered during work in an excavation, during tank cleaning operations, working below scaffolds, or during demolition activities.

5.2 GUARDRAIL SYSTEMS

Guardrail systems shall be used as an engineering control to eliminate hazards of unprotected edges or open holes, such as work near the edge of an excavation, well, shaft or pit. Note: engineering controls are preferred over personal protective equipment for controlling hazards.

5.2.1 System Specifications

- Height of the top rail edge must be 42 inches $\pm$ 3 inches above the working level.

- Midrails shall be installed midway between the top rail and working level.

- Guardrail system must be capable of withstanding 200 pounds of force applied outward or downward within 2 inches of the top edge of the guardrail at any point. (Midrails must have 150 pound capacity.)

- Guardrail system shall be constructed to prevent puncture or laceration to

personnel or equipment, or snagging of clothing.

- Top rails and midrails shall be at least one-quarter of an inch-thick to prevent cuts/lacerations. If wire rope is used, it must be flagged every 6 inches. Metal strapping and rope are not acceptable for use.

- Toeboards shall be installed whenever personnel are working above other personnel to prevent tools or debris from being kicked out, falling, and striking the people below.

5.2.2 System Use

- Personnel shall not lean on guardrails or rest equipment against guardrails.

- Inspect guardrails regularly for defects, and replace/rebuild defective components immediately.

5.3 COVERS

Holes (including skylights) in walking/working surfaces that present a potential for e mployees to fall 6 feet or more must be protected using guardrails, personal fall arrest systems, or covers. Holes that could permit objects to fall and strike personnel below must also be protected with covers.

- Covers shall be capable of supporting at least twice the maximum axle load of the largest vehicle expected to drive over the cover.

- Covers shall be capable of supporting at least twice the weight of employees expected to walk over the cover.

- Covers shall be secured to prevent displacement by wind, equipment, or employees.

- Covers shall be marked with signs or other hazard warnings such as **"Do not remove - open hole."**

5.4 PERSONAL FALL ARREST SYSTEMS

These systems shall be used when engineering controls are not feasible to control a fall hazard of 6 feet or more or when working above dangerous equipment. Improper selection and use of fall protection equipment, or failure to use fall protection equipment can lead to serious accidents or fatalities resulting from unprotected falls, swing falls, rollout, or failure of fall arrest system components.

5.4.1 System Specifications

- Components of a personal fall arrest system include a body system (harness), connecting device (rope or web lanyard, shock absorbing lanyard, self-retracting lifeline), and a tie-off or anchorage point (5,000 pounds per worker; eye bolt or beam**). The use of components from more than one manufacturer is not allowed**.

- Only ANSI (Z359.1) approved fall protection equipment shall be used.

- Use lanyards with locking snaphooks only. Non-locking snaphooks are not acceptable, since they may contribute to roll out.

- Dee-rings, snap hooks, and attachment straps must have 5,000-pound tensile strength.

5.4.2 System Use

- Where employees are required to work where engineering controls are not feasible to control a fall hazard of six feet or more or where work areas are above dangerous equipment **employees will be required to observe the Continual Tie Off policy of Shaw E & I**.

- Where elevated work locations that require the use of personal fall arrest systems exist, procedures and equipment to ensure a prompt rescue in the event of a fall shall be in place.

- Use a portable anchorage point (cross arm strap) to connect the lanyard to the anchorage point when there is no eye bolt for direct attachment. Hitching the lanyard onto itself as a choker is <u>never</u> allowed.

- Attach connecting devices to the dee-ring in the middle of the back.

- Locate anchorage points at or above the dee-ring attachment point in the middle of the back.

- Do not work above the tie-off anchor point. If it is necessary to work above the tie-off point, reposition the tie-off anchor point to a point above the middle of the back.

- Choose an anchor point that is located well above the lower level. A 6 foot man, with a 6 foot lanyard, plus 3.5 foot maximum shock absorbing exten-

sion requires a minimum clearance of 15.5 feet from anchor point to ground to avoid striking the ground during a fall.

- Do not wrap synthetic straps or lanyards around sharp edges that may cut or damage the straps or lanyards.

- Destroy and discard all components of a fall arrest system (e.g. harness, lanyard) after a fall, and replace them with new fall arrest equipment. NOTE: Specific fall arrest components such as retractable lifelines may be sent to the manufacturer for testing and re-certification.

- Maintain fall arrest systems that are free of debris, rust, and corrosion; protect them from crushing and sharp surfaces. Appropriately clean and dry components before storing them in a safe place.

- Decontaminate or dispose of chemically or radiologically contaminated components properly at the conclusion of a project. Caution; synthetic materials may be damaged or weakened by exposure to chemical substances.

- System components shall be used only for employee fall protection and not to hoist equipment or materials.

5.4.3 Inspecting Components

Inspect systems using the following guidelines prior to each use:

Harnesses and Dee-Rings

- Hold with two hands, bend, and look for broken fibers, cuts, and pulled stitches.

- Dee-rings shall pivot freely. Inspect for distortion, cracks, and breaks.

- Inspect for wear, frayed or cut fibers, or distortion of buckles. Rivets must be tight and immovable with the fingers. Bent rivets may fail under stress.

- Inspect for frayed or broken strands. Look for tufts on webbing surface.

- Inspect for wear of repeated buckling and unbuckling on the tongue or billet.

- Look for loose, distorted grommets. There shall be no additional punched holes.

Lanyards

- Inspect for frays by twisting the rope.
- Inspect for failing hook latches, absence of locking latches, or a change in shape of the metal eye on lanyards or hooks.
- Examine for rips or tears in shock absorbing lanyard sections.
- Self-retracting lifelines must be inspected annually by the manufacturer.

5.5 WARNING LINE SYSTEMS

Warning line systems are often combined with other fall protection systems to provide fall protection for work on low-sloped roofs. Personnel working on low-sloped roofs with unprotected sides 6 feet or more above the next lower level must implement fall protection to include one of the following:

- Warning line and guardrail system
- Warning line and safety net system
- Warning line and personal fall arrest system
- Warning line and safety monitoring system, or
- Guardrail, safety net, or personal fall arrest system

5.5.1 System Specifications

- Warning lines consist of ropes, wires or chains, and supporting stanchions.
- Flag warning lines every 6 feet with high visibility material.
- With the warning line erected, stanchions shall be capable of resisting at least 16 pounds applied horizontally, perpendicular to the warning line, without tipping over.
- The lowest point (sag) of the lines must be at least 34 inches from the work surface and no more than 39 inches from the work surface.
- The warning line shall have a minimum tensile strength of 500 pounds.

5.5.2 System Use

- Erect warning lines around all sides of the roof work area.

- Erect warning lines at least 6 feet from the roof edge when mechanical equipment is not being used.

- When mechanical equipment is in use, erect warning lines at least 6 feet from the edge parallel to equipment operation, and at least 10 feet from the edge that is perpendicular to equipment operations.

- No employee is allowed in an area between a roof edge and a warning line unless performing designated work tasks in that area and supported by a personal fall arrest system.

- Mechanical equipment can be used and stored only in areas where employees are protected by warning lines, guardrails, or a personal fall arrest system.

- Access points, storage and hoist areas shall be connected to the work area by a path formed with two warning lines. When this path is not in use, it shall be barricaded with rope, wire, or chain, equivalent in strength and height to the warning line, to prevent employees from walking directly into the work area.

5.6 SAFETY MONITORING SYSTEM

This system may be used in combination with a warning line system to provide fall protection during work on low-slope roofs. It may be used alone as a fall protection system during work on low-sloped roofs 50 feet or less in width, or as otherwise specified in a fall protection plan. Use of this system requires prior approval of the responsible health and safety professional.

5.6.1 A competent person shall be designated as the "safety monitor" to recognize fall hazards and warn employees of these hazards or unsafe acts.

5.6.2 The safety monitor shall be on the same walking/working surface and within visual distance of the employees being monitored at all times.

5.6.3 The safety monitor shall be close enough to communicate orally with employees.

5.6.4 The safety monitor shall not have other job responsibilities that would distract the safety monitor's attention.

5.6.5 Mechanical equipment shall not be used or stored in areas where safety monitoring systems are used for roofing operations on low-sloped roofs.

5.6.6 No employees other than those performing roofing work covered under the fall protection plan shall be allowed in an area covered by the safety monitoring system.

5.7 OVERHEAD PROTECTION

Employees are required to wear hardhats in areas where falling object hazards exist, and to implement one of the following:

- Erect toeboards, screens or a guardrail system to prevent objects from falling from the work surface.
- Erect a canopy structure or a debris net, to catch objects if they do fall, and keep objects away from the edge of the work surface.
- Barricade areas where objects could fall, keep employees out of barricaded areas and keep objects away from the edge of the work surface.

5.8 OTHER FALL PROTECTION SYSTEMS

5.8.1 Work on manlifts or other elevated platforms can expose personnel to fall hazards. Guardrails, midrails and possibly toeboards shall be installed on manlifts or other elevated platforms, and personnel shall tie off to the boom or basket during work activities. A personal fall arrest system shall be used when the above engineering controls cannot be implemented due to clearance restrictions.

5.8.2 A number of other fall protection systems can be used with approval of the responsible health and safety professional. These systems include safety nets, controlled access zones, a fall protection plan, or a combination of these. These systems are less likely to be used on Shaw E & I projects due to the nature of the work and the selection of guardrails, covers, and personal fall arrest systems to better provide fall protection.

5.8.3 Other industry standards that involve fall hazards are 29 CFR 1926 Subpart L, the Scaffolding standard, Subpart X, Floor and Wall Openings and Stairways and Ladders.

5.8.4 If a fall hazard situation arises at a Shaw E & I project site or facility, and is not addressed by this procedure, then it is the responsibility of the responsible operations manager to contact the health and safety to determine what method(s) will be used to control the fall hazard.

5.9 TRAINING

The following statements describe the requirements of the Shaw E & I fall protection training program.

5.9.1 Training must be provided to all employees who may be exposed to fall hazards during the course of their work. Training will teach employees to recognize fall hazards and falling object hazards at work and to implement procedures to control these hazards.

5.9.2 The program shall address procedures for erecting, maintaining, disassembling, inspecting and storing fall protection equipment, as outlined in sections 5 through 11 of this procedure**.**

5.9.3 Retraining shall be conducted for situations where an employee is believed to lack the skill and understanding to recognize and control fall hazards at work, which may include changes in the workplace or changes in the types of fall protection systems or equipment to be used**.**

5.9.4 Training must be documented in a permanent file**.**

5.10 INCIDENT INVESTIGATION

All incidents involving employee falls or serious incidents shall be investigated to determine if the fall protection plan needs to be changed (e.g., new practices, procedures or training). Changes shall be implemented to prevent similar types of falls or incidents from recurring.

5.11 PURCHASING OF EQUIPMENT

When purchasing equipment and raw materials for use in fall protection systems, applicable ANSI and ASTM requirements shall be followed.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

HS013	Health and Safety Procedure Variances
HS051	Tailgate Safety Meetings
HS052	Health and Safety Plans

8.0 ATTACHMENTS

1. Responsibility Matrix

ATTACHMENT 1
FALL PROTECTION

Responsibility Matrix

Action	Procedure Section	Responsible Party		
		Site Supervisor	**HS Representative**	**EH&S Operations Manager**
Issue, revise and maintain procedure	3.1			X
Serve as competent person	4.4	X	X	
Conduct/participate in training	5.9	X	X	
Inspect fall protection devices	5.4.3	X	X	
Approve alternative fall protection devices/procedures	5.6; 5.8		X	X

STANDARD OPERATING PROCEDURE

Subject: Portable Ladder Safety

1. PURPOSE

The purpose of this procedure is to establish the requirements for the inspection, storage, setup, and proper use of portable step, straight, and extension ladders.

2. SCOPE

This procedure applies to all portable ladder usage within the Shaw Environmental & Infrastructure Group (Shaw E&I). In the event that a client's ladder safety requirements exceed those discussed within this procedure, the more protective safety requirements and practices shall be followed.

Variances and exceptions may be requested pursuant to the provisions of EI-HS013, "Health and Safety Procedure Variance."

3. REFERENCES

- Procedure No. HS013, Health and Safety Procedure Variance
- Procedure No. HS050, Employee and Subcontractor Training Requirements
- 29 Code of Federal Regulations (CFR) 1910.25, *Portable Wood Ladders*
- 29 CFR 1910.26, *Portable Metal Ladders*
- 29 CFR 1910.27, *Fixed Ladders*
- 29 CFR 1926.1053, *Ladders*
- 29 CFR 1917.119, *Portable Ladders*
- American National Standards Institute A14.1, A14.2, and A14.5

4. DEFINITIONS

- **Company**—All wholly-owned subsidiaries of Shaw E&I.

5. RESPONSIBILITY MATRIX

5.1 Procedure Responsibility

The Senior Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

5.2 Action/Approval Responsibilities

The Responsibility Matrix is shown as Attachment 1, "Responsibility Matrix."

6. PROCEDURE

This procedure establishes the minimum safety standards required for the inspection, storage, setup, and use of portable step, straight, and extension ladders. It is not intended to address the requirements for fixed ladders as specified in 29 CFR 1910.27, or for scaffolds as specified in Subpart L of 29 CFR 1926.

6.1 Inspection

The ladder user is required to perform an inspection of the ladder prior to use and after any event that could result in ladder damage. Ladders that have been determined to be defective will be tagged "out of service" and will either be repaired to a condition meeting their original design or permanently taken out of service. A supervisor will immediately be informed of the condition of any defective ladder. The following guidelines are applicable during ladder inspections:

- Ensure all rivets, joints, rungs, nuts, and bolts are tight. Ladder extension locks and slip-resistant feet will be in good condition and functioning properly.
- Ensure spreader mechanism, ropes, cables, and pulleys operate properly and replace them if they are worn or defective.
- Verify wood ladders are not coated with any opaque covering except for manufacturer labels, which may be placed on the outside face of one side rail.
- Inspect for damaged or bent rungs, steps, side rails, extension locks, and other components.
- Ensure ladders are clean and free from grease, oil, mud, snow, wet paint, and other slippery materials.
- Verify all manufacturer identification, usage, and warning labels are present and legible.

6.2 Storage

Ladders will be stored in such a manner as to provide for ease of access or inspection, and to prevent danger of an accident when withdrawing a ladder for use. Ladders are to be stored on racks designed to protect the ladder from damage. These racks must have sufficient support points to prevent any possibility of excessive sagging. Wood ladders will be stored in a location where there is good ventilation, but where they will not be exposed to the elements. Ladders carried on vehicles will be adequately supported to avoid sagging and will be securely fastened in position to minimize chafing and the effects of road vibration.

6.3 Setup

Manufacturer recommendations are to be followed when setting up ladders. The feet are to be placed on a firm, level, nonslippery surface that provides a secure footing. Do not place feet on boxes, unstable bases, or on scaffolds to gain additional height. Do not place ladders in front of door openings or other high traffic areas unless the door has been secured and personnel working from ladders are otherwise protected. Metal ladders are not to be used in places where they may come in contact with energized parts. Stepladders are to be fully open, spreaders secure, and pail shelf in position. For straight and extension ladders the following recommendations are applicable:

- The correct angle for using straight and extension ladders is for the foot of the ladder to be placed from the wall a distance equal to one-fourth (1/4) the effective length of the ladder. (Effective length = length of ladder from base to point of support.)

- A ladder is not to be used to gain access to a roof or other elevated working surface unless the top of the ladder extends at least three (3) feet above the point of support at eaves, gutter, edge, or roof line.
- Secure the ladder base when raising and never set up a ladder when it is extended. The top section should only be extended from the ground level. Where possible, use a second employee to hold the ladder while it is being extended. Ladders will not be repositioned or extended while occupied.
- The ladder must be positioned with both top rails supported unless equipped with a single support attachment.
- On two-section extension ladders, the minimum overlap for the two sections is to be at least 3 feet.

6.4 Use

Only employees who have been trained in accordance with Section 6.5 of this procedure will be permitted to use portable step, straight, or extension ladders. Only Type 1, 1A, and 1AA ladders will be authorized for use. The following operational rules will be observed:

- All manufacturer hazard warnings and safety use instruction labels must be followed.
- Ladders must not be used in high winds.
- The top two steps of stepladders are not to be used as steps.
- Personnel using ladders must:
  - Face the ladder while climbing up or down and keep body centered between side rails.
  - Work only within arm's length of the ladder.
  - Use both hands when ascending or descending while maintaining a firm grip.
  - Allow no other person on the ladder.
  - Use rope to raise or lower material and tools, or at lower heights have coworker hand up/down items.
- Straight and extension ladders must be attended by either another employee, or tied off when in use.
- Portable ladders are designed as a one-person working ladder. The ladder base section is to be placed with a secure footing. Safety shoes or feet of good substantial design are to be installed on all straight or extension ladders.

6.5 Training

Employees will be trained to recognize hazards related to ladder use and the procedures to follow to minimize these hazards. Training on the safe use of ladders will be conducted prior to an employee being allowed to use a ladder. This training will be conducted by a local health and safety representative or supervisor familiar with safe ladder use. It will consist of a review of this procedure, applicable Occupational Safety and Health Administration standards, and manufacturer recommendations; and a demonstration of correct ladder usage. The evaluation of correct usage will be tailored to the employee's anticipated work situation. The employee will have to demonstrate that he/she knows and understands how to safely use a ladder, is familiar with the content of this procedure, and can demonstrate overall ladder use skills. Employees will acknowledge receiving this training by signing the ladder training record provided as Form EI-HS302.01_1, "Employee Training Record, Portable Ladder Training."

7. ATTACHMENTS

- Attachment 1, New Employee Health and Safety Checklist

8. FORMS

- EI-HS302.01_1, Employee Training Record, Portable Ladder Training

9. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
01 05/06/2009	The procedure title has been changed from “ladder Safety” to “Portable Ladder Safety” since fixed ladders are not addressed in this procedure. The inspection, storage, set-up and use section now addresses both stepladders and straight/extension ladders. This change has eliminated redundant information and has reduced the length of the procedure.	Mike Zustra

Attachment 1
Safety Councils
Responsibility Matrix

Action	Procedure Section	Responsible Party		
		Ladder User	Local Health and Safety Representative or Supervisor	Senior Director of Safety and Health
Issuance, Revision, and Maintenance of Procedure	5.1			X
Ladder Inspection	6.1	X		
Inform Supervisor of Defective Ladder	6.1	X		
Properly Store Ladder After Use	6.2	X		
Provide Ladder Training	6.5		X	
Receive Ladder Training	6.5	X		
Acknowledge Receipt of Training	6.5	X		
Forward Copy of Attachment 2 to Knoxville Health and Safety Training Office	6.5		X	

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Employee Training Record:
Portable Ladder Training*

NAME _____ EMPLOYEE NUMBER _____

LOCATION _____ SUPERVISOR _____

1. I have reviewed, understand, and agree to abide by the ladder procedures described in Shaw E&I Procedure No. EI-HS302.

2. I acknowledge that it is my responsibility to inspect ladders prior to their use and after any event that could result in ladder damage.

SIGNATURE _____ DATE _____

1. I have observed a demonstration of the ladder usage skills for the above employee and feel that he or she understands how to correctly use a ladder; is familiar with safety rules and regulatory requirements; and has demonstrated satisfactory ladder skills.

INSTRUCTOR SIGNATURE _____ DATE _____

***Place original completed form in the project health and safety file and forward a copy to the Knoxville Health and Safety Training Office.**

STANDARD OPERATING PROCEDURE

Subject: **Pressurized Water Cleaning and Cutting Equipment**

UNCONTROLLED WHEN PRINTED

1. PURPOSE

This procedure covers the personnel requirements, operator training, operating procedures, and recommended equipment performance/design for the proper operation of all types of pressure water jet cleaning and cutting equipment as normally used by industries concerned with construction, maintenance, repair, cleaning, cutting, and demolition work.

2. SCOPE

This procedure applies to all types of pressure water jet cleaning and cutting equipment used by The Shaw Group Inc.'s Environmental & Infrastructure Group (Shaw E&I) personnel. This procedure is also applicable at lower pressures at which there is foreseeable risk of injury. Exceptions shall be per the requirements of Procedure No. EI-HS013, "Health and Safety Procedure Variance."

3. REFERENCES

- ASTM International E-1575-93, Standard Practice for Pressure Water Cleaning and Cutting
- Water Jet Technology Association's Recommended Practices for the Use of Manually Operated High Pressure Water Jetting Equipment
- Procedure No. EI-HS013, Health and Safety Procedure Variance
- Procedure No. EI-HS045, Job Safety Analysis
- Procedure No. EI-HS052, Health and Safety Plans

4. DEFINITIONS

- **Dump System**—The discharge orifice operator-controlled, manually operated device or system that reduces the pressure to a level that yields a pressure flow at the nozzle that is considerably below the risk threshold.
- **High-Pressure Water Cleaning**—The use of high-pressure water, with or without the addition of other liquids or solid particles, to remove unwanted matter from various surfaces where the pressure of the liquid jet exceeds 1,000 pounds per square inch gauge (psig) at the orifice.

  Warning: The limit of 1,000 psig does not mean that pressures below 1,000 psig cannot cause injury or require any less attention to the principles of this practice. Adequate precautions, similar to those of this practice, are required at all pressures.

- **High-Pressure Water Cutting**—The use of high-pressure water, with or without the addition of other liquids or solid particles, to penetrate into the surface of a material for the purpose of cutting that material, where the pressure of the liquid jet exceeds 1,000 psig at the orifice.
- **Hose Assembly**—A hose with safety coupling attached in accordance with manufacturers specifications.
- **Lance**—A rigid metal tube used to extend the nozzle from the end of the hose.
- **Lancing**—An application whereby a lance and nozzle combination is inserted into, and retracted from, the interior of a pipe or tubular product.

- **Moleing**—An application whereby a hose fitted either with a nozzle or with a nozzle attached to a lance is inserted into, and retracted from, the interior of a tubular product. It is a system commonly intended for cleaning the internal surfaces of tubes, pipes, or drains. It can be self-propelled by its backward-directed jets and is manufactured in various shapes, sizes, and combinations of forward- and backward-directed jets.

- **Nozzle**—A device, with one or more openings, where the fluid discharges from the system. The nozzle restricts the area of flow of the fluid, accelerating the water to the required velocity and shaping it to the required flow pattern and distribution for a particular application. Combinations of forward and backward nozzles are often used to balance the thrust. Such nozzles are commonly referred to as tips, jets, orifices, etc.

- **Operator**—A person, who has been trained in accordance with the original manufacturer's instructional training program, and has been qualified through demonstrating the knowledge, experience, and ability to perform the assigned task.

- **Operator Trainee**—A person not fully qualified due to the lack of sufficient knowledge or experience, or both, to perform the assigned task without supervision.

- **Pressure Water Jet System**—Water delivery systems that have nozzles or other openings whose function is to increase the speed of liquids that may cause injury. Solid particles or additional chemicals may also be introduced, but the exit in all cases will be in a free stream. The system shall include the pumps (pressure-producing devices), hoses, lances, nozzles, valves, safety devices, and personal protective equipment, as well as any heating elements or injection systems, attached thereto.

- **Shotgunning**—An application where a lance or nozzle combination can be manipulated in virtually all planes of operation.

5. RESPONSIBILITY MATRIX

5.1 Procedure Responsibility

The Senior Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

5.2 Action/Approval Responsibilities

The Responsibility Matrix is shown as Attachment 1, "Responsibility Matrix."

6. PROCEDURE

All equipment shall be operated in a manner consistent with the manufacturer's instructions for the specific model of equipment to be used. Such instructions and manuals shall be kept in a waterproof compartment with the equipment.

NOTE: Rental equipment shall not be accepted without the manufacturer's manual.

6.1 Qualified Operators

Only personnel who have undergone a proper training program and who have demonstrated the knowledge and skill, and gained the experience to perform all likely assigned tasks shall operate water jetting equipment. They may also supervise the training of new operators.

6.2 Training

Before being assigned to their first water jetting jobs, employees shall receive proper training. A core module for pressurized water systems is available from the Training Department. This shall be

supplemented with site-specific, hands-on training per the manufacturer's instructions for the specific equipment in use. Training shall cover the topics listed in Sections 6.2.1 through 6.2.9.

6.2.1 Cutting Action

The cutting action of a water jet and the potential hazard it poses to the human body shall be demonstrated through the use of audiovisual aids or actual use of equipment (by cutting through a piece of lumber, a concrete block, etc.).

6.2.2 System Operation

The operation of water jetting systems shall be explained by pointing out potential problems and proper corrective actions.

6.2.3 Operating Pressure

The need to operate equipment at or below the manufacturer's recommended working pressure shall be stressed.

6.2.4 Control Devices

The operation of all control devices shall be explained. The importance of not tampering with any control devices, as well as the importance of keeping them in proper working order, shall be stressed.

6.2.5 Equipment Maintenance

The importance of the proper and timely care and maintenance of water jetting equipment shall be presented. Instructions shall be provided on the procedures to follow in maintaining equipment and when the equipment must be returned for care by more qualified associates.

Stress that equipment shall not be repaired, or connections tightened, when the unit is in operation or the pump is running.

6.2.6 Valve Maintenance

Point out that valves and seating surfaces in pressure regulating devices encounter high wear during water jetting. These items require frequent inspections, maintenance, and/or replacement to ensure proper operation.

6.2.7 Hose

The proper method of identifying and connecting hoses, including laying out without kinks, protecting hoses from excessive wear, identifying a worn or unsafe hose, and using proper tools on couplings and fittings shall be explained. Fittings and couplings on hoses shall not be tightened or tampered with while the hose is pressurized. Safety connectors (whipchecks) should be used across all hose connections.

6.2.8 Stance

The proper stance for sound footing and how to use the various devices for lancing, shotgunning, and moleing shall be demonstrated. The trainee, under close supervision, shall be trained to use the various devices while the unit is slowly pressurized and is operating at its normal working capacity.

6.2.9 Proficiency

Personnel shall demonstrate knowledge and skill in the proper operation of equipment through practical applications before performing indirectly supervised work.

6.3 Personal Protective Equipment

The minimum personal protective equipment (PPE) shall be explained. Instructions shall be given as to when and how specific clothing and other types of protective devices shall be worn according to the type of work performed, locations, etc.

6.3.1 Compliance

All applicable recommended practices and regulations, instructions, and warnings covering PPE shall be followed as prescribed by the original equipment manufacturer's programmed instructional material.

6.3.2 Head Protection

All operators shall wear hard hats with attached face shields.

6.3.3 Eye Protection

Suitable eye protection (adequate for the purpose and of adequate fit on the person) shall be provided to all operators of pressure water jetting equipment and must be worn within the working area. Where liquids liable to cause eye damage (review appropriate Material Safety Data Sheet) are encountered, it is necessary to use either a combination of visor and impact-resistant goggles, or a full hood with shield.

6.3.4 Body Protection

All operators shall be supplied with suitable waterproof clothing and jet-resistant PPE (i.e., foot and leg guards) having application for the type of work being undertaken. Garments shall provide full protective cover to the operator, including arms. Liquid- or chemical-resistant suits shall be worn where there is a reasonable probability of injury (review appropriate Material Safety Data Sheet) that can be prevented by such equipment.

6.3.5 Hand Protection

Adequate hand protection shall be supplied to all operators and shall be worn when there is a reasonable probability of injury that can be prevented by such equipment. (See original equipment manufacturer specifications.)

6.3.6 Foot and Leg Protection

All operators shall be supplied with waterproof boots with steel toecaps and shanks. Metatarsal guards and leg guards shall be used by the jetting gun operators.

6.3.7 Hearing Protection

Pressure water jetting operations may produce noise levels in excess of 90 decibels, A-scale. Suitable ear protection issued in accordance with the recommended practices of the original equipment manufacturer must be worn. Provisions shall be made for regular inspection and maintenance, including daily cleaning of hearing protection devices that are of the reusable type. All personnel and operators shall receive instruction in the correct use of ear protectors such that noise exposure lies within the limits as specified by the original equipment manufacturer's instructions.

6.3.8 Respiratory Protection

A respiratory protection program shall be implemented where there is a reasonable probability of injury that can be prevented by such a program.

6.3.9 Equipment Limitations

It should be recognized that some protective equipment may not necessarily protect the operator from injury by direct high-pressure water jet impact. Shields and guards shall be used as provided in the original equipment operator's instructions and training programs to prevent any injury.

6.4 Pre-Operating Procedures

6.4.1 Planning

Preplan each job. Follow the steps outlined in the original manufacturer's instructions and programmed training materials. Personnel familiar with the item to be cleaned, the material to be cut, and the work environment shall meet with the personnel that will be performing the work and develop a Job Safety

Analysis (Procedure No. EI-HS045, "Job Safety Analysis (JSA)") that outlines potential hazards of the work area, environmental problems, safety standards, and emergency aid procedures.

6.4.2 Checklist

Use the manufacturer's checklist, or listing of critical items, to ensure that the proper equipment selection is followed (Attachment 2, "Reservice and Operational Checklist for Pressure Water Jet Cleaning and Cutting Equipment").

6.4.3 Dump Valve

All systems shall incorporate at least one fluid shut-off or dump device. The orifice operator must always be able to shut down the water jet by releasing pressure on the trigger, switch, or foot valve pedal.

6.4.4 Warning Barriers

Erect suitable barriers to encompass the hazard area and post signs to warn personnel they are entering a hazardous area. The perimeter should be outside the effective range of the jet wherever possible. Barriers may be of rope, safety tape, barrels, etc., as long as they give an effective warning and are highly visible.

6.4.5 Hook-Ups

Hose shall be arranged so that a tripping hazard does not occur. Support hoses, pipes, and fittings to prevent excessive sway or wear, or both, created by vibration or stress on the end connections when laid on the ground, over sharp objects, or on vertical runs shall be used. Check all hoses for evidence of damage, wear, or imperfections. The check shall be made periodically during the operation.

6.4.5.1 Fittings

Clean and lubricate all fittings before installing in the system. Be sure all fittings, hoses, and nozzles are fit for the purpose.

6.4.5.2 Pre-Flushing

Flush the system completely with sufficient water to remove any contaminants before installing the nozzle.

6.4.5.3 Nozzles

Remove nozzles and check all orifices for any blockage or damage, or both, or for imperfections.

6.4.5.4 Electrical Equipment

Any electrical equipment in the immediate area of the operation that presents a hazard to the operator shall be de-energized, shielded, or otherwise made safe. Ground fault circuit interrupters shall be used for any necessary power hook-ups.

6.5 Operational Procedures

6.5.1 Work Area

Isolate the workpieces/items to be jetted from any unprotected areas to a protected pressure water jetting area. Cutting or cleaning in place or adjacent to the installed position can be done with the necessary clearance and permission of the occupier and equipment/facility owner.

6.5.2 Area Limits

Area limits applicable to the cutting or cleaning operations shall be defined by barriers and should be marked with notices to warn against access to other personnel and specific hazards present. Suitable barriers shall be an approved form of hazard warning, rope, or tape, as a minimum. Alternatively, a suitable barrier shield is acceptable at any reasonable distance. Notices should read "Danger - Keep Clear, Pressure Water Jetting in Operation - Severe Injury May Result," or other suitable wording.

6.5.3 Corrosive Materials

Where there is a possibility of encountering corrosive or toxic material, the general contractor or employer or owner shall be requested to inform the person in charge of pressure water jetting of any precautions that may be necessary, including the collection and disposal of waste materials.

6.5.4 Work Surface

Operators should have good access to the workpiece, safe walking and working surfaces, and secure footing. The work area should be kept clear of loose items and debris to prevent tripping and slipping hazards.

6.5.5 Unauthorized Access

Prevent access by unauthorized persons into the area where pressure water jet cleaning or cutting, or both, is taking place. The area shall be secured as described in Section 6.5.2. The perimeter should be outside the effective range of the jet wherever possible.

6.5.6 Approaching the Operator

Personnel having reasons to enter the pressure water jet cleaning and cutting area must wait until the jet is stopped and their presence is known. Personnel wishing to have the jet stopped shall approach a team member other than the jet operator. The jet operator shall not be distracted until the jet has been stopped.

6.5.7 Side Protection

Suitably placed side shields shall be provided to safeguard personnel and equipment against contact with grit or solids removed by the jet.

6.5.8 Pressurizing the System

Increase pressure slowly on the system while it is being inspected for leaks or faulty components, or both. Repair or replace components only when the equipment is properly locked out and tagged. The system shall be depressurized, shut down, and the key removed for repairs.

6.5.9 Team Operations

In jetting operations a minimum of two persons, one at the pump and one at the orifice or gun, shall be employed at all times.

6.5.10 Supervision

All pressure water jetting operations shall be controlled by a supervisor who has been trained in accordance with the instructions of the original equipment manufacturer in all aspects of the jetting operation.

6.5.11 Number of Operators

The operators of the pressure water jetting equipment should consist of two or more operators according to the equipment being used and the nature of the job. These operators shall work as a team, with one member designated in charge. The operator of the gun or lance shall take the lead role while jetting is in progress.

6.5.12 Gun Operator

One operator from the team shall hold the lance, gun, or delivery hose with the nozzle mounted on it. That operator's primary duty is to direct the jet.

6.5.13 Second Operator

The second operator of the team shall attend the pump unit, keep close watch on the first operator for signs of difficulty or fatigue, and watch the surrounding area for intrusion by other persons or unsafe

situations. If required, the operator will shut off the pressure until any unsafe acts or conditions have been corrected and it is safe to continue.

Warning: Exercise caution in shutting off the pressure rapidly, as this can cause loss of footing by the gun operator.

6.5.14 Additional Operators

Additional operators are required in the following circumstances:

- To assist the first operator with the handling of the lance if it is too long or too heavy for one person; or
- To provide communication if the lance operator is out of sight of the pump unit operator.

6.5.15 Job Rotation

The team members should rotate their duties during any job to minimize fatigue to the operator holding the lance or gun.

6.5.16 Team Leader

The team leader is responsible for basic equipment checks, the preparation of the working area for safe operation, and for completing a daily Job Safety Analysis for the work.

6.5.17 Code of Signals

Before starting a jetting operation, the team members, one of whom must be in charge, shall agree on signals to be used during the operation of the equipment.

6.5.18 Fitness

The operator and other team members shall be capable of performing the required operations safely. All shall be capable of speaking and reading the instructions and warnings in the language of their place of work.

6.6 Single Person Operation

Single person operation is allowed where the pressure does not constitute a hazard to personnel. Single person operations are prohibited at operating pressures exceeding 1,000 psig and may be deemed unsafe at lower pressures due to jobsite conditions.

NOTE: All HAZWOPER operations are required to use the buddy system.

6.6.1 Single Operator Guidelines

All other recommendations pertaining to team operations shall apply.

6.7 Shotgunning

6.7.1 Controls

The person operating the nozzle shall have direct control of the dump system.

6.7.2 Attendance

The pressurized system shall never be left unattended.

6.7.3 Multiple Operation

When more than one shotgunning operation is being performed within the same area, install a physical barrier or maintain adequate spacing between operators to prevent the possibility of injury from the pressure water.

6.7.4 Target Holding

Never manually hold objects to be cleaned.

6.7.5 Connection Protection

The point where the hose connects to the gun shall be shrouded by a protective device such as a heavy duty hose, shoulder guard, and the like, to prevent injury to the operator should the hose, pipe, or fitting rupture.

6.7.6 Minimum Length

When used, the minimum length of the shotgun lance extension shall be 4 feet (1.2 meters) from the triggering device to the nozzle.

6.7.7 Hose Protection

Use steel-braided hoses on air-operated, fail-safe systems to keep the system from being activated by someone stepping on the hose or running over it.

6.8 Moleing or Flex Lancing

6.8.1 Control

The operator shall have direct control of the dump system.

6.8.2 Reversing

A positive method shall be used to prevent the nozzle from reversing direction inside the item being cleaned. Safety guards for this purpose shall be used.

6.8.3 Retrojets

During manual operations, the entrance to a line or pipe shall not be cleaned with a nozzle containing back jets without adequate shielding.

6.8.4 Clearance

The clearance between the outside diameter of the hose, lance, and nozzle assembly and the inside wall of the item being cleaned shall be sufficient to allow adequate washout of water and debris.

6.8.5 Pressurization

During manual operation, insert the nozzle into the tube prior to pressurizing. Conversely, depressurize the system before removing the nozzle from the tube.

6.8.6 End Identification

Hoses shall be conspicuously marked no closer than 24 inches (600 millimeter) from the nozzle to warn the operator of the nozzle location.

6.8.7 Nozzle Support

Where the length of the nozzle and rigid coupling is less than the inside diameter of the pipe, a length of rigid pipe of not less than the diameter of the pipe being cleaned shall be fitted directly behind the nozzle, or a suitable safety shield shall be provided to protect the operator. This is to prevent the nozzle from turning around 180 degrees and doubling back towards the operator. Specific safety guards shall be used for this purpose.

6.9 Ridge Lancing

6.9.1 Control

The operator inserting the nozzle shall have direct control of the dump system.

6.9.2 Clearance

The clearance between the outside diameter of the lance and nozzle and the inside wall of the item being cleaned shall be sufficient to allow adequate washout of water and debris.

6.9.3 Pressurization

When under manual operation the nozzle shall be inserted into the tube prior to pressurizing. Conversely, the system shall be depressurized before removal of the nozzle from the tube, unless proper shielding is provided.

6.9.4 Shields

When lancing tubes with a rigid lance, a guard shall be installed around the lance to prevent a lance nozzle from being inadvertently withdrawn and causing injury.

6.10 Additives

Any water additive (chemical, detergent, or solid particle) shall be used in accordance with the manufacturer's recommendations.

6.11 Proper Operation

6.11.1 Start-Up

Do not start the pump unit and bring it up to pressure unless each team member is in his designated position, the nozzle is held in or directed at the workpiece, and the lance or gun is securely held.

6.11.2 Adjustments

Apart from operational procedures, no attempt shall be made to perform maintenance or adjust any nut, hose connection, fitting, etc., while the system is under pressure. Stop the pumps, discharge any pressure in the line, and remove the key prior to making any such adjustment. Take care to release the pressure in the dry shut-off gun and the line when the unit is switched off.

6.11.3 Equipment Malfunction

If for any reason the water flow does not shut off when the trigger or foot pedal is released, cease work until the item has been serviced, repaired, or changed by properly trained personnel. Equipment shall be shut down, depressurized, and the key removed prior to making repairs.

6.11.4 Reaction Force

The operators shall be allowed to experience the reaction force of the jet progressively until the required operating pressure is reached. Use the lowest pressure compatible with the work to be done. Do not adjust the pressure without the operator being aware of this operation.

6.11.5 Effect of Line Pulses

Operators shall be made aware of the reactive effect of pressure in the line that can transmit a severe jolt to the operator when the dump valve or dry shut-off valve is operated. To minimize this effect, keep total hose lengths as short as possible. Damping devices shall be introduced into the system in accordance with the original equipment manufacturer's designs or instructions.

6.11.6 Thermoplastic Hoses

Thermoplastic hose shall not be used for water jetting unless specifically designed for this purpose.

6.11.7 Operator Position

While operating, the team members shall be safely positioned. Stop the jetting if any person encroaches into the working area.

6.11.8 Work Stoppage

Stop work in the following cases:

- In the event that leaks or damage become apparent
- If any person becomes aware of any change in conditions or of any hazards being introduced or existing
- If plant or work alarms are sounded
- If any of the practices in this procedure are not being followed

6.11.9 Hose Protection

Protect all hoses from being run over and crushed by vehicles, fork lift trucks, and the like.

6.11.10 Back Thrust

The back thrust from a linearly directed jet can be calculated from the equation:

$$B = 0.052\ Q(P)0.5$$

Where:
B = Back thrust, pounds (kilograms)
Q = Flow rate, gallons per minute (or metric equivalents)
P = Jet pressure (pounds per square inch)

It is not recommended that one person be required to withstand a back thrust of more than one third of his or her body weight for any extended period of time.

6.12 Use of Lances and Nozzles

6.12.1 Lances

Lances that are rigid or semirigid, having nozzles fitted to them with any combination of forward, backward, or 90 degree angle jets, shall be used with either a dump system or dry shut-off control valve. When a flexible lance or nozzle mounted on a hose is in use, do not operate the jet at pressure unless the nozzle is properly positioned inside the workpiece or the operator is protected by screens or proper shielding from the rear-facing jets. If necessary, clean the lead-in to the workpiece by other methods.

6.12.2 Flexible Lances

Flexible lances, used to clean pipes where the inside diameter of the pipe is not small enough to prevent the lance from turning back on itself, shall have a piece of rigid straight tube, slightly longer than the diameter of the pipe, fitted immediately behind the nozzle to prevent this from happening.

6.12.3 Distance Indicator

When using an assembly that allows the nozzle to enter the workpiece with restricted visibility, clearly mark the lance, hose, or floor in a manner that enables the operator to judge how far the nozzle is in the workpiece before pressure is applied and, conversely, so that pressure is released before the apparatus is completely withdrawn from the workpiece.

6.12.4 Lance Length

The length of a rigid lance or combination of lances shall be such that the operator can maintain control at all times.

6.12.5 Jet Pressure

Operators shall select the nozzle and minimum operating pressure to allow effective and efficient jetting.

6.12.6 Improper Use

Should an operator enter a manhole or access port for any purpose (with the jetting machine turned off), the hose shall not be used to support his weight when climbing up or down.

6.12.7 "T" Pieces

A "T" piece or nozzle carrier "T" (devices for producing two equal and opposite jets at the end of the land and at right angles to the normal flow) shall be inserted into a tube or vessel, or between two surfaces, before the system is pressurized. This is necessary to ensure that should one jet be larger than the other, or one jet become blocked or partially blocked, the operator of the lance will not be spun out of control. When a "T" piece is used to provide a balancing jet on a long lance to clean a single surface, it is not always possible to check for equal thrust from both jets in the above described manner; therefore, check these lances by progressive pressure increases.

Caution: This shall also apply to any form of multi-jet nozzle having a radial component.

6.13 Health and Safety Plan

The Health and Safety professional for the job shall include an appropriate Activity Hazard Analysis for pressurized water cleaning in the project Health and Safety Plan (Procedure No. EI-HS052, "Health and Safety Plans").

7. ATTACHMENTS

- Attachment 1, Responsibility Matrix

8. FORMS

- Form EI-HS303.1_0, Reservice and Operational Checklist for Pressure Water Jet Cleaning and Cutting Equipment

9. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
01 / 05/06/2009	Several references were made to Job Safety Analyses since procedure number HS045 did not exist when this procedure was last updated.	Mike Zustra

Attachment 1
Pressurized Water Cleaning and Cutting Equipment
Responsibility Matrix

Action	Procedure Section	Responsible Party				
		Location Manager	Site Supervisor	Project Manager	HS	Senior Director HS
Issue, Revise, and Maintain Procedure	5.1					X
Provide Training	6.2	X		X		
Job Set-Up/Checklist	6.4.2		X	X		
Incorporate requirements in HASP	6.13			X	X	

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Attachment 2
Reservice and Operational Checklist for Pressure Water Jet Cleaning and Cutting Equipment

The following information shall be verified before starting work:

ITEM #	DESCRIPTION	Y
1.	Date (Print):_____	
2.	Location:_____	
3.	Equipment being cleaned (Print):_____	
4.	Is the area, including the other end of unit being cleaned, properly secured?	
5.	Have precautions been taken to protect all electrical equipment?	
6.	Is there any hazard to personnel resulting from damage to the equipment such as release of corrosive chemicals, flammable liquids, gases, or the like?	
7.	Are all fittings of the correct pressure rating?	
8.	Are all hoses of the correct pressure rating?	
9.	Are all fittings in good operating condition?	
10.	Are all hoses in good operating condition?	
11.	Are all nozzles free from plugging and in good operating condition?	
12.	Have precautions been taken to prevent line-mole reversal?	
13.	Is the filter on the pump suction clean and in good operating condition?	
14.	Is there an adequate water supply?	
15.	Have precautions been taken against freezing?	
16.	Do all personnel have proper personal protective equipment for this job?	
17.	Do all personnel have proper training for this job?	
18.	Are all personnel qualified to perform this work?	
19.	Has the complete hook-up been flushed and air removed from the system prior to installing the nozzle?	
20.	Has hook-up, including pipes, hoses, and connections, been pressure tested with water at the maximum operating pressure?	
21.	Is the dump system operating properly (will it dump when released)?	
22.	Are all control systems operational?	
23.	Is the location of emergency medical aid known?	

PROCEDURE

Subject: COMPRESSED GAS CYLINDERS

1.0 PURPOSE AND SUMMARY

This procedure prescribes the steps to be taken while handling, using, and storing known compressed gases contained within cylinders. Cylinders containing unknown compressed gases will be handled in accordance with Shaw Environmental & Infrastructure, Inc. (Shaw E & I) Procedure HS 306: Handling of Unknown Compressed Gas Cylinders.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The National Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The responsibility matrix is Attachment 1.

4.0 DISCUSSION

There are numerous government and industry documents which have established regulations and guidelines for the handling, storage, and use of compressed gases contained within cylinders. These documents include those developed by the American National Standards Institute, Inc., Compressed Gas Association, Inc., U.S. Department of Labor, and U.S. Department of

Transportation. This procedure has been developed to merge the requirements of these organizations into one concise procedure applicable to all of Shaw E & I's compressed gas cylinder activities. Other documents developed by Shaw E & I's clients may have precedence as long as they met or exceed the requirements contained within this procedure. One example of such a document is the U.S. Army Corps of Engineers Safety and Health Requirements Manual 385-1-1 which contains specific requirements not necessarily contained within this procedure.

5.0 TEXT

The following guidelines for the handling, use, and storage of compressed gas cylinders have been based upon accident prevention experience and established industrial and governmental standards. It should not be assumed that every acceptable safety precaution is contained herein, or that unusual circumstances may not require further or additional procedures. In the event that revisions to this procedure are thought to be required the National Director of Health and Safety will be informed of the recommended changes and may issue a revision.

5.1 Cylinder Handling

- Prior to the acceptance of a compressed gas cylinder it will be verified that the content has been identified by either labels or stencils. Never accept a cylinder if the contents are not clearly identified. Color coding must not be relied on to identify the contents of a cylinder since universal color coding standards have not been established. Each cylinder must meet the U.S. Department of Transportation requirements published in 49 CFR Part 178, Subpart C.

- Unless cylinders are firmly secured on a special carrier intended for this purpose, pressure regulators will be removed with valve protection caps in place prior to movement. The preferred equipment for the transport of cylinders is either a hand or fork truck equipped with an appropriate chain or belt for securing the cylinder(s). In the event that a hand or fork truck is not available the cylinder(s) will be moved by tilting and rolling them on their bottom edges.

- Ropes, chains, or slings will not be used to lift cylinders unless provisions have been made at the time of manufacture for appropriate lifting attachments, such as lugs. Where lifting attachments have not been provided, suitable cradles or platforms to hold the cylinders will be used for lifting.

- Personnel should never carry, slide, roll, or drag compressed gas cylinders. Cylinders will not be manually lifted higher than six inches or longer than the time required to properly place them into position. Shaw E & I's sixty pounds per person lifting limit will be adhered to during this activity.

5.2 Cylinder Use

- Cylinders will be secured in the immediate area in which they will be used prior to the removal of protective cylinder caps. These caps will be kept in place during all handling and storage activities regardless if the cylinder is full or empty.

- Suitable pressure relief and regulating devices will be used to protect systems that have a pressure ratio greater or less than the compressed gas supply source. If these devices appear to be damaged or defective in any way, their use will be discontinued until their condition is evaluated. Modification, alteration, and repair of all regulators and pressure relief devices will be done only by qualified personnel.

- Connections that do not fit will not be forced. Threads on regulator connections or other ancillary equipment will match those on cylinder valve outlets. Connections to piping, regulators, and other apparatus will be kept tight to prevent leakage. Where hose is used, it will be kept in good condition.

- Where compressed gas cylinders are connected to a manifold, the manifold and its related equipment will be of proper design for the product they are to contain. Regulators, gauges, hoses and other appliances provided for use with a particular gas, or group of gases, will not be used on cylinders containing gases having different chemical properties unless information obtained from the supplier indicates that this can be done safely.

- All cylinder valves will be opened slowly while keeping the valve outlets pointed away from personnel and sources of ignition. On valves without hand wheels, the wrenches recommended by the gas supplier will be used. On valves with hand wheels, wrenches will not be used. Valve wheels will not be hammered in attempts to open and close the valve.

- Compressed gas will not be used to dust off clothing. This could result in serious injury to the eyes or body, or create a fire hazard.

- When withdrawing a nonliquified gas from a cylinder, the pressure will not be reduced below 20 pounds per square inch gauge (psig) so as to preclude the backflow of atmospheric air or other contaminants into the cylinder.

- When using cylinders in conjunction with a cutting or burning activity they will be placed so that sparks, hot slag, or flames will not reach them. Electrodes will not be struck against a cylinder to strike an ark.

- Before a pressure regulator is removed from a cylinder, the cylinder valve will be closed and the regulator drained of gas pressure.

- Cylinders containing oxygen or combustible gases will not be taken into confined spaces.

- Cylinders used to supply fixed process equipment will never be connected in a rigid manner. Flexible tubing bent in a loop will be used to allow some movement of the cylinder or process equipment.

5.3 Cylinder Storage

- Cylinders will be stored in an upright position and secured with chains or straps to prevent them from falling over. The chains or straps should be of sufficient strength and placed high enough on the cylinder to prevent them from tipping over.

- Incompatible gases will never be stored together. Where gases of different types are stored at the same location, the cylinders will be grouped by types of gases, and the groups arranged to take into account the compatibility of the gases. Oxygen cylinders in storage will be separated from fuel-gas cylinders or combustible materials by a minimum distance of twenty feet or by a noncombustible barrier at least five feet high having a fire-resistance rating of at least one-half hour.

- Full and empty cylinders will be stored separately so that older containers can be removed first with a minimum handling of other cylinders.

- Cylinders will be stored away from heat sources(never above 125 degrees F), including steam or hot water pipes, and away from areas where they might be subject to mechanical damage or contact with electrical circuits.

- Cylinders will not be stored near salt or other corrosive chemicals or fumes. Corrosion may compromise the integrity of the cylinders and will likely cause the valve caps to stick.

- Acetylene cylinders will always be stored and used in the upright position to minimize the possibility of solvent being discharged.

- Cylinders may be stored outdoors but should be protected from the ground beneath to prevent bottom corrosion. They may also be stored in the sun except in localities where extreme temperatures prevail. If a supplier recommends storage in the shade for a particular gas, such recommendation will be followed.

- Storage of cylinders in indoor locations will occur only in areas where cylinders will not be subject to damage by passing or falling objects, where cylinders could not be knocked over, or subject to tampering by unauthorized personnel. Indoor areas will be well ventilated, well-protected, dry, and at least 20 feet from combustible materials such as oil or gasoline. Cylinders will not be kept in unventilated enclosures such as lockers or cupboards.

6.0 EXCEPTION PROVISIONS

Variances may be requested as described in procedure HS013; Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

Shaw E & I Procedure HS 306: Handling of Unknown Compressed Gas Cylinders
Compressed Gas Association, Inc., Pamphlets and Technical Bulletins
American National Standards Institute, Inc., Guidance Documents
OSHA 29 and 49 Code of Federal Regulations

8.0 ATTACHMENTS

1. Responsibility Matrix

ATTACHMENT 1
COMPRESSED GASSES

Responsibility Matrix

Action	Procedure Section	Affected Associate	HS Representative	National Director of HS
Issuance, revision and maintenance of this procedure	3.1			X
Review and understand procedure	5.0	X	X	
Ensure compliance with Shaw E & I, cylinder supplier, and client requirements	5.0	X	X	

PROCEDURE

Subject: HANDLING COMPRESSED GAS CYLINDERS WITH UNKNOWN CONTENTS

1.0 PURPOSE AND SUMMARY

The handling of compressed gas cylinders with unknown contents can be an extremely hazardous activity. Since there is such great variability in the type, content, and condition of cylinders, there is no universal method to address all potential situations that may be encountered. The intent of this procedure is to describe the general guidelines for the safe handling of compressed gas cylinders with unknown contents. Detailed requirements, specific to anticipated situations, should be included in the site-specific health and safety plan or other similar project document. Key elements of this procedure include:

- Determining cylinder condition
- Determining cylinder manufacturer or owner
- Sampling of contents
- Use of supplied air respiratory equipment
- Handling identified contents.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Company - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

5.0 TEXT

Upon the initial discovery of a compressed gas cylinder with potentially unknown contents, notification to a health and safety representative will be made. Handling of the cylinder(s), with the exception of mitigating a hazard, will not be permitted unless the activity is directed by a health and safety representative familiar with cylinder handling activities. Cylinders with known contents will be handled in accordance with the requirements established in Procedure HS304.

5.1 Determining Cylinder Condition

The first step in the process is to determine the condition of the cylinder(s) and whether or not it can be safely handled. Check for spots on cylinders where the paint is rusted or where unusual corrosion has occurred. This may signify an unstable cylinder due to an internal chemical reaction which may have caused corrosion from the inside of the cylinder outward. The cylinder body, valve area, and overpressurization plugs/rupture disks should also be visually inspected for the presence of damage or deterioration.

Cylinders determined to be unstable must be handled in a remote fashion utilizing a modified forklift, front loader, etc., specially equipped to handle cylinders. A blast shield must be placed between the operator/ground personnel and the cylinder(s) for protection against accidental cylinder failure. Cylinders with unknown contents must always be handled with the utmost care due to their potential for containing extremely reactive and/or toxic gases.

5.2 Determining Cylinder Manufacturer or Owner

The second step in the process is to attempt to identify the manufacturer or owner of the cylinder(s). This can be done by visually inspecting all markings, codes, numbers, U.S. Department of Transportation (DOT) stampings, names, paint color etc., on the cylinder(s). The Compressed Gas Association publishes various industry standards which can be used as references during the identification process. There are usually specific valves and regulators for specific types of gases. In some cases, photographs of

the cylinder can be used by gas manufacturers to determine whether the cylinder is theirs and possibly what type of gas it contains. It is possible to find cylinders which have been refilled, by end users, with gases other than their original contents. For this reason, numbers, valving, color, etc., should be used as an indicator of potential contents, not verification of contents.

A visual check of exposed threads on valves can sometimes reveal the general classification of cylinder contents. Right-handed threads are indicative of inert gases, while left-handed threads can indicate flammable gases.

If the cylinder owner or manufacturer can be established, most have technical support personnel that can provide guidance for the proper handling and disposal of the cylinder and its contents.

5.3 Sampling of Contents

In the event that a positive determination cannot be made, a sample of the cylinder may be the only way to identify its contents. No testing or maneuvering of cylinders may be done if they appear deteriorated in either cylinder body or valve area such that they might fail when touched or tampered with (see Section 5.1). If both the valve and cylinder are in good condition, a sample of the gas can be obtained and submitted for analysis. This type of sampling activity would require personnel to use supplied air respiratory equipment and dermal protection as specified by the health and safety representative.

Once the content of the cylinder(s) has been positively identified and the cylinder has been determined to be structurally sound, the contents should be handled in accordance with applicable regulatory requirements.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS304 Compressed Gas Cylinders

8.0 ATTACHMENTS

1. Responsibility Matrix

ATTACHMENT 1

HANDLING COMPRESSED GAS CYLINDERS WITH UNKNOWN CONTENTS RESPONSIBILITY MATRIX

Action	Procedure Section	*Responsible Party*	
		Project Manager	**Director of Health and Safety**
Issue, Revise, and Maintain Procedure	3.1		X
Notify Health and Safety Representative Upon Discovery of Unknown Cylinder(s)	5.0	X	

PROCEDURE

Subject: EXCAVATION AND TRENCHING

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to describe the company requirements for excavation and trenching safety. These requirements are based on the federal Occupational Safety and Health Administration (OSHA) excavation standard found in 29 Code of Federal Regulations (CFR) 1926, Subpart P.

Some company activities are likely to occur in states or localities that either currently have or will have requirements that differ from those contained within the federal standard. In such circumstances, the local health and safety representative will be responsible for ensuring that these requirements are included in either a site health and safety plan or a similar document and conveyed to all affected employees. If federal, state, or local regulations vary or conflict, the more protective requirements and practices will be followed.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health & Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Accepted Engineering Practices
Those requirements or practices which are compatible with standards required by a registered professional engineer.

Angle of Repose
The greatest angle above the horizontal plane at which a material will lie without sliding.

Benching
A method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels of steps, usually with vertical or near-vertical surfaces between levels.

Competent Person
An employee who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees and who has the authority to take prompt corrective measures to eliminate them.

Company
All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Excavation
Any man-made cut, cavity, trench or depression in an earth surface, including its sides, walls, or faces, formed by earth removal.

Registered Professional Engineer
An individual currently registered as a professional engineer (preferably civil) in the state where work is to be performed.

Sheeting
Members of a shoring system that retain the earth in position and in turn are supported by other members of the shoring system.

Shield
A structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Shields may be pre-manufactured or job-built in accordance with 1926.652(c)(3) or (c)(4). Shields used in trenches are usually referred to as "trench boxes" or "trench shields".

Shoring
Structure such as a metal hydraulic, mechanical, or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.

Sloping
A method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

Support System
A structure such as underpinning, bracing, or shoring, which provides support to an adjacent structure, underground installation, or the sides of an excavation.

Tabulated Data
Tables and charts approved by a registered professional engineer and used to design and construct a protective system.

Trench
A narrow (in relation to its length) excavation made below the surface of the ground. In general, the depth is greater than the width at the bottom, but the width of a trench at the bottom is not greater than 15 feet.

Type A Soil
Cohesive soils with an unconfined compressive strength of 1.5 ton per square foot (tsf) (144kPa) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, soil is NOT Type A if:

- The soil is fissured;
- The soil is subject to vibration from heavy traffic, pile driving, or similar effects;

- The soil has been previously disturbed;
- The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater; or
- The material is subjected to other factors that would require it to be classified as a less stable material.

Type B Soil
This classification refers to:

- Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa)
- Granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam, and, in some cases, silty clay loam and sandy clay loam.
- Previously disturbed soils except those which would otherwise be classified Type C soil;
- Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subjected to vibration;
- Dry rock that is not stable; or
- Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

Type C Soil
This classification refers to:

- Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less;
- Granular soils including gravel, sand, and loamy sand;
- Submerged soil or soil from which water is freely seeping;
- Submerged rock that is not stable; or
- Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper.

5.0 TEXT

5.1 Pre-Excavation Requirements

5.1.1 Underground Utilities. Prior to opening an excavation, the estimated location of underground utilities such as sewer, telephone, fuel, electric, water, or any other underground installation that may be reasonably expected to be encountered during the excavation work shall be determined.

Utility companies or a utility location service shall be contacted within the established pre-notification time, advised of the proposed work, and asked to delineate the location of all underground utilities. Employees should be careful to protect and preserve the utility markings until they are no longer required for safe excavation. At least 3 feet of clearance between any underground utility and the cutting edge or point of powered excavation equipment will be maintained until the precise location of the utility is determined. Initial excavation within this 3 foot area will be conducted manually.

5.1.2 Surface Encumbrances. All surface encumbrances (trees, poles, boulders, etc.) that may create a hazard to employees shall be removed or supported.

5.1.3 Vehicular Traffic. Employees exposed to vehicular traffic shall be provided with, and shall wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material. Traffic control devices (i.e., barricades, signs, cones, flag persons, etc.) shall be specified and used in accordance with regulations applicable to the roadway or area in which excavation activities are occurring.

5.1.4 Training. Those who supervise the entry of personnel into an excavation must have completed a training course that included instruction in:

- Types of hazards associated with excavation operations;
- Safe work practices and techniques;
- A review of applicable Federal, state and local regulations; and
- A review of this procedure.

Employees who enter excavations are required to complete a site-specific training session to enable them to recognize unsafe conditions in and around the excavation. This training can be conducted during a tailgate safety meeting that emphasizes the specific excavation hazards that may be encountered.

Training documentation shall be maintained in the project file with a copy forwarded to the Knoxville Training Department.

As part of standard employee supervision process, training shall be complemented with on-the-job instruction and reinforcement of accepted practices to the extent necessary to assure compliance with this procedure and all other applicable regulations.

5.2 Excavation Work Practices

5.2.1 General. Each employee working within an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with 29 CFR 1926 Subpart P, except when the excavation is made entirely in stable rock or when the excavation is less that 5 feet deep and examination of the ground by a competent person provides no indication of a potential cave-in. A competent person shall ensure that protective systems, when required, are installed and maintained per the design specifications.

No employees shall be permitted to enter an excavation unless it is absolutely essential to do so and all requirements of this procedure are met.

5.2.2 Supervision. Work in an excavation shall at all times be supervised by a competent person. This individual will remain outside of the excavation at all times, and will be responsible for identifying any unusual developments above ground which may warn of impending earth movement.

5.2.3 Soil Classification. Based on the results of tests described in Attachment 3, the competent person will classify each soil/rock deposit as stable rock, Type A, Type B, or Type C. When layers of soil/rock exist, the weakest layer will be classified; however, each layer may be classified individually when a more stable layer lies under a less stable layer. If the properties or conditions of a soil/rock deposit change in any way, re-evaluation will be required.

5.2.4 Access and Egress. Structural ramps that are used solely by employees as a means of access or egress from excavations shall be designed by a competent person. Structural ramps used for access or egress of equipment shall be designed by a competent person qualified in structural design, and shall be constructed in accordance with the design.

A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are 4 or more feet in depth so as to require no more than 25 feet of lateral travel for employees.

5.2.5 Protective Systems. Protective systems shall be designed in accordance with 29 CFR 1926.652(b) or (c) and shall have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied or transmitted to the system.

5.2.6 Exposure to Falling Loads. No employees shall be permitted underneath loads handled by lifting or digging equipment. Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by spillage or falling materials. Operators may remain in the cabs of vehicles being

loaded or unloaded provided the vehicles are equipped with a cab shield and/or canopy adequate to protect the operator from shifting or falling materials.

5.2.7 Warning System for Mobil Equipment. When mobile equipment is operated adjacent to an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system shall be utilized such as barricades, hand or mechanical signals, or stop logs.

5.2.8 Hazardous Atmospheres. Where an oxygen deficient (less that 19.5% O_2) or hazardous atmosphere exists, or could reasonably be expected to exist, the excavation shall be tested before employees enter. Testing shall be conducted as often as necessary to ensure that the atmosphere remains safe. Some excavations may be considered confined spaces which require compliance with Shaw E & I Procedure HS300.

Adequate precautions shall be taken to prevent employee exposure to oxygen deficient or hazardous atmospheres. As appropriate, ventilation and/or respiratory protective devices shall be used.

5.2.9 Water Accumulation Hazards. Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. If water is controlled or prevented from accumulating by the use of water removal equipment, the process shall be monitored by a competent person to ensure proper operation.

If the excavation work interrupts the natural drainage of surface water (streams, run-off channels), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to run-off from heavy rains shall be regularly inspected by a competent person.

5.2.10 Stability of Adjacent Structures. Structures adjoining an excavation shall be evaluated to assess their stability. Excavation below the level of the base or footing of any foundation or retaining wall that could reasonably be expected to pose a hazard to employees shall only be permitted when:

- A support system (underpinning) is provided to ensure the safety of employees and the stability of the structure;
- The excavation is in stable rock;
- A registered professional engineer has determined that the structure will be unaffected by the excavation; or
- A registered professional engineer has determined that such excavation will not pose a hazard to employees.

Sidewalks, pavements and other surface structures shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

5.2.11 Protection from Loose Rock or Soil. Employees shall be protected from loose rock or soil which could fall or roll from the excavation face or edge. Such protection could consist of scaling to remove loose materials, or the installation of protective barriers. All spoil shall be placed at least 2 feet from the edge of the excavation. It is strongly recommended that spoil be placed 4 or more feet from the excavation edge so as not to cover surface indicators of subsidence (such as fissures or cracks).

5.2.12 Inspections. The competent person shall make daily inspections of excavations, adjacent areas, and protective systems for evidence of conditions that could result in a cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. The inspection shall be made prior to start of work, and as needed throughout the shift. Inspections shall be made after each rainstorm or other hazard-increasing event and will be documented using Attachment (2).

Where the inspection finds evidence of any hazardous condition, exposed employees shall be immediately removed from the hazardous area until necessary precautions have been taken.

5.2.13 Fall Protection. Where employees or equipment are permitted to cross over excavations, walkways or bridges shall be provided. Standard guardrails shall be provided where walkways are 6 feet or more above lower levels.

Adequate barriers or other types of physical protection shall be provided at all remotely located excavations. All wells, pits, shafts, etc., shall be barricaded or covered and shall be backfilled as soon as possible.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS050 Training Requirements
HS051 Tailgate Safety Meetings
HS300 Confined Spaces
29 CFR 1926 Subpart P - Excavations

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Excavation Inspection
3. Soil Classification Worksheet
4. Selection of Protective Systems for Excavations 20 Feet or Less in Depth
5. Sloping Options
6. Shoring or Shielding Options

ATTACHMENT 1
EXCAVATION AND TRENCHING

Responsibility Matrix

Action	Procedure Section	*Responsible Party*					
		Employee	**Supervisor**	**Registered Professional Engineer**	**Director of Health and Safety**	**Local H&S Representative**	**Competent Person**
Incorporate state, local, or client-specific excavation requirements into project plans.	1.0					X	
Issue, revise, and maintain procedure	3.1				X		
Coordinate identification of underground utilities.	5.1.1		X				
Determine need for traffic control devices.	5.1.3		X				
Participate in excavation training.	5.1.4	X	X			X	X
Ensure that protective systems are installed and maintained.	5.2.1						X
Classify Soil Type	5.2.3						X
Design Structural Ramps	5.2.4						X
Selection and design of protective system(s)	5.2.5			X			
Determine stability of adjacent structures.	5.2.10			X			
Inspecting excavation for hazardous conditions	5.2.12	X	X				X

ATTACHMENT 2
EXCAVATION INSPECTION

THIS INSPECTION IS TO BE COMPLETED BY THE COMPETENT PERSON EACH DAY THAT EMPLOYEES WILL BE ENTERING AN EXCAVATION.

Project Name: _____ Project No.: _____

Date: _____ Time: _____ Competent Person: _____

Soil Classification (see Soil Classification Worksheet): _____

Excavation Depth: _____ Excavation Width: _____

Type of Protective System Used: _____

	T		
	YES	**NO**	**N/A**
1. GENERAL:			
Surface encumbrances removed or supported			
Employees protected from loose rock or soil that could pose a hazard by falling or rolling into the excavation.			
Hard hats, steel-toed boots, and safety glasses worn by all employees.			
Spoils, materials, and equipment set back at least 2 feet from the edge of the excavation.			
Walkways over excavations 6 feet or more above lower levels are equipped with standard guardrails.			
Warning vest or other highly visible clothing provided and worn by all employees exposed to public vehicular			
Employees required to stand away from vehicles being loaded or unloaded.			
Warning system established and utilized when mobile equipment is operating near excavation edge.			
Employees prohibited from going under suspended loads.			
2. UTILITIES:			
Utility companies contacted and/or utility locations delineated.			
Underground installations protected, supported, or removed while excavation is open.			
3. MEANS OF ACCESS AND EGRESS:			
Lateral travel to means of egress no greater that 25 feet in trench excavations 4 feet or more in depth.			
Ladders used in excavations secured and extended 3 feet above the edge of the trench.			
Structural ramps used by employees designed by a competent person.			
Structural ramps used for equipment designed by a registered professional engineer.			
4. WET CONDITIONS:			
Precautions taken to protect from the accumulation of water.			

Water removal equipment monitored by a competent person.			
Surface water or runoff diverted or controlled to prevent accumulation in the excavation.			
Inspections made after every rainstorm or other hazard-increasing occurrence.			
5. HAZARDOUS ATMOSPHERE:			
Atmosphere within the excavation tested where there is a reasonable possibility of an oxygen deficient, combustible, or otherwise hazardous atmosphere.			
Adequate precautions taken to protect employee from exposure to a hazardous atmosphere.			
Testing conducted to ensure that the atmosphere remains safe.			
Emergency equipment, such as breathing apparatus, safety harness and line, and basket stretcher readily available where hazardous atmosphere does exist.			
6. SUPPORT SYSTEMS:			
Materials and/or equipment for support systems selected based on soil analysis, trench depth, and expected loads.			
Materials and equipment used for protective systems inspected and in good condition.			
Damaged materials and equipment used for protective systems inspected by a Registered Professional Engineer after repairs and before being placed back into service.			
Protective systems installed without exposing employees to the hazards of cave-ins, collapses, or from being struck by materials or equipment.			
Members of support systems securely fastened to prevent failure.			
Support systems provided to insure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc.			
Excavations below the level of the base or footings approved by a registered professional engineer.			
Removal of support systems progresses from the bottom, and members are released slowly as to note any indication of possible failure.			
Excavation of material to a level of greater that 2 feet below the bottom of the support system and only if the system is designed to support the loads calculated for the full depth.			
Shield system placed to prevent lateral movement.			
Employees are prohibited from remaining in shield system during vertical movement.			

7. REMARKS:

_____

_____

ATTACHMENT 3
SOILS CLASSIFICATION WORKSHEET

The following worksheet outlines the visual and manual tests that the competent person must perform at least once, and each time soil conditions change. At least one visual and one manual test must be performed; however, performing several tests is recommended so that the condition of the excavation is thoroughly examined.

Project Name:_____ Project Number: _____

Date: _____ Time: _____

Where was the sample taken from? _____

I.	**VISUAL TESTS:** *One or more visual tests are required for each classification and each time conditions change.*		
1.	Estimate range of particle sizes:	a. primarily fine-grained = cohesive material b. primarily coarse-grained = granular material	
2.	Observe excavated soil:	a. clumps = cohesive material b. breaks up easily = granular material	
3.	Observe sides and adjacent surface area of opened excavation:	a. crack like openings = fissured material b. soil spalls off vertical sides = possible fissured material	
4.	Previous excavation activities:	a. previously disturbed soil	b. not previously disturbed soil
5.	Observe opened side of excavation:	a. layered systems c. estimate degree of slope of layers:	b. layers sloped towards excavation _____
6.	Water condition:	a. evidence of surface water c. depth of water table :	b. water seeping from sides _____
7.	Vibration present:	a. area adjacent to excavation	b. area within excavation

II.	**MANUAL TESTS-** *One or more manual tests are required for classification and each time soil conditions change.*	
1.	Plastically- soil is cohesive if following is true:	a. mold soil samples into a small ball b. roll ball into thread χ≅ diameter c. pick up 2" length of χ≅ thread by one end without breaking
2.	Dry Soil Strength:	a. crumbles on its own or with moderate pressure = granular b. falls into clumps which break into smaller clumps that are only broken with difficulty = clay with gravel, sand, or silt. c. breaks into clumps which do not break into smaller clumps and can only be broken with difficulty with no visual indication of fissures = unfissured.
3.	Thumb penetration test: *(These tests are to be run on a large clump of material as soon as it is excavated.)*	a. can be easily indented by the thumb but penetrated by thumb only with great effort Type A b. easily penetrated several inches by thumb and molded by light finger pressure = Type C
4.	Unconfined Compressive Strength: (*Saturated Soil Needed)*	a. Pocket Penetrometer reading (take 10 readings and average) 0 - 0.5 = Type C, 0.5 - 1.5 = Type B, 1.5 - 2.0 = Type A b. Shear Vane reading X2: 0 - 0.5 = Type C, 0.5 - 1.5 = Type B,1.5 - 2.0 = Type A
5.	Drying Test: *(A dry soil sample 1" thick X 6' diameter is needed)*	a. develops cracks = fissured material b. dries without cracks and breaks by hand with considerable force significant cohesive content = unfissured cohesive material. c. sample breaks easily by hand = fissured cohesive or granular material d. easily pulverize dry clumps by hand or by stepping on them = granular e. don=t pulverize easily = fissured cohesive.

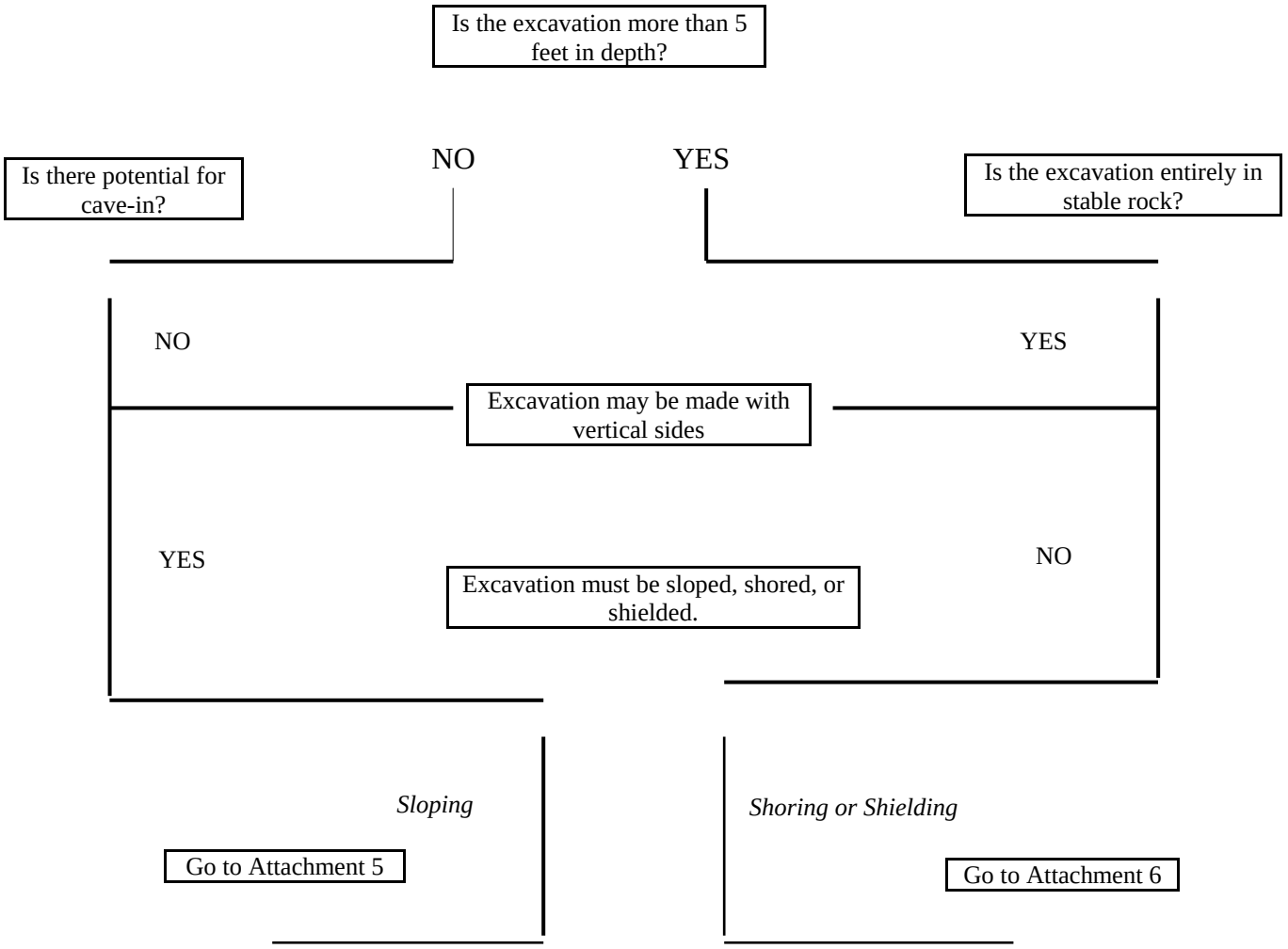
SOIL CLASSIFICATION: Type A Type B Type C Stable Rock Other _____

COMPETENT PERSON: _____ _____ _____

Print Name Signature Date

ATTACHMENT 4

SELECTION OF PROTECTIVE SYSTEMS FOR EXCAVATIONS 20 FEET OR LESS IN DEPTH



For excavations greater than 20 feet in depth, design by a registered professional engineer in compliance with 1926.652 (b) and (c) is required.

ATTACHMENT 5
SLOPING OPTIONS

Sloping selected as the method of protection

YES

Will soil classification be made in accordance with 1926.652(b)?

Excavation must comply with one of the following three options:

EITHER

Option 1: 1926.652(b)(2) which requires following Appendices A or B.

OR

Option 2: 1926.652(b)(3) which requires other tabulated data (see Def.) to be followed.

OR

Option 3: 1926.652(b)(4) which requires the excavation be designed by a registered professional engineer.

NO

Excavation must comply with 1926.652(b)(1) which requires a slope of 1.5H:1V (34^{o})

ATTACHMENT 6
SHORING OR SHIELDING OPTIONS

Shoring or shielding selected as the method of protection.

Soil Classification is required. The excavation must comply with one of the four options below.

EITHER

Option 1:
1926.652(c)(1) which requires Appendices A and C to be followed (Timber Shoring).

OR

Option 2:
1926.652(c)(2) which requires manufacturer's data to be followed (trench jacks, etc.).

OR

Option 3:
1926.652(c)(3) which requires tabulated data (see Def.) to be followed.

OR

Option 4:
1926.652(c)(4) which requires the excavation be designed by a registered professional engineer.

PROCEDURE

Subject: UNDERGROUND/OVERHEAD UTILITY CONTACT PREVENTION

1.0 PURPOSE AND SUMMARY

This procedure prescribes the steps to be followed in order to prevent accidents involving the contact with or damage of underground/overhead utilities. The company provides the operational and training practices required to safely execute work where underground/overhead utility hazards may exist.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure. Also, see Attachment 1 for matrix of responsibilities.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Company
All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Competent Person – Drilling Oversight (CPDO) Training
When drilling activity is to take place the Shaw's Field Team Leader (FTL) must have successfully completed Shaw's in-house training pertinent to competent person drilling oversight (CPDO Training). The FTL is required not only to have successfully completed CPDO training but to have an appropriate educational background, coupled with field experience and, the authority to make changes to correct deficiencies, or to stop the job if need be.
NOTE: The CPDO training requirement will become effective September 1st 2006. This means that every FTL will have successfully completed CPDO Training prior to August 31, 2006.

Competent Person - Excavation and Trenching
A person who is capable of identifying existing and predictable hazards in the excavation/trenching work area and who has the authority to take prompt corrective measures to eliminate them. NOTE: Excavation/Trenching training is required when trenching/excavation hazards are present/anticipated (i.e. spoil piles, use of three foot (3') or larger diameter augers, or other circumstances) but only recommended when trenching/excavation hazards are not present/anticipated.

Excavation
Any manmade cut, cavity, trench or depression in an earth surface formed by earth removal.

Underground Utility
Any active or inactive subsurface or buried structure that is or was designed to service a public or private facility. These may include, but are not limited, to the following:

- Electric power lines
- Natural gas lines
- Telephone lines
- Telephone cables and fiber optic lines
- Water lines
- Steam and pneumatic lines
- Sewer lines
- Drain lines
- Underground storage tanks
- Septic tanks
- Process or product lines

Overhead Utility
Any active or inactive overhead structure that is or was designed to service a public or private facility. These may include, but are not limited, to the following:

- Overhead power lines
- Overhead telephone lines
- Overhead fiber optic lines
- Overhead cables
- Overhead supports
- Overhead piping
- Traffic lights
- Utility Bridges

One Call Center
Each state has a One Call, Dig Safe, Miss Dig, etc. dial-in number for requesting mark-out of buried public utilities, such as gas lines, electrical lines, telephone/cable lines, sewer lines, and water lines. This number is typically called a minimum of 72 hours prior to subsurface activities depending on the particular state the work will be conducted. The One Call Center will notify the local public utilities for a line location mark-out for the particular location. The individual public utilities must locate and mark-out the utilities upon request. In most cases, the markouts will not be performed on private property. A confirmation number is established and confirmation report generated and submitted to the requester.

As-Built Drawings
As-built drawings are blueprints that are usually obtained from the facility owner or client. They show original buried utilities and any modifications which have been made.

Private Utility Locating Service
A private utility locating service is a firm established to locate underground utilities using specialized locating equipment, such as ground penetrating radar location devices or radio transmitter type utility locating equipment.

Fiber Optic Service Lines
Fiber optic service lines are communication lines that are buried underground. When damaged, these lines are very expensive to replace. Fiber optic companies routinely provide on-site supervision, if requested. The company encourages this practice.

Field Team Leader (FTL)
The FTL is the person with whom the responsibility of the execution of the field work resides. This person may be the project manager, senior geologist, staff geologist, etc. This individual must have the sufficient experience, training and, field knowledge to ensure all site configuration information is collected and analyzed.

Site Survey
A site survey is an inspection of the work site to look for signs of other buried utilities that may not be indicated through as-built drawings or through utility locating services. The survey typically involves inspection of overhead electrical services, inspection of basements, utility rooms, garages, etc., for signs of old electrical conduits or fuel/water/septic lines. The FTL must contact the appropriate site representative to provide any additional information that may be marked on the as-builts.

5.0 TEXT

Underground/overhead utilities may be encountered at any job site. The guidelines established in this procedure were developed to help identify and mitigate the potential hazards associated with this type of work.

Any subsurface activity is subject to the underground utility locating regulations for the state where the work will be conducted. This procedure authorizes the use of state, local or other required practices, but requires that the practice which most limits the liability to Shaw for damaged utilities is utilized. No variance is required under these circumstances, but the project-specific Health and Safety Plan (HASP) or work plan shall fully document these more protective procedures.
.

5.1 Preliminary Requirements

The Project Manager or designee must visit the site to mark the boring/excavation locations so they can be clearly identified and then contact the One Call Center for the state in which the work is to be performed in to formally request a utility mark out at the particular work location(s).

Prior to assignment of work the Field Team Leader (FTL) will assure that all affected employees receive an overview of the hazards of encountering underground/overhead utilities. The FTL is responsible to review this procedure, the work practices to control these hazards, and the roles and responsibilities of each worker with the work crew. This procedure and other requirements that may be contained in the site specific HASP shall be reinforced during daily tailgate safety meetings.

5.2 Operating Requirements

5.2.1 Underground Utilities Requirements

Prior to conducting any project site activities, the FTL must ensure that all existing underground/overhead utilities in the work area are located per the state or local mark-out protocols. Documentation of utility mark-out must be completed using the Utility Mark-out Documentation form (Attachment 3). No boring/excavation work is to be performed until all utility mark-outs are verified.

While on-site, the FTL must conduct a site survey to search for signs of other buried or overhead utilities. This will include areas such as garages, basements, etc. The results of such surveys must be documented on the Utility Markout Documentation form (Attachment 3). The property owner, client, or facility operator must be consulted on the issue of underground utilities. All knowledge of past and present utilities must be evaluated prior to conducting work..

After all mark outs have been completed, and the boring locations have been accepted by the FTL prior to drilling, each borehole location must be hand dug to a minimum of five feet bgs.

If the investigation requires boreholes in an area not covered by a municipal one call system (on private property), then the FTL must utilize appropriate geophysical techniques, hand held utility locating devices, a private utility locating firm, or other approved method to determine the locations of underground utilities. The current accepted geophysical methods for the investigation and location of buried utilities include: Ground Penetrating Radar (GPR), Time Domain and/or Frequency Domain Electromagnetic methods, Magnetometer, and Inductive/Conductive Radio-Magnetic methods. The geophysical methods can be very useful for locating buried utility lines in areas where hand digging is not possible or practical. However, it must be noted that these methods do have limitations that are a function of soil conditions, depth of investigation, imaging resolution, or other factors.

If it is determined that a non-invasive geophysical investigation may be needed, assistance with selecting the appropriate method(s) can be obtained from the Shaw E & I Science and Technology Division, Geophysics & Mapping Group, and a variance request must be submitted and approved prior to the inception of intrusive field activity.

Should the local geology be prone to refusal or should there be any other reason the boring location cannot be cleared to a minimum of 5’ bgs then the appropriate aforementioned alternative methods should be utilized to ensure the boring location is clear of utilities 5’ bgs, and a variance request must be submitted for review.

5.2.2 Overhead Utilities Requirements

Overhead utility locations must be marked (warning tape, flags, etc.) where heavy equipment, or other equipment, has the potential for contacting overhead utilities. Conduct a site inspection on a daily basis to determine where activities will take place and the location of overhead utilities and overhead obstructions. Once they have been identified, place warning tape on poles and/or guy wires and attempt to plan the work so that no contact will be made with the overhead utilities or obstructions. Share the information with all site personnel during the tailgate safety meeting.

Maintain at least 10 feet from overhead power lines, up to 50 kV. For voltages over 50 kV, add 0.4 inches per kV to obtain the safe distance between equipment and power lines. If voltage is unknown, remain at least 20 feet from overhead power lines.

As a precaution, a spotter must be used at all times when it is possible to violate the minimum distance requirements for overhead utilities. If contact is deemed unavoidable, consult with the client and the respective health and safety representative to evaluate the area to determine if the particular overhead utility can be removed prior to engaging in the activity.

5.2.3 Other Requirements

Only hand digging is permitted within 3 feet of underground high voltage, product or gas lines. Once the line is exposed heavy equipment can be used but must remain at least 3 feet from the exposed line.

Only experienced, demonstrably proficient equipment operators will be used to operate such heavy equipment as drill rigs, backhoes, front-end loaders, cranes, etc.

Due the sensitivity and costs associated with damage to fiber optic cables the FTL must have documented verbal contact and an agreement with the fiber optic company for all work within 50' of the fiber optic cables. Subsurface investigations near fiber optic cables are more fully discussed in site specific HASP's. Contact your division Health and Safety Professional for specific information on this subject.

5.3 Training Requirements

Competent Person Drilling Oversight (CPDO) Training

The FTL (at least one onsite Shaw person will be performing the drilling oversight) will be required to have successfully completed the approved internal Competent Person Drilling Oversight (CPDO) training.

Prior to assignment of work the Field Team Leader (FTL) will assure that all affected employees receive an overview of the hazards of encountering underground/overhead utilities. The FTL is responsible to review this procedure, the work practices to control these hazards, and the roles and responsibilities of each worker with the work crew. This procedure and other requirements that may be contained in the site specific HASP shall be reinforced during daily tailgate safety meetings.

Trenching/Excavation Training

The Field Team Leader or at least one onsite Shaw employee will be required to have successfully completed Trenching/Excavation training prior to the inception of site work activity when trenching excavation hazards (i.e. spoil piles, use of 3' diameter augers, or anytime similar hazards are present) are present/anticipated. NOTE: This training is now recommended rather than required when trenching/excavation hazards are NOT anticipated/required

5.4 Incident Reporting Requirements

Employees are required to immediately report to their direct supervisor any overhead or underground utility contact incident, or near miss incidents. Any supervisor (but preferably the supervisor directly responsible for the involved employees) with first-hand knowledge of an incident is required to investigate the incident. The Project Manager and respective Health and Safety Manager or Representative shall be informed of the incident immediately.

At a minimum, the incident investigation will require completion of the incident investigation report and General Liability Property Damage and Loss Report form found in H&S Procedure HS020.

In addition, Attachment 5 provides a "Tip Sheet" to help properly assess and investigate the incident causes and recommendations or requirements.

5.5 Local Jurisdiction Requirements

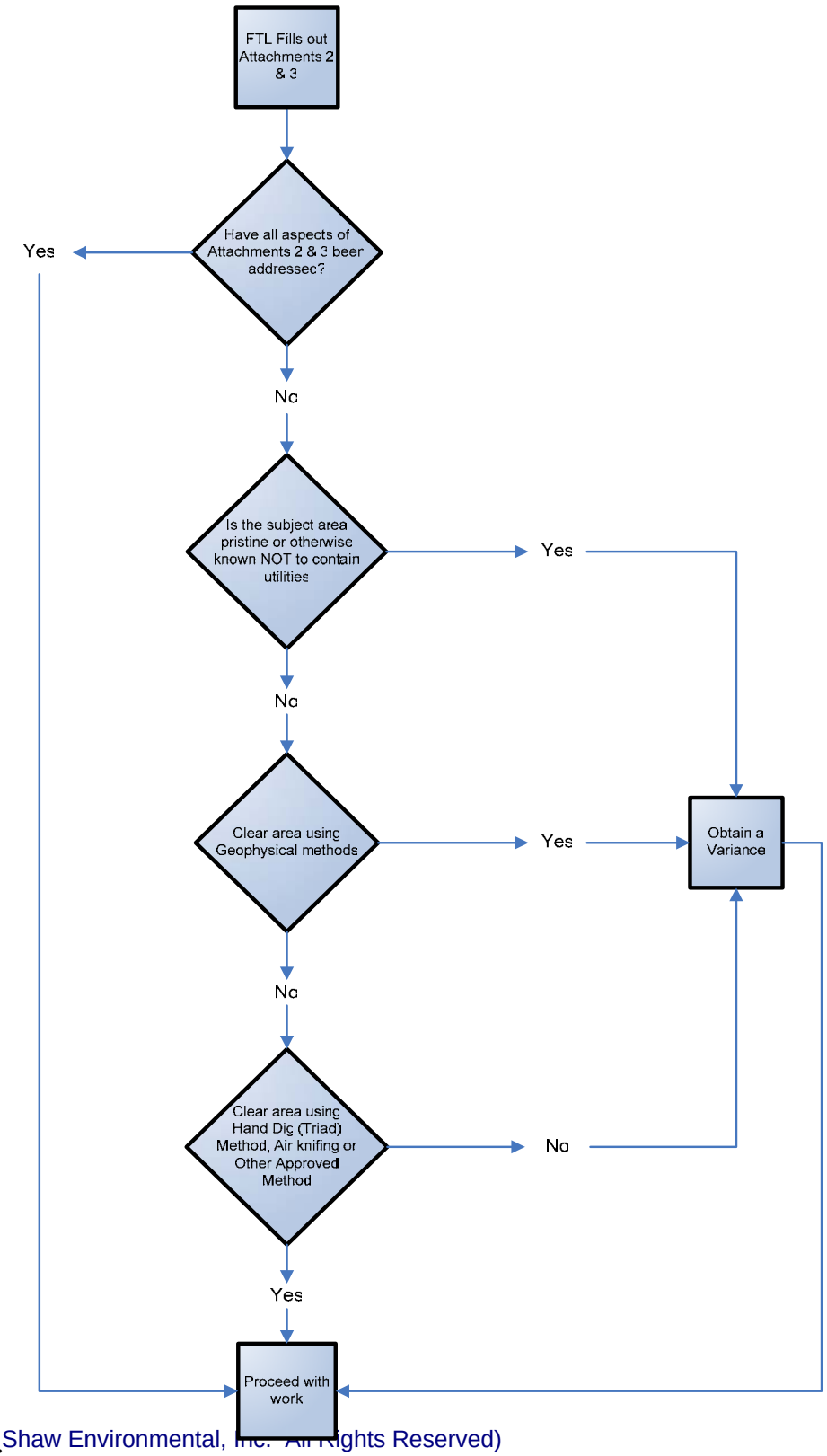
Where local jurisdictions or clients have established requirements different from those in this procedure, the practice which most limits the liability to Shaw for damaged utilities shall be utilized. No variance is required under these circumstances but the project-specific Health and Safety Plan or work plan shall fully document the alternate procedures.

6.0 EXCEPTION PROVISIONS

Anytime a minimum of a 5' clearance cannot be obtained by either hand digging or by using geophysical means, the FTL must obtain a variance from the Regional VP (or equivalent level such as Operations Director for Federal Business Line) or designee to proceed with drilling operations in that area. This would include an initial verbal variance documented in the field log followed up by a written (email) approval from either the Regional VP (or equivalent level or title) or designee. The record of communication will be noted in the field log for the project and, a record of the approval or denial will be placed in the project file.

A variance form can be obtained in HS 013. A flowchart to assist one in determining how and when a variance should be obtained can be found immediately following this section.

HS 308 Flow Chart



7.0 CROSS REFERENCES

HS013	Health and Safety Procedure Variances
HS020	Accident Prevention Program: Reporting, Investigation, and Review
HS050	Training Requirements
HS307	Excavation and Trenching

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Pre Drilling Checklist
3. Utility Markout Documentation
4. Underground Utility Hits – Tip Sheet for Incident Investigations
5. Frequently Asked Questions

ATTACHMENT 1 - UNDERGROUND/OVERHEAD UTILITY CONTACT PREVENTION
Responsibility Matrix

Action	Procedure Section	Vice President	Project Manager	Field Team Leader	HS Representative
Project-specific HASP or Work Plan shall document the practices to be used at a particular site.	1.0		X	X	X
Contact the One Call Center for mark out of utilities at the site	5.1		X		
Complete Utility Markout Documentation Form	5.2		X	X	
As-built drawings shall be reviewed	5.2			X	
Only experienced demonstrably proficient equipment operators will be used to operate such heavy equipment as backhoes, front-end loaders, cranes, etc.	5.3			X	
Provide training*	5.3				
Incident Investigation and Reporting	5.4		X	X	X
Exceptions to Procedure	6.0	X	X	X	X

*Provided by Shaw's Training Department

ATTACHMENT 2 - PRE - DRILLING/BORING/GEOPROBE Checklist

Purpose: This form is designed to help the FTL make decisions drilling/boreholing/geoprobing around underground/overhead utilities.

DATE_____ PROJECT NAME/NUMBER_____
Field Team Leader Name: _____
DURATION/SUMMARY OF WORK TO BE PERFORMED: _____
_____

Consideration	Check	Check	Explanation	Initial
Has the state one-call been contacted?	□ Yes	□ No		
Are any as-built drawings available? If so, do they show any utilities?	□ Yes	□ No		
Has a visual inspection of the work area(s) been completed?	□ Yes	□ No		
If one-call not available has a private locating service or Shaw S&T group been contacted?	□ Yes	□ No		
Were any utilities identified through private locating service? If so, indicate on site drawings.	□ Yes	□ No		
Are there any fiber optic cables within 50 feet of hole locations?	□ Yes	□ No		
If fiber optic cables are within 50 feet has an agreement with the fiber optic company been established?	□ Yes	□ No		
Can a test borehole be advanced by hand digging, probing, post hole digging, and/or air knifed to 5 feet bgs?	□ Yes	□ No		
If hand digging, probing, post hole digging, and or air knifing to 5 feet bgs is not possible, can a non-invasive geophysical investigation be conducted? If not, why?	□ Yes	□ No		
Are you comfortable with approving this authorization?	□ Yes	□ No		
Other considerations:				

ATTACHMENT 3 - UTILITY MARK-OUT DOCUMENTATION

Project Name:_____ Location:_____
FTL Name: _____ Date:_____
Utility Called:_____ Confirmation #:_____
Subcontractor:_____ Task/Activity:_____
County of work:_____ Municipality of work:_____

Before work is done on any site, contact the appropriate local utility locating service (One Call, Miss Dig, Uloco, etc.) or a local utility contractor to have sub grade utilities marked. NOTE: Boring locations to be placed not in the public right of way are typically not marked out by the public utility mark out, and a private utility locate service must be engaged. Indicate to the utility locator the nearest intersecting street for the site: _____ Confirmation No:_____.

List utility firms (public and private) and the utility they will mark.

Utility Marker Emergency Telephone Numbers Major Utilities Marked by Color Code			
Name of Utility Company	**Utility**	**Color Code**	**Emergency Telephone Number**
	Water	Blue	
	Gas	Yellow	
	Electric	Red	
	Telephone/ Cable/ Communication	Orange	
	Sewer	Green	
"ALL UNDERGROUND UTILITIES MAY NOT BE LOCATED BY THE LOCAL UTILITY SERVICE". Accordingly, you must list other known utilities in the area that the "One Call" service will not contact:			

Attach photos of the area prior to placing boreholes.
Take photos of the area indicating minimum 5' hand dig, post hole dig, probe, GPR or other:
NOTE: For any borehole, should 5' minimum clearance not be obtained, you must contact Business Line VP or equivalent (Operations Director or other on the Federal Business Line) and obtain a variance.

Completed by:_____ _____ _____
Name Signature Date

ATTACHMENT 3 – UNDERGROUND UTILITY HITS
TIP SHEET FOR INCIDENT INVESTIGATIONS

1. Location of the incident.
2. The time of day the incident occurred.
3. What type of utility was hit?
4. How deep was the line hit (in feet)?
5. Who called Designated Locator Service?
6. Note the "One Call" number on the Incident Investigation Follow-up report.
7. Attach the "One Call" record keeping documentation.
8. Were mark-outs completed by the utilities? If so, please identify.
9. Were mark-outs legible at the site?
10. Was the mark-out of the line that was hit accurate?
11. Was the mark-out misinterpreted?
12. Is there a utility damage sheet attached to the Incident Investigation Follow-up Report?
13. Have there been any faults or oversights by any 3rd party? If so, is it documented on the Incident Investigation Follow-up Report?
14. Did the FTL interview the property owner/manager prior to the incident?
15. Was pre-screened by hand digging 5 feet?
16. Were any supplemental utility locator devices used? If so, did we obtain them? If so, were they used on site?
17. Were there blueprints/as built plans available? If so, did we obtain them? If so, were they used on site?
18. Who is paying for the repairs?
19. Please define the total hours and cost estimate/impact to address the utility damage incident:

    _____ Site time in hours (not billed to the job)
    _____ PM time hours (not billed to the job)
    _____ H&S time in hours (not billed to the job)
    _____ BLM Time in hours (not billed to the job)
    _____ Rework/non-billable time (estimate)
    _____ Subcontractor rework/non-billable costs (estimate)
    _____ Repair costs to company (estimate)
    _____ Repair cost to customer (estimate)

20. Has the FTL completed Shaw's in-house CPDO training?
21. Has the FTL completed trenching/excavation training?
22. Is he/she current with the OSHA 40 hour and 8 hour refresher? If so, what are the dates of the training?
23. Who was the Site Safety Officer on the job site?
24. Does he/she have OSHA 8 hour supervisor training? If so, what are the dates of the training?
25. What was the name of the drilling subcontractor that was on site?
26. Have we researched the training background for this vendor?
27. Was a JSA performed at least once during the day that covered utility contacts and associated hazards?
28. Does this vendor have approved status?
29. Was there a tailgate safety meeting that took place?
30. Were utility mark-outs addressed at the tailgate safety meeting?
31. Were there any markings nearby the "hit" area?

ATTACHMENT 5 – Frequently Asked Questions (FAQs)

During the roll-out of this revision of HS 308 a variety of questions/comments/concerns arose. These concerns have been put in the form of most frequently asked questions (FAQs) and their respective responses. These FAQs will clear up misunderstanding pertaining to this procedure, and provide valuable information that will help our workforce have a better understanding of how this procedure should be implemented. Please review the FAQs below:

1. *No other competitor of Shaw has felt the need to do anything as extreme as this procedure to ensure minimization of utility hits. Instituting this procedure will put us out of business.*

Response: After thorough review of claims and incidents involving drilling activities and underground utilities, the committee believes that our business/client needs are best served by adopting this policy. And that the likelihood of being put out of business is much greater from continuing to do business the way we currently do it than by adopting this improved policy. The committee realized that 100% adherence to this procedure at all work sites is likely not possible. For those cases where legitimate reasons exist for non-compliance, the committee realized that an effective responsive (variance) system must be in place. The committee believes that the variance procedure, as stated in the policy, should address the exceptions as they occur.

The Committee is not aware of any specific ASTM or true “industry standard”. However, the committee is aware that best practices can vary tremendously and many times are client dependent. For example one extremely large Shaw client requires that we continuously probe. On the other end of the spectrum some clients look completely to Shaw for guidance in these matters.

2. *Our clients want us to do the work but do not wish to pay the additional fees involved with this new procedure. Could we offer them a two tiered pricing, one to do it the old way, and one to do it the new way?*

Response: The committee believes that contacting an underground utility of any type, no matter who is at fault or who ultimately pays for fixing, the outcome is a “black eye” for all involved. When these events occur, even if Shaw is not at fault, the committee believes that continued good client relations, and the potential for obtaining future business lessens as utility hits/incidents occur. This procedure is designed to minimize health and safety risks to our workers AND to mitigate liability to Shaw. Receiving the necessary compensation for the precautionary measures outlined in the procedure would be expected, and should be itemized in the initial proposal including a statement as to what will specifically be done in the field to mitigate risks relative to underground utilities and WHY Shaw believes these steps are necessary. However, if the client is willing to assume the entire liability resulting from “hitting” an underground utility, the contract should be written to reflect this

and a variance would be in order. Keep in mind that Shaw cannot allow a client's desires to take on liability to affect the health and safety of workers. No matter what the client desires might be, Shaw would still expect the basic procedures to be followed for health and safety purposes. The training though yet to be finalized will provide project manager's examples of wording to be used in proposals and contracts.

3. Hand digging to 5' is impossible during frost conditions in Minnesota, Wisconsin and many northern areas. How should this be addressed?

Response: When conditions present themselves that do not allow for hand digging each borehole, other methods must be used for clearance and a variance must be obtained. The alternative methods include a range of non-invasive geophysical survey techniques designed specifically for locating buried utilities, pipelines, tank (UST), and other buried objects that can interfere with drilling. These non-invasive geophysical methods are suggested and mentioned in the procedure.

4. What if the field crew runs into refusal during hand dig clearance?

Response: If refusal occurs and moving to an alternate spot presents the same problem, hand digging may not be possible as mentioned in #2 above. When conditions present themselves that do not allow for hand digging each borehole, other methods must be used for clearance and/or a variance must be obtained. Of course, we expect that the dig safe folks to be contacted, and that a private locating service be utilized if available. Should a private locating service not be available, we can use trained internal sources.
The alternative methods include a range of non-invasive geophysical survey techniques designed specifically for locating buried utilities, pipelines, tank (UST), and other buried objects that can interfere with drilling. The current accepted geophysical methods for the investigation and location of buried utilities include: Ground Penetrating Radar (GPR), Time Domain and/or Frequency Domain Electromagnetic methods, Magnetometer, and Inductive/Conductive Radio-Magnetic methods. These non-invasive geophysical methods are suggested and discussed in the procedures. The geophysical methods can be very useful for locating buried utility lines in areas where drilling and digging are not possible or practical, but these methods do have some limitations that are a function of soil conditions, depth of investigation, and imaging resolution.
If it is determined that a non-invasive geophysical investigation may be needed, assistance with selecting the appropriate method(s) can be obtained from the Shaw E & I Science and Technology Division, Geophysics & Mapping Group. Of course, it is expected that the "dig safe" folks will be contacted, and that a private utility locating service be utilized when appropriate (utility location method is known to be feasible), and if available. Should a private locating service not be available, we can use trained internal Shaw E & I personnel resources to perform utility line location work. Finally, if the Project Manager has determined that a variance to the procedure is justified, a variance request should be submitted for review.

5. Why is trenching/excavation training required for putting in Geoprobe® boreholes? This seems like tremendous overkill.

Response: The committee believes that, in general, trenching/excavation training is a good educational tool that promotes overall health and safety awareness and provides important information/techniques for our field staff. Trenching/excavation training provides insights into fall hazards, spoil pile placement, and many other related safety issues. Many of our drilling jobs have involved oversized auger bits (3' in diameter) where a large deep borehole is created. The committee agrees that when the diameter of the borehole lessens (i.e. use of a Geoprobe®), the impact of trenching/excavation training decreases. Trenching excavation training is now a requirement only when large boreholes are created or other hazards as mentioned above are present, but only recommended training when Geoprobe ® or similar equipment is being used and the result is trenching excavation type hazards do NOT exist. NOTE: Specific training pertinent to drilling/ Geoprobing ®/boring (CPDO training) will be provided and will be mandatory. Additionally, CPDO and trenching / excavation training are both required on projects where 3' or larger diameter boreholes are to be drilled.

6. Are there any training requirements besides trenching/excavation training?

Response: The committee evaluated a need for training specific to the HS 308 policy (drilling) and solicited the assistance of the training department and certain operations employees to develop CPDO training. This CPDO training includes basic steps needed to be taken from call the dig-safe number, private utility searches, geo-physical capabilities, probing, hand augering, air knifing, water pumping/knifing, hand digging and others.

7. Hand diggings creates heat stress, tripping hazards, back injuries, and other hazards and is unnecessary.

Response: The committee did not envision using a spade and a strong back to dig various 5' holes at the field site. The committee does envision using an air knife, water knife, probe, or other method rather than a hand shovel. The committee understands that not all methods may be acceptable in all states, municipalities or to all clients. The committee was also aware that when all else fails one could consider using a l" diameter stainless steel auger placing 5' bgs hand borings in a triangular pattern where the auger bit could be placed in between these small hand borings. The committee envisions this theme and methodology to be expanded within the upcoming training. Additional information on augering techniques will be provided in the specific training (CPDO) mentioned above.

8. I need to put borings in pristine farmland next door to a contamination zone. There are no and have never been any utilities in this area. What should I do?

Response: Once you go through the proper utility locate procedure and are confident that no utilities

exist in the subject area, you need to obtain a variance. This would also hold true for pristine forest preserves, wildlife refuges, or other areas not affected by utilities.

9. Who needs to sign off on a variance?

Response: Variances are signed by the Area Vice President (or designee, which may be delegated to the BLM for each office) along with the Project/Program Manager/Director. When we know in advance that HS308 cannot be adhered to, one should make plans to get a formal variance approval and appropriate paperwork developed two weeks prior to field activity. Variances can also be obtained when field conditions arise that make adherence to HS308 impossible. The variance can be obtained via cell phone in the field with the PM and appropriate management with the outcome noted in the field logbook followed up by an appropriate e-mail. This e-mail should be kept in the project file as proof of variance approval. It is recommended that variances be obtained as soon as it is known that they will be required.

10. What constitutes a "probe"? I assume a Geoprobe® is not valid?

Response: A Geoprobe® is NOT a valid probe in that Geoprobes® have caused damage to sewer lines and other utilities. Probes are typically made of a fiberglass-like material that have a pointed end but will not damage subsurface utilities and allows for the field staff to sense if underground items are encountered.

11. Under 5.1, is a subcontractor a designee?

Response: Although a subcontractor can make arrangements to contact dig safe and more, Shaw must ensure that the sub has, in fact, done what they had agreed to do. It should be remembered that typically on drilling projects, from many of our customer's perspective, the liability remains with Shaw, and they will look to Shaw, not our subs, for resolution of any events that occur. Hence, it is incumbent on Shaw to insure that our procedures are followed by Shaw and Shaw subs.

12. Does ground surface include concrete, asphalt or other man-made coverings?

Response: A simple NO. Some of our projects include drilling through airport runways or tarmacs which can be up to 15" in depth. Manmade surfaces do NOT count in the 5' hand dig clearance specification. If we are attempting to advance boreholes below existing concrete surfaces, the geology below the concrete will be exposed by cutting the concrete and removal of the concrete. After the concrete is removed and the geology is exposed, a hand auger can then be used. Hopefully, the twelve concerns above and the responses to these comments will have helped users understand the implementation of this HS 308 policy. More importantly the committee realizes that information on this subject will be provided during the training mentioned above. It is the committee's belief that once this program has been completely rolled out the need for variances will be minimal and the interactions of the safety department with operations management with this entire process will make ensure success.

PROCEDURE

Subject: UNDERGROUND STORAGE TANK REMOVAL

1.0 PURPOSE AND SUMMARY

This procedure prescribes the training practices and recommended work practices for underground storage tank removal. The use of work practices required by local regulations is authorized (no variance required). The project-specific Health and Safety Plan or Work Plan shall document the practices to be used at a particular site.

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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health & Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Cold Cutting

Methods of material cutting that utilize a nonelectric or nonflammable gas system, such as pneumatic chisels or drills, or a high pressure water device.

Confined Space
Normally considered to be enclosures having limited means for entry and exit, by reason of location, size, or number of openings; and unfavorable natural ventilation which could contain or produce dangerous air contaminants, flammable or explosive atmospheres, and/or oxygen deficiency. Confined spaces may include storage tanks, excavations, or trenches.

Competent Person - Excavation and Trenching
A person, such as a supervisor or engineer, who is capable of identifying existing and predictable hazards in the excavation/trenching work area and who has the authority to take prompt corrective measures to eliminate them.

Excavation
Any manmade cavity or depression in the earth's surface, including its sides, walls or faces, formed by earth removal and producing unsupported earth conditions by reasons of the excavation.

Hot Work
Any work involving burning, welding, riveting, or similar fire-producing operations, as well as work which produces a source of ignition, such as drilling, grinding, abrasive blasting, etc.

Ignition Sources
A heat source of sufficient energy to cause ignition of flammable vapors. The most commonly encountered categories of ignition sources in industry are open flames, hot surfaces, and electrical or frictional sparks.

Lead Hazard
The potential for exposure to organic (tetraethyl) lead in tanks which have been used for leaded petroleum products. Since these tanks will contain residual lead of varying concentrations, they must be regarded as dangerous to that extent the respiratory protective equipment and protective clothing must be used throughout the cleaning process. These tanks must not be considered lead-free unless indicated by lead-in-air analysis.

LEL (Lower Explosive Limit)
The minimum concentration of a combustible gas or vapor in air (usually expressed in percent by volume at sea level), which will ignite if an ignition source is present.

Oxygen Deficiency
For the purpose of this procedure, any atmosphere containing less than 20% oxygen shall be considered oxygen deficient and immediately dangerous to life and health.

Purging
The method by which gases, vapors, or other airborne impurities are displaced from a confined space. This may involve such measures as mechanical ventilation, steam ventilation, or introducing another gas, such as nitrogen or carbon dioxide, to control flammable vapors.

Qualified Person

- **Qualified Person - Confined Space**
  A person, such as a supervisor or engineer, who by reason of experience or instruction, has successfully demonstrated his ability to anticipate, recognize, and evaluate hazards to employees that may occur during underground storage tank closure projects. Training in the evaluation of employee exposure to toxic substances, confined space entry procedures, and in the use of atmospheric testing instruments is required. These training requirements can be satisfied through the successful completion of Shaw E & I's Excavation Safety, and the Hazards and Protection/Confined Space training courses.

- **Qualified Person - Excavation and Trenching**
  A person, such as an engineer, who by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience has successfully demonstrated his/her ability to design shoring, sloping/benching, or alternate systems that meet accepted regulatory and engineering requirements.

Trench
An excavation made below the surface of the ground. In general, the depth is greater than the width at the bottom, but the width of a trench at the bottom is not greater than 15 feet.

Underground Storage Tank
By regulatory definition, a tank with 10% or more of its volume below ground. Included in the volume is all piping attached to the tanks.

5.0 TEXT

Underground storage tank removal is considered a hazardous waste operation and is subject to the applicable training requirements listed in Shaw E & I Procedure HS050 Training Requirements.

This type of work is subject to significant local regulatory control, often with significant differences between jurisdictions. This procedure presents recommended practices, but authorizes use of locally required practices.

5.1 Preliminary Requirements

State or local agencies mandated to regulate the RCRA Underground Storage Tank Program shall be notified, and applicable permits obtained by the Shaw E & I Project Manager or the client.

Tank closure projects that involve trenching or excavation 5 feet or deeper and into which a person may be required to descend are subject to Shaw E & I Procedure HS307.

The project manager shall perform a site reconnaissance and confirm locations of underground storage tanks and all associated piping with the client.

Assure and record in writing that all existing utilities or other underground facilities in the work area are located before commencing excavation. Complete the Underground/Overhead Utility Checklist (Attachment 2).

Trees, boulders, poles and other surface encumbrances located at the work site shall be made safe or removed prior to initiation of the tank closure project.

Assure that construction equipment (not in transit) and personnel do not come closer than authorized to any energized overhead high voltage conductor such as electric utility lines.

5.2 Operating Requirements - Hazard Assessment

At the beginning of the project, each work shift, and as often as necessary to ensure safety, a competent person shall conduct an area survey to locate work place hazards and determine appropriate safety control measures.

Only experienced, demonstrably proficient equipment operators will be used to operate such heavy equipment as backhoes, front-end loaders, cranes, etc. Where certification or licensing requirements exist, such personnel shall possess appropriate certification and/or licensing for operating specified heavy equipment.

While operating heavy equipment in the work area, the equipment operator shall maintain communication with a designated signalman through either direct voice contact or approved, standard hand signals. In addition, all site personnel in the immediate work area shall be made aware of the equipment operations.

All equipment, such as pipe, rebar, etc., shall be kept out of traffic lanes and access ways. Equipment shall be stored so as not to endanger personnel at any time.

A flagman with roadwork vest, signs, cones, and high-level warning signs shall be provided when it is necessary to control normal vehicular traffic due to vehicles, such as end-dumps, entering or leaving the site.

5.3 Fire Safety

Hot work shall not be conducted unless all requirements of Shaw E & I Procedure HS314 Hot Work in Hazardous Locations have been met.

Cold cutting of underground storage tanks to facilitate cleaning shall only be performed under direct supervision of a qualified person.

Equipment on-site shall be bonded and grounded, spark-proof, and explosion resistant, as appropriate. Particular attention to bonding/grounding shall be made during transfer of flammable/combustible liquids into vacuum trucks and when ventilation equipment is utilized.

A fire extinguisher with a minimum rating of 10B:C shall be strategically located in the area of active work.

No smoking shall be allowed in the work area.

5.4 Underground Storage Tank Decontamination

Underground storage tanks that have been removed, but not cleaned, are considered hazardous waste. These tanks must be transported in accordance with Department of Transportation hazardous material packaging and shipping requirements, including manifesting, and taken to a permitted hazardous waste disposal site.

Minimum decontamination procedures that shall be performed to allow transportation of removed tanks under a bill of lading, disposal at a non-hazardous waste facility, or tank demolition for scrap include:

- Removal of all residual liquid material, followed by triple rinsing with an appropriate cleaning solution to remove remaining sludge and/or scale from the interior surfaces of the tank.

- Routine tank testing to determine the effectiveness of the cleansing, flushing and rinsing procedure. Residual liquid in tanks shall not be less than a pH of 3, nor greater than 11. Tanks that have contained flammable or combustible liquids shall be checked with a combustible gas indicator. Readings above 0% LEL shall require additional tank cleansing.

- A physical examination of the tank interior to confirm that the rinsing process has removed all residual material. When triple rinsing is not sufficient to remove all sludge or scale, tanks shall be entered per Shaw Environmental & Infrastructure, Inc. (Shaw E & I) Procedure HS300 Confined Spaces so that personnel can physically scrape or effectively pressure-wash interior surfaces.

- The proper handling and disposal of all rinsate or residual material which is considered to be hazardous waste, unless an analysis of the material's hazardous constituents does not warrant this action.

- An inspection and certification of cleanliness, by a certified chemist in those cities and counties requiring such credentials, for each tank that has been scraped or pressure washed, and then rinsed.

- An awareness that tank cleaning may not remove all flammable substances in the tank, such as those that have absorbed to or penetrated walls of a container, or those that are retained in seams located at the junction of walls and ends of tanks. Low readings on a combustible gas indicator do not assure that explosive conditions will not occur later under conditions that promote vaporization of such residues.

- The purging of flammable vapors within the tank, prior to transportation from a site, to levels that preclude potential explosive atmospheres, or such lower levels as may be required by the local agency. A standard method of tank purging, once all liquids have been removed, is placement of one and one-half (12) pounds of dry ice (carbon dioxide) per one hundred (100) gallons of tank liquid capacity while simultaneously sealing all tank openings except the vent(s). Nitrogen gas or other methods listed in API1604 Removal and Disposal of Used Underground Petroleum Storage Tanks may also be used to purge tanks.

- The proper disposal at a land-based facility, or demolition for reuse as scrap, of decontaminated storage tanks. Documentation shall be provided to the appropriate local regulatory agency.

5.5 Underground Storage Tank Removal

After the tank has been freed of vapors and before it is removed from the excavation, plug or cap all accessible holes. One plug should have a χ inch vent hole to prevent the tank from being subjected to excessive differential pressure caused by temperature changes. The tank should always be positioned with this vent plug on top of the tank during subsequent transport and storage.

Excavate around the tank to uncover it for removal. Remove the tank from the excavation and place it on a level surface. Use wood blocks to prevent movement of the tank after removal and prior to loading on a truck for transportation. Use screwed (boiler) plugs to plug any corrosion holes in the tank shell.

Tanks should be removed from the site as promptly as possible after vapor-freeing procedures have been completed, preferably on the day of tank removal from the excavation. If a tank remains at the site overnight or longer, additional vapor may be released from any liquid absorbed in the tank walls or residues remaining in the tank.

Before the tank is removed from the site, the tank atmosphere should be checked with a combustible gas indicator to ensure that it does not exceed 10% of the lower flammable limit.

The tank should be secured on a truck for transportation to the storage or disposal site with the χ inch vent hole located at the uppermost point on the tank. Tanks should be transported in accordance with all applicable local, state, and federal regulations.

5.6 Air Monitoring

Should chemical contaminants be present in an underground storage tank or surrounding soil, air monitoring for combustible or oxygen deficient environments, or specific toxic constituents, shall be conducted by a qualified person (see Shaw E & I Procedure HS300 Confined Spaces). Operations associated with underground storage tank closure that may require air monitoring includes:

- Excavation of soil
- Hot work or cold cutting
- Storage tank cleaning and purging
- Confined space entry
- Tank certification prior to removal from site

Additional tests shall be selected and performed to the satisfaction of the qualified person based on the recommendations of the regional Health & Safety professional. All tests shall be repeated as often as necessary to assure safety since changing conditions may result in varying atmospheric contaminant concentrations.

All work activity is prohibited in atmospheres where tests indicate that the concentration of flammable vapors is grater than 10% of the lower explosive limit (LEL), or the concentration of oxygen is less than 20% or greater than 23.5%. Positive steps, such as ventilation, shall be taken to establish acceptable atmospheric conditions prior to resumption of operations.

Tests indicating the presence of toxic contaminants in concentrations at or above the permissible explosive guidelines in the HASP mandate that work in such an atmosphere proceed only when personal protective equipment appropriate for the specific contaminants is provided to all affected associates, based on recommendations of the regional Health & Safety professional.

5.7 General Site Safety Requirements

Hearing protection shall be utilized when noise levels in the work area exceed 85 dBa, or when indicated by the Health & Safety Department.

Good housekeeping practices shall be implemented on site.

Work practices and personal protective equipment shall be used as required in the site-specific HASP.

5.8 Local Jurisdiction Requirements

Where local jurisdictions have established requirements different from those in this procedure, the more protective practices shall be utilized. No variance is required under these circumstances but the project-specific Health and Safety Plan or work plan shall fully document the alternate procedures.

6.0 EXCEPTION PROVISIONS

Exceptions shall be per the requirements of Shaw E & I Procedure HS013.

7.0 CROSS REFERENCES

API1604 Removal and Disposal of Used Underground Petroleum Tanks
HS050 Training Requirements
HS300 Confined Space Entry
HS307 Excavation and Trenching

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Underground/Overhead Utility Checklist

ATTACHMENT 1
UNDERGROUND STORAGE TANK REMOVAL

Responsibility Matrix

Action	Procedure Section	*Responsible Party*			
		Equipment Operator	**Project Manager**	**Qualified Person**	**HS**
Project-specific HASP or Work Plan shall document the practices to be used at a particular site.	1.0		X		X
State or local agencies shall be notified and applicable permits obtained.	5.1		X		
Perform site reconnaissance and confirm locations of underground storage tanks and all associated piping with client.	5.1		X		
Complete the Underground/Overhead Utility Checklist.	5.1		X		
A competent person shall conduct an area survey to locate workplace hazards and determine appropriate safety control measures.	5.2			X	
Only experienced, demonstrably proficient equipment operators will be used to operate such heavy equipment as backhoes, front-end loaders, cranes, etc.	5.2	X			
The equipment operator shall maintain communication with a designated signalman through either direct voice contact or approved, standard hand signals.	5.2	X			
A flagman with roadwork vest, signs, cones, and high-level warring signs shall be provided when necessary.	5.2		X		
Fire extinguisher with a minimum rating of 10B:C shall be strategically located.	5.3		X		
Decontamination procedures shall be performed.	5.4		X		X
Air monitoring shall be conducted by a qualified person (see HS300).	5.6			X	

ATTACHMENT 2
UNDERGROUND/OVERHEAD UTILITY CHECKLIST

Project Name/Number_____ **Date**_____

Location_____

This checklist must be completed for any intrusive subsurface work such as excavating or drilling. It records the fact that all underground and overhead structures and utilities in the work area are identified and located. The Project Manager must request utility markouts before the start of field operations to allow the client and utility companies time to complete them. If complete information is not available, a magnetometer survey must be performed to locate obstacles prior to excavating or drilling.

PROCEDURE:

A diagram of the project area depicting the proposed location of excavation or drilling sites must be attached to this Health and Safety Plan. The diagram must clearly indicate the areas checked for underground structures/utilities and overhead power lines. This form and the diagram must be signed by the Project Manager, the Shaw E & I Field Supervisor, and the client representative (if applicable).

CHECKLIST:

TYPE OF STRUCTURE	PRESENT	NOT PRESENT	METHOD OF MARKOUT
Electric Power Line			
Natural Gas Line			
Telephone Line			
Water Line			
Product Line			
Steam Line			
Sewer Line			
Drain Line			
Underground Tank			
Overhead Power Line			
Overhead Product Line			
Septic Tank/Drain			

Client Representative_____ _____
(If applicable) (Signature) (Date)

Shaw E & I Project Manager_____ _____
(Signature) (Date)

Shaw E & I Field Supervisor_____ _____
(Signature) (Date)

PROCEDURE

Subject: **Electrical Safety**

1.0 PURPOSE AND SUMMARY

The Electrical Safety program is designed to prevent electrically related injuries and property damage. This program also provides for proper training of maintenance employees to ensure they have the requisite knowledge and understanding of electrical work practices and procedures. Only employees qualified in this program may conduct adjustment, repair or replacement of electrical components or equipment. Electricity has long been recognized as a serious workplace hazard, exposing employees to such dangers as electric shock, electrocution, fires and explosions. References: NFPA 70E, Electrical Safety Requirements for Employee Workplaces, National Electrical Code (NEC) and OSHA Standard (Electrical Safety) 29 CFR 1910.331 to 1910.339

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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Disconnecting Means is a switch that is used to disconnect the conductors of a circuit from the source of electric current. Disconnect switches are important because they enable a circuit to be opened, stopping the flow of electricity, and thus can effectively protect workers and equipment.

Electrical Circuits are defined as devices specifically designed to connect, disconnect or reverse circuits under a power load condition.

Qualified Worker: An employee trained and authorized to conduct electrical work.

Unqualified/Nonqualified: Employees who have not been trained or authorized by management to conduct electrical work.

5.0 HAZARD CONTROL

5.1 Engineering Controls

- All electrical distribution panels, breakers, disconnects, switches, junction boxes shall be completely enclosed.
- Water tight enclosure shall be used where there is possibility of moisture entry either from operations or weather exposure.
- Electrical distribution areas will be guarded against accidental damage by locating in specifically designed rooms, use of substantial guard posts and rails and other structural means.
- A clear approach and 3 foot side clearance shall be maintained for all distribution panels.
- All conduit shall be fully supported throughout it's length. Non-electrical attachments to conduit is prohibited.
- All non-rigid cords shall be provided strain relief where necessary.

5.2 Administrative Controls

- Only trained and authorized employees may conduct repairs to electrical equipment.
- Contractors performing electrical work must be hold a license for the rated work.

- Areas under new installation or repair will be sufficiently guarded with physical barriers and warning signs to prevent unauthorized entry.
- Access to electrical distribution rooms is limited to those employees who have a need to enter.
- All electrical control devices shall be properly labeled.
- Work on energized circuits is prohibited unless specifically authorized by senior facility management.

5.3 Protective Equipment

- Qualified employees will wear electrically rated safety shoed/boots.
- All tools used for electrical work shall be properly insulated.
- Electrical rated gloves shall be available for work on electrical equipment.
- Electrically rated matting will be installed in front of all distribution panels in electric utility rooms.

6.0 ELECTRICAL EQUIPMENT

6.1 Examination

- Electrical equipment shall be free from recognized hazards that are likely to cause death or serious physical harm to employees. Safety of equipment shall be determined using the following considerations:
- Mechanical strength and durability, including, for parts designed to enclose and protect other equipment, the adequacy of the protection thus provided.
- Electrical insulation.
- Heating effects under conditions of use.
- Arcing effects.
- Classification by type, size, voltage, current capacity, and specific use.
- Other factors which contribute to the practical safeguarding of employees using or likely to come in contact with the equipment.

6.2 Identification of Disconnecting Means and Circuits

Each disconnecting means for motors and appliances shall be legibly marked to indicate its purpose. Each service, feeder, and branch circuit, at its disconnecting means or over current device, shall be legibly marked to indicate its purpose. These markings shall be of sufficient durability to withstand the environment involved.

Each disconnect switch or over current device required for a service, feeder, or branch circuit must be clearly labeled to indicate the circuit's function, and the label or marking should be located at the point where the circuit originates. For example, on a panel that controls several motors or on a motor control center, each disconnect must be clearly marked to indicate the motor to which each circuit is connected. All labels and markings must be durable enough to withstand weather, chemicals, heat, corrosion, or any other environment to which they may be exposed.

7.0 TRAINING

7.1 Training for Unqualified Employees

Training for Unqualified Employees is general electrical safety precautions to provide an awareness and understanding of electrical hazards.

Electrical Safety Rules for Non-Qualified Workers

- Do not conduct any repairs to electrical equipment
- Report all electrical deficiencies to your supervisor
- Do not operate equipment if you suspect and electrical problem
- Water and electricity do not mix.
- Even low voltages can kill or injure you
- Do not use cords or plugs if the ground prong is missing
- Do not overload electrical receptacles

7.2 Training for Qualified Employees

Training for Qualified Employees includes specific equipment procedures and requirements of:
Electrical Safety, 29 CFR 1910.331 to 1910.339

8.0 POWERED EQUIPMENT SAFETY RULES

Electrical equipment is defined as cord or plug-type electrical devices which includes the use of flexible or extension cords. Examples of portable electrical equipment
included powered hand tools, powered bench tools, fans, radios, etc. The following safety rules apply to portable electrical equipment (PEE):

- PEE shall be handled in such a manner as to not cause damage. Power cords may not be stapled or otherwise hung in a way that may cause damage to the outer jacket or insulation.
- PEE shall be visually inspected for damage, wear, cracked or spilt outer jackets or insulation, etc., before use or before each shift. PEE that remain connected once put in place need not be inspected until relocated. Any defects; such as cracked or split outer jackets or insulation must be repaired, replaced or placed out of service.
- Always check the compatibility of cord sets and receptacles for proper use.
- Ground type cord sets may only be used with ground type receptacles when used with equipment requiring a ground type conductor.
- Attachment plugs and receptacle may not be altered or connected in a way that would prevent the proper continuity of the equipment grounding conductor. Adapters may not be used if they interrupt the continuity of the grounding conductor.
- Only portable electrical equipment that is double insulated or designed for use in areas that are wet or likely to contact conductive liquids may be used.
- Employees that are wet or have wet hands may not handle PEEs (plug-in, un-plug, etc.).
- Locking-type connectors shall be properly secured after connection to a power source.

9.0 ELECTRICAL CIRCUIT SAFETY PROCEDURES

When these circuits are employed, the following rules apply:

- Cable connectors (not of load-break type) fuses, terminal plugs or cable splice connectors may not be used, unless an emergency, to connect, disconnect or reverse in place of proper electrical circuits.
- After a protective circuit is disconnected or opened, it may not be connected or closed until it has been determined that the equipment and circuit can be safely energized.
- Over current protectors of circuits or connected circuits may not be modified,

even on a temporary basis, beyond the installation safety requirements.

- Only Qualified Employees may perform test on electrical circuits or equipment.
- Test equipment and all associated test leads, cables, power cords, probes and connectors shall be visually inspected for external damage before use.
- Any damage or defects shall be reported to supervision and placed out of service or replaced.
- Test equipment shall be rated to meet or exceed the voltage being tested and fit for the environment in which it is being used.
- Where flammable or ignitable materials are stored, even occasionally, electrical equipment capable of igniting them may not be used unless measures are taken to prevent hazardous conditions from developing.

10.0 ATTACHMENTS

1. Responsibility Matrix

ATTACHMENT 1
ELECTRICAL SAFETY

RESPONSIBILITY MATRIX

Action	Procedure Section	*Responsible Party*			
		Project/Location Manager	**Project/ Location Supervisors**	**Health and Safety Representative**	**Director of Health and Safety**
Issue, Revise, and Maintain Procedure	3.1				X
Verify Compliance With All Hazard Controls	5.1 5.2 5.3	X		X	
Ensure Equipment is Free of Recognized Hazards	6.1 6.2	X	X		
Maintain Training Records	7.1 7.2			X	

PROCEDURE

Subject: FIRE PROTECTION

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to establish the guidelines for the proper selection and use of portable fire extinguishers. The various types of fire extinguishers are listed as well as there use.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 TEXT

The four factors for, a fire is heat, fuel, oxygen, and chain reaction. Removal of any one of the four will extinguish a fire. Fire extinguishers cool, smoother, or inhibit chemical chain reaction. Another method is to remove or shut off the fuel supply.

There are many models, sizes, and makes of fire extinguishers; some are for general use and some for specific purposes. Their portability and availability ensure that fire extinguishers are quick, effective deterrents against fires.

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4.1.1 Classification of Fires

- Class A fires occur in wood, rubber, paper, cloth, and most plastics. The most effective type of extinguishing agent is one using water or solutions containing large concentrations of water, because the "quenching-cooling" effect reduces the temperature of the burning material below its ignition temperature. Fire extinguishers suitable for this type of fire are designated with the classification "A" on the label.

- Class B fires occur in flammable or combustible liquids such as petroleum products and greases. A "blanketing-smothering" effect of an agent that excludes oxygen or inhibits the chemical chain reaction is the most effective. Extinguishers labeled "Class B" employ carbon dioxide, dry chemical, Halon, or foam.

- Class C fires involve energized electrical equipment. The extinguishing agent must be nonconductive. Carbon dioxide, dry chemical and Halon are the normal types used for electrical fires.

- Class D fires involve combustible metals such as aluminum, magnesium, zirconium, and titanium. The use of water and some of the other conventional types of extinguishing agents are ineffective and may even cause a violent reaction. These fires can be extinguished with specially prepared agents. Where these hazards exist, extinguishing agents with the "D" class rating should be provided.

4.1.2 Type of Fire Extinguishers

The following types of fire extinguishers are used for Class A, B, C, and D fires:

- Water - May be stored pressure, or cartridge operated. These are to be used on Class A fires only by themselves. They may also be used for cooling purposes in combination with other fires, but never on electrical fires or flammable liquids. Water extinguishers must be protected against freezing. Stored pressure type is recommended.

- Foam - May be used on Class A and B fires only. They must be protected against freezing from temperatures below 40^0F, and antifreeze solutions may not be used.

- Carbon Dioxide - May be used on Class B and C fires, and may be effective on small surface Class A fires.

- Dry Chemical - May be used on Class B and C fires. Many multipurpose types are effective on Class A fires and these are highly recommended.

- Special Extinguishers may be used on Class D fires.

- Water and foam extinguishers will reach approximately 25-35 ft; carbon dioxide has a range of about 5-ft, and dry chemical will reach from 5 ft to 20 ft depending upon size.
  The effectiveness of carbon dioxide and dry chemical fire extinguishers is decreased in windy conditions.

4.1.3 Fire Extinguisher Operation

Directions for fire extinguisher operation are printed on the nameplate. When indoor, a safe and clear means of exit shall be maintained at all times. Fires shall be fought from upwind of the smoke and fumes, extinguishing at the base of the fire and working up. After a fire is put out, a watchman should stand by for possible re-ignition until it has cooled.

4.1.4 Specific Location Requirements

Normally, each site shall be protected by 5 lb. dry chemical Class A, B, and C; 10 lb. dry chemical Class A, B, and C; in the following locations:

- Each floor or elevation at each exit - 10 lb. dry chemical, Class A, B, C
- In each shop at each door - 10 lb. dry chemical, Class A, B, C
- Trucks used over the road - 5 lb. dry chemical, Class A, B, C
- Gasoline air compressors - 5 lb. dry chemical, Class A, B, C
- Cranes - 5 lb. dry chemical, Class A, B, C
- Gasoline welding machines - 5 lb. dry chemical, Class A, B, C
- Gasoline powered pumps - 5 lb. dry chemical, Class A, B, C
- Nelson heaters (and similar) - 10 lb. dry chemical, Class A, B, C
- Gasoline powered generators -5 lb. dry chemical, Class A, B, C
- Gasoline pumps (fuel) - 10 lb. dry chemical, Class A, B, C (25 ft to each side)
- Flammable liquid storage - 10 lb. dry chemical, Class A, B, C (number as needed)
- Not more than 30 ft from any welding or burning area - 10 lb. dry chemical, Class A, B, C (one could serve 3 or 4 welders in the same area)

Special cases not covered in this procedure shall be reviewed with the Safety Representative for possible use of other types of extinguishers.

4.1.5 Inspection of Equipment

All portable fire extinguishers shall be subjected to an annual maintenance check. Stored pressure extinguishers do not require an internal examination. All of the annual maintenance records shall include, the date, and retain this record for one year after the last entry or the life of the shell, whichever is less.

4.1.6 Training

This procedure applies to all Shaw personnel and subcontractors working where portable fire extinguisher requirements are applicable. As such an educational program which familiarize employees with the general principles of fire extinguishers use and the hazards involved with incipient stage fire fighting shall be performed upon initial employment and at least annually thereafter.

5.0 EXCEPTION PROVISION

Variances and exceptions may be requested following the provisions of Procedure HS013, Health and Safety Procedure Variances

6.0 CROSS REFERENCES

Title 29, Code of Federal Regulations, Parts 1910 and 1926, *Occupational Safety and Health Administration* (OSHA), U.S. Department of Labor.

National Fire Protection Association (NFPA), National Fire Codes.

7.0 ATTACHMENTS

1. Responsibility Matrix

ATTACHMENT 1
FIRE PROTECTION PROGRAM

RESPONSIBILITY MATRIX

Action	Procedure Section	*Responsible Party*		
		Project/Location Supervisor	**Health and Safety Representative**	**Director of Health and Safety**
Issue, Revise, and Maintain Procedure	3.1			X
Ensure Adequate Fire Protection is Available.	4.1.1 4.1.2	X		
Identify Areas Which Require Fire Protection	4.1.4	X		
Maintain Current Inspections	4.1.5		X	
Provide Training			X	

PROCEDURE

Subject: HOT WORK

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to establish guidelines for company hot work activities. The type of hot work activities covered by this procedure include all spark- or flame-producing operations capable of initiating a fire or explosion. These activities may include welding, braising, cutting, grinding, etc.

Some clients may have requirements that differ from those contained in this procedure. In such circumstances, the more protective requirements will be followed.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Company - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

5.0 TEXT

5.1 Supervisor Responsibilities

Based on fire/explosion potentials, project/location supervisors are to establish approved areas for welding, cutting, and other types of hot work. The supervisor will be aware of the hazards involved and familiar with the provisions of this procedure, and may delegate his/her responsibilities to a qualified employee.

The supervisor will ensure that cutters or welders are properly trained in the safe operation of their equipment, the safe use of the process, the requirements of this procedure, and emergency procedures. Only approved apparatus, such as torches, manifolds, regulators or pressure-reducing valves, and acetylene generators will be used by company employees and contractor personnel.

Only those contractors who have suitably qualified personnel to perform welding, cutting, and other types of hot work will be utilized. These contractors will be advised about specified hot work areas and hazardous locations where special procedures for hot work are necessary.

5.2 Fire Prevention Precautions

Hot work will only be permitted in areas that are or have been made firesafe. This can be achieved by using a specific area designed or approved for such work, such as a maintenance shop or a detached outside location which will be of noncombustible or fire-resistive construction, essentially free of combustible and flammable contents, and suitably segregated from adjacent areas. When work cannot be relocated, the area will be made firesafe by removing combustibles or protecting combustibles from ignition sources.

Hot work will NOT be permitted in the following situations unless specific approval is given by a health and safety representative:

- In the presence of a potentially explosive atmosphere (mixtures of flammable gases, vapors, liquids, or dusts with air), or inside drums, tanks, or other containers, and equipment in which an explosive atmosphere may develop.

- In any area where combustible gases are in excess of ten percent (10%) of the lower explosive limit (LEL).

- On storage or process vessels or lines which contain or have contained flammable or combustible liquids, gases, vapors, or solids.

5.3 Preparation for Hot Work

Before hot work is permitted, the area will be inspected by a supervisor to ensure that the following requirements have been met:

- Equipment will be in safe operating condition and in good repair.
- Where practical, all combustible material will be relocated at least 35 feet horizontally from the area of work. Where relocation is impractical, combustibles will be protected with flame-proofed covers or otherwise shielded.
- Openings or cracks in walls, floors, or ducts within 35 feet of the area of hot work will be tightly covered to prevent the passage of sparks to adjacent areas.
- Where cutting or welding is to be done near walls, partitions, ceiling, or roof of combustible construction, fire-resistant shields or guards will be provided to prevent ignition. If welding is to be done on a metal wall, partition, ceiling, or roof, precautions will be taken to prevent ignition of combustibles on the other side, due to conduction or radiation.
- Fully charged and operable fire extinguishers, appropriate for the type of possible fire, will be available at the work area. Where fire hose lines are available, they will be connected and ready for use.
- Fire watchers will be required whenever hot work is performed in hazardous locations or when specified by the supervisor.
- Combustible gas readings will be taken in areas where combustible gases and vapors may exist.
- The work area is free of toxic contaminants at concentrations in excess of established threshold limit values, or all personnel who will work in the area have been provided respiratory protective devices and protective apparel appropriate for the degree of exposure.
- Prior to performing hot work on painted surfaces, a lead-based paint survey will be conducted.
- If hot work requires entry into a confined space, all provisions of Procedure HS300, Confined Spaces, will be met.
- When hot work is to be performed on tanks or other vessels that contain or have contained flammable or combustible liquids, the vessel will be properly isolated, purged, or inerted, as appropriate, to reduce the concentrations of flammable and toxic air contaminants to safe levels.

- When hot work is to be performed on the bottoms of tanks or other vessels that are not supported above grade, special procedures will be followed due to the possible entrapment of flammable liquids or vapors beneath the tank. For vessels that have at one time contained flammable materials, refer to APreparing Tank Bottoms for Hot Work,≅ Petroleum Safety Data 2207, American Petroleum Institute. Work will be performed on stationary tank bottoms only when personnel have become familiar with this reference and are prepared to follow the outlined procedures.

5.4 Hot Work Permit

When the supervisor is satisfied that all the requirements in the preceding section have been met, the Hot Work Permit (Attachment 2) will be completed, reviewed with employees who will perform the hot work, and maintained near the work area. The Hot Work Permit is good only for the date issued, and is valid only for the shift for which it is issued.

If at any time during the hot work operation a change in conditions at the work area is suspected, such as release of flammable gases or vapors, work will be stopped immediately and the supervisor will be notified. Such work stoppage invalidates the Hot Work Permit, and a new permit will be completed after inspections and tests have been performed by a supervisor.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS300 Confined Spaces

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Hot Work Permit

ATTACHMENT 1
HOT WORK

Responsibility Matrix

Action	Procedure Section	*Responsible Party*		
		Project/Location Supervisor	**Health and Safety Representative**	**Director of Health and Safety**
Issuance, Revision, and Maintenance of Procedure	3.1			X
Establish Approved Areas for Hot Work	5.1	X		
Ensure Employees Conducting Hot Work are Qualified	5.1	X		
Approve Hot Work in Hazardous Locations	5.2		X	
Inspect Hot Work Areas	5.3	X		
Complete Hot Work Permit	5.4	X		

ATTACHMENT 2
HOT WORK PERMIT

Project Name _____ Project No. _____

Good for This Date Only _____/_____/_____ Time: From _____AM/PM To _____AM/PM

Hot Work Area _____

Specific Work to be Done _____

Personal Protective Equipment Required: _____

_____

_____

Emergency Equipment Required: _____

_____

CHECKLIST	INITIAL: YES	INITIAL: DOES NOT APPLY
Area personnel have been informed of work to be performed.		
All tanks, lines, valves are disconnected, blinded, or blocked out.		
Electrical service has been locked out and tagged.		
Equipment and all attached piping has been cleaned and purged with (check blank): Water _____ Steam _____ Inert Gas _____ Air _____		
All grounding/bonding wire in place.		
Surrounding equipment and operations are safe for hot work.		
No open vessels, lines, or combustible items within 35 feet of hot work area.		
Fully charged and appropriate fire extinguisher easily accessible.		
Fire watch has been provided.		
No flammable gases greater than 10% LEL in hot work area.		
Compressed gas cylinders kept upright and secured.		
Air monitoring required.		

AIR MONITORING (If Required)						
EXACT LOCATION OF TEST	**TIME**	**% LOWER EXPLOSIVE LIMIT**	**% OXYGEN**	**OTHER TEST _____**	**OTHER TEST _____**	**INITIAL**

Special Instructions: _____

_____

_____

Completed By: _____ _____ _____

Printed Name Signature Date

PROCEDURE

Subject: CONTROL OF HAZARDOUS ENERGY AND HAZARDOUS MATERIAL SOURCES (LOCKOUT/TAGOUT)

1.0 PURPOSE AND SUMMARY

This procedure establishes the minimum requirements for the lockout and tagout of energy and hazardous material sources and must be used to:

- Ensure that all machinery, equipment, or confined spaces are isolated from all potential hazard sources (mechanical, electric, chemical hazards, etc.) and are locked out and tagged out prior to employees performing any servicing, maintenance, or entry activities.
- Ensure that field projects where hazardous energy/material sources are present develop a site-specific Lockout/Tagout procedure.
- Ensure that equipment can accommodate locks. Additional means such as a tagout program may be used to ensure safety when locks are not used.
- Establish procedures for release of the Lockout/Tagout that include machine inspections, notification and safe positioning of workers, and removal of the Lock/Tag.
- Ensure the use of standardized locks and tags that identify the worker using them, making sure that locks and tags are of sufficient quality and durability to ensure their effectiveness.
- Provide the necessary employee training.

For a basic overview of the Lockout/Tagout System refer to the "Flow Diagram - Overview: Lockout/Tagout System" (Attachment 2).

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedures Responsibility

The Director of Health & Safety is responsible for the issuance, revision and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Affected Employee - An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout and tagout, or whose job requires the employee to work in an area in which isolation of hazards is necessary to provide a safe workplace.

Authorized Employee - A person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. An affected employee becomes an authorized employee when that employee's duties include performing servicing or maintenance.

Blanking or Blinding - The absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or skillet blind) that completely covers the bore, and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

Capable of Being Locked Out - An energy/hazard isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be

affixed, or it has a locking mechanism built into it. Other energy isolating devices are capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy/hazard isolating device or permanently alter its energy control capability.

Double Valve and Vent - A valve arrangement in a piping system in which three valves are arranged in conjunction with a vent line. One valve is upstream of the vent, another downstream, and one is on the vent itself. To isolate the downstream system, the vent valve is opened, the other two are closed, and all three valves are locked in this position.

Energized - Connected to an energy source or containing residual or stored energy.

Energy Isolating Device - A mechanical device that physically prevents the transmission or release or energy, including but not limited to the following: A manually operated electrical circuit breaker, a disconnect switch, a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors and, in addition, no pole can be operated independently; a line valve; a block; and any similar device used to block or isolate energy. Push buttons, selector switches and other control circuit type devices are not energy isolating devices.

Energy Source - Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

Group Lock Box - A device capable of holding and securing the key or other release mechanism for a group lock, which can accomodate the individual locks from all members of the work crew.

Hot Tap - A procedure used in repair, maintenance, and service activities which involves welding on a piece of equipment (pipeline, vessel or tank) under pressure, in order to install connections or appurtenances. It is commonly used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems.

Lockout - The placement of an energy/hazard isolating device, in accordance with an established procedure, which ensures that the equipment being controlled cannot be operated until the device is removed.

Lockout Device - A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy/hazard isolating device in the safe position and prevent the energization of a machine or equipment. This includes blank flanges and bolted slip blinds.

Normal Production Operations - The utilization of a machine or equipment to perform its intended production function.

Qualified Employee - An employee whose skills and training meet or exceed 29 CFR 1910.332(b)(3) for work on or near exposed energized parts must, at a minimum, be trained in

and familiar with the skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment; to determine the nominal voltage of exposed lines; and the clearance distances to which the qualified persons will be exposed.

Servicing and/or Maintenance - Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or unjamming machines or equipment, making adjustments or tool changes, where the employee may be exposed to an unexpected energization or start-up of the equipment, or release of hazardous energy/or material.

Setting-up - Any work performed to prepare a machine or equipment to perform its normal production operation.

Tagout - The placement of a tagout device on an energy/hazard isolation device, in accordance with an established procedure, to indicate that the device and the equipment being controlled may not be operated until the tagout device is removed.

Tagout Device - A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolation device in accordance with an established procedure, that indicates that the device and the equipment being controlled may not be operated until the tagout device is removed.

5.0 TEXT

5.1 Scope/Application

This procedure covers any activity which requires isolation of a source of energy or hazardous material, such as, the servicing and maintenance of equipment and confined space entry. It outlines methods to prevent the unexpected energization or start-up of the equipment, or release of stored energy or material that could cause injury to employees. For any projects planned for more than 30 days with lockout/tagout planned for more than seven calendar days or when locking/tagging out specialized equipment having its own lockout requirements, a site-specific/equipment specific plan must be developed and incorporated as part of the Site-Specific Health and Safety Plan. Otherwise Attachments 4-7 (discussed later in text) must be utilized to document lockout/tagout.

In situations where our client has specific lockout/tagout requirements, Shaw Environmental & Infrastructure, Inc. (Shaw E & I) personnel can follow client procedures after an Shaw E & I health and safety professional has approved them as being at least as protective as Shaw E & I procedures. In such cases, the client procedures shall be incorporated into the Shaw E & I health and safety plan and all affected employees trained on these procedures.

5.1.1 Exclusions. Normal operations including repetitive, routine minor adjustments that do not require removal of equipment guarding.

When work is conducted on equipment where an employee has direct control over the cord(s) or plug(s) connected to the associated equipment.

5.1.2 References. OSHA General Industry Standard, 29 CFR 1910.147, The Control of Hazardous Energy (Lockout/Tagout), 29 CFR 1910.146, Permit-Required Confined Spaces, and 29 CFR1910.331-335, Safety-Related Work Practices.

5.2 Responsibility

Each new, transferred, authorized or affected employee and other employees whose work operations are or may be in an area where lockout/tagout procedures are utilized must be instructed in the purpose and use of this lockout/tagout procedure.

- **All Personnel**
  All site personnel will be responsible for continuous adherence to the health and safety procedures during the performance of assigned work. In no case may work be performed in a manner that conflicts with the intent of this procedure.

- **Authorized Employee**
  The authorized employee, or his/her designee, is responsible for reviewing the planned activities prior to commencement of work and confirming that the maintenance manager or his designee of the particular facility where the work is to be accomplished is made aware of the nature and extent of the work and when it is to commence.

- **Site Supervisor**
  The site supervisor is responsible for verifying that all proper lockout/tagout procedures have been followed. The site supervisor must ensure that the power disconnects, appropriate attachment of locks and tags, and proper documentation of the procedure are implemented. He/she is also the designated custodian and controller for all locks, tags, and group lock boxes issued to authorized employees.

- **Subcontractors, Visitors and Other On-Site Personnel**
  Subcontractors are responsible for the health and safety of their employees and for complying with the requirements established by the site Health & Safety Plan. All Shaw E & I subcontractors and visitors are responsible to the Shaw E & I site supervisor.

- **Site Health and Safety Coordinator**
  The health and safety coordinator will assist in compliance with the other applicable company policies and procedures, and the Health and Safety Plan.

5.3 Procedures for Lockout/Tagout

Lockout and tagout devices must be capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected.

Locks are to be used when a machine, equipment, or piping system is capable of being locked out. All locks must be accompanied by a tag to indicate the name of the employee applying the lockout device and warn against the hazard if the valve is opened, or the machine/equipment is energized. A legend such as "This lock and tag to be removed only by authorized personnel" with an additional message: "Do Not Start," "Do Not Open," "Do Not Close," "Do Not Energize," or "Do Not Operate" must be utilized.

All tags and their means of attachment must be sturdy enough to prevent inadvertent removal. The tag attachment will be attachable by hand, self-locking, non-releasable, and non-reusable, with a minimum unlocking strength of not less than 50 pounds. Tags must be durable and not deteriorate from exposure to weather conditions and corrosive environments or cause the message on the tag (hand-written or pre-existing) to become illegible. Lockout and tagout devices must be singularly identified; must be the only device(s) used for controlling energy; and must not be used for other purposes.

All equipment must be designed with a hazardous energy/material isolating device as a means of protection for the employee against injury during repairs. **All new equipment installed must be designed to accept a lockout device**.

Authorized padlocks will be assigned to each authorized employee. Each group's lock will be individually keyed and the supervisor on each shift will maintain possession of the master key for these padlocks. The specific project must provide a sufficient number of locks for each employee on site.

All tags must contain the authorized employee name, date of application of the lock, equipment name or number and the reason for lockout. The tag must be attached to the lockout device.

On any equipment that can start automatically, the main disconnect must be switched to the "off" position, locked, and tagged by the authorized employee. This switch must be turned off before opening the main power disconnect and remain off until the disconnect is closed. Locking out 220v, 440v and other equipment must always be done at the main feed or starter panel.

All hazardous material lines must be blanked, blinded, or double valve and vent locked to prevent release of hazardous material.

Blanking or blinding of hazardous material lines are preferable to the double valve and vent technique. All blanks and blinds must be identified with tags in the same manner as locks.

A "Lockout Log" (Attachment 3) must be maintained by the site supervisor. This log must be included in the Health and Safety Plan.

5.3.1 Lockout/Tagout Overview

- Check equipment file for specific lockout/tagout procedures.
- Determine the requirements for lockout. If there is more than one energy source to the equipment, document each source.
- Conduct a survey to locate and identify all energy isolation devices that apply to the equipment.
- Use the equipment type-specific procedures as outlined in Attachments 4-7, if applicable. Complete the "Lockout/Tagout Procedure for Specific Equipment" form (Attachment 8) logging all data and return to the site-supervisor.
- Shut off energy source(s) to affected equipment.
- Affix lock(s) and tag(s) to each energy source controlling device.
- Identify work on process lines or vessels and determine isolation requirements.
- Blind, blank, disconnect, or double valve and vent all hazardous material lines, including steam, and identify the isolation points with tags.
- When only tag is used because machine or equipment can't be locked out, the following steps must be taken: Remove fuses, block machine, etc. and complete the "Lockout/Tagout Procedure for Specific Equipment" form (Attachment 8) and give to the site supervisor for the record.
- Stored energy - Relieve all stored energy from capacitor banks, springs, compressed air, hydraulic, steam, etc.
- Verify isolation of energy has occurred by attempting to activate equipment by using the on/off switch.
- Return control switch to "off" position before proceeding with work.

5.3.2 Removal of Lockout/Tagout

- Ensure that nonessential items, such as tools, etc., are removed from equipment.
- Ensure that equipment components are intact.
- Check work area to ensure that all employees are safely positioned or removed from the area.
- Notify all affected employees and site supervisor before re-energizing the equipment.
- Remove lockout/tagout device.
- Re-energize equipment or open valves and restore flow in process line, place back in into service.

5.3.3 Preparation for Confined Space Entry

1. Refer to Shaw E & I Procedures HS300, HS301, or HS302 for Confined Space Entry.
2. Blank or blind piping, identify with tags.
3. Misalign or remove sections of lines, pipes, or ducts, identify with tags.
4. Double valve and vent system, identify with tags.
5. Lockout or tagout all sources of energy.
6. Block or disconnect all mechanical linkages.

If it is impossible or impractical to lockout a piece of equipment, the site supervisor, H&S Professional, and the Maintenance Engineer of the facility must approve a method to make the equipment safe before any activities beyond normal operations of the equipment are performed. This can be done by disconnecting wiring, removing fuses, disconnecting or blanking supply lines, etc. "Danger - Do Not Operate" tags must be used to describe the condition.

The practice of permitting a person to place or remove a lock for someone else is prohibited. No employee can be sure he/she is safe until he/she places their own lock correctly.

5.4 Safety Audit

5.4.1 Verification Audit. A periodic audit of the lockout/tagout system must be performed to ensure that the requirements of this procedure are being implemented. The audit will be conducted by authorized and qualified employees

other than the ones(s) utilizing the procedurebeing inspected. Any deficiencies that are observed must be corrected immediately. For each project, the site-supervisor will be responsible for daily audits of lockout/tagout systems to ensure proper installation of locks and tags to the equipment and adherence to the appropriate procedures.

Where lockout or tagout is used for energy control, the periodic inspection must include a review, between the inspector and each authorized employee, of that employee's responsibilities under the energy control procedure being inspected.

5.4.2 Follow-up Audit. A follow-up audit must be conducted to ensure that all deficiencies noted have been corrected.

5.4.3 Documentation. Audit documentation must identify the machine or equipment on which the lockout procedure is being utilized, the date of the inspection, employees interviewed and employee(s) performing the inspection. The audit results must be provided to the Health & Safety Department to be documented as being performed.

5.5 Training

Training must be provided to ensure that the purpose and function of the energy control program are understood by employees, and that the knowledge and skills required for the safe application, usage, and removal of the energy controls are acquired by employees.

- Each authorized employee must receive training in the recognition of applicable hazardous energy/material sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for isolation and control.

- All affected employees must be instructed in the purpose and use of the lock and tag system.

- All other employees (including new hires) whose work operations are or may be in an area where lockout/tagout may be utilized, must be instructed about the procedure, and the prohibition relating to attempts to restart or re-energize machines or equipment that are locked out or tagged out.

- Retraining must be conducted for all authorized and affected employees whenever there is a change in job assignment, change in equipment, changes in a process that presents a new hazard or there is a change in the lockout/tagout procedure. Retraining must also be conducted whenever there is significant evidence, based on the periodic audits, indicating employee deviation from, or lack of understanding of, the lockout/tagout procedure.

- Employee site-specific training must be documented to ensure that it has beenaccomplished and is being kept up to date. The documentation must contain each employee's name and dates of training.

Documentation of employee training and retraining must be maintained and kept up to date by the Shaw E & I H&S representative and forwarded to the Shaw E & I Training Department.

5.6 Shift or Personnel Changes

Specific procedures must be utilized during shift or personnel changes to ensure the continuity of lockout or tagout protection. These must include provision for the orderly transfer of lockout or tagout device protection between off-going and oncoming employees to minimize exposure to hazards from the unexpected energization or start-up of the machine or equipment or the release of stored energy. All site-specific locks in place must be covered in the tailgate safety meetings on each shift.

All individual lock(s) of the outgoing shift working on equipment will be removed and replaced by the on-coming shift's individual lock(s). The authorized employees of the on-coming shift must inspect and "try" the system to ensure de-energization.

The site supervisor must re-audit the system as necessary.

5.7 Troubleshooting

Special precautions must be observed when the authorized employee must perform maintenance troubleshooting tasks with energized equipment. This function requires added caution and communications between all other affected employees to ensure employee protection.

An authorized employee must identify all start-stop locations and circuit breakers for disconnecting equipment. All other affected employees must be kept informed throughout the testing and troubleshooting. If the job is left incomplete, the authorized employee must install his/her individual lock and tag before leaving the job.

The following sequence must be followed when troubleshooting any equipment:

1. Written approval including detailed work plan, must be obtained from the site supervisor and H&S Professional to ensure that troubleshooting can be performed safely.

2. Inspect and clear machine or equipment of all tools and unnecessary materials.

3. Ensure that all affected employees are positioned out of the way of machine activation. Instruct all affected employees in the procedures that must be followed, the potential hazards that may exist, and the safety precautions that have been taken. Document this training on the Tailgate Safety meeting form.
4. Remove the lockout and tagout devices.

5. Energize and proceed with the troubleshooting, testing or positioning of the machine or equipment.

6. De-energize, reapply all lockout and tagout devices and "try" the system to ensure de-energization or place machine back into service.

5.8 Group Lockout/Tagout

When servicing and/or maintenance is performed by a crew, craft, department or other group, the work crew must use a procedure which affords the employees a level of protection equivalent to that provided by the implementation of a personal lockout or tagout device.

- Primary responsibility is vested in an authorized employee for a set number of employees working under the protection of a group lockout or tagout device.

- Provision for the authorized employee to ascertain the exposure status of individual group members with regard to the lockout or tagout of the machine or equipment; and

- When more than one crew, craft, department, etc. is involved, assignment of overall job-associated lockout or tagout control responsibility to an authorized employee to coordinate affected work forces and ensure continuity of protection; and

- Each authorized employee must affix a personal lockout or tagout device to the group lockout device, group lockbox, or comparable mechanism when he or she begins work, and must remove those devices when he or she stops working on the machine or equipment being serviced or maintained.

The following procedure applies to distribution and utilities systems. The employee authorized to "Group Lockout" will lock and tag out the system. Using the "group lockout" locks and tags. The "Group Lockout" must be signed by the authorized employee.

1. Use of personal tags and locks on the "Group Lock Box" must follow the normal lockout/tagout procedure.

2. The authorized employee must verify that all energy sources are in a neutral state.

3. The authorized employee places the group lock and tags on the hazard isolation device.

4. The authorized employee then places the "Group Lock Key" in the "Group Lock Box", and tag the box with a "DANGER DO NOT OPERATE" tag stating which system is locked out and why.

5. Each employee, prior to working on the "Group Lockout" system, must attach his/her personal tag and lock to the "Group Lockout Box."

6. Upon completion of work, all employees must remove their personal lock and tag.

7. The authorized employee must them remove the "Group Lock" locks and tags and follow normal procedures for restoring energy.

8. If repairs take more than the initiating shift, and the authorized employee is not remaining on the job for the completion, he/she may transfer "Authorization" to another employee by stating so on the "DANGER DO NOT OPERATE" tag. The employee identified then becomes the authorized employee. He/she is now authorized to remove the "Group Lockout" locks and tags installed by the original authorized employee if the work is completed on that shift. The follow-up shift must them follow normal procedures for "Group Lock/Tagout."

5.9 Outside Personnel (Contractors, etc.)

Whenever outside servicing personnel are to be engaged in activities covered by the scope and application of this standard, the on-site employer and the outside employer must inform each other of their respective lockout or tagout procedures.

All subcontractor's lockout/tagout procedures must be reviewed and approved by Shaw E & I prior to the project.

5.10 Special Situations

If lockout/tagout lasts for more than one shift, the appropriate protection must not be interrupted. No lock is to be removed until the next shift is ready to lockout the equipment.

When the employee(s) who originally applied a lock(s) is not at the site to remove it, the lock can be removed only in an emergency and only under the direction of an authorized employee, the site-supervisor, and if applicable the site-safety and health coordinator. Such actions and associated personnel safeguards shall be documented on the Field Activity Daily Log and the Lockout Log.

6.0 EXCEPTION PROVISIONS

Variances to this procedure shall be requested in accordance with procedure HS013 Health and Safety Procedure Variances.

7.0 CROSS REFERENCE

HS050 Training Requirements
HS052 Health and Safety Plans
HS300 Confined Spaces
HS301 Confined Spaces, Marine
HS302 Confined Spaces, Leaded Product
HS310 Hazardous Waste Operations
HS311 Emergency Response Operations
HS312 Hazardous Waste Operations at TSD Facilities

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Flow Diagram - Overview: Lockout/Tagout System
3. Lockout Log
4. Lockout/Tagout for Electrical Equipment
5. Lockout/Tagout for Compressed Air and Gases
6. Lockout/Tagout for Steam, Water, and Fluid Lines
7. Lockout/Tagout for Hydraulic Equipment
8. Lockout/Tagout Procedure for Specific Equipment

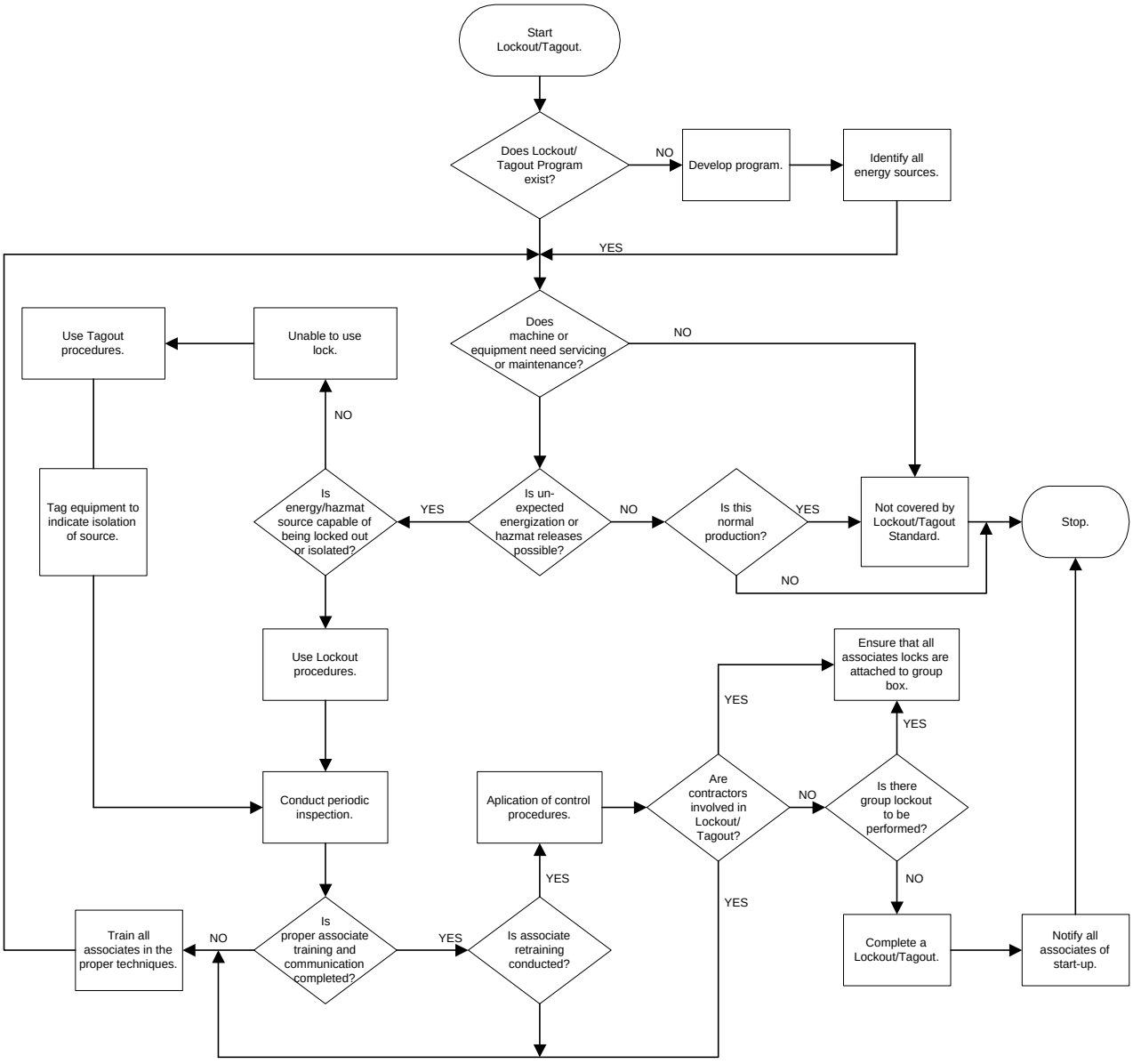
ATTACHMENT 1
CONTROL OF HAZARDOUS ENERGY SOURCE (LOCKOUT/TAGOUT)

Responsibility Matrix

Action	Procedure Section	*Responsible Party*						
		Location Mgr.	**Authorized Associate**	**Site Supervisor**	**Sub-contractor**	**HS**	**All**	**Training Dept.**
Comply with procedure	5.2				X		X	
Review plan & notify maintenance	5.2		X					
Verify proper procedures followed	5.2`	X		X		X		
Verification audit - daily	5.4.1			X				
Provide training to associates	5.5	X						
Attend appropriate training	5.5						X	
Maintain training records	5.5							X
Write/approve location lockout plan, if required	5.1		X			X		

ATTACHMENT 2

FLO DIAGRAM:
OVERVIEW of the LOCKOUT/TAGOUT SYSTEM



ATTACHMENT 3

LOCKOUT LOG

AUTHORIZED EMPLOYEE	DATE	EQUIPMENT NAME	EQUIPMENT NUMBER	REASON FOR LOCKOUT

ATTACHMENT 4
LOCKOUT/TAGOUT FOR ELECTRICAL EQUIPMENT

Job:_____

Device:_____

Location:_____

Authorized Person:_____

Site Supervisor:

PREPARATION FOR SHUTDOWN

1. Determine power type and shutoff location
2. Determine if there is more than one energy source
3. Determine magnitude of power (voltage)
4. Notify affected employees in the area that equipment will be under lockout for maintenance.
5. Shutoff power sources to machine.

LOCKOUT/TAGOUT

6. Lock and tag main power switches in the OFF position, remove fuses.
7. Verify that no power is available to the equipment using a voltmeter, if necessary.
8. Drain devices such as capacitor banks.
9. Verify that these devices have no stored energy by use of the voltmeter.
10. Repair equipment.

RETURN TO SERVICE

11. Be sure all connections are made and any unused tools and equipment are removed.
12. Remove lock if necessary to verify machine is repaired. The maintenance employee, while verifying the machine is repaired cannot leave the immediate area.
13. Remove tag from machine.
14. Notify employees in the area that the equipment is available.

Signature:

Authorized Person:_____

Site Supervisor: _____

ATTACHMENT 5
LOCKOUT/TAGOUT FOR COMPRESSED AIR AND GASES

Job:_____

Device:_____

Location:_____

Authorized Person:_____

Site Supervisor:

PREPARATION FOR SHUTDOWN

1. Determine types and shutoff location
2. Determine if there is more than one energy source
3. Determine magnitude of compressed air, gas, steam, water, or fluids.
4. Notify affected employees in the area that equipment will be locked out for maintenance.
5. Shutoff main supply to machine.

LOCKOUT/TAGOUT

6. Lock and tag main supply in the OFF position.
7. Bleed line and verify that no air or gases remain in the equipment.
8. Repair equipment.

RETURN TO SERVICE

9. Be sure all connections are made and any unused tools and equipment are removed.
10. Remove lock if necessary to verify proper operation.
12. Remove tag.
13. Notify employees in the area that the equipment is available.

Signature:

Authorized Person:_____

Site Supervisor: _____

ATTACHMENT 6
LOCKOUT/TAGOUT FOR STEAM, WATER, AND FLUID LINES

Job:_____

Device:_____

Location:_____

Authorized Person:_____

Site Supervisor:_____

PREPARATION FOR SHUTDOWN

1. Determine types and shutoff location
2. Determine if there is more than one energy source
3. Determine magnitude of compressed air or gas.
4. Notify affected employees in the area that equipment will be under lockout for maintenance.
5. Disconnect/shutoff main steam, water or fluid lines to equipment.

LOCKOUT/TAGOUT

6. Lock and tag main supply (i.e. chaining through valve handle with lock) in the OFF position with a bleeder open on the load side.
7. Drain fluids from shutoff valves to equipment.
8. Repair equipment.

RETURN TO SERVICE

9. Be sure all connections are made and any unused tools and equipment are removed.
10. Remove lock if necessary to verify machine is repaired. The maintenance employee cannot leave the immediate area, while verifying the machine is repaired.
11. Remove tag from machine.
12. Notify employees in the area that the equipment is available.

Signature:

Authorized Person:_____

Site Supervisor: _____

ATTACHMENT 7
LOCKOUT/TAGOUT FOR HYDRAULIC EQUIPMENT

Job:_____

Device:_____

Location:_____

Authorized Person:_____

Site Supervisor: _____

PREPARATION FOR SHUTDOWN

1. Determine types and shutoff location
2. Determine if there is more than one energy source
3. Determine magnitude of energy (pressure).
4. Notify affected employees in the area that equipment will be under lockout for maintenance.
5. Shutoff main hydraulic to equipment.

LOCKOUT/TAGOUT

6. Lock and tag main supply in the OFF position.
7. Drain fluids from shutoff valves to equipment.
8. Verify that the hydraulic fluid is disconnected.
9. Block ram or items controlled by the hydraulic system using the appropriate blocking.
10. Repair equipment.

RETURN TO SERVICE

11. Be sure all connections are made and any unused tools and equipment are removed.
12. Remove lock if necessary to verify machine is repaired. Maintenance employee cannot leave the immediate area, while verifying the machine is repaired.
13. Remove tag from machine.
14. Notify employees in the area that the equipment is available.

Signature:

Authorized Person:_____

Site Supervisor:_____

ATTACHMENT 8
LOCKOUT/TAGOUT PROCEDURE FOR SPECIFIC EQUIPMENT

Equipment:

Cat. No. and Location:

Serial Number (if available):

Electrical: Voltage: Location:

Describe:

Air (Type): Location:

Describe:

Gases (Type): Location:

Describe:

Steam (Type): Location:

Describe:

Water: Location:

Describe:

Fluids: Location:

Describe:

Hydraulic: Location:

Describe:

Stored Energy- Capacitors, Springs, Etc.:

Describe:

LOG DATA AND RETURN TO SITE-SUPERVISOR

PROCEDURE

Subject: **DRILL RIG OPERATIONS**

1.0 PURPOSE AND SUMMARY

This procedure describes the general requirements for the safe operation of conventional drilling equipment. It includes provisions for training, inspections, and the general work practices necessary to safely conduct drilling activities. Site-specific hazards, controls, and work practices are to be addressed in the Health and Safety Plan (HASP) required to be developed for each project.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Company – All wholly owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

5.0 TEXT

The company currently subcontracts the majority of its drilling work to qualified drilling contractors. Therefore, the primary responsibility for safety, maintenance, and operation of the drill rig rests with the subcontractors lead driller. He/She is responsible for the safe operation of the drill rig as well as the drill crews adherence to the requirements of the HASP and this procedure. In cases where the company owns and operates drilling equipment, these responsibilities are to be that of the company designated lead driller.

5.1 Training

All members of drilling crews must possess required state or local licenses necessary to perform such work. The drill crew must also receive site-specific health and safety training prior to beginning work and must participate in daily tailgate safety meetings. Prior to arriving at a project site, the drilling crew must be familiar with the operation, inspection, and maintenance requirements of the equipment as well as its safety features and emergency procedures.

5.2 Inspections

Before being placed into service, the drilling equipment will be inspected, by the lead driller, in accordance with the manufacturer's guidelines. The Shaw E & I site supervisor will accompany the lead driller during this initial inspection. Inspections shall be documented in the field activity daily log and shall demonstrate that all installed safety equipment is functional.

5.3 Set Up

The drill rig must be properly blocked and leveled prior to raising the derrick. The wheels which remain on the ground will be chocked, if necessary, and the parking brake set. The rig can only be moved after the derrick has been lowered.

General preparatory drilling requirements include:

- Before drilling, the existence and location of underground utilities will be determined and marked by the appropriate underground utility identification service. All drilling should occur a minimum of 5 feet from any known or suspected location of an underground structure or utility. A hand auger or posthole digger must be utilized to positively identify utilities when drilling is anticipated to occur within 5 feet of an underground utility.

- If drilling is conducted in the vicinity of overhead power lines, the distance as specified in Section 5.7 must be maintained between the lines and any point on the drilling equipment.

- Work area access must be restricted from vehicular/pedestrian traffic by utilizing temporary fencing or warning tape.

- If lubrication fittings are not accessible with guards in place, machinery must be stopped and lockout/tagout procedures applied before oiling and greasing. Fuel, hydraulic fluid, oil, or lubrication fittings will not be refilled unless the drill rig engine has been turned off.

- Rigging equipment for material handling must be inspected prior to use on each shift and as often as necessary to ensure it is safe. Defective rigging must be removed from service immediately.

- Lifting and transporting of drums should be completed using the appropriate equipment and following safe loading and unloading practices.

5.4 Hoisting Operations

- Drillers must never engage the rotary clutch without watching the rotary table and ensuring it is clear of personnel and equipment.

- Unless the drawworks is equipped with an automatic feed control, the brake must not be left unattended without first being tied down.

- Drillers will not add or remove pipe from the drill stem without assistance of the driller's helper.

- Drill pipe must not be hoisted until the driller is sure that the pipe is latched and the drilling assistant has signaled that he/she may safely hoist the load.

- During instances of unusual loading of the derrick or mast, such as when making an unusually hard pull, only the driller will be on the rig floor and no one will be on the rig or derrick.

- The brakes on the drawworks of every drilling rig must be tested at the beginning of each shift to determine whether they are in good order.

- A hoisting line with a load imposed will not be permitted to be in direct contact with any derrick member or stationary equipment unless it has been specifically designed for line contact.

- Hoisting control stations must be kept clean and controls labeled as to their functions.

- Under no circumstances will personnel be permitted to ride the traveling block or elevators, nor will the cat line be used as a personnel carrier.

5.5 Cat Line Operations

- Only experienced drillers will be allowed to operate the cathead controls. The kill switch must be clearly labeled and operational prior to operation of the cat line.

- The cathead area must be kept free of obstruction and entanglements.

- The operator will not use more wraps than necessary to pick up the load. More than one layer of wrapping is not permitted.

- Personnel must not stand near, step over, or go under a cable or cat line which is under tension.

- Employees rigging loads on cat lines must:

  - Keep out from under the load
  - Keep fingers and feet where they will not be crushed
  - Be sure to signal clearly when the load is being picked
  - Use standard visual signals only, and not depend on shouting to coworkers
  - Make sure that the load is properly rigged, since a sudden jerk in the cat line may shift or drop the load.

5.6 Pipe Handling

- Pipe must be loaded and unloaded, layer by layer, with the bottom layer pinned or blocked securely on all four corners. Each successive layer must be effectively blocked or chocked.

- Workers will not be permitted to top off the load during loading, unloading, or transferring of pipe or rolling stock.

- Employees must be instructed never to try to stop rolling pipe or casing; they must be instructed to stand clear of rolling pipe.

- When pipe is being hoisted, personnel will use a sling to control the bottom end of the pipe. After the pipe is off the stockpile, personnel will control the end by hand.

5.7 Working Near Overhead Energized Lines

Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated so that a clearance of 10 feet (305 cm) is maintained. If the voltage is higher than 50kV, the clearance will be increased 4 inches for every 10kV over that voltage. However, under any of the following conditions, the clearance may be reduced.

- If the vehicle is in transit with its structure lowered, the clearance may be reduced to 4 feet.

- If insulating barriers are installed to prevent contact with the lines, and if the barriers are rated for the voltage of the line being guarded and are not a part of or an attachment to the vehicle or its raised structure, the clearance may be reduced to a distance within the designed working dimensions of the insulating barrier.

5.8 Direct Push Sampling

Many subsurface sampling activities are now conducted using a direct push method. This method involves using a hydraulic hammer press to drive hollow steel rods vertically into the subsurface to obtain samples. The hazards associated with the use of this technique are somewhat similar to those of conventional drilling. The main difference is that percussion rather than rotational forces are used to reach sample depths.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

HS013	Health and Safety Procedure Variances
HS051	Tailgate Safety Meetings
HS052	Health and Safety Plans
HS315	Control of Hazardous Energy Sources

8.0 ATTACHMENTS

1. Responsibility Matrix

ATTACHMENT 1
DRILL RIG OPERATIONS

Responsibility Matrix

Action	Procedure Section	*Responsible Party*			
		Lead Driller	**Site Supervisor**	**HS Representative**	**Director of Health and Safety**
Issue, revise and maintain procedure	3.1				X
Responsible for safe operation of drill rig	5.0	X			
Conduct/participate in training	5.1	X	X	X	
Inspect drilling equipment	5.2	X			

PROCEDURE

Subject: MUNITIONS and EXPLOSIVES of CONCERN (MEC)

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to prescribe the requirements for specifying and controlling health and safety requirements for Munitions and Explosives of Concern (MEC), Chemical Warfare Material (CWM), and Demining Hazard related projects. This procedure was formerly titled Unexploded Ordnance (UXO).

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Chemical Agent Identification Sets (CAIS) – Chemical agents placed in glass ampoules, vials and/or bottles. Once used to train US military in the safe handling, identification and decontamination of chemical warfare agents.

Chemical Warfare Material (CWM) - Items generally configured as a munition containing a chemical compound that is intended to kill, seriously injure, or incapacitate a person through its

physiological effects. CWM includes V- and G-series nerve agents or H-series (mustard) and L-series (lewisite) blister agents in other-than-munition configurations; and certain industrial chemicals (e.g., Hydrogen Cyanide (AC), Cyanogen Chloride (CK), or Carbonyl Dichloride (called phosgene or CG)) configured as a military munition. Due to their hazards, prevalence, and military-unique application, CAIS are also considered CWM. CWM does not include: riot control devices; chemical defoliants and herbicides; industrial chemicals (e.g., AC, CK, or CG) not configured as a munition; smoke and other obscuration producing items; flame and incendiary producing items; or soil, water, debris or other media contaminated with low concentrations of chemical agents where no chemical agent hazards exist

Company - All wholly owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Demining – activities, which lead to the removal of mine and UXO hazards, including technical survey, mapping, clearance, marking, post-clearance documentation, community mine action liaison and the handover of cleared land.

Munitions and Explosives of Concern (MEC) – Specific categories of military munitions that may pose unique explosives safety risks, means:

- Unexploded ordnance (UXO)
- Discarded military munitions (DMM)
- Munitions Constituents (e.g. TNT, RDX) present in high enough concentrations to pose an explosive hazard - formerly known as Ordnance and Explosives (OE).

Unexploded ordnance (UXO) - Military munitions that have been primed, fuzed, armed, or otherwise prepared for action, and have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installation, personnel, or material and that remain unexploded either by malfunction, design, or any other cause.

5.0 TEXT

Projects, which contain potential MEC/CWM/Demining hazards, are a significant portion of the company's business. These projects present certain unique and inherent safety hazards, which require special attention and expertise to provide safe and effective project execution. Once contract requirements relating to MEC/CWM/Demining activities are identified, all Program/Project Managers must contact the Range Services & Munitions Response Center in Edgewood, MD at 410-612-6530. The Range Service & Munitions Response Center will schedule internal/external resources for project support and/or assist in coordinating technical support. All projects, which contain a MEC component, must have an approved site-specific work plan prior to the performance of MEC activities by Company or subcontractor MEC personnel.

The Range Service & Munitions Response Center was established to support Program/Project Managers in the execution of their projects and to provide a single point of contact for obtaining assistance in evaluating MEC/CWM/Demining project requirements.

If unexpectedly during project work, a suspected or known MEC is encountered, field personnel shall immediately stop work. The MEC shall not be probed, touched, or handled by unauthorized Shaw personnel and subcontractors under any circumstance. The basic guidelines for MEC safety are listed below:

- Once you recognize a MEC hazard, do not move any closer
- Stop all work
- Make all radio and cell phone transmissions at least 100 meters away from the MEC hazard
- Do not try to remove anything that is on or near the MEC
- Do not move or disturb the MEC
- Mark the MEC hazard area properly so that other personnel will stay away from it
- Evacuate all nonessential personnel from the MEC hazard area
- Immediately report the MEC hazard to your supervisor

6.0 EXCEPTION PROVISIONS

Exceptions shall be per the requirements of Shaw E & I Procedure HS013**.**

7.0 CROSS REFERENCES

(None)

8.0 ATTACHMENTS

1. Responsibility Matrix

ATTACHMENT 1
MUNITIONS and EXPLOSIVES of CONCERN (MEC)

Responsibility Matrix

Action	Procedure Section	*Responsible Party*		
		Range Services & Munitions Response Center	**Project/Program Management**	**Director of Health and Safety**
Issue, revise and maintain procedure	3.1			X
Identify MEC contract requirement	5.0		X	
Contact Range Services & Munitions Support Center	5.0		X	
Provide project support and resources	5.0	X		

STANDARD OPERATING PROCEDURE

Subject: Heat Stress

1. PURPOSE

This procedure establishes guidelines to protect employees from the effects of heat related illness. It describes the five major types of heat-induced illnesses, methods of prevention and treatment, and prescribes heat stress monitoring methods.

2. SCOPE

This procedure applies to all job sites of The Shaw Group Inc.'s Environmental & Infrastructure Group (Shaw E&I) having potential heat stress conditions. Variances and exceptions may be requested pursuant to the provisions of Procedure No. EI-HS013, "Health and Safety Procedure Variance."

3. REFERENCES

- Procedure No. EI-HS013, Health and Safety Procedure Variance
- Title 8, California Code of Regulations, Section 3395, *Heat Stress Prevention*

4. DEFINITIONS

- **Acclimatization**—Temporary adaptation of the body to work in the heat that occurs gradually when a person is exposed to it. Acclimatization peaks in most people within 4 to 14 days of regular work for at least 2 hours per day in the heat.
- **Company**—All wholly-owned subsidiaries of Shaw E&I.
- **Heat Stress**—The net heat load to which a worker may be exposed from the combined contributions of metabolic cost of work, clothing requirements, and environmental factors such as air temperature, humidity, air movement, and radiant heat exchange. Mild or moderate heat stress can cause discomfort and adversely affect performance and safety but is not harmful to health. As the heat stress approaches human tolerance limits, the risk of heat illness increases.
- **Shade**—Blockage from direct sunlight. Canopies, umbrellas, and other temporary structures or devices may be used to provide shade. One indication that blockage is sufficient is when objects do not cast a shadow in the area of blocked sunlight. Shade is not adequate when heat in the area of shade defeats the purpose of the shade, which is to allow the body to cool.

5. RESPONSIBILITY MATRIX

5.1 Procedure Responsibility

The Senior Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

5.2 Action/Approval Responsibilities

The Responsibility Matrix is shown as Attachment 1, "Responsibility Matrix."

6. PROCEDURE

Adverse climatic conditions are important considerations in planning and conducting site operations. High ambient temperature can result in deleterious health effects ranging from transient heat fatigue, physical discomfort, reduced efficiency, personal illness, and increased accident probability to serious illness or death. Heat stress is of particular concern when chemical protective garments are worn; these garments prevent evaporative body cooling, thereby placing employees at considerably higher risk of developing heat stress.

Heat stress is caused by a number of interacting environmental and personal risk factors. Environmental risk factors include air temperature, relative humidity, radiant heat from the sun and other sources, conductive heat sources such as the ground, air movement, workload severity and duration, and personal protective equipment and clothing. Personal risk factors include age, degree of acclimatization, overall health, water consumption, alcohol consumption, caffeine consumption, and use of prescription or over-the-counter drugs that affect the body's water retention or other physiological responses to heat. Because heat stress is a common and potentially serious occupational illness, regular monitoring and other preventive precautions are vital.

6.1 Signs, Symptoms, and First Aid (Referenced from American Red Cross, First Aid/ Cardiopulmonary Resuscitation/AED for the Workplace, 2006)

Employees must immediately report to the Site Supervisor or to the Site Safety Officer any symptoms or signs of heat illness experienced by themselves or observed in co-workers. Regardless of the worker's protests, no employees with any symptoms of possible serious heat illness should be sent home or left unattended without medical assessment and authorization.

6.1.1 Heat Rash

Heat rash can be caused by continuous exposure to hot and humid air and skin abrasion from sweat soaked clothing.

Signs and Symptoms: The condition is characterized by a localized red skin rash and reduced sweating. Aside from being a nuisance, the ability to tolerate heat is reduced.

First Aid: Remove clothing from affected area. Wash skin with mild soap and water, rinse clean, and allow it to dry thoroughly.

6.1.2 Heat Cramps

Heat cramps are caused by profuse perspiration with inadequate electrolytic fluid replacement. This often robs the larger muscle groups (abdominal and quadriceps) of blood, which can cause painful muscle spasms and pain.

Signs and Symptoms: Muscle spasms and pain in the extremities and abdomen.

First Aid: Remove worker to a cool place and give sips of cool water. Watch for signs of heat exhaustion or stroke.

6.1.3 Heat Syncope (Fainting)

Heat syncope is a loss of consciousness because of low blood pressure. Heat causes the blood vessels to expand (dilate), so body fluid moves into the legs by gravity, which causes low blood pressure and may result in fainting. Heat syncope can be caused by blood pooling in the legs after standing still for a long time in a hot environment. It can also be caused after vigorous physical activity for two or more hours. The risk of heat syncope is higher among those who are not acclimated and to those who are dehydrated.

Signs and Symptoms: Feeling faint or lightheaded; pale, cool, and moist skin; lightheadedness when changing position, such as moving from a lying position to a standing position.

First Aid: Remove worker to a cool, shaded place. Give sips of cool water. Loosen tight clothing. Remove perspiration-soaked clothing. Place the worker in a seated or supine position with legs raised. Apply cool, wet towels to the skin. Fan the person. Watch for signs of heat stroke.

6.1.4 Heat Exhaustion

Heat exhaustion is an early indicator that the body's cooling system is becoming overwhelmed.

Signs and Symptoms: Cool, moist, pale, ashen or flushed skin, headache, nausea, dizziness, weakness, exhaustion, heavy sweating.

First Aid: Remove worker to a cool, shaded place. Give sips of cool water. Loosen tight clothing. Remove perspiration-soaked clothing. Place the worker in a seated or supine position with legs raised. Apply cool, wet towels to the skin. Fan the person. Watch for signs of heat stroke.

6.1.5 Heat Stroke

Heat stroke is when the body's systems are overwhelmed by heat and stop functioning. Heat stroke is a life-threatening condition.

Signs and Symptoms: Red, hot, dry skin, changes in the level of consciousness, vomiting. **This is a medical emergency! Call 911 immediately**.

First Aid: Move worker to a cool, shaded place. Loosen tight clothing. Remove perspiration soaked clothing. Place the worker in a seated or supine position with legs raised. Apply cool, wet towels to the skin. Fan the person. If the person is conscious, give small amounts of cool water to drink. If the person refuses water, vomits, or starts to lose consciousness, place the person on his or her side and continue to cool the person by applying ice or cold packs on their wrists, ankles, groin, neck, and in the armpits. Continue to check breathing and signs of life (coughing, slight body movement, or a pulse.)

6.1.6 Emergency Planning

The site-specific health and safety plan and/or job safety analysis must specify the site-specific procedures for providing emergency medical services, contacting emergency medical services, and directing emergency responders to the work site.

6.2 Prevention

The prevention of heat-related illnesses requires adequate hydration, nutrition, acclimatization, access to shade if heat stress symptoms appear, monitoring, and in some cases the use of cooling devices.

6.2.1 Hydration

During periods of high heat, adequate liquids must be provided to replace lost body fluids. Most people do not become aware of thirst until they have lost 1 to 2 liters of body fluids. Highly motivated workers may incur losses of 3 to 4 liters before extreme thirst forces them to stop and drink. Therefore, workers must drink more than the amount required to satisfy thirst. Prehydration, the consuming of a large drink of water immediately before the start of heat exposure, is highly recommended.

In California, workers potentially exposed to heat stress in outdoor work sites are required to have ready and easy access to potable water or liquid sufficient to provide one quart per employee per hour (Title 8, California Code of Regulations, Section 3395, Heat Stress Prevention). Replacement fluids can be a 0.1 percent salt water solution, commercial "sports drinks" or "thirst quenchers," or a combination of these with fresh water. However, drinks that are popular because they "cut" thirst are

not recommended, because they inhibit intake before rehydration is complete. For this reason it is better to drink water or dilute flavored beverages and to avoid carbonation, caffeine, and drinks with heavy concentrations of sugar or salt.

The replacement fluid temperature should be kept cool, 50 degrees Fahrenheit (°F) to 60°F, and must be located within a few steps of each worker or brought to the worker every hour or more frequently under the most stressful conditions.

Alcohol is a common and serious problem among those who work in heat. Alcohol not only impairs intake of food and water, but also acts as a diuretic (increase in urination) and disturbs judgment. The adverse effects of alcohol extend many hours beyond the time of intake.

6.2.2 Nutrition

Workers in high heat areas should eat well balanced meals in order to replace salt and minerals lost in perspiration. High sweat rates involve a continuous loss of sodium chloride and small amounts of potassium, which must be replaced on a daily basis. In addition, work in heat accelerates the turnover of trace elements including magnesium and zinc. All of these essential elements should normally be obtained from wholesome food.

Do not consume salt tablets, as they are easily abused, and overdoses lead to gastro-intestinal problems, increased urine output, and greater susceptibility to heat illness. If salt and mineral loss is a problem, employees should consider lightly salting their regular meals and increasing fruit consumption to replace these losses.

6.2.3 Acclimatization

Acclimatization can greatly increase human tolerance to heat, so that work becomes less physically challenging after a period of gradual adjustment. Individuals with a high level of physical fitness generally display partial heat acclimatization and are able to complete the process more quickly and with less stress than sedentary persons. Season may also affect the time that must be allowed for acclimatization. Workers recruited in summer may already be partly heat acclimatized, while winter hires will require a longer period of adjustment.

Acclimatization for heavy work under extremely hot conditions may require a period of 4 to 10 days of progressively increasing work time starting with about 2 hours work per day. For less severe conditions, the first 2 to 3 days of work in the heat should be limited to 2 to 4 hours. Employees undergoing acclimatization need to be monitored closely for signs and symptoms of heat illness.

Maintenance of full heat acclimatization requires exposure to work in heat three to four times per week; lower frequency or passive exposure to heat have a much weaker effect and may allow gradual decay of heat tolerance. However, weekends off work have no measurable effect on acclimatization. Discontinuing heat exposure for 2 to 3 weeks will cause loss of most acclimatization, although some will be retained in persons exposed to hot weather and/or regular aerobic exercise.

6.2.4 Access to Shade

Employees suffering from heat illness or believing a recovery period is needed will be provided access to an area with shade that is either open to the air or provided with ventilation for cooling for a period of no less than 5 minutes. Access to shade will be permitted at all times. **Employees will remove chemical protective garments during rest periods and will not be assigned other tasks during rest periods**.

6.2.5 Cooling Devices

Vortex tubes or cooling vests may be worn beneath impermeable clothing. If cooling devices are worn, only physiological monitoring will be used to determine work activity.

6.3 Monitoring

Susceptibility to heat stress depends on numerous factors including ambient temperature, humidity, radiant heat, air movement, personal protective equipment, the degree of acclimatization, and physical condition of the individual workers. Therefore, the decision to start either environmental or physiological heat stress monitoring must be based on the experience and observations of the Site Safety Officer and on the professional judgment of the Health and Safety Manager and in consideration of the guidelines summarized below. **However, on all job sites having potential heat stress conditions, the monitoring of site workers by watching for the signs and symptoms of heat stress (see Section 6.1 above) must be ongoing by Supervisors, Site Safety Officers, and the workers themselves.**

6.3.1 Environmental Monitoring (American Conference of Governmental Industrial Hygienists [ACGIH], Threshold Limit Values [TLV], and Biological Exposure Indices [BEI], most recent edition)

The Wet Bulb Globe Temperature (WBGT) index is the simplest and most suitable technique to evaluate the environmental heat stress factors. If employees are performing moderate to heavy physical work on construction/remediation sites in standard permeable cotton or synthetic work clothing, heat stress monitoring is advisable when the ambient air temperature exceeds 90°F and any time discomfort due to heat stress is either noticed or reported. Either the WBGT index or physiological monitoring may be used. When WBGT exceeds 78°F, the work regiment in Table 2 of the ACGIH TLV/BEI booklet should be followed. **Note: WBGT measurements are not designed for and should not be used to assess heat stress involving the use of semi permeable or impermeable protective clothing**.

6.3.2 Physiological Monitoring (National Institute for Occupational Safety and Health/Occupational Safety and Health Administration/United States Coast Guard/U.S. Environmental Protection Agency, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, 1985)

Physiological monitoring can be used in lieu of or in addition to WBGT. The advantage of physiological monitoring is that it determines each individual's unique response to environmental heat stress factors. If employees are wearing impermeable protective clothing, physiological monitoring is advisable beginning at 70°F and/or any time discomfort due to heat stress is either noticed or reported.

Physiological monitoring may be performed by the Site Safety Officer. Alternatively, it may be self-performed if the affected employees have been trained to do so. The following two parameters are to be monitored at the beginning of each rest period:

- **Heart Rate**—Radial (wrist) pulse will be determined as early as possible during each rest period. Monitoring consists of taking the radial pulse of a worker for 30 seconds immediately after exiting the work area. If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same. If the heart rate still exceeds 110 beats per minute at the next rest period, increase the following rest period by one-third. The initial rest period should be at least 5 minutes.

- **Body Temperature**—Each individual will measure his/her oral temperature with a disposable thermometer for one minute or with an electronic aural device as early as possible in the first rest period. If the temperature exceeds 99.6°F at the beginning of the rest period, then the work cycle will be decreased by one-third with the rest period remaining the same. Return to work is not permitted if body temperature exceeds 100.4°F.

  NOTE: Some aural temperature devices, which are also known as ear canal or tympanic devices, will not work accurately in high intensity ambient light.

Attachment 2, "Heat Stress Monitoring Record," will be used to record the results of heat stress monitoring.

6.4 Training

Employees potentially exposed to heat stress conditions will be trained on the contents of this procedure. This training may be conducted during Daily Tailgate Safety Meetings. Training topics and attendance must be documented.

7. ATTACHMENTS

- Attachment 1, Heat Stress Responsibility Matrix

8. FORMS

- Form EI-HS400.1_0, Heat Stress Monitoring Record

9. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
01 05/06/2009	• Heat syncope (fainting) was added to this procedure. • The first aid treatments, for each of the heat stress conditions, have been updated to reflect current American Red Cross guidance. • Nutrition (Section 6.2.2) and access to shade (Section 6.2.4) discussions have been added to the procedure. • The heart rate component of the physiological monitoring section has been modified.	Mike Zustra

Attachment 1
Heat Stress Responsibility Matrix

Action	Procedure Section	Responsible Party			
		Senior Director of Health and Safety	Project Supervisor	Site Safety Officer	All Site Workers
Issuance, Revision, and Maintenance of Procedure	3.1	X			
Immediately report symptoms or signs of heat illness in themselves or others to the Site Supervisor or Safety Officer	5.0				X
Conduct Monitoring	5.3			X	
Inform Employees About Procedure	5.4		X	X	

Form No. **EI-HS400.1_0**

Shaw™ Shaw E & I

Heat Stress Monitoring Record

Project/Location ____ Date

Employee Name	**Initial Reading Time**	**First Work Period Time**		**Second Work Period Time**		**Third Work Period Time**		**Fourth Work Period Time**		**Fifth Work Period Time**		**Sixth Work Period Time**	
	WBGT (°F)	WBGT (°F)		WBGT (°F)		WBGT (°F)		WBGT (°F)		WBGT (°F)		WBGT (°F)	
	Air Temp. (°F)	Air Temp. (°F)		Air Temp. (°F)		Air Temp. (°F)		Air Temp. (°F)		Air Temp. (°F)		Air Temp. (°F)	
	Initial Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.
	Initial H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.
	Initial Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.
	Initial H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.
	Initial Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.
	Initial H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.
	Initial Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.
	Initial H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.

PROCEDURE

Subject: COLD STRESS

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to establish the guidelines necessary to protect employees from the adverse health effects caused by exposure to low temperature environments.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The responsibility matrix is Attachment 1.

4.0 TEXT

Most cold related worker fatalities have resulted from failure to escape low air temperatures, or from immersion in low temperature water. Employees should be protected from exposure to cold so that their deep core temperature does not fall below 96.8° degrees Fahrenheit. Core body temperatures below this level will likely result in reduced mental alertness, reduction in rational decision making, or loss of consciousness with the threat of fatal consequences.

4.1 Signs and Symptoms of Cold Stress

Several factors increase the harmful effects of cold including, being very young or old, wet clothing, having wounds or fractures, smoking, drinking alcoholic beverages, fatigue, emotional stress and certain diseases and medications. The two most prominent adverse effects from exposure to cold temperatures are frostbite and hypothermia. Treatment for cold related injuries should be administered by a person qualified in first aid or a professional medical provider.

4.1.1 Frostbite. Frostbite is the most common injury caused by exposure to cold temperatures. It occurs when cells of the body freeze restricting blood flow and causing tissue damage. The first sign of frostbite is slightly flushed skin which then changes to white or grayish yellow and finally grayish blue. Pain is sometimes initially felt but is often followed by a cold numb feeling.

4.1.2 Hypothermia. Hypothermia is the most severe form of cold stress and results from a drop in the body's core temperature. The initial signs include; shivering, numbness, confusion, weakness, impaired judgement, impaired vision, and drowsiness. Hypothermia victims typically progress through five stages of the condition including; (1) shivering, (2) apathy, (3) loss of consciousness, (4) decreasing pulse and breathing rate, and (5)death.

4.2 Precautionary Measures

It is recommended that employees wear insulated clothing to maintain core temperatures above 96.8°F when working in air temperatures below 40°F. This protective clothing may include but is not limited to:

- Insulated suits, such as whole-body thermal underwear
- Wool or polypropylene socks
- Insulated gloves and boots
- Insulated head cover, such as knit caps, hard hat liners, etc.

When conducting work in air temperatures below 35°F, the following practices shall be followed:

- If the clothing of an employee is expected to become wet, the outer layers of clothing must be impermeable to water.

- If an employees underclothing becomes wet it must be changed immediately. If the clothing becomes wet from sweating, the employee may finish the task which caused the sweating before changing into dry clothing.

- Employees will be provided a warm area (65°F or above) to change from work clothing into street clothing and for breaks.

- Hot liquids, such as soups, warm drinks, etc. shall be provided in the break area. The intake of caffeine containing products shall be discouraged due to their diuretic and circulatory effects.

- If appropriate, approved space heaters may be provided in the work area to warm the hands, feet, etc.

- The buddy system shall be practiced. Any employee observed with signs of cold stress shall immediately proceed to the break area.

- Employees will be reminded to layer their clothing, i.e., wear thinner, lighter clothing next to the body with heavier clothing layered outside the inner clothing.

- Avoid overdressing when going into warm areas or when performing activities which are strenuous. This could potentially lead to heat stress situations.

- Auxiliary heated versions of handwear, footwear, etc., can be used in lieu of mittens, insulated socks, etc. if extremely cold conditions exist.

- Employees handling liquids with high evaporation rates (gasoline, hexane, alcohol, etc.) shall take special precautions to avoid soaking of clothing with the liquids because of the added danger of cold injury caused by evaporative cooling.

- Work shall be arranged in such a way that sitting still or standing for long periods is minimized.

- If the air temperature is 20°F or below the hands shall be protected by mittens or gloves prior to contact with cold surfaces such as metal, etc.

Air temperature is not the only factor to be considered while evaluating cold stress situations. Wind chill cooling rate and the cooling power of air are critical factors. The higher the wind speed the greater the risk of experiencing cold related injuries. For exposed skin, continuous exposure should not be permitted when the air speed and temperature result in an equivalent chill temperature of -25°F of less. The wind chill table provided in attachment two can be used to help assess hazardous conditions attributable to wind chill effects.

4.3 Training

Training on the contents of this procedure will be conducted during tailgate safety meetings held at project or office locations where employees are exposed to cold temperatures. Topics to be discussed during this training will include:

- Proper rewarming procedures and first aid treatment of cold related cases
- Proper clothing practices

- Eating and drinking habits
- Recognition of signs and symptoms of cold stress
- Safe cold weather work practices.

5.0 EXCEPTION PROVISIONS

Variances may be requested as described in procedure HS013; Health and Safety Procedure Variances.

6.0 CROSS REFERENCES

Shaw Environmental & Infrastructure, Inc. (Shaw E & I) Procedure HS051-Tailgate Safety Meetings

Shaw E & I Procedure HS600-Personal Protective Equipment

Threshold Limit Values and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists.

Standard First Aid Workbook, American Red Cross

7.0 ATTACHMENTS

1. Responsibility Matrix
2. Windchill Table

ATTACHMENT 1
COLD STRESS

Responsibility Matrix

Action	*Responsible Party*			
	Procedure Section	**Employee**	**Local HS Representative**	**Director of Health and Safety**
Issuance, revision and maintenance of this procedure	3.1			X
Provide training	4.2		X	
Receive training	4.2	X		

ATTACHMENT 2

Windchill Table

Estimated Wind Speed (mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER In under an hour with dry skin. Maximum danger is false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute.			GREAT DANGER Flesh may freeze within 30 seconds.				
	Trenchfoot and immersion foot may occur at any point on this chart.											

PROCEDURE

Subject: HEARING CONSERVATION PROGRAM

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to establish guidelines for the company hearing conservation program. Regulatory requirements mandate that the company administer a hearing conservation program whenever employee sound exposures equal or exceed an 8-hour time-weighted average (TWA) sound level of 85 decibels (dB).

Evidence is well established that worker exposure to sound of sufficient intensity and duration can result in hearing damage. This procedure prescribes the control measures required to prevent employee exposure to excessive sound levels and includes provisions for:

- Monitoring of the workplace to determine employee exposures.
- An audiometric testing program which includes baseline and annual audiograms.
- An employee training and information program.
- Description of various control measures that can be used to decrease exposures.
- Providing hearing protection to all affected employees when administrative or engineering controls fail to reduce sound levels to below the action level.
- Recordkeeping requirements.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Vice President, Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Action Level - An 8-hour TWA of 85 dB or a dose of 50 percent.

Company - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Standard Threshold Shift (STS) - Change in hearing threshold relative to the baseline audiogram of 10 dB or more at 2,000, 3,000, and 4,000 hertz (Hz) in either ear.

5.0 TEXT

5.1 General

The company hearing conservation program will be implemented and protection against the effects of sound exposure will be provided whenever sound levels exceed the action level.

5.2 Monitoring

Monitoring of employee exposures to sound will be conducted whenever it is anticipated that exposure may exceed the action level. This monitoring will be conducted by a qualified individual who, through professional credentials, training, or experience, has the necessary qualifications to specify and use the type of monitoring equipment (area or personal) that will best represent employee exposures. This monitoring will be repeated whenever changes in the work environment lead to the possibility of additional exposures or inadequacy of selected hearing protection. Employees will be provided the opportunity to observe monitoring and will be notified when the results exceed the action level.

Sound level monitoring instrumentation will be operated on the A-weighted scale in slow response mode. Employee sound exposures will be computed in accordance with Attachment 2 and without regard to any attenuation provided by the use of hearing protection.

5.3 Audiometric Testing

Audiometric testing will be provided to all employees exposed at or above the action level. Testing will be in accordance with Procedure HS100, Medical Policies and Procedures.

5.3.1 Baseline Audiogram. Audiometric test results obtained from the pre-hire medical examination will be used as the baseline audiogram. Testing to establish a baseline audiogram shall be preceded by at least 14 hours without exposure to workplace sound. Employees will also be notified of the need to avoid high levels of non-occupational sound exposure during this 14-hour period.

5.3.2 Annual Audiograms. Annual audiograms will be conducted for all employees exposed at or above the action level during the preceding year. Each annual audiogram will be compared to that employee's baseline audiogram to determine if the audiogram is valid and if a STS has occurred.

5.4 Employee Training and Information

All employees who are exposed to sound levels above the action level are required to participate in a formal training program. This program will be presented by a health and safety representative and include, as a minimum, the following information:

- The effects of sound on hearing.
- The purpose of hearing protection; the advantages, disadvantages, and attenuation of various types; and instructions on selection, fitting, use, and care.
- The specific nature of operations which could result in exposure to excessive sound levels.
- The purpose of audiometric testing and an explanation of the test procedures.
- The engineering controls and administrative practices associated with the employee's job assignment.

This training program will be repeated annually. Participating employees are required to complete the Hearing Protection Training Completion Record (Attachment 3). This record will be maintained by the company Training Department in Knoxville. In addition, tailgate safety meetings will be periodically used to instruct employees on the need for hearing protection in designated areas.

The project/location manager will make available to affected employees or their authorized representatives a copy of 29 Code of Federal Regulations (CFR) 1910.95 and will also post a copy in the workplace.

5.5 Control Measures

A straightforward method of controlling sound exposure is to examine the problem in terms of its three basic elements including:

- Sound arises from a source;
- Travels over a path; and
- Affects a receiver or listener.

The solution to a given sound problem might require alteration or modification of any or all of these three basic elements including:

- Modifying the source to reduce its sound output;
- Altering or controlling the transmission path to reduce the sound level reaching the listener; or
- Providing the receiver with hearing protection (but only if the sound source or path cannot be controlled).

5.5.1 Sound Control at the Source. Perhaps the best method for controlling sound at its source is the initial equipment selection process. The following summarizes those features that the buyer should look for and steps to be taken in selecting equipment:

- Low-sound certification.
- Advertisement of “quiet” operation, evidence of sound control design.
- Evidence of “lower” and “slower” operating characteristics.
- Conductance of side-by-side sound tests of equipment.
- Request an “on-site” or “in operation” inspection of mechanical equipment before purchase.

Most mechanical devices are complex sound generators. Though it is impractical to discuss all possible solutions to all sound problems, some general control measures and methods have been provided below:

- Reduce impact or impulse sound by reducing the weight, size, or height of fall of impacting mass.

- Reduce speed in machines and flow velocities and pressure in fluid conveyance systems.

- Balance rotating parts to control machinery sound and vibration of fans, fly wheels, pulleys, cams, shafts, etc.

- Reduce frictional resistance between rotating, sliding, or moving parts by frequent lubrication and proper alignment; static and dynamic balancing of rotating parts; and/or correction of eccentricity or "out-of-roundness" of wheels, gears, rollers, pulleys, etc.

- Reduce resistance in air or fluid systems by use of low flow velocities, smooth surfaces of duct or pipe systems, and long-radius turns and flared sections in pipes, etc., to reduce turbulence.

- Isolate vibration elements in machinery; install motors, pumps, etc., on most massive part of machine; use belt or roller drives in place of gear trains; use flexible hoses and wiring instead of rigid piping and stiff wiring; etc.

- Apply vibration damping materials such as liquid mastics; pads of rubber, felt, foam, or fibrous blankets; or sheet metal viscoelastic laminates or composites to vibrating machine surface.

- Reduce sound leakage from the interior of machines such as compressors by sealing or covering all openings or applying acoustical materials to machine interiors.

5.5.2 Sound Control in the Transmission Path. Another effective way to limit employee exposure to sound is through the use of transmission path controls. These controls may include, but are not necessarily limited to:

- Separation of the sound source and receiver.

- Use of sound absorbing materials on ceiling, floor, or wall surfaces.

- Use of sound barriers and deflectors in the sound path.

- Use of acoustical lining on inside surfaces of passageways, ducts, pipe chases, or electrical channels.

- Use of mufflers or silencers on all gasoline or diesel engines, regardless of size, and particularly on equipment when large quantities of high-pressure, high-velocity gases, liquids, steam, or air are discharged.

- Use vibration isolators and flexible couplers where the sound transmission path is structural in character.

5.5.3 Protection for the Receiver. When engineering controls fail to reduce sound levels to below the action level, hearing protection will be provided. Hearing protection will be provided at no cost to employees and will be replaced as necessary.

Supervisors will ensure that hearing protection is worn by all employees who are exposed at or above the action level. Employees will be given the opportunity to select their hearing protection from a variety of suitable protection devices that attenuate their exposure to the action level or below. Attenuations are determined by subtracting 7 dB from the noise reduction rating (NRR) of the protector and subtracting the remainder from the TWA sound level.

5.6 Recordkeeping

The company will maintain records of all audiometric test records required by this procedure and retain them for at least the following periods:

- Sound exposure measurement records will be retained for two (2) years.

- Audiometric test records will be retained for the duration of the affected employee's employment.

All records required by this procedure will be provided upon request to employees, former employees, representatives designated by the individual employee, and any authorized government representative.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS100 Medical Policies and Procedures

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Sound Exposure Computation
3. Hearing Protection Training Completion Record

ATTACHMENT 1
HEARING CONSERVATION PROGRAM

Responsibility Matrix

Action	Procedure Section	*Responsible Party*		
		Health and Safety Representative	**Project/Location Manager**	**Vice President, Health and Safety**
Issue, Revise, and Maintain Procedure	3.1			X
Monitor Employee Exposures	5.2	X		
Provide Training	5.4	X		
Make Available/Post 29 CFR 1910.95	5.4		X	

ATTACHMENT 2

SOUND EXPOSURE COMPUTATION

Computation of Employee Sound Exposure

A. Sound dose is computed using Table 1 as follows:

When the sound level is constant over the entire work shift, the sound dose (D), in percent, is given by:

$$D = 100\ C/T$$

Where C is the total length of the work day, in hours, and T is given in Table 1.

B. When the work shift sound exposure is composed of two or more periods of sound at different levels, the total sound dose over the work day is given by:

$$D = 100\ (C_1/T_1 + C_2/T_2 \ldots + C_n/T_n)$$

Where C_n indicates the total time of exposure at a specific sound level and T_n indicates the reference duration for that level as given by Table 1.

C. The eight-hour TWA sound level, in decibels, may be computed from the dose, in percent, by means of the formula:

$$TWA = 16.61 \log_{10} (D/100) + 90$$

For an eight-hour work shift with the sound level constant over the entire shift, the TWA is equal to the measured sound level.

Conversion Between ☛Dose☚ and ☛8-Hour TWA☚ Sound Level

Sound exposure is usually measured with an audio dosimeter which gives a readout in terms of "dose." Dosimeter readings can be converted to an 8-hour TWA sound level.

In order to convert the reading of a dosimeter into TWA, use Table 2. This table applies to dosimeters that are set to calculate dose or percent exposure according to the relationships in Table 1. So, for example, a dose of 91 percent over an 8-hour day results in a TWA of 89.3 decibels and a dose of 50 percent corresponds to a TWA of 85 decibels.

If the dose as read on the dosimeter is less than or greater than the values found in Table 2, the TWA may be calculated by using the formula:

$$TWA= 16.61 \log_{10} (D/100) + 90$$

Where TWA equals 8-hour TWA sound level and D equals accumulated dose in percent exposure.

Table 1
Permissible Sound Exposure

A-Weighted Sound Level (decibels)	Permitted Duration Per Workday (T) (hours)	A-Weighted Sound Level (decibels)	Permitted Duration Per Workday (T) (hours)
80	32.0	106	0.87
81	27.9	107	0.76
82	24.3	108	0.66
83	21.1	109	0.57
84	18.4	110	0.50
85	16.0	111	0.44
86	13.9	112	0.38
87	12.1	113	0.33
88	10.6	114	0.29
89	9.2	115	0.25
90	8.0	116	0.22
91	7.0	117	0.19
92	6.1	118	0.16
93	5.3	119	0.14
94	4.6	120	0.125
95	4.0	121	0.11
96	3.5	122	0.095
97	3.0	123	0.082
98	2.6	124	0.072
99	2.3	125	0.063
100	2.0	126	0.054
101	1.7	127	0.047
102	1.5	128	0.041
103	1.3	129	0.036
104	1.1	130	0.031
105	1.0		

Table 2
Conversion From ☛Percent Sound Exposure☚ or ☛Dose☚ To ☛8-Hour TWA Sound Level☚

Dose or Percent Sound Exposure (D)	TWA	Dose or Percent Sound Exposure (D)	TWA	Dose or Percent Sound Exposure (D)	TWA	Dose or Percent Sound Exposure (D)	TWA
10	73.4	104	90.3	260	96.9	640	103.4
15	76.3	105	90.4	270	97.2	650	103.5
20	78.4	106	90.4	280	97.4	660	103.6
25	80.0	107	90.5	290	97.7	670	103.7
30	81.3	108	90.6	300	97.9	680	103.8
35	82.4	109	90.6	310	98.2	690	103.9
40	83.4	110	90.7	320	98.4	700	104.0
45	84.2	111	90.8	330	98.6	710	104.1
50	85.0	112	90.8	340	98.8	720	104.2
55	85.7	113	90.9	350	99.0	730	104.3
60	86.3	114	90.9	360	99.2	740	104.4
65	86.9	115	91.1	370	99.4	750	104.5
70	87.4	116	91.1	380	99.6	760	104.6
75	87.9	117	91.1	390	99.8	770	104.7
80	88.4	118	91.2	400	100.0	780	104.8
81	88.5	119	91.3	410	100.2	790	104.9
82	88.6	120	91.3	420	100.4	800	105.0
83	88.7	125	91.6	430	100.5	810	105.1
84	88.7	130	91.9	440	100.7	820	105.2
85	88.8	135	92.2	450	100.8	830	105.3
86	88.9	140	92.4	460	101.0	840	105.4
87	89.0	145	92.7	470	101.2	850	105.4
88	89.1	150	92.9	480	101.3	860	105.5
89	89.2	155	93.2	490	101.5	870	105.6
90	89.2	160	93.2	500	101.6	880	105.7
91	89.3	165	93.6	510	101.8	890	105.8
92	89.4	170	93.8	520	101.9	900	105.8
93	89.5	175	94.0	530	102.0	910	105.9
94	89.6	180	94.2	540	102.2	920	106.0
95	89.6	185	94.4	550	102.3	930	106.1
96	89.7	190	94.6	560	102.4	940	106.2
97	89.8	195	94.8	570	102.6	950	106.2
98	89.9	200	95.0	580	102.7	960	106.3
99	89.9	210	95.4	590	102.8	970	106.4
100	90.0	220	95.7	600	102.9	980	106.5
101	90.1	230	96.0	610	103.0	990	106.5
102	90.1	240	96.3	620	103.2	999	106.6
103	90.2	250	96.6	630	103.3		

ATTACHMENT 3

HEARING PROTECTION TRAINING COMPLETION RECORD

	INITIAL
1. I have been informed about the health hazards associated with exposure to excessive sound levels and its potential effect on hearing.	
2. I have been informed about the types of work that may result in exposure to excessive sound levels, and the necessary protective steps to prevent excessive exposure, including engineering controls and administrative practices.	
3. I understand the purpose for, proper use, and limitations of hearing protection devices, and I have received instructions on selection, fitting, use, and care of such devices.	
4. I have been informed about the purpose of audiometric testing and an explanation of the test procedures.	
5. Copies of the applicable regulations governing occupational exposure to excessive sound have been made available to me.	

PRINT NAME: _____

SIGNATURE: _____

EMPLOYEE NUMBER: _____

DATE: _____

Please File Completed Forms and Forward a Copy to the Knoxville Training Department

STANDARD OPERATING PROCEDURE

Subject: Fatigue Management

1. PURPOSE

The purpose of this procedure is to provide guidance for the prevention of fatigue when working 12 hours per day for extended periods on field-based projects. These extended work hour assignments have traditionally been associated with either disaster responses or client-imposed project work schedules.

2. SCOPE

This procedure applies to projects expected to be in the field more than 60 days with 12 hour shifts, and those projects scheduled for less than 60 days but requiring employees to work 72 hours or greater per week. Federal, state, local, or client fatigue management guidelines that are more stringent will supersede this procedure.

3. REFERENCES

3.1 Internal References

- Procedure No. EI-HS800, Motor Vehicle Operation: General Requirements
- Procedure No. EI-HS810, Commercial Motor Vehicle Regulations and DOT Compliance

3.2 External References

- U.S. National Response Team, Technical Assistance Document, Volume I, “Guidance for Managing Worker Fatigue during Disaster Operations”
- United States Coast Guard, “Boat Operations and Training Manual, COMDTINST M 16114.32A”
- United States Coast Guard, “Crew Endurance Management, COMDINST 3500.2”

4. DEFINITIONS

- **Designated Rest Area**—This term refers to rest an employee receives after leaving the project site and seeking undisturbed rest in an air-conditioned/heated area with access to sanitary facilities necessary for showering and other bodily functions. When the definition of a “designated rest area” cannot be met, the Project or Program Health and Safety Manager may recommend an additional amount of rest hours or a reduced rotation schedule.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Senior Director of Health & Safety is responsible for the issuance, revision, and maintenance of this procedure.

5.2 Project Responsibility

The Project Manager is responsible for the implementation and enforcement of this procedure in the field.

6. PROCEDURE

Working prolonged or excessive work hours is recognized as contributing to an increased risk of workplace accidents and injuries. This increase in accidents and injuries is attributed to fatigue, which is linked to reduced alertness and productivity. During a disaster response, additional factors such as poor living conditions, limited access to nutritious meals, disrupted sleep patterns, limited sanitation facilities, and exposure to environmental physical and/or chemical hazards can exacerbate this fatigue.

6.1 Project Work Schedules

Employees shall not be routinely scheduled for workdays longer than 12 hours. The workday includes time spent on the job site, any loading or unloading activities at the Shaw office/shop, and the operation of company vehicles. If travel time to and from work exceeds 90 minutes one way, work hours shall be shortened by the travel time in excess of the 180 minute round trip travel time.

When job conditions require more than 12 consecutive hours of work, the Project/Site Supervisor shall assure that no employee works more than 16 consecutive hours. When an employee has worked a 16-hour shift, that employee shall be given a minimum of 10 hours of designated rest before returning to work. Approval to work greater than a 72 hour work week must be granted by a Division President and the Senior Director of Health and Safety.

No employee shall be assigned to work more than 12 consecutive days without one day of designated rest. Employees who have completed 12 consecutive days of work may volunteer for additional consecutive days of work. However, no employee shall work more than 14 consecutive days without one day of designated rest. Employees required to transition from day or night shifts shall be provided at least 14 hours of rest in a designated rest area before the next shift begins.

6.2 Disaster Work Schedules

Because of the broad variety of activities in which disaster site workers may be engaged, there is no simple solution for dealing with disaster worker fatigue issues. Based upon our experiences with Hurricanes Katrina, Rita, and Wilma, the primary factors that negatively impact employee fatigue include disrupted sleep patterns, poor living conditions, and limited access to nutritious meals. The contribution of each of these issues to overall fatigue will no doubt vary among disasters.

During the initial emergency response phase of a disaster clean-up, employees shall not work in excess of 84 hours per week or 12 hours per day, 7 days a week. After working this schedule for 14 days, employees shall be provided the opportunity to receive 24 hours of rest. If travel time to and from work exceeds 90 minutes one way, work hours shall be shortened by the travel time in excess of the 180 minute round trip travel time.

After completion of the emergency response phase, work schedules shall not extend beyond the project guidelines outlined in Section 6.1. These guideline work hours shall be further reduced when employees are assigned to ongoing disaster activities without designated rest areas or eating facilities.

7. ATTACHMENTS

- None

8. FORMS

- None

9. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
00 / 08/23/10	Initial Issue.	Troy Allen

PROCEDURE

Subject: OSHA REGULATED TOXIC AND HAZARDOUS SUBSTANCES

1.0 PURPOSE AND SUMMARY

OSHA has identified certain toxic and hazardous substances that are subject to substance-specific standards due to their hazardous nature. These standards establish minimum protective measures for associates potentially exposed to them.

This procedure establishes that, as a minimum, Shaw Environmental & Infrastructure, Inc. (Shaw E & I) will comply with substance specific standards where they are applicable. The project-specific Health and Safety Plan will be the controlling document.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health & Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

(None.)

5.0 TEXT

OSHA has issued substance-specific standards for the following toxic and hazardous substances:

Subpart Z - Toxic and Hazardous Substances
General Industry, 29 CFR 1910

1910.1001	Asbestos	1910.1016	N-Nitrosodimethylamine
1910.1002	Coal tar pitch volatiles interpretation of term	1910.1017	Vinyl chloride
1910.1003	4-Nitrobiphenyl	1910.1018	Inorganic arsenic
1910.1004	alpha-Naphthylamine	1910.1025	Lead
1910.1006	Methyl chloromethyl ether	1910.1027	Cadmium
1910.1007	3,3'-Dichlorobenzidine (and its salts)	1910.1028	Benzene
1910.1008	bis-Chloromethyl ether	1910.1029	Coke oven emissions
1910.1009	beta-Naphthylamine	1910.1030	Bloodborne Pathogens (see HS512)
1910.1010	Benzidine	1910.1043	Cotton dust
1910.1011	4-Aminodiphenyl	1910.1044	1,2-dibromo-3-chloropropane
1910.1012	Ethyleneimine	1910.1045	Acrylonitrile
1910.1013	beta-Propiolactone	1910.1047	Ethylene oxide
1910.1014	2-Acetylaminofluorene	1910.1048	Formaldehyde
1910.1015	4-Dimethylaminoazobenzene	1910.1050	Methylenedianiline

Subpart Z - Toxic and Hazardous Substances
Construction, 29 CFR 1926

1910.1051	1,3 Butadiene	1926.1110	Benzidine
1910.1052	Methylene Chloride	1926.1111	4-Aminodiphenyl
1926.53	Ionizing Radiation	1926.1112	Ethyleneimine
1926.54	Non-Ionizing Radiation	1926.1113	beta-Propiolactone
1926.58	Asbestos	1926.1114	2-Acetylaminofluorene
1926.60	MDA	1926.1115	4-Dimethylaminoazobenzene
1926.62	Lead	1926.1116	N-Nitrosodimethylamine
1926.63	Cadmium	1926.1117	Vinyl chloride
1926.1101	Asbestos	1926.1118	Inorganic arsenic
1926.1102	Coal tar pitch volatiles; interpretation of term	1926.1127	Cadmium
1926.1103	4-Nitrobiphenyl	1926.1128	Benzene
1926.1104	alpha-Naphthylamine	1926.1129	Coke oven emissions
1926.1106	Methyl chloromethyl ether	1926.1144	1,2-dibromo-3-chloropropane
1926.1107	3,3'-Dichlorobenzidine (and its salts)	1926.1145	Acrylonitrile
1926.1108	bis-Chloromethyl ether	1926.1147	Ethylene oxide
1926.1109	beta-Naphthylamine	1926.1148	Formaldehyde

Whenever Shaw E & I undertakes work involving one or more of these substances, the minimum health and safety requirements shall be those established in the applicable OSHA Standard(s). It

is the responsibility of the Project Manager and HS professional to verify compliance. Where other federal, state, or local substance-specific regulations apply, Shaw E & I will adhere to the regulations. If applicable regulations vary or conflict with each other, the more protective requirements and practices shall be followed.

The application of required health and safety practices to a specific project or location shall be documented in the project-specific Health and Safety Plan (HASP). Preparation requirements and approval authorities for HASPs are established in Shaw E & I Procedure HS052 Health and Safety Plans.

Future substance-specific standards issued by OSHA shall be considered included in this procedure by reference, until such time as this document is updated.

6.0 EXCEPTION PROVISIONS

(None permitted.)

7.0 CROSS REFERENCES

HS052 Health and Safety Plans

8.0 ATTACHMENTS

1. Responsibility Matrix

ATTACHMENT 1
OSHA REGULATED TOXIC AND HAZARDOUS SUBSTANCES

Responsibility Matrix

Action	Procedure Section	*Responsible Party*	
		Project Manager	**HS**
Verify compliance with OSHA Standard(s)	5.0	X	X
Ensure project-specific HASP documents all applicable health and safety requirements	5.0	X	X

PROCEDURE

Subject: CADMIUM COMPLIANCE PLAN

1.0 PURPOSE AND SUMMARY

The purpose of this document is to provide associate protection against cadmium, and to comply with the OSHA requirement for a written compliance plan. It essentially duplicates OSHA language in the Shaw Environmental & Infrastructure, Inc. (Shaw E & I) format and should be referenced (not duplicated) in applicable HASPs.

Key provisions include:

- Definitions
- Exposure monitoring
- Regulated areas
- Methods of compliance
- Compliance program
- Respiratory Protection (exposures > 10 x PEL require quantitative fit testing)
- Personal Protective Equipment
- Hygiene practices
- Medical requirements
- Hazard Communication
- Recordkeeping
- Observation of monitoring
- Reporting requirements

It is the responsibility of the Project Manager (PM) and Site Safety Officer (SSO) to implement the provisions of this document as appropriate for a particular project. This document shall work in conjunction with the site-specific HASP to form a complete site plan. Topics which must be addressed in the site-specific HASP are listed below:

- Describe each operation or task where cadmium is or may be emitted.
- Describe the specific means (work practices, equipment, etc.) that will be used to comply with this plan.
- Describe the technologies considered to keep exposures below the Permissible Exposure Limit.
- Results and sources of any previous air monitoring, if any.
- Briefly describe how and when engineering and administrative controls will be implemented, if any.
- Work practices for emergency situations.
- Personal protective equipment requirements.
- Hygiene facilities.
- Emergency contingency planning.
- Specific identity of the competent person(s).

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Action Level (AL) is defined as an airborne concentration of cadmium of 2.5 micrograms per cubic meter of air (2.5 Φg/m^3), calculated as an 8-hour time-weighted average (TWA).

Associate exposure and **similar language referring to the air cadmium level to which an associate is exposed** means the exposure to airborne cadmium that would occur if the associate were not using respiratory protective equipment.

Authorized person means any person authorized by the company and required by work duties to be present in regulated areas or any person authorized by the OSH Act or regulations issued under it.

Chief means the Chief of the Division of Occupational Safety and Health (OSHA), or designee.

Competent person means a person who is capable of identifying existing and potential cadmium hazards in the workplace and the proper methods to control them in order to protect workers, and has the authority necessary to take prompt corrective measures to eliminate or control such hazards. The duties of a competent person include at least the following: determining prior to the performance of work whether cadmium is present in the workplace; establishing, where necessary, regulated areas and assuring that access to and from those areas is limited to authorized associates; assuring the adequacy of any associate exposure monitoring required by the standard; verifying that associates exposed to air cadmium levels above the PEL wear appropriate personal protective equipment and are trained in the use of appropriate methods of exposure control; verifying that proper hygiene facilities are provided and that workers are trained to use those facilities; and verifying that the engineering controls required by this standard are implemented, maintained in proper operating condition, and functioning properly. Generally, this will be a member of the Shaw E & I HS staff.

Emergency means any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment which results in an unexpected and potentially hazardous release of cadmium.

Final medical determination is the written medical opinion of the associate=s health status by the examining physician under sections 5.8.3-.12 or, if multiple physician review under section 5.8.13 or the alternative physician determination under section 5.8.14 is involved, it is the final, written medical finding, recommendation or determination that emerges from that process.

High-efficiency particulate air (HEPA) filter means a filter capable of trapping and retaining at least 99.97 percent of mono-dispersed particles of 0.3 micrometers in diameter.

NIOSH means the Director of the National Institute for Occupational Safety and Health (NIOSH), U.S. Department of Health and Human Services, or designee.

Permissible Exposure Limit (PEL) means an airborne concentration of cadmium of 5 micrograms per cubic meter of air (5 Φg/m^3), calculated as an 8-hour time-weighted average exposure (TWA).

Regulated area means an area demarcated by the company where an associate=s exposure to airborne concentrations of cadmium exceeds, or can reasonably be expected to exceed the permissible exposure limit (PEL).

5.0 TEXT

This procedure applies to all occupational exposures to cadmium and cadmium compounds, in all forms, in all construction work where an associate may potentially be exposed to cadmium.

Construction work is defined as work involving construction, alteration and/or repair, including but not limited to the following:

1. Wrecking, demolition or salvage of structures where cadmium or materials containing cadmium are present;

2. Use of cadmium containing-paints and cutting, brazing, burning, grinding or welding on surfaces that were painted with cadmium-containing paints;

3. Construction, alteration, repair, maintenance, or renovation of structures, substrates, or portions thereof, that contain cadmium, or materials containing cadmium;

4. Cadmium welding; cutting and welding cadmium-plated steel; brazing or welding with cadmium alloys;

5. Installation of products containing cadmium;

6. Electrical grounding with cadwelding, or electrical work using cadmium-coated conduit;

7. Maintaining or retrofitting cadmium-coated equipment;

8. Cadmium contamination/emergency cleanup; and

9. Transportation, disposal, storage, or containment of cadmium or materials containing cadmium on the site or location at which construction activities are performed.

5.1 Exposure Monitoring

5.1.1 General. Prior to performance of any construction work where associates may be potentially exposed to cadmium, establish the applicability of this standard by determining whether cadmium is present in the workplace and whether there is the possibility that associate exposures will be at or above the action level. The Project Manager shall designate a competent person who will make this determination. Investigation and material testing techniques shall be used, as appropriate, in the determination. Investigation shall include a review of relevant plans, past reports, material safety data sheets, and other available records, and consultations with the property owner and discussions with appropriate individuals and agencies.

Where cadmium has been determined to be present in the workplace, and it has been determined that there is a possibility the associate's airborne exposure will be at or above the action level, the competent person shall identify associates potentially exposed to cadmium at or above the action level.

Determinations of associate exposure shall be made from breathing-zone air samples that reflect the monitored associates regular, daily 8-hour TWA exposure to cadmium.

Eight-hour TWA exposures shall be determined for each associate on the basis of one or more personal breathing-zone air samples reflecting full shift exposure on each shift, for each job classification, in each work area. Where several associates perform the same job tasks, in the same job classification, on the same shift, in the same work area, and the length, duration, and level of cadmium exposures are similar, sample a representative fraction of the associates instead of all associates in order to meet this requirement. In representative sampling, the company shall sample the associate(s) expected to have the highest cadmium exposures.

5.1.2 Specific. During initial monitoring, where a determination shows the possibility of associate exposure to cadmium at or above the action level, the company shall immediately conduct exposure monitoring that is representative of the exposure for each associate in the workplace who is or may be exposed to cadmium at or above the action level (see 29 CFR 1910.1027, Appendix E).

In addition, if the associate periodically performs tasks that may expose the associate to a higher concentration of airborne cadmium, the associate shall be monitored while performing those tasks.

Where we have objective data, demonstrating that associate exposure to cadmium will not exceed airborne concentrations at or above the action level under the expected conditions of processing, use, or handling, we may rely upon such data instead of implementing initial monitoring.

Where a determination is made that a potentially exposed associate is not exposed to airborne concentrations of cadmium at or above the action level, the PM or SSO shall make a written record of such determination. The record shall include data developed and shall also include the date of determination, and the name and social security number of each associate.

5.1.3 Monitoring Frequency (Periodic Monitoring). If the initial monitoring or periodic monitoring reveal exposures to be at or above the action level, monitoring will be conducted at a frequency and pattern needed to assure that the monitoring results reflect with reasonable accuracy the associate's typical exposure levels, given the variability in the tasks performed, work practices, and environmental conditions on the job site, and to assure the adequacy of respiratory selection and the effectiveness of engineering and work practice controls.

If the initial monitoring or the periodic monitoring indicates that exposures are below the action level and that result is confirmed by the results of another monitoring taken at least seven days later, the SSO may discontinue the monitoring for those associates whose exposures are represented by such monitoring.

5.1.4 Additional Monitoring. The PM shall institute the initial exposure monitoring required whenever there has been a change in the raw materials, equipment, personnel, work practices, or finished products that may result in additional associates being exposed to cadmium at or above the action level or in associates already exposed to cadmium at or above the action level being exposed above the PEL, or whenever the competent person has any reason to suspect that any other change might result in such further exposure.

5.1.5 Associate Notification of Monitoring Results. No later than five working days after the receipt of the results of any monitoring performed under this section, the SSO shall notify each affected associate individually in writing of the results. In addition, within the same time period, the SSO shall post the results of the exposure monitoring in an appropriate location that is accessible to all affected associates.

Wherever monitoring results indicate that associate exposure exceeds the PEL, the SSO shall include in the written notice a statement that the PEL has been exceeded and a description of the corrective action being taken by the company to reduce associate exposure to or below the PEL.

5.1.6 Accuracy of Measurement. The company shall use a method of monitoring and analysis that has an accuracy of not less than plus or minus 25 percent (+/-25%), with a confidence level of 95 percent, for airborne concentrations of cadmium at or above the action level and the permissible exposure limit.

5.2 Regulated Areas

The company shall establish a regulated area wherever an associate's exposure to airborne concentrations of cadmium is, or can reasonably be expected to be in excess of the permissible exposure limit (PEL).

Regulated areas shall be demarcated from the rest of the workplace in any manner that adequately establishes and alerts associates of the boundaries of the regulated area, including associates who are or may be incidentally in the regulated areas, and that protects persons outside the area from exposure to airborne concentrations of cadmium in excess of the PEL.

Access to regulated areas shall be limited to authorized persons.

Each person entering a regulated area shall be supplied with and required to use a respirator, selected in accordance with section 5.5.

The company shall assure that associates do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas, or carry the products associated with any of these activities into regulated areas or store such products in those areas.

5.3 Methods of Compliance/Compliance Hierarchy

Except as specified below, the PM shall implement engineering and work practice controls to reduce and maintain associate exposure to cadmium at or below the PEL, except to the extent that it can be demonstrated that such controls are not feasible.

The requirement to implement engineering controls to achieve the PEL does not apply where it can be demonstrated that:

1. The associate is only intermittently exposed; and
2. The associate is not exposed above the PEL on 30 or more days per year (12 consecutive months)

Wherever engineering and work practice controls are not sufficient to reduce associate exposure to or below the PEL, the company nonetheless shall implement such controls to reduce exposures to the lowest achievable levels. Such controls shall be supplemented with respiratory protection.

Use of associate rotation as a method of compliance is prohibited.

High speed abrasive disc saws and similar abrasive power equipment shall not be used for work on cadmium or cadmium-containing materials unless they are equipped with appropriate engineering controls to minimize emissions, if the exposure levels are above the PEL.

Materials containing cadmium shall not be applied by spray methods, if exposures are above the PEL, unless associates are protected with supplied-air respirators with full face piece, hood, helmet, suit, operated in positive pressure mode and measures are instituted to limit overspray and prevent contamination of adjacent areas.

Mechanical Ventilation

When ventilation is used to control exposure, measurements that demonstrate the effectiveness of the system in controlling exposure, such as capture velocity, duct velocity, or static pressure shall be made as necessary to maintain its effectiveness.

Measurements of the system's effectiveness in controlling exposure shall be made as necessary within five working days of any change in production, process, or control that might result in a significant increase in associate exposure to cadmium.

If air from exhaust ventilation is recirculated into the workplace, the system shall have a high efficiency filter and be monitored to assure effectiveness.

If mechanical ventilation is used, procedures shall be developed and implemented to minimize associate exposure to cadmium when maintenance of ventilation systems and changing of filters is being conducted.

5.4 Compliance Program

Written compliance programs shall be reviewed and updated at least annually, but as often and as promptly as necessary to reflect significant changes in compliance status or significant changes in the lowest air cadmium level that is technologically feasible.

A competent person shall review the comprehensive compliance program initially and after each change.

5.5 Respirator Protection

5.5.1 General. Where respirators are required, they shall be provided at no cost to the associate and the PM shall assure that they are used in compliance with the requirements. Respirators shall be used in the following circumstances:

- Where exposure levels exceed the PEL, during the time period necessary to install or implement feasible engineering and work practice controls;
- In those maintenance and repair activities and during those brief or intermittent operations where exposures exceed the PEL and engineering and work practice controls are not feasible, or are not required;
- In regulated areas;
- Where all feasible engineering and work practice controls and such controls are not sufficient to reduce exposures to or below the PEL;
- In emergencies;
- Wherever an associate who is exposed to cadmium at or above the action level requests a respirator; and
- Wherever an associate is exposed to cadmium above the PEL and engineering controls are not required.

5.5.2 Respirator Selection. Where respirators are required, the SSO shall select and provide the appropriate respirator as specified below. Respirators will be selected from among those jointly approved as acceptable protection against cadmium dust, fume, and mist by the Mine Safety and Health Administration (MSHA) and by the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 30 CFR Part 11 and Shaw E & I Procedure HS601.

The SSO shall provide a powered, air-purifying respirator (PAPR) in lieu of a negative pressure respirator wherever:

(1) An associate entitled to a respirator chooses to use this type of respirator; and

(2) This respirator will provide adequate protection.

(3) **Respirator Program**
Where respiratory protection is required, the provisions of HS601 shall be followed.

RESPIRATORY PROTECTION FOR CADMIUM

Airborne Concentration or Condition of Use[a] (1)	Required Respirator Type[b] (2)
10 X or less	A half mask, air-purifying respirator equipped with a HEPA[c(3)] filter[d](4)
25 X or less	A powered air-purifying respirator ('PAPR') with a loose-fitting hood or helmet equipped with a HEPA filter, or a supplied-air respirator with a loose-fitting hood or helmet face piece operated in the continuous flow mode
50 X or less	A full face piece air-purifying respirator equipped with a HEPA filter, or a powered air-purifying respirator with a tight-fitting half mask equipped with a HEPA filter, or a supplied air respirator with a tight-fitting half mask operated in the continuous flow mode
250 X or less	A powered air-purifying respirator with a tight-fitting full face piece equipped with a HEPA filter, or supplied-air respirator with a tight-fitting full face piece operated in the continuous flow mode
1000 X or less	A supplied-air respirator with half mask or full face piece operated in the pressure demand or other positive pressure mode
1000 X or unknown	A self-contained breathing apparatus with unknown concentrations, a full face piece operated in the pressure demand or other positive pressure mode, or a supplied-air respirator with a full face piece operated in the pressure demand or other positive pressure mode and equipped with an auxiliary escape type self-contained breathing apparatus operated in the pressure demand mode

[a] Concentrations expressed as multiple of the PEL.

[b] Respirators assigned for higher environmental concentrations may be used at lower exposure levels. Quantitative fit testing is required for all tight-fitting air purifying respirators where airborne concentration of cadmium exceeds 10 times the TWA PEL (10 x 5 m/mŠ3Δ = 50 m/mŠ3Δ). A full face piece respirator is required when eye irritation is experienced.

[c] HEPA means High Efficiency Particulate Air.

[d] Fit testing, qualitative or quantitative, is required.

5.5.3 Respirator Fit Testing. For each associate wearing a tight-fitting, air purifying respirator (either negative or positive pressure) who is exposed to airborne concentrations of cadmium that do not exceed 10 times the PEL (10 x 5 mg/m3 = 50 mg/m3), either quantitative or qualitative fit test will be performed at the time of initial fitting and at least annually thereafter. If quantitative fit testing is used for a negative pressure respirator, a fit factor that is at least 10 times the protection factor for that class of respirators shall be achieved at testing.

For each associate wearing a tight-fitting air purifying respirator (either negative or positive pressure) who is exposed to airborne concentrations of cadmium that exceed 10 times the PEL (10 x 5 mg/m3 = 50 mg/m3), the company shall perform quantitative fit testing at the time of initial fitting and at least annually thereafter. For negative-pressure respirators, a fit factor that is at least ten times the protection factor for that class of respirators shall be achieved during quantitative fit testing.

For each associate wearing a tight-fitting, supplied-air respirator or self-contained breathing apparatus, the company shall perform quantitative fit testing at the time of initial fitting and at least annually thereafter. This shall be accomplished by fit testing an air purifying respirator of identical type face piece, make, model, and size as the supplied air respirator or self-contained breathing apparatus that is equipped with HEPA filters and tested as a surrogate (substitute) in the negative pressure mode. A fit factor that is at least 10 times the protection factor for that class of respirators shall be achieved during quantitative fit testing. A supplied-air respirator or self-contained breathing apparatus with the same type face piece, make, model, and size as the air purifying respirator with which the associate passed the quantitative fit test may then be used by that associate up to the protection factor listed for that class of respirators.

Fit testing shall be conducted in accordance with 29 CFR 1910.1027, Appendix C.

Emergency Situations
Each project-specific HASP shall provide for dealing with emergency situations involving substantial releases of airborne cadmium. The plan shall include provisions for the use of appropriate respirators and personal protective equipment. In addition, associates not essential to correcting the emergency situation shall be restricted from the area and normal operations halted in that area until the emergency is abated.

5.6 Protective Work Clothing and Equipment

5.6.1 Provision and Use. If an associate is exposed to airborne cadmium above the PEL or where skin or eye irritation is associated with cadmium exposure at any level, the PM shall provide at no cost to the associate, and assure that the associate uses, appropriate protective work clothing and equipment that prevent

contamination of the associate. Protective work clothing and equipment includes, but is not limited to:

- Coveralls or similar full-body work clothing;
- Gloves, head coverings, and boots or foot coverings; and
- Face shields, vented goggles, or other appropriate protective equipment.

5.6.2 Removal and Storage. Associates shall remove all protective clothing and equipment contaminated with cadmium at the completion of the work shift and do so only in change rooms.

No associate may take cadmium-contaminated protective clothing or equipment from the workplace, except for associates authorized to do so for purposes of laundering, cleaning, maintaining, or disposing of cadmium-contaminated protective clothing and equipment at an appropriate location or facility away from the workplace.

Contaminated protective clothing and equipment, when removed for laundering, cleaning, maintenance, or disposal, must be placed and stored in sealed, impermeable bags or other closed, impermeable containers that are designed to prevent dispersion of cadmium dust.

Containers of contaminated protective clothing and equipment that are to be taken out of the change rooms or the workplace for laundering, cleaning, maintenance or disposal shall bear labels in accordance with section 5.9.3.

5.6.3 Cleaning, Replacement, and Disposal. Provide the protective clothing and equipment in a clean and dry condition as often as necessary to maintain its effectiveness, but in any event at least weekly. The PM is responsible for cleaning and laundering the protective clothing and equipment to maintain its effectiveness and is also responsible for disposing of such clothing and equipment

The PM also is responsible for repairing or replacing required protective clothing and equipment as needed to maintain its effectiveness. When rips or tears are detected while an associate is working they shall be immediately mended, or the worksuit shall be immediately replaced.

The removal of cadmium from protective clothing and equipment by blowing, shaking, or any other means that disperses cadmium into the air is prohibited.

Laundering of contaminated clothing or cleaning of contaminated equipment in the workplace will be done in a manner that prevents the release of airborne cadmium in excess of the permissible exposure limit.

Any person who launders or cleans protective clothing or equipment contaminated with cadmium will be informed of the potentially harmful effects

of exposure to cadmium, and that the clothing and equipment should be laundered or cleaned in a manner to effectively prevent the release of airborne cadmium in excess of the PEL.

5.7 Hygiene Areas and Practices

5.7.1 General. For associates whose airborne exposure to cadmium is above the PEL, provide clean change rooms, handwashing facilities, showers, and lunchroom facilities.

5.7.2 Change Rooms. Change rooms must be equipped with separate storage facilities for street clothes and for protective clothing and equipment, which are designed to prevent dispersion of cadmium and contamination of the associate's street clothes (see also 29 CFR 1910.141).

5.7.3 Showers and Handwashing Facilities. Associates whose airborne exposure to cadmium is above the PEL must shower during the end of the work shift.

Associates who are exposed to cadmium above the PEL must wash their hands and faces prior to eating, drinking, smoking, chewing tobacco or gum, or applying cosmetics.

5.7.4 Lunchroom Facilities. Lunchroom facilities must be readily accessible to associates, tables for eating must be maintained free of cadmium, and no associate in a lunchroom facility may be exposed at any time to cadmium at or above a concentration of 2.5 mg/m3.

Associates may not enter lunchroom facilities with protective work clothing or equipment unless surface cadmium has been removed from the clothing and equipment by HEPA vacuuming or some other method that removes cadmium dust without dispersing it.

5.7.5 Housekeeping. All surfaces shall be maintained as free as practicable of accumulations of cadmium.

All spills and sudden releases of material containing cadmium shall be cleaned up as soon as possible.

Surfaces contaminated with cadmium shall, wherever possible, be cleaned by vacuuming or other methods that minimize the likelihood of cadmium becoming airborne.

HEPA-filtered vacuuming equipment or equally effective filtration methods shall be used for vacuuming. The equipment shall be used and emptied in a manner that minimizes the reentry of cadmium into the workplace.

Shoveling, dry or wet sweeping, and brushing may be used only where vacuuming or other methods that minimize the likelihood of cadmium becoming airborne have been tried and found not to be effective.

Compressed air shall not be used to remove cadmium from any surface unless the compressed air is used in conjunction with a ventilation system designed to capture the dust cloud created by the compressed air.

Waste, scrap, debris, bags, containers, personal protective equipment, and clothing contaminated with cadmium and consigned for disposal shall be collected and disposed of in sealed impermeable bags or other closed, impermeable containers. These bags and containers shall be labeled in accordance with Section 5.9.3.

5.8 Medical Surveillance

5.8.1 General. Currently exposed - A medical surveillance program shall be instituted for all associates who are or may be exposed at or above the action level and all associates who perform the following tasks, operations or jobs: remediation of cadmium containing wastes, electrical grounding with cadwelding; cutting, brazing, burning, grinding or welding on surfaces that were painted with cadmium -containing paints; electrical work using cadmium-coated conduit; use of cadmium containing paints; cutting and welding cadmium-plated steel; brazing or welding with cadmium alloys; fusing of reinforcing steel by cadmium welding; maintaining or retrofitting cadmium-coated equipment; and, wrecking and demolition where cadmium is present. A medical surveillance program will not be required if the associate:

- Is not currently exposed by the company to airborne concentrations of cadmium at or above the action level on 30 or more days per year (twelve consecutive months); and,
- Is not currently exposed by the company in those tasks on 30 or more days per year (twelve consecutive months).

Previously exposed - A medical surveillance program shall be instituted for all associates who might previously have been exposed to cadmium prior to the effective date of this standard in tasks specified under above, unless the company demonstrates that the associate did not in the years prior to the effective date of this section work in those tasks with exposure to cadmium for an aggregated total of more than 12 months.

To determine an associate's fitness for using a respirator, the company shall provide the limited medical examination specified in section 5.5.

The company shall assure that all medical examinations and procedures required by this section are performed by or under the supervision of a licensed physician, who has read and is familiar with the health effects section of 29 CFR 1910.1027,

Appendix A, the regulatory text of this section, the protocol for sample handling and lab selection in 29 CFR 1910.1027, Appendix F, and the questionnaire of 29 CFR 1910.1027, Appendix D.

The company shall provide the medical surveillance required by this section, including multiple physician review without cost to associates, and at a time and place that is reasonable and convenient to associates.

The company shall assure that the collecting and handling of biological samples of cadmium in urine (CdU), cadmium in blood (CdB), and beta-2 microglobulin in urine (b2-M) taken from associates under this section is done in a manner that assures their reliability and that analysis of biological samples of cadmium in urine (CdU), cadmium in blood (CdB), and beta-2 microglobulin in urine (b2-M) taken from associates under this section is performed in laboratories with demonstrated proficiency to perform the particular analysis. (See 29 CFR 1910.1027, Appendix F)

5.8.2 Initial Examination. For associates covered by medical surveillance, thecompany shall provide an initial medical examination. The examination shall beprovided to those associates within 30 days after initial assignment to a job with exposure to cadmium.

The initial medical examination shall include:

- A detailed medical and work history, with emphasis on:
- Past, present, and anticipated future exposure to cadmium;
- Any history of renal, cardiovascular, respiratory, hematopoietic, reproductive, and/or musculo-skeletal system dysfunction;
- Current usage of medication with potential nephrotoxic side-effects;
- Smoking history and current status; and
- Biological monitoring that includes the following tests:

    a. Cadmium in urine (CdU), standardized to grams of creatinine (g/Cr);

    b. Beta-2 microglobulin in urine (b2-M), standardized to grams of creatinine (g/Cr), with pH specified, as described in 29 CFR 1910.1027, Appendix F; and

    c. Cadmium in blood (CdB), standardized to liters of whole blood (lwb).

Recent Examination: An initial examination is not required to be provided if adequate records show that the associate has been examined in accordance with the requirements of this section within the past 12 months. In that case, such records shall be maintained as part of the associate's medical record and the prior exam shall be treated as if it were an initial examination.

5.8.3 Actions Triggered by Initial Biological Monitoring. If the results of the biological monitoring tests in the initial examination show the associate's CdU level to be at or below 3 mg/g Cr, b2-M level to be at or below 300 mg/g Cr and CdB level to be at or below 5 mg/lwb, then:

1. For associates who are subject to medical surveillance because of current or anticipated exposure to cadmium, the company shall provide the minimum level of periodic medical surveillance.

2. For associates who are subject to medical surveillance because of prior but not current exposure, the company shall provide biological monitoring for CdU, b2-M, and CdB within one year after the initial biological monitoring and then follow the requirements for periodic medical surveillance.

For all associates who are subject to initial medical surveillance if the results of the initial biological monitoring tests show the level of CdU to exceed 3 mg/g Cr, the level of b2-M to be in excess of 300 mg/g Cr, or the level of CdB to be in excess of 5 mg/lwb, the company shall:

1. Within two weeks after receipt of biological monitoring results, reassess the associate's occupational exposure to cadmium as follows:

   - Reassess the associate's work practices and personal hygiene;
   - Reevaluate the associate's respirator use, if any, and the respirator program;
   - Review the hygiene facilities;
   - Reevaluate the maintenance and effectiveness of the relevant engineering controls; and
   - Assess the associate's smoking history and status;

2. Within 30 days after the exposure reassessment, take reasonable steps to correct any deficiencies found in the reassessment that may be responsible for the associate's excess exposure to cadmium; and,

3. Within 90 days after receipt of biological monitoring results, provide a full medical examination to the associate. After completing the medical examination, the examining physician shall determine in a written medical opinion whether to medically remove the associate. If the physician determines that medical removal is not necessary, then until the associate's CdU level falls to or below 3 mg/g Cr, b2-M level falls to or

below 300 mg/g Cr and CdB level falls to or below 5 mg/lwb, the company shall:

- Provide biological monitoring in accordance with section 5.8.2. on a semiannual basis; and

- Provide annual medical examinations in accordance with section 5.8.4.

For all associates who are subject to medical surveillance under section 5.8.1 (Current), if the results of the initial biological monitoring tests show the level of CdU to be in excess of 15 mg/g Cr, or the level of CdB to be in excess of 15 mg/lwb, or the level of b2-M to be in excess of 1,500 mg/g Cr, the company shall comply with the requirements of section 5.8.3. Within 90 days after receipt of biological monitoring results, the company shall provide a full medical examination. After completing the medical examination, the examining physician shall determine in a written medical opinion whether to medically remove the associate. However, if the initial biological monitoring results and the biological monitoring results obtained during the medical examination both show that: CdU exceeds 15 mg/g Cr, or CdB exceeds 15 mg/lwb; or b2-M exceeds 1500 mg/g Cr, and in addition CdU exceeds 3 mg/g Cr or CdB exceeds 5 mg/liter of whole blood, then the physician shall medically remove the associate from exposure to cadmium at or above the action level. If the second set of biological monitoring results obtained during the medical examination does not show that a mandatory removal trigger level has been exceeded, then the associate is not required to be removed by the mandatory provisions of this section. If the associate is not required to be removed by the mandatory provisions of this section or by the physician's determination, then until the associate's CdU level falls to or below 3 mg/g Cr, b2-M level falls to or below 300 mg/g Cr and CdB level falls to or below 5 mg/lwb, the company shall:

1. Periodically reassess the associate's occupational exposure to cadmium;
2. Provide biological monitoring on a quarterly basis; and
3. Provide semiannual medical examinations.

For all associates to whom medical surveillance is provided, beginning on January 1, 1999, whenever the results of initial biological monitoring tests show the associate's CdU level to be in excess of 7 mg/g Cr, or b2-M level to be in excess of 750 mg/g Cr, or CdB level to be in excess of 10 mg/lwb, the company shall comply with the requirements of section 5.8.3 for initial surveillance. Within 90 days after receipt of biological monitoring results, the company shall provide a full medical examination to the associate. After completing the medical examination, the examining physician shall determine in a written medical opinion whether to medically remove the associate. However, if the initial biological monitoring results and the biological monitoring results obtained during the medical examination both show that: CdU exceeds 7 mg/g Cr; or CdB exceeds 10 mg/lwb; or b2-M exceeds 750 mg/g Cr, and in addition

CdU exceeds 3 mg/g Cr or CdB exceeds 5 mg/liter of whole blood, then the physician shall medically remove the associate from exposure to cadmium at or above the action level. If the second set of biological monitoring results obtained during the medical examination does not show that a mandatory removal trigger level has been exceeded, then the associate is not required to be removed by the mandatory provisions of this section. If the associate is not required to be removed by the mandatory provisions of this section or by the physician's determination, then until the associate's CdU level falls to or below 3 mg/g Cr, b2-M level falls to or below 300 mg/g Cr and CdB level falls to or below 5 mg/lwb, the company shall:

1. Periodically reassess the associate's occupational exposure to cadmium;
2. Provide biological monitoring on a quarterly basis; and
3. Provide semiannual medical examinations.

5.8.4 Periodic Medical Surveillance. For each associate who is covered by initial medical surveillance because of current or anticipated exposure to cadmium, the company shall provide at least the minimum level of periodic medical surveillance, which consists of periodic medical examinations and periodic biological monitoring. A periodic medical examination shall be provided within one year after the initial examination and thereafter at least biennially. Biological sampling shall be provided at least annually either as part of a periodic medical examination or separately as periodic biological monitoring.

The periodic medical examination shall include:

1. A detailed medical and work history, or update thereof, with emphasis on: past, present and anticipated future exposure to cadmium; smoking history and current status; reproductive history; current use of medications with potential nephrotoxic side-effects; any history of renal, cardiovascular, respiratory, hematopoietic, and/or musculo-skeletal system dysfunction; and as part of the medical and work history, for associates who wear respirators, questions 3-11 and 25-32 in 29 CFR 1910.1027, Appendix D;

2. A complete physical examination with emphasis on: blood pressure, the respiratory system, and the urinary system;

3. A 14 inch by 17 inch, or a reasonably standard sized posterior-anterior chest X-ray (after the initial X-ray, the frequency of chest X-rays is to be determined by the examining physician);

4. Pulmonary function tests, including forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV1);

5. Biological monitoring;

6. Blood analysis, including blood urea nitrogen, complete blood count, and serum creatinine;

7. Urinalysis, including the determination of albumin, glucose, and total and low molecular weight proteins;

8. For males over 40 years old, prostate palpation, or other at least as effective diagnostic test(s); and

9. Any additional tests or procedures deemed appropriate by the examining physician.

Periodic biological monitoring shall be provided in accordance with section 5.8.3.

If the results of periodic biological monitoring or the results of biological monitoring performed as part of the periodic medical examination show the level of the associate's CdU, b2-M, or CdB to be in excess of the levels specified in sections 5.8.1; or, beginning on January 1, 1999, in excess of the levels specified, the company shall take the appropriate actions specified in section 5.8.3.

For previously exposed associates:

1. If the associate's levels of CdU did not exceed 3 mg/g Cr, CdB did not exceed 5 mg/lwb, and b2-M did not exceed 300 mg/g Cr in the initial biological monitoring tests, and if the results of the followup biological monitoring within one year after the initial examination confirm the previous results, the company may discontinue all periodic medical surveillance for that associate.

2. If the initial biological monitoring results for CdU, CdB, or b2-M were in excess of the levels specified in section 5.8.3, but subsequent biological monitoring results show that the associate's CdU levels no longer exceed 3 mg/g Cr, CdB levels no longer exceed mg/lwb, and b2-M levels no longer exceed 30 mg/g Cr, the company shall provide biological monitoring for CdU, CdB, and b2-M within one year after these most recent biological monitoring results. If the results of the followup biological monitoring within one year confirm the previous results, the company may discontinue all periodic medical surveillance for that associate.

3. However, if the results of the follow-up tests indicate that the level of the associate's CdU, b2-M, or CdB exceeds these same levels, the company is required to provide annual medical examinations until the results of biological monitoring are consistently below these levels or the examining physician determines in a written medical opinion that further medical surveillance is not required to protect the associate's health.

A routine, biennial medical examination is not required to be provided if adequate medical records show that the associate has been examined in accordance with the requirements of section 5.8.4 within the past 12 months. In that case, such records shall be maintained by the company as part of the associate's medical record, and the next routine, periodic medical examination shall be made available to the associate within two years of the previous examination.

5.8.5 Actions Triggered by Medical Examinations. If the results of a medical examination carried out in accordance with this section indicate any laboratory or clinical finding consistent with cadmium toxicity that does not require action under sections 5.8.2-4, the company shall take the following steps and continue to take them until the physician determines that they are no longer necessary.

1. Periodically reassess: the associate's work practices and personal hygiene; the associate's respirator use, if any; the associate's smoking history and status; the respiratory protection program; the hygiene facilities; the maintenance and effectiveness of the relevant engineering controls; and take all reasonable steps to correct the deficiencies found in the reassessment that may be responsible for the associate's excess exposure to cadmium.

2. Provide semi-annual medical reexaminations to evaluate the abnormal clinical sign(s) of cadmium toxicity until the results are normal or the associate is medically removed; and

3. Where the results of tests for total proteins in urine are abnormal, provide a more detailed medical evaluation of the toxic effects of cadmium on the associate's renal system.

5.8.6 Examination for Respirator Use. To determine an associate's fitness for respirator use, the company shall provide a medical examination that includes the elements specified below. This examination shall be provided prior to the associate's being assigned to a job that requires the use of a respirator to any associate without a medical examination within the preceding 12 months that satisfies the requirements of this section. It will include:

1. A detailed medical and work history, or update thereof, with emphasis on: past exposure to cadmium; smoking history and current status; any history of renal, cardiovascular, respiratory, hematopoietic, and/or musculo-skeletal system dysfunction; a description of the job for which the respirator is required; and questions 3-11 and 25-32 in 29 CFR 1910.1027, Appendix D;

2. A blood pressure test;

3. Biological monitoring of the associate's levels of CdU, CdB and b2-M, unless such results already have been obtained within the twelve months; and

4. Any other test or procedure that the examining physician deems appropriate.

After reviewing all the information obtained from the medical examination, the physician shall determine whether the associate is fit to wear a respirator.

Whenever an associate has exhibited difficulty in breathing during a respirator fit test or during use of a respirator, the company, as soon as possible, shall provide the associate with a periodic medical examination to determine the associate's fitness to wear a respirator.

Where the results of the examination are abnormal, medical limitation or prohibition of respirator use shall be considered. If the associate is allowed to wear a respirator, the associate's ability to continue to do so shall be periodically evaluated by a physician.

5.8.7 Emergency Examinations. In addition to the medical surveillance, the company shall provide a medical examination as soon as possible to any associate who may have been acutely exposed to cadmium because of an emergency.

The examination shall include the requirements of section 5.8.4, with emphasis on the respiratory system, other organ systems considered appropriate by the examining physician, and symptoms of acute overexposure, per 29 CFR 1910.1027, Appendix A.

5.8.8 Termination of Employment Examination. At termination of employment, the company shall provide a medical examination, including a chest X-ray where necessary, to any associate to whom at any prior time the company was required to provide medical surveillance (5.8.1 or .7) However, if the last examination satisfied the requirements and was less than six months prior to the date of termination, no further examination is required unless otherwise specified in sections 5.8.3 or .5.

In addition, if the company has discontinued all periodic medical surveillance under 5.8.4, no termination of employment medical examination is required.

5.8.9 Information Provided to the Physician. The company shall provide the following information to the examining physician:

- A copy of this standard and appendices;

- A description of the affected associate's former, current, and anticipated duties as they relate to the associate's occupational exposure to cadmium;

- The associate's former, current, and anticipated future levels of occupational exposure to cadmium;

- A description of any personal protective equipment, including respirators, used or to be used by the associate, including when and for how long the associate has used that equipment; and

- Relevant results of previous biological monitoring and medical examinations.

5.8.10 Physician's Written Medical Opinion. The company shall promptly obtain a written, signed medical opinion from the examining physician for each medical examination performed on each associate. This written opinion shall contain:

- The physician's diagnosis for the associate;

- The physician's opinion as to whether the associate has any detected medical condition(s) that would place the associate at increased risk of material impairment to health from further exposure to cadmium, including any indications of potential cadmium toxicity;

- The results of any biological or other testing or related evaluations that directly assess the associate's absorption of cadmium;

- Any recommended removal from, or limitation to, the activities or duties of the associate or to the associate's use of personal protective equipment, such as respirators; and

- A statement that the physician has clearly and carefully explained to the associate the results of the medical examination, including all biological monitoring results and any medical conditions related to cadmium exposure that requires further evaluation or treatment, and any limitation on the associate's diet or use of medications.

The company shall promptly obtain a copy of the results of any biological monitoring provided by the company to an associate independently of a medical examination, and, in lieu of a written medical opinion, an explanation sheet explaining those results.

The company shall instruct the physician not to reveal orally or in the written medical opinion given to the company specific findings or diagnoses unrelated to occupational exposure to cadmium.

5.8.11 Medical Removal Protection (MRP). The company shall temporarily remove an associate from work where there is excess exposure to cadmium on each occasion that medical removal is required under sections 5.8.3, .4, or .6 and on

each occasion that a physician determines in a written medical opinion that the associate should be removed from such exposure. The physician's determination may be based on biological monitoring results, inability to wear a respirator, evidence of illness, other signs or symptoms of cadmium-related dysfunction or disease, or any other reason deemed medically sufficient by the physician.

The company shall medically remove an associate in accordance with section 5.8.11 regardless of whether at the time of removal a job is available into which the removed associate may be transferred.

Whenever an associate is medically removed under section 5.8.11, the company shall transfer the removed associate to a job where the exposure to cadmium is within the permissible levels specified in that section as soon as one becomes available.

For any associate who is medically removed under the provisions of section 5.8.11, the company shall provide follow-up medical examinations semi-annually until, in a written medical opinion, the examining physician determines that either the associate may be returned to his/her former job status or the associate must be permanently removed from excess cadmium exposure.

The company may not return an associate who has been medically removed for any reason to his/her former job status until a physician determines in a written medical opinion that continued medical removal is no longer necessary to protect the associate's health.

Where an associate is found unfit to wear a respirator, the company shall remove the associate from work where exposure to cadmium is above the PEL.

Where removal is based upon any reason other than the associate's inability to wear a respirator, the company shall remove the associate from work where exposure to cadmium is at or above the action level.

Except as specified in section 5.8.11, no associate who was removed because his/her level of CdU, CdB and/or b2-M exceeded the trigger levels in sections 5.8.3 or .4 may be returned to work with exposure to cadmium at or above the action level until the associate's levels of CdU fall to or below 3 m/g Cr, CdB fall to or below 5 m/lwb, and b2-M fall to or below 300 m/g Cr.

However, when in the examining physician's opinion continued exposure to cadmium will not pose an increased risk to the associate's health and there are special circumstances that make continued medical removal an inappropriate remedy, the physician shall fully discuss these matters with the associate, and then in a written determination may return a worker to his/her former job status despite what would otherwise be unacceptably high biological monitoring results. Thereafter and until such time as the associate's biological monitoring results have decreased to levels where he/she could have been returned to his/her former

job status, the returned associate shall continue medical surveillance as if he/she were still on medical removal. Until such time, the associate is no longer subject to mandatory medical removal. Subsequent questions regarding the associate's medical removal shall be decided solely by a final medical determination.

Where the company, although not required by this section to do so, removes an associate from exposure to cadmium or otherwise places limitations on an associate due to the effects of cadmium exposure on the associate's medical condition, the company shall provide the same medical removal protection benefits to that associate as would have been provided had the removal been required under section 5.8.11.

5.8.12 Medical Removal Protection Benefits. The company shall provide medical removal protection benefits to an associate for up to a maximum of 18 months each time, and while the associate is temporarily medically removed.

For purposes of this section, the requirement that the company provide medical removal protection benefits means that the company shall maintain the total normal earnings, seniority, and all other associate rights and benefits of the removed associate, including the associate's right to his/her former job status, as if the associate had not been removed from the associate's job or otherwise medically limited.

Where, after 18 months on medical removal because of elevated biological monitoring results, the associate's monitoring results have not declined to a low enough level to permit the associate to be returned to his/her former job status:

1. The company shall make available to the associate a medical examination pursuant to this section in order to obtain a final medical determination as to whether the associate may be returned to his/her former job status or must be permanently removed from excess cadmium exposure; and

2. The company shall assure that the final medical determination indicates whether the associate may be returned to his/her former job status and what steps, if any, should be taken to protect the associate's health;

The company may condition the provision of medical removal protection benefits upon the associate's participation in medical surveillance provided in accordance with this section.

5.8.13 Multiple Physician Review. If the company selects the initial physician to conduct any medical examination or consultation provided to an associate under this section, the associate may designate a second physician to:

1. Review any findings, determinations, or recommendations of the initial physician; and

2. Conduct such examinations, consultations, and laboratory tests as the second physician deems necessary to facilitate this review.

The company shall promptly notify an associate of the right to seek a second medical opinion after each occasion that an initial physician provided by the company conducts a medical examination or consultation pursuant to this section. The company may condition its participation in, and payment for, multiple physician review upon the associate doing the following within fifteen (15) days after receipt of this notice, or receipt of the initial physician's written opinion, whichever is later:

1. Informing the company that he or she intends to seek a medical opinion; and
2. Initiating steps to make an appointment with a second physician.

If the findings, determinations, or recommendations of the second physician differ from those of the initial physician, then the company and the associate shall assure that efforts are made for the two physicians to resolve any disagreement.

If the two physicians have been unable to quickly resolve their disagreement, then the company and the associate, through their respective physicians, shall designate a third physician to:

1. Review any findings, determinations, or recommendations of the other two physicians; and

2. Conduct such examinations, consultations, laboratory tests, and discussions with the other two physicians as the third physician deems necessary to resolve the disagreement among them.

The company shall act consistently with the findings, determinations, and recommendations of the third physician, unless the company and the associate reach an agreement that is consistent with the recommendations of at least one of the other two physicians.

5.8.14 Alternate Physician Determination. The company and an associate may agree upon the use of any alternate form of physician determination in lieu of the multiple physician review, so long as the alternative is expeditious and at least as protective of the associate.

5.8.15 Information the Company Must Provide the Associate. The company shall provide a copy of the physician's written medical opinion to the examined associate within five working days after receipt thereof.

The company shall provide the associate with a copy of the associate's biological monitoring results and an explanation sheet explaining the results within five working days after receipt thereof.

Within 30 days after a request by an associate, the company shall provide the associate with the information the company is required to provide the examining physician.

5.8.16 Reporting. In addition to other medical events that are required to be reported on the OSHA Form No. 200, the company shall report any abnormal condition or disorder caused by occupational exposure to cadmium associated with employment as specified in Chapter (V)(E) of the Reporting Guidelines for Occupational Injuries and Illnesses.

5.9 Communication of Cadmium Hazards to Associates

5.9.1 General. In communications concerning cadmium hazards, companies shall comply with the requirements of the Hazard Communication Standard, including but not limited to the requirements concerning warning signs and labels, material safety data sheets (MSDS), and associate information and training.

5.9.2 Warning Signs. Warning signs shall be provided and displayed in regulated areas. In addition, warning signs shall be posted at all approaches to regulated areas so that an associate may read the signs and take necessary protective steps before entering the area.

Warning signs required by this section shall bear the following information:

DANGER
CADMIUM
CANCER HAZARD
CAN CAUSE LUNG AND KIDNEY DISEASE
AUTHORIZED PERSONNEL ONLY
RESPIRATORS REQUIRED IN THIS AREA

The company shall ensure that signs required by this section are illuminated, cleaned, and maintained as necessary so that the legend is readily visible.

5.9.3 Warning Labels. Shipping and storage containers containing cadmium, cadmium compounds, or cadmium contaminated clothing, equipment, waste, scrap, or debris shall bear appropriate warning labels, as specified in Section 5.9.2.

The warning labels shall include at least the following information:

DANGER - CONTAINS CADMIUM - CANCER HAZARD - AVOID CREATING DUST - CAN CAUSE LUNG AND KIDNEY DISEASE

Where feasible, installed cadmium products shall have a visible label or other indication that cadmium is present.

5.9.4 Associate Information and Training. The company shall institute a training program for all associates who are potentially exposed to cadmium, assure associate participation in the program, and maintain a record of the contents of such program.

Training shall be provided prior to or at the time of initial assignment to a job involving potential exposure to cadmium and at least annually thereafter.

The company shall make the training program understandable to the associate and shall assure that each associate is informed of the following:

- The health hazards associated with cadmium exposure, with special attention to the information incorporated in 29 CFR 1910.1027, Appendix A;
- The quantity, location, manner of use, release, and storage of cadmium in the workplace and the specific nature of operations that could result in exposure to cadmium, especially exposures above the PEL;
- The engineering controls and work practices associated with the associate's job assignment;
- The measures associates can take to protect themselves from exposure to cadmium, including modification of such habits as smoking and personal hygiene, and specific procedures the company has implemented to protect associates from exposure to cadmium such as appropriate work practices, emergency procedures, and the provision of personal protective equipment;
- The purpose, proper selection, fitting, proper use, and limitations of respirators and protective clothing;
- The purpose and a description of the medical surveillance program required by section 5.8;
- The contents of this procedure and its attachments, and
- The associate's rights of access to records.

The company shall make a copy of this section and its appendices readily available to all affected associates and shall provide a copy without cost if requested.

In a multi-company workplace, if the company produces, uses, or stores cadmium in a manner that may expose employees of other companies to cadmium, those companies will be notified of the potential hazard.

5.10 Recordkeeping

5.10.1 Exposure Monitoring. The company shall establish and keep an accurate record of all air monitoring for cadmium in the workplace.

This record shall include at least the following information:

- The monitoring date, shift, duration, air volume, and results in terms of an 8-hour TWA of each sample taken, and if cadmium is not detected, the detection level;
- The name, social security number, and job classification of all associates monitored and of all other associates whose exposures the monitoring result is intended to represent, including, where applicable, a description of how it was determined that the associate's monitoring result could be taken to represent other associate's exposures;
- A description of the sampling and analytical methods used and evidence of their accuracy;
- The type of respiratory protective device, if any, worn by the monitored associate and by any other associate whose exposure the monitoring result is intended to represent;
- A notation of any other conditions that might have affected the monitoring results.
- Any exposure monitoring or objective data that were used and the levels.

The company shall maintain this record for at least thirty (30) years.

5.10.2 Objective Data for Exemption from Requirement for Initial Monitoring. For purposes of this section, objective data are information demonstrating that a particular product or material containing cadmium or a specific process, operation, or activity involving cadmium cannot release dust or fumes in concentrations at or above the action level even under the worst-case release conditions. Objective data can be obtained from an industry-wide study or from laboratory product test results from manufacturers of cadmium-containing products or materials. The data the company uses from an industry-wide survey

must be obtained under workplace conditions closely resembling the processes, types of material, control methods, work practices and environmental conditions in the company's current operations.

The company shall maintain the record of the objective data relied upon for at least 30 years.

5.10.3 Medical Surveillance. Records shall be maintained per Shaw E & I Procedure HS102.

5.10.4 Training. The company shall certify that associates have been trained by preparing a certification record which includes the identity of the person trained, the signature of the company or the person who conducted the training, and the date the training was completed. The certification records shall be prepared at the completion of training and shall be maintained on file for one (1) year beyond the date of training of that associate.

5.10.5 Availability. Access to records shall be per Shaw E & I Procedure HS102. Within 15 days after a request, the company shall make an associate's medical records available for examination and copying to the subject associate, to designated representatives, to anyone having the specific written consent of the subject associate, and after the associate's death or incapacitation, to the associate's family members.

5.11 Observation of Monitoring

5.11.1 Associate Observation. The company shall provide affected associates or their designated representatives an opportunity to observe any monitoring of associate exposure to cadmium.

5.11.2 Observation Procedures. When observation of monitoring requires entry into an area where the use of protective clothing or equipment is required, the company shall provide the observer with that clothing and equipment and shall assure that the observer uses such clothing and equipment and complies with all other applicable safety and health procedures.

5.12 Reporting Requirements

5.12.1 Use (California Only). All uses of cadmium that are covered by this procedure and require the establishment of regulated areas shall be reported in writing to Cal/OSHA within 15 calendar days. Any changes in the reported information shall be similarly reported in writing within 15 calendar days of such change. The report shall include:

- The name of the company and the address of each workplace where regulated areas are required;

- An identifying description of where the regulated areas are located in the workplace;

- A brief description of each process or operation which creates associate exposure to cadmium including the estimated number of associates engaged in each process or operation; and

- The names and addresses of any collective bargaining units or other representatives of the affected associates.

5.12.2 Temporary Worksite Notification (California Only). Temporary worksites need to be reported to Cal/OSHA only once. Such notice shall also provide the time and date of commencement of work, the approximate duration of the work, the location, the type of business, and the kind of work for each temporary worksite at least 24 hours prior to the commencement of each job when feasible, to the nearest OSHA office.

5.12.3 Emergency (California Only). Any emergency as defined shall be reported as follows:

- A report of the occurrence of the emergency and the facts obtainable at that time shall be made within 24 hours to the nearest district office of Cal/OSHA.

- A written report shall be filed within 15 calendar days after the emergency occurred. The written report shall include:

    1. A description of the operation or process involved including its location, the amount of cadmium released, and the duration of the emergency.

    2. A statement of the known or estimated extent of associate exposure to cadmium and area of contamination.

    3. An analysis of the circumstances that led up to the emergency.

    4. A description of the measures taken or to be taken, with specific completion dates, to prevent further similar emergencies from occurring again.

5.12.4 Posting. A copy of each written report shall be posted in the regulated areas or other appropriate location where the posting is conspicuous to affected associates.

6.0 EXCEPTION PROVISIONS

(None Permitted.**)**

7.0 CROSS REFERENCES

HS100 Medical Policies and Procedures
HS102 Management of Employee Exposure and Medical Records
HS104 Employee Notification of Industrial Hygiene
29 CFR 1910.1027 Appendix B: Substance Technical Guidelines for Cadmium
29 CFR 1910.1027 Appendix C: Qualitative and Quantitative Fit Testing Requirements
29 CFR 1910.102 Appendix D: Occupational Health History Interview with Reference to Cadmium Exposure
29 CFR 1910.1027 Appendix E: Cadmium in Workplace Atmospheres
29 CFR 1910.1027 Appendix F: Non-Mandatory Protocol for Biological Monitoring

8.0 ATTACHMENTS

1. Responsibility Matrix
2. 29 CFR 1910.1027, Appendix A: Substance Safety Data Sheet

ATTACHMENT 1

Responsibility Matrix

Action	Procedure Section	*Responsible Party*	
		Project Manager	**Site Safety Officer**
Implement the provisions of this document as appropriate for a particular project.	1.0	X	X

ATTACHMENT 2
29 CFR 1910.1027 APPENDIX A

Title:	**Substance Safety Data Sheet - Cadmium**
Subpart	**Z**
Subpart Title:	**Toxic and Hazardous Substances**

I. Substance Identification

A. Substance: Cadmium.

1910.1027 App A, Paragraph 1 B. 8-Hour, Time-weighted-average, Permissible Exposure Limit (TWA PEL):

1910.1027 App A, Paragraph 2 1. TWA PEL: Five micrograms of cadmium per cubic meter of air 5 ug/m(3), time-weighted average (TWA) for an 8-hour workday.

1910.1027 App A, Paragraph 3 C. Appearance: Cadmium metal-soft, blue-white, malleable, lustrous metal or grayish-white powder. Some cadmium compounds may also appear as a brown, yellow, or red powdery substance.

1910.1027 App A, Paragraph 4

II. Health Hazard Data

A. Routes of Exposure. Cadmium can cause local skin or eye irritation. Cadmium can affect your health if you inhale it or if you swallow it.

1910.1027 App A, Paragraph 5

B. Effects of Overexposure.

1910.1027 App A, Paragraph 6 1. Short-term (acute) exposure: Cadmium is much more dangerous by inhalation than by ingestion. High exposures to cadmium that may be immediately dangerous to life or health occur in jobs where workers handle large quantities of cadmium dust or fume; heat cadmium-containing compounds or cadmium-coated surfaces; weld with cadmium solders or cut cadmium-containing materials such as bolts.

1910.1027 App A, Paragraph 7 2. Severe exposure may occur before symptoms appear. Early symptoms may include mild irritation of the upper respiratory tract, a sensation of constriction of the throat, a metallic taste and/or a cough. A period of 1-10 hours may precede the onset of rapidly progressing shortness of breath, chest pain, and flu-like symptoms with weakness, fever, headache, chills, sweating and muscular pain. Acute pulmonary edema usually develops within 24 hours and reaches a maximum by three days. If death from asphyxia does not occur, symptoms may resolve within a week.

1910.1027 App A, Paragraph 8 3. Long-term (chronic) exposure. Repeated or long-term exposure to cadmium, even at relatively low concentrations, may result in kidney damage and an increased risk of cancer of the lung and of the prostate.

1910.1027 App A, Paragraph 9

C. Emergency First Aid Procedures.

1910.1027 App A, Paragraph 10 1. Eye exposure: Direct contact may cause redness or pain. Wash eyes immediately with large amounts of water, lifting the upper and lower eyelids. Get medical attention immediately.

1910.1027 App A, Paragraph 11 2. Skin exposure: Direct contact may result in irritation. Remove contaminated clothing and shoes immediately. Wash affected area with soap or mild detergent and large amounts of water. Get medical attention immediately.

1910.1027 App A, Paragraph 12 3. Ingestion: Ingestion may result in vomiting, abdominal pain, nausea, diarrhea, headache and sore throat. Treatment for symptoms must be administered by medical personnel. Under no circumstances should the employer allow any person whom he retains, employs, supervises or controls to engage in therapeutic chelation. Such treatment is likely to translocate cadmium from pulmonary or other tissue to renal tissue. Get medical attention immediately.

1910.1027 App A, Paragraph 13 4. Inhalation: If large amounts of cadmium are inhaled, the exposed person must be moved to fresh air at once. If breathing has stopped, perform cardiopulmonary resuscitation. Administer oxygen if available. Keep the affected person warm and at rest. Get medical attention immediately.

1910.1027 App A, Paragraph 14 5. Rescue: Move the affected person from the hazardous exposure. If the exposed person has been overcome, attempt rescue only after notifying at least one other person of the emergency and putting into effect established emergency procedures. Do not become a casualty yourself. Understand your emergency rescue procedures and know the location of the emergency equipment before the need arises.

1910.1027 App A, Paragraph 15

III. Employee Information

A. Protective Clothing and Equipment.

1910.1027 App A, Paragraph 16 1. Respirators: You may be required to wear a respirator for non-routine activities; in emergencies; while your employer is in the process of reducing cadmium exposures through engineering controls; and where engineering controls are not feasible. If respirators are worn in the future, they must have a joint Mine Safety and Health Administration (MSHA) and National Institute for Occupational Safety and Health (NIOSH) label of approval. Cadmium does not have a detectable odor except at levels well above the permissible exposure limits. If you can smell cadmium while wearing a respirator, proceed immediately to fresh air. If you experience difficulty breathing while wearing a respirator, tell your employer.

1910.1027 App A, Paragraph 17 2. Protective Clothing: You may be required to wear impermeable clothing, gloves, foot gear, a face shield, or other appropriate protective clothing to prevent skin contact with cadmium. Where protective clothing is required, your employer must provide clean garments to you as necessary to assure that the clothing protects you adequately. The employer must replace or repair protective clothing that has become torn or otherwise damaged.

1910.1027 App A, Paragraph 18 3. Eye Protection: You may be required to wear splash-proof or dust resistant goggles to prevent eye contact with cadmium.

1910.1027 App A, Paragraph 19

B. Employer Requirements.

1910.1027 App A, Paragraph 20 1. Medical: If you are exposed to cadmium at or above the action level, your employer is required to provide a medical examination, laboratory tests and a medical history according to the medical surveillance provisions under paragraph (l) of this standard. (See summary chart and tables in this Appendix A.) These tests shall be provided without cost to you. In addition, if you are accidentally exposed to cadmium under conditions known or suspected to constitute toxic exposure to cadmium, your employer is required to make special tests available to you.

1910.1027 App A, Paragraph 21 2. Access to Records: All medical records are kept strictly confidential. You or your representative are entitled to see the records of measurements of your exposure to cadmium. Your medical examination records can be furnished to your personal physician or designated representative upon request by you to your employer.

1910.1027 App A, Paragraph 22 3. Observation of Monitoring: Your employer is required to perform measurements that are representative of your exposure to cadmium and you or your designated representative are entitled to observe the monitoring procedure. You are entitled to observe the steps taken in the measurement procedure, and to record the results obtained. When the monitoring procedure is taking place in an area where respirators or personal protective clothing and equipment are required to be worn, you or your representative must also be provided with, and must wear the protective clothing and equipment.

1910.1027 App A, Paragraph 23

C. Employee Requirements.

You will not be able to smoke, eat, drink, chew gum or tobacco, or apply cosmetics while working with cadmium in regulated areas. You will also not be able to carry or store tobacco products, gum, food, drinks or cosmetics in regulated areas because these products easily become contaminated with cadmium from the workplace and can therefore create another source of unnecessary cadmium exposure.

1910.1027 App A, Paragraph 24 Some workers will have to change out of work clothes and shower at the end of the day, as part of their workday, in order to wash cadmium from skin and hair. Handwashing and cadmium-free eating facilities shall be provided by the employer and proper hygiene should always be performed before eating. It is also recommended that you do not smoke or use tobacco products, because among other things, they naturally contain cadmium. For further information, read the labeling on such products.

1910.1027 App A, Paragraph 25

IV. Physician Information

A. Introduction.

1910.1027 App A, Paragraph 26 The medical surveillance provisions of paragraph (l) generally are aimed at accomplishing three main interrelated purposes: First, identifying employees at higher risk of adverse health effects from excess, chronic exposure to cadmium; second, preventing cadmium-induced disease; and third, detecting and minimizing existing cadmium-induced disease. The core of medical surveillance in this standard is the early and periodic monitoring of the employee's biological indicators of: (a) recent exposure to cadmium; (b) cadmium body burden; and (c) potential and actual kidney damage associated with exposure to cadmium.

1910.1027 App A, Paragraph 27 The main adverse health effects associated with cadmium overexposure are lung cancer and kidney dysfunction. It is not yet known how to adequately biologically monitor human beings to specifically prevent cadmium-induced lung cancer. By contrast, the kidney can be monitored to provide prevention and early detection of cadmium-induced kidney damage. Since, for non-carcinogenic effects, the kidney is considered the primary target organ of chronic exposure to cadmium, the medical surveillance provisions of this standard effectively focus on cadmium-induced kidney disease. Within that focus, the aim, where possible, is to prevent the onset of such disease and, where necessary, to minimize such disease as may already exist. The by-products of successful prevention of kidney disease are anticipated to be the reduction and prevention of other cadmium-induced diseases.
1910.1027 App A, Paragraph 28

B. Health Effects.

1910.1027 App A, Paragraph 29 The major health effects associated with cadmium overexposure are described below.

1910.1027 App A, Paragraph 30 1. Kidney. The most prevalent non-malignant disease observed among workers chronically exposed to cadmium is kidney dysfunction. Initially, such dysfunction is manifested as proteinuria. The proteinuria associated with cadmium exposure is most commonly characterized by excretion of low-molecular weight proteins (15,000 to 40,000 MW) accompanied by loss of electrolytes, uric acid, calcium, amino acids, and phosphate. The compounds commonly excreted include: beta-2-microglobulin (B(2)-M), retinol binding protein

(RBP), immunoglobulin light chains, and lysozyme. Excretion of low molecular weight proteins are characteristic of damage to the proximal tubules of the kidney (Iwao et al., 1980).

1910.1027 App A, Paragraph 31 It has also been observed that exposure to cadmium may lead to urinary excretion of high-molecular weight proteins such as albumin, immunoglobulin G, and glycoproteins (Ex. 29). Excretion of high-molecular weight proteins is typically indicative of damage to the glomeruli of the kidney. Bernard et al., (1979) suggest that damage to the glomeruli and damage to the proximal tubules of the kidney may both be linked to cadmium exposure but they may occur independently of each other.

1910.1027 App A, Paragraph 32 Several studies indicate that the onset of low-molecular weight proteinuria is a sign of irreversible kidney damage (Friberg et al., 1974; Roels et al., 1982; Piscator 1984; Elinder et al., 1985; Smith et al., 1986). Above specific levels of B(2)-M associated with cadmium exposure it is unlikely that B(2)-M levels return to normal even when cadmium exposure is eliminated by removal of the individual from the cadmium work environment (Friberg, Ex. 29, 1990).

1910.1027 App A, Paragraph 33 Some studies indicate that such proteinuria may be progressive; levels of B(2)-M observed in the urine increase with time even after cadmium exposure has ceased. See, for example, Elinder et al., 1985. Such observations, however, are not universal, and it has been suggested that studies in which proteinuria has not been observed to progress may not have tracked patients for a sufficiently long time interval (Jarup, Ex. 8-661).

1910.1027 App A, Paragraph 34 When cadmium exposure continues after the onset of proteinuria, chronic nephrotoxicity may occur (Friberg, Ex. 29). Uremia results from the inability of the glomerulus to adequately filter blood. This leads to severe disturbance of electrolyte concentrations and may lead to various clinical complications including kidney stones (L-140-50).

1910.1027 App A, Paragraph 35 After prolonged exposure to cadmium, glomerular proteinuria, glucosuria, aminoaciduria, phosphaturia, and hypercalciuria may develop (Exs. 8-86, 4-28, 14-18). Phosphate, calcium, glucose, and amino acids are essential to life, and under normal conditions, their excretion should be regulated by the kidney. Once low molecular weight proteinuria has developed, these elements dissipate from the human body. Loss of glomerular function may also occur, manifested by decreased glomerular filtration rate and increased serum creatinine. Severe cadmium-induced renal damage may eventually develop into chronic renal failure and uremia (Ex. 55).

1910.1027 App A, Paragraph 36 Studies in which animals are chronically exposed to cadmium confirm the renal effects observed in humans (Friberg et al., 1986). Animal studies also confirm problems with calcium metabolism and related skeletal effects which have been observed among humans exposed to cadmium in addition to the renal effects. Other effects commonly reported in chronic animal studies include anemia, changes in liver morphology, immunosuppression and hypertension. Some of these effects may be associated with co-factors. Hypertension, for example, appears to be associated with diet as well as cadmium exposure. Animals injected with cadmium have also shown testicular necrosis (Ex. 8-86B).

1910.1027 App A, Paragraph 37 2. Biological Markers It is universally recognized that the best measures of cadmium exposures and its effects are measurements of cadmium in biological fluids, especially urine and blood. Of the two, CdU is conventionally used to determine body burden of cadmium in workers without kidney disease. CdB is conventionally used to monitor for recent exposure to cadmium. In addition, levels of CdU and CdB historically have been used to predict the percent of the population likely to develop kidney disease (Thun et al., Ex. L-140-50; WHO, Ex. 8-674; ACGIH, Exs. 8-667, 140-50).

1910.1027 App A, Paragraph 38 The third biological parameter upon which OSHA relies for medical surveillance is Beta-2-microglobulin in urine (B(2)-M), a low molecular weight protein. Excess B(2)-M has been widely accepted by physicians and scientists as a reliable indicator of functional damage to the proximal tubule of the kidney (Exs. 8-447, 144-3-C, 4-47, L-140-45, 19-43-A).

1910.1027 App A, Paragraph 39 Excess B(2)-M is found when the proximal tubules can no longer reabsorb this protein in a normal manner. This failure of the proximal tubules is an early stage of a kind of kidney disease that commonly occurs among workers with excessive cadmium exposure. Used in conjunction with biological test results indicating abnormal levels of CdU and CdB, the finding of excess B(2)-M can establish for an examining

physician that any existing kidney disease is probably cadmium-related (Trs. 6/6/90, pp. 82-86, 122, 134). The upper limits of normal levels for cadmium in urine and cadmium in blood are 3 ug Cd/gram creatinine in urine and 5 ug Cd/liter whole blood, respectively. These levels were derived from broad-based population studies.

1910.1027 App A, Paragraph 40 Three issues confront the physicians in the use of B(2)-M as a marker of kidney dysfunction and material impairment. First, there are a few other causes of elevated levels of B(2)-M not related to cadmium exposures, some of which may be rather common diseases and some of which are serious diseases (e.g., myeloma or transient flu, Exs. 29 and 8-086). These can be medically evaluated as alternative causes (Friberg, Ex. 29). Also, there are other factors that can cause B(2)-M to degrade so that low levels would result in workers with tubular dysfunction. For example, regarding the degradation of B(2)-M, workers with acidic urine (pH > 6) might have B(2)-M levels that are within the "normal" range when in fact kidney dysfunction has occurred (Ex. L-140-1) and the low molecular weight proteins are degraded in acid urine. Thus, it is very important that the pH of urine be measured, that urine samples be buffered as necessary (See Appendix F.), and that urine samples be handled correctly, i.e., measure the pH of freshly voided urine samples, then if necessary, buffer to pH > 6 (or above for shipping purposes), measure pH again and then, perhaps, freeze the sample for storage and shipping. (See also Appendix F.) Second, there is debate over the pathological significance of proteinuria, however, most world experts believe that B(2)-M levels greater than 300 ug/g Cr are abnormal (Elinder, Ex. 55, Friberg, Ex. 29). Such levels signify kidney dysfunction that constitutes material impairment of health. Finally, detection of B(2)-M at low levels has often been considered difficult, however, many laboratories have the capability of detecting excess B(2)-M using simple kits, such as the Phadebas Delphia test, that are accurate to levels of 100 ug B(2)-M/g Cr U (Ex. L-140-1).

1910.1027 App A, Paragraph 41 Specific recommendations for ways to measure B(2)-M and proper handling of urine samples to prevent degradation of B(2)-M have been addressed by OSHA in Appendix F, in the section on laboratory standardization. All biological samples must be analyzed in a laboratory that is proficient in the analysis of that particular analyte, under paragraph (l)(1)(iv). (See Appendix F). Specifically, under paragraph (l)(1)(iv), the employer is to assure that the collecting and handling of biological samples of cadmium in urine (CdU), cadmium in blood (CdB), and beta-2 microglobulin in urine (B(2)-M) taken from employees is collected in a manner that assures reliability. The employer must also assure that analysis of biological samples of cadmium in urine (CdU), cadmium in blood (CdB), and beta-2 microglobulin in urine (B(2)-M) taken from employees is performed in laboratories with demonstrated proficiency for that particular analyte. (See Appendix F.)

1910.1027 App A, Paragraph 42 3. Lung and Prostrate Cancer. The primary sites for cadmium-associated cancer appear to be the lung and the prostate (L-140-50). Evidence for an association between cancer and cadmium exposure derives from both epidemiological studies and animal experiments. Mortality from prostrate cancer associated with cadmium is slightly elevated in several industrial cohorts, but the number of cases is small and there is not clear dose-response relationship. More substantive evidence exists for lung cancer.

1910.1027 App A, Paragraph 43 The major epidemiological study of lung cancer was conducted by Thun et al., (Ex. 4-68). Adequate data on cadmium exposures were available to allow evaluation of dose-response relationships between cadmium exposure and lung cancer. A statistically significant excess of lung cancer attributed to cadmium exposure was observed in this study even when confounding variables such as co-exposure to arsenic and smoking habits were taken into consideration (Ex. L-140-50).

1910.1027 App A, Paragraph 44 The primary evidence for quantifying a link between lung cancer and cadmium exposure from animal studies derives from two rat bioassay studies; one by Takenaka et al., (1983), which is a study of cadmium chloride and a second study by Oldiges and Glaser (1990) of four cadmium compounds.

1910.1027 App A, Paragraph 45 Based on the above cited studies, the U.S. Environmental Protection Agency (EPA) classified cadmium as "B1", a probable human carcinogen, in 1985 (Ex. 4-4). The International Agency for Research on Cancer (IARC) in 1987 also recommended that cadmium be listed as "2A", a probable human carcinogen (Ex. 4-15). The American Conference of Governmental Industrial Hygienists (ACGIH) has recently recommended that cadmium be labeled as a carcinogen. Since 1984, NIOSH has concluded that cadmium is possibly a human carcinogen and has recommended that exposures be controlled to the lowest level feasible.

1910.1027 App A, Paragraph 46 4. Non-carcinogenic Effects. Acute pneumonitis occurs 10 to 24 hours after initial acute inhalation of high levels of cadmium fumes with symptoms such as fever and chest pain (Exs. 30,

8-86B). In extreme exposure cases pulmonary edema may develop and cause death several days after exposure. Little actual exposure measurement data is available on the level of airborne cadmium exposure that causes such immediate adverse lung effects, nonetheless, it is reasonable to believe a cadmium concentration of approximately 1 mg/m(3) over an eight hour period is "immediately dangerous" (55 FR 4052, ANSI; Ex. 8-86B).

1910.1027 App A, Paragraph 47 In addition to acute lung effects and chronic renal effects, long term exposure to cadmium may cause other severe effects on the respiratory system. Reduced pulmonary function and chronic lung disease indicative of emphysema have been observed in workers who have had prolonged exposure to cadmium dust or fumes (Exs. 4-29, 4-22, 4-42, 4-50, 4-63). In a study of workers conducted by Kazantzis et al., a statistically significant excess of worker deaths due to chronic bronchitis was found, which in his opinion was directly related to high cadmium exposures of 1 mg/m(3) or more (Tr. 6/8/90, pp. 156-157).

1910.1027 App A, Paragraph 48 Cadmium need not be respirable to constitute a hazard. Inspirable cadmium particles that are too large to be respirable but small enough to enter the tracheobronchial region of the lung can lead to bronchoconstriction, chronic pulmonary disease, and cancer of that portion of the lung. All of these diseases have been associated with occupational exposure to cadmium (Ex. 8-86B). Particles that are constrained by their size to the extra-thoracic regions of the respiratory system such as the nose and maxillary sinuses can be swallowed through mucocillary clearance and be absorbed into the body (ACGIH, Ex. 8-692). The impaction of these particles in the upper airways can lead to anosmia, or loss of sense of smell, which is an early indication of overexposure among workers exposed to heavy metals. This condition is commonly reported among cadmium-exposed workers (Ex. 8-86-B).

1910.1027 App A, Paragraph 49

C. Medical Surveillance.

In general, the main provisions of the medical surveillance section of the standard, under paragraphs (l)(1)-(17) of the regulatory text, are as follows:

1910.1027 App A, Paragraph 50 1. Workers exposed above the action level are covered;

1910.1027 App A, Paragraph 51 2. Workers with intermittent exposures are not covered;

1910.1027 App A, Paragraph 52 3. Past workers who are covered receive biological monitoring for at least one year;

1910.1027 App A, Paragraph 53 4. Initial examinations include a medical questionnaire and biological monitoring of cadmium in blood (CdB), cadmium in urine (CdU), and Beta-2-microglobulin in urine (B(2)-M);

1910.1027 App A, Paragraph 54 5. Biological monitoring of these three analytes is performed at least annually; full medical examinations are performed biennially;

1910.1027 App A, Paragraph 55 6. Until five years from the effective date of the standard, medical removal is required when CdU is greater than 15 ug/gram creatinine (g Cr), or CdB is greater than 15 ug/liter whole blood (lwb), or B(2)-M is greater than 1500 ug/g Cr, and CdB is greater than 5 ug/lwb or CdU is greater than 3 ug/g Cr;

1910.1027 App A, Paragraph 56 7. Beginning five years after the standard is in effect, medical removal triggers will be reduced;

1910.1027 App A, Paragraph 57 8. Medical removal protection benefits are to be provided for up to 18 months;

1910.1027 App A, Paragraph 58 9. Limited initial medical examinations are required for respirator usage;

1910.1027 App A, Paragraph 59 10. Major provisions are fully described under section (l) of the regulatory text; they are outlined here as follows:

1910.1027 App A, Paragraph 60 A. Eligibility B. Biological monitoring C. Actions triggered by levels of CdU, CdB, and B(2)-M (See Summary Charts and Tables in Attachment 1.)

1910.1027 App A, Paragraph 61 D. Periodic medical surveillance E. Actions triggered by periodic medical surveillance (See appendix A Summary Chart and Tables in Attachment 1.)

1910.1027 App A, Paragraph 62 F. Respirator usage G. Emergency medical examinations H. Termination examination I. Information to physician J. Physician's medical opinion K. Medical removal protection L. Medical removal protection benefits M. Multiple physician review N. Alternate physician review O. Information employer gives to employee P. Recordkeeping Q. Reporting on OSHA form 200 11. The above mentioned summary of the medical surveillance provisions, the summary chart, and tables for the actions triggered at different levels of CdU, CdB and B(2)-M (in Appendix A Attachment-1) are included only for the purpose of facilitating understanding of the provisions of paragraphs (l)(3) of the final cadmium standard. The summary of the provisions, the summary chart, and the tables do not add to or reduce the requirements in paragraph (l)(3).

1910.1027 App A, Paragraph 63

D. Recommendations to Physicians.

1. It is strongly recommended that patients with tubular proteinuria are counseled on: the hazards of smoking; avoidance of nephrotoxins and certain prescriptions and over-the-counter medications that may exacerbate kidney symptoms; how to control diabetes and/or blood pressure; proper hydration, diet, and exercise (Ex. 19-2). A list of prominent or common nephrotoxins is attached. (See Appendix A Attachment-2.)

1910.1027 App A, Paragraph 64 2. DO NOT CHELATE; KNOW WHICH DRUGS ARE NEPHROTOXINS OR ARE ASSOCIATED WITH NEPHRITIS.

1910.1027 App A, Paragraph 65 3. The gravity of cadmium-induced renal damage is compounded by the fact there is no medical treatment to prevent or reduce the accumulation of cadmium in the kidney (Ex. 8-619). Dr. Friberg, a leading world expert on cadmium toxicity, indicated in 1992, that there is no form of chelating agent that could be used without substantial risk. He stated that tubular proteinuria has to be treated in the same way as other kidney disorders (Ex. 29).

1910.1027 App A, Paragraph 66 4. After the results of a workers' biological monitoring or medical examination are received the employer is required to provide an information sheet to the patient, briefly explaining the significance of the results. (See Attachment 3 of this Appendix A.)

1910.1027 App A, Paragraph 67 5. For additional information the physician is referred to the following additional resources:

1910.1027 App A, Paragraph 68 a. The physician can always obtain a copy of the preamble, with its full discussion of the health effects, from OSHA's Computerized Information System (OCIS).

1910.1027 App A, Paragraph 69 b. The Docket Officer maintains a record of the rulemaking. The Cadmium Docket (H-057A), is located at 200 Constitution Ave. N.W., Room N-2625, Washington, D.C. 20210; telephone: 202-219-7894.

1910.1027 App A, Paragraph 70 c. The following articles and exhibits in particular from that docket (H-057A):

Exhibit Number	Author and Paper Title
8-447	Lauwerys et. al., Guide for physicians, AHealth Maintenance of Workers Exposed to Cadmium≅, published by the Cadmium Council
4-67	Takenaka, S., H. Oldiges, H. Konig, D. Hochrainer, G. Oberdorster. ACarcinogenicity of Cadmium Chloride Aerosols in Wistar Rats≅. JNCI 70:367 373, 1983. (32)
4-68	Thun, M.J., T.M. Schnoor, A.B. Smith, W.E. Halperin, R.A. Lemen. AMortality Among a Cohort of U.S. Cadmium Production Workers - An Update≅. JNCI 74(2) :325-33, 1985. (8)
4-25	Elinder, C.G., Kjellstrom, T., Hogstedt, C. et al., ACancer Mortality of Cadmium Workers≅. Brit. J. Ind. Med. 42:651-655, 1985. (14)
4-26	K.J. Ellis et al., ACritical Concentrations of Cadmium in Human Renal Cortex: Dose Effect Studies to Cadmium Smelter Workers≅. J. Toxicol. Environ. Health 7:691-703, 1981. (76)
4-27	K.J. Ellis, S.H. Cohn and T.J. Smith. ACadmium Inhalation Exposure Estimates: Their Significance with Respect to Kidney and Liver Cadmium Burden≅. J. Toxicol. Environ. Health 15:173-187, 1985.
4-28	F.Y. Falck, Jr., L.J. Fine, R.G. Smith, K.D. McClatchey, T. Annesley, B. England, and A.M. Schork. AOccupational Cadmium Exposure and Renal Status≅. Am. J. Ind. Med. 4:541, 1983. (64)
8-86A	L. Friberg, C.G. Elinder, et al. ACadmium and Health, a Toxicological and Epidemiological Appraisal Volume I Exposure, Dose, and Metabolism≅. CRC Press, Inc., Boca Raton, FL, 1986. (Available from the OSHA Technical Data Center)
8-86B	L. Friberg, C.G. Eliner, et al. ACadmium and Health, a Toxicological and Epidemiological Appraisal Volume II Effects and Response≅. CRC Press, Inc., Boca Raton, FL, 1986. (Available from the OSHA Technical Data Center)
L-140-45	C.G. Elinder, ACancer Morality of Cadmium Workers≅, Brit. J. Ind. Med., 42, 651-655, 1985.
L-140-50	M. Thun, C.G. Elinder, L. Friberg. AScientific Basis for an Occupational Standard for Cadmium≅. Am. J. Ind. Med., 20; 629-642, 1991.

V. Information Sheet. The information sheet (Appendix A Attachment-3.) or an equally explanatory one should be provided to you after any biological monitoring results are reviewed by the physician, or where applicable, after any medical examination.

1910.1027 App A, Paragraph 87

Appendix A

Attachment 1: Appendix A Summary Chart and Tables A and B of Actions Triggered by Biological Monitoring

> Appendix A - Summary Chart: Section (1)(3) Medical Surveillance- Categorizing Biological Monitoring Results (A) Biological monitoring results categories are set forth in Appendix A Table A for the periods ending December 31, 1998 and for the period beginning January 1, 1999.
>
> 1910.1027 App A, Paragraph 88 (B) The results of the biological monitoring for the initial medical exam and the subsequent exams shall determine an employee's biological monitoring result category.

1910.1027 App A, Paragraph 89 Actions Triggered by Biological Monitoring (A)(i) The actions triggered by biological monitoring for an employee are set forth in Appendix A Table B.

1910.1027 App A, Paragraph 90 (ii) The biological monitoring results for each employee under section (1)(3) shall determine the actions required for that employee. That is, for any employee in biological monitoring category C, the employer will perform all of the actions for which there is an X in column C of Appendix A Table B.

1910.1027 App A, Paragraph 91 (iii) An employee is assigned the alphabetical category ("A" being the lowest) depending upon the test results of the three biological markers.

1910.1027 App A, Paragraph 92 (iv) An employee is assigned category A if monitoring results for all three biological markers fall at or below the levels indicated in the table listed for category A.

1910.1027 App A, Paragraph 93 (v) An employee is assigned category B if any monitoring result for any of the three biological markers fall within the range of levels indicated in the table listed for category B, providing no result exceeds the levels listed for category B.

1910.1027 App A, Paragraph 94 (vi) An employee is assigned category C if any monitoring result for any of the three biological markers are above the levels listed for category C.

1910.1027 App A, Paragraph 95 (B) The user of Appendix A Tables A and B should know that these tables are provided only to facilitate understanding of the relevant provisions of paragraph (l)(3) of this section. Appendix A Tables A and B are not meant to add to or subtract from the requirements of those provisions.

1910.1027 App A, Paragraph 96 Appendix A - Table A Categorization of Biological Monitoring Results

APPLICABLE THROUGH 1998 ONLY

Biological Marker	Monitoring Result Categories		
	A	B	C
Cadmium in urine (CdU) (ug/g creatinine)	< = 3	>3 and < = 15	>15
B(2)-microglobulin (B(2)-M) (ug/g creatinine)	< = 300	>300 and < = 1500	>1500 (1)
Cadmium in blood (CdB) (ug/liter whole blood)	< = 5	>5 and < = 15	>15

(1) If an employee's B(2)-M levels are above 1,500 ug/g creatinine, in order for mandatory medical removal to be required (See Appendix A Table B.), either the employee's CdU level must also be >3 ug/g creatinine or CdB level must also be >5 ug/liter whole blood.

1910.1027 App. A, Paragraph 97

APPLICABLE BEGINNING JANUARY 1, 1999

Biological Marker	Monitoring Result Categories		
	A	**B**	**C**
Cadmium in urine (CdU) (ug/g creatinine)	< = 3	>3 and < = 7	>7
B (2)-microglobulin (B(2)-M) (ug/g creatinine)	< = 300	>300 and < = 750	>750 (1)
Cadmium in blood (CdB) (ug/liter whole blood)	< = 5	>5 and < = 10	>10

(1) If an employee's B(2)-M levels are above 750 ug/g creatinine, in order for mandatory medical removal to be required (See Appendix A Table B.), either the employee's CdU level must also be >3 ug/g creatinine or CdB level must also be >5 ug/liter whole blood.

1910.1027 App A, Paragraph 98 Appendix A - Table B - Actions Determined by Biological Monitoring

This table presents the actions required based on the monitoring result in Appendix A Table A. Each item is a separate requirement in citing non-compliance. For example, a medical examination within 90 days for an employee in category B is separate from the requirement to administer a periodic medical examination for category B employees on an annual basis.

Required Actions	Monitoring Result Category		
	A[1]	B[1]	C[1]
(1) Biological Monitoring:			
(a) Annual	X		
(b) Semiannual		X	
(c) Quarterly			X
(2) Medical Examination:			
(a) Biennial	X		
(b) Annual		X	
(c) Semiannual			X
(d) Within 90 days		X	
(3) Assess within two weeks:			
(a) Excess cadmium exposure		X	X
(b) Work practices		X	X
(c) Personal hygiene		X	X
(d) Respirator usage		X	X
(e) Smoking history		X	X
(f) Hygiene facilities		X	X
(g) Engineering controls		X	X
(h) Correct within 30 days		X	X
(i) Periodically Assess Exposures			X
(4) Discretionary Medical Removal		X	X
(5) Mandatory Medical Removal			X[2]

[1] For all employees covered by medical surveillance exclusively because of exposures prior to the effective date of this standard, if they are in Category A, the employer shall follow the requirements of paragraphs (l)(3)(i)(B) and (l)(4)(v)(A). If they are in Category B or C, the employer shall follow the requirements of paragraphs (l)(4)(v)(B)-(C).
[2] See footnote Appendix A Table A.

1910.1027 App A, Paragraph 101

Appendix A - Attachment - 2: List of Medications. A list of the more common medications that a physician, and the employee, may wish to review is likely to include some of the following:

(1) anticonvulsants: paramethadione, phenytoin, trimethadone;
(2) antihypertensive drugs: captopril, methyldopa;
(3) antimicrobials: aminoglycosides, amphotericin B, cephalosporins, ethambutol;
(4) antineoplastic agents: cisplatin, methotrexate, mitomycin-C, nitrosoureas, radiation;
(5) sulfonamide diuretics: acetazolamide, chlorthalidone, furosemide, thiazides;
(6) halogenated alkanes, hydrocarbons, and solvents that may occur in some settings: carbon tetrachloride, ethylene glycol, toluene; iodinated radiographic contrast media; nonsteroidal anti-inflammatory drugs; and,
(7) other miscellaneous compounds: acetominophen, allopurinol, amphetamines, azathioprine, cimetidine, cyclosporine, lithium, methoxyflurane, methysergide, D-penicillamine, phenacetin, phenendione.

A list of drugs associated with acute interstitial nephritis includes:

(1) antimicrobial drugs: cephalosporins, chloramphenicol, colistin, erythromycin, ethambutol, isoniazid, paraaminosalicylic acid, penicillins, polymyxin B, rifampin, sulfonamides, tetracyclines, and vancomycin;
(2) other miscellaneous drugs: allopurinol, antipyrene, azathioprine, captopril, cimetidine, clofibrate, methyldopa, phenindione, phenylpropanolamine, phenytoin, probenecid, sulfinpyrazone, sulfonamid diuretics, triamterene; and,
(3) metals: bismuth, gold.

1910.1027 App A, Paragraph 102 This list has been derived from commonly available medical textbooks (e.g., Ex. 14-18). The list has been included merely to facilitate the physician's, employer's, and employee's understanding. The list does not

represent an official OSHA opinion or policy regarding the use of these medications for particular employees. The use of such medications should be under physician discretion.

1910.1027 App A, Paragraph 103 - Appendix A - Attachment 3 - Biological Monitoring and Medical Examination Results

Employee

Testing Date

Cadmium in Urine _____ ug/g Cr

Cadmium in Blood _____ ug/lwb

Beta-2-microglobulin in Urine _____ ug/g Cr

(Normal Levels: < = 3 ug/g Cr, < = 5 ug/lwb, < = 300 ug/g Cr)

Physical Examination Results:

N/A

Satisfactory

Unsatisfactory _____ (see physician again)

Physician's Review of Pulmonary Function:

Test: N/A _____ Normal _____ Abnormal

Next biological monitoring or medical examination scheduled for

The biological monitoring program has been designed for three main purposes:

1) to identify employees at risk of adverse health effects from excess, chronic exposure to cadmium;
2) to prevent cadmium-induced disease(s); and
3) to detect and minimize existing cadmium-induced disease(s).

1910.1027 App A, Paragraph 104 The levels of cadmium in the urine and blood provide an estimate of the total amount of cadmium in the body. The amount of a specific protein in the urine (beta-2-microglobulin) indicates changes in kidney function. All three tests must be evaluated together. A single mildly elevated result may not be important if testing at a later time indicates that the results are normal and the workplace has been evaluated to decrease possible sources of cadmium exposure. The levels of cadmium or beta-2-microglobulin may change over a period of days to months and the time needed for those changes to occur is different for each worker.

1910.1027 App A, Paragraph 105 If the results for biological monitoring are above specific "high levels" [cadmium urine greater than 10 micrograms per gram of creatinine (ug/g Cr), cadmium blood greater than 10 micrograms per liter of whole blood (ug/lwb), or beta-2-microglobulin greater than 1000 micrograms per gram of creatinine (ug/g Cr)], the worker has a much greater chance of developing other kidney diseases.

1910.1027 App A, Paragraph 106 One way to measure for kidney function is by measuring beta-2-microglobulin in the urine. Beta-2-microglobulin is a protein which is normally found in the blood as it is being filtered in the kidney, and the kidney reabsorbs or returns almost all of the beta-2-microglobulin to the blood. A very small amount (less than 300 ug/g Cr in the urine) of beta-2-microglobulin is not reabsorbed into the blood, but is released in the urine. If cadmium damages the kidney, the amount of beta-2-microglobulin in the urine increases because the kidney cells are unable to reabsorb the beta-2-microglobulin normally. An increase in the amount of beta-2-microglobulin in the urine is a very early sign of kidney dysfunction. A small increase in beta-2-microglobulin in the urine will serve as an early warning sign that the worker may be absorbing cadmium from the air, cigarettes contaminated in the workplace, or eating in areas that are cadmium contaminated.

1910.1027 App A, Paragraph 107 Even if cadmium causes permanent changes in the kidney's ability to reabsorb beta-2-microglobulin, and the beta-2-microglobulin is above the "high levels", the loss of kidney function may not lead to any serious health problems. Also, renal function naturally declines as people age. The risk for changes in kidney function for workers who have biological monitoring results between the "normal values" and the "high levels" is not well known. Some people are more cadmium-tolerant, while others are more cadmium-susceptible.

1910.1027 App A, Paragraph 108 For anyone with even a slight increase of beta-2-microglobulin, cadmium in the urine, or cadmium in the blood, it is very important to protect the kidney from further damage. Kidney damage can come from other sources than excess cadmium-exposure so it is also recommended that if a worker's levels are "high" he/she should receive counseling about drinking more water; avoiding cadmium-tainted tobacco and certain medications (nephrotoxins, acetaminophen); controlling diet, vitamin intake, blood pressure and diabetes; etc.

1910.1027 App A, Paragraph 109
[57 FR 42389, Sept. 14, 1992, as amended at 58 FR 21781, Apr. 23, 1993]

PROCEDURE

Subject: LEAD COMPLIANCE PLAN

1.0 PURPOSE AND SUMMARY

The purpose of this document is to provide associate protection against Lead, and to comply with the OSHA requirement for a written compliance plan. It essentially duplicates OSHA language in the Shaw Environmental & Infrastructure, Inc. (Shaw E & I) format and should be referenced (not duplicated) in applicable HASPs.

It is the responsibility of the Project Manager (PM) and Site Safety Officer (SSO) to implement the provisions of this document as appropriate for a particular project. This document shall work in conjunction with the site-specific HASP to form a complete site plan. Topics which must be addressed in the site-specific HASP are listed below:

- Describe the specific means (work practices, equipment, etc.) that will be used to comply with this plan.
- Describe the technologies considered to keep exposures below the Permissible Exposure Limit.
- Results and sources of any previous air monitoring, if any.
- Briefly describe how and when engineering and administrative controls will be implemented, if any.
- Work practices for emergency situations.
- Personal protective equipment requirements.
- Hygiene facilities.
- Emergency contingency planning.
- Specific identity of the competent person(s).

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Corporate Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Action Level (AL) - Employee exposure, without regard to use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air (30 mg/m^3) averaged over an 8-hour period.

Authorized person - Employee exposure, without regard to use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air (30 mg/m^3) averaged over an 8-hour period.

Competent Person - One who is capable of identifying existing and predictable lead hazards in the surroundings or working conditions and who has authorization to take prompt corrective measures to eliminate them.

Exposure Assessment - Breathing zone air sampling utilizing a properly calibrated air sampling pump, connected via a flexible tubing, to a filter cassette. The lead particulates are collected on a membrane filter, and subsequently analyzed by an American Industrial Hygiene Association accredited laboratory.

High-efficiency particulate air (HEPA) filter means a filter capable of trapping and retaining at least 99.97 percent of mono-dispersed particles of 0.3 micrometers in diameter.

Lead - Includes metallic lead, all inorganic lead compounds, and organic lead soaps. Excluded from this definition (and outside the scope of this procedure) are all other organic lead compounds.

Lead Work Area or Regulated Area - Any area in which airborne lead levels exceed or can be expected to exceed the action level.

Objective Data - Information demonstrating that a particular product or material containing lead or a specific process, operation, or activity involving lead cannot release dust or fumes in concentrations at or above the action level under any expected conditions of use. Objective data can be obtained from an industry-wide study or from laboratory product test results from manufacturers of lead containing products or materials. The data used from an industry-wide survey must be obtained under workplace conditions that closely resemble the processes, types of material, control methods, work practices, and environmental conditions in the anticipated operation.

Permissible Exposure Limit (PEL) means an airborne concentration of Lead of 50 micrograms per cubic meter of air (50 $\mu g/m^3$), averaged over an 8-hour period.

5.0 TEXT

5.1 Exposure Monitoring

5.1.1 General. Lead can be absorbed into the body by inhalation (breathing) and ingestion (eating). Very small amounts of lead that may be unintentionally ingested via eating,

drinking, or smoking on the job can be harmful. Good personal hygiene is important on all jobs where lead is present.

Lead exposure can affect the brain, leading to seizures, coma, and death. Lead poisoning can occur at high exposure concentrations (acute) or at low exposure concentrations over a long period of time (chronic) and can cause either temporary or permanent damage. Even jobs of 1 or 2 weeks' duration can cause lead poisoning.

Lead is a cumulative poison. It accumulates in the blood, bones and organs, including the kidneys, brain and liver. It stays in the bones for decades. It may be slowly released over time to cause toxic effects. An increasing blood lead level usually means that there has been recent exposure and that lead is building up in the body faster than it is being eliminated. The early effects of lead poisoning are not specific and resemble “flu-like” illnesses. Worker awareness and training are important so that employees can recognize the symptoms of exposure and get prompt medical attention.

Cumulative exposure to lead, which is typical in construction settings, may result in damage to the blood, nervous system, kidneys, bones, heart, and reproductive system and contributes to high blood pressure.

No employee is to be exposed to lead concentration above the PEL of 50 $\mu g/m^3$ of air. The PEL is an 8-hour average of exposure for any workday. The standard contains special provisions for extended work shifts and overtime. For example, the PEL for a 10-hour TWA is set at 40 $\mu g/m^3$ of air. Allowable employee exposure (in $\mu g/m^3$) equals 400 divided by hours worked in the day.

5.1.2 Exposure Assessment. Shaw shall conduct an exposure assessment for each work place or work operation covered by this procedure to determine whether any employee is exposed to lead at or above the action level. Employee exposure is that exposure which would occur if the employee were not using a respirator.

The initial assessment may be based on previous objective data or historical measurements of airborne lead. To satisfy initial lead exposure assessment, the historical monitoring data must have been obtained within the past 12 months, with similar processes, work practices, and lead-containing materials. If such data are not available, monitoring of a representative sample of employees with the highest exposure levels is required.

It is not a requirement that each individual employee's exposure level be measured. Exposure monitoring must consist of at least one personal breathing zone sample for each job classification within each operation for each shift or for the shift with the highest exposure level. Full shift personal samples shall be representative of the monitored employee's regular, daily exposure to lead.

5.1.3 Monitoring Frequency. If the initial determination reveals exposures at or above the action level, but at or below the PEL, monitoring shall be performed every 6 months until at least two consecutive measurements taken at least 7 days apart are below the action level.

If the initial determination reveals exposure levels above the PEL, monitoring shall be performed at least quarterly and be continued until at least two consecutive measurements taken at least 7 days apart are at or below the PEL.

5.1.4 Monitoring Requirements. The method of monitoring and analysis shall have an accuracy (to a confidence level of 95 percent) of not less than plus or minus 25 percent for airborne concentrations of lead equal to or greater than 30 $\mu g/m^3$.

- Where a determination shows the possibility of any employee exposure at or above the action level, the company shall conduct monitoring which is representative of the exposure for each employee in the workplace or process area who is exposed to lead.

- For the purposes of monitoring requirements, employee exposure is that exposure which would occur if the employee were not using a respirator.

- Monitoring and sample collection shall cover full shift (for at least seven continuous hours) personal samples including at least one sample for each shift for each job classification in each work area.

- Full shift personal samples must be representative of the monitored employee's regular, daily exposure to lead.

5.1.5 Employee Notification. Within five working days after completion of the exposure assessment, Shaw shall notify each employee in writing of the monitoring results, including corrective actions to be taken if the exposure was found to be at or above the PEL. Some tasks which have been identified as having the potential to produce exposures to lead in excess of the PEL require interim worker protection, pending completion of the exposure assessments. Among the tasks requiring interim protection are: abrasive blasting; welding, cutting, and burning of steel structures; manual scraping and sanding; painting with lead paint; heat gun applications; using lead containing mortar; abrasive blasting enclosure movement and removal; and power tool cleaning, rivet busting, and cleanup activities where dry expendable abrasives are used.

5.2 METHODS OF COMPLIANCE

Employee exposure levels to lead shall be reduced to, or below, the PEL by means of engineering controls, work practices, and as a last resort, respiratory protection.

Whenever engineering and work practice controls are not sufficient to reduce employee exposure to or below the PEL, Shaw shall use respiratory protection.

Prior to commencement of a project or work operation with potential for exposure to lead, Shaw shall establish and implement a site specific written compliance program to achieve compliance with this procedure.

The written compliance program shall include at least the following:

- A description of each activity in which lead is emitted (e.g., equipment used, materials involved, controls in place, crew size, employee job responsibilities, operating procedures and maintenance practices)
- A description of the specific means that will be employed to achieve compliance and, where engineering controls are required, engineering plans and studies used to determine methods selected for controlling exposure to lead
- A report of the technology considered in meeting the PEL
- Air monitoring data that document the source of lead emissions
- A detailed schedule for implementation of the program, including documentation such as copies of purchase orders for equipment, construction contracts, etc.
- A work practice program that includes provisions for protective work clothing and equipment, housekeeping, and hygiene facilities and practices, as well as other relevant good work practices
- An administrative controls schedule
- A description of arrangements made among contractors on multi-contractor sites with respect to informing affected employees of potential exposure to lead and with respect to responsibility for compliance
- Other relevant information
- The compliance program shall provide for frequent and regular inspections of job sites, materials, and equipment to be made by a competent person.
- A copy of the written program shall be submitted, upon request, to any affected employee, any authorized employee representative, or any OSHA compliance personnel and shall be available at the work site for examination and copying by any OSHA compliance personnel.
- The written program shall be revised and updated at least every 6 months to reflect the status of the program.
- Where mechanical ventilation is used to control lead exposure, an evaluation shall be made of the mechanical performance of the system in controlling exposure as necessary to maintain its effectiveness.
- If administrative controls are used as a means of reducing employee TWA exposure to lead, Shaw shall establish and implement a job rotation schedule that includes:

1) Name or identification number of each affected employee
2) Duration and exposure levels at each job or work station where each affected employee is located
3) Any other information which may be useful in assessing the reliability of administrative controls to reduce exposure to lead

5.3 RESPIRATORY PROTECTION

5.3.1 General When the use of respirators is required, Shaw shall provide, at no cost to the employee, medical evaluations of the employees required to wear respirators, and assure the use of, respirators which comply with the requirements of this paragraph. Respirators shall be used in the following circumstances:

1) When an employee's exposure to lead exceeds the PEL

2) In work situations in which engineering controls and work practices are not sufficient to reduce exposures to or below the PEL

3) Whenever an employee requests a respirator

4) During exposure assessment

The selection of an appropriate respirator or combination of respirators shall be based on Attachment 2

5.3.2 Respirator Selection Shaw shall select respirators from among those approved for protection against lead dust, fumes, and mist by the National Institute for Occupational Safety and Health (NIOSH). An Powered Air-Purifying respirator shall be provided to employees which choose to use such respirator, If it will provide adequate protection.

5.3.3 Respirator Fit Testing Shaw shall assure that the respirator issued to an employee exhibits minimum face piece leakage and that the respirator is fitted properly. A qualitative or quantitative face fit test must be performed at the time of initial fitting and repeated at least every 12 months for employees wearing negative pressure respirators.

- The qualitative fit test may be used only for testing the fit of half-mask respirators where they are permitted to be worn.
- A respiratory protection program must be instituted that contains basic requirements for proper selection, use, cleaning, and maintenance of respirators.
- Shaw shall permit each employee who uses a filter respirator to change the filter elements whenever an increase in breathing resistance is detected and shall maintain an adequate supply of filter elements for this purpose.
- Employees who wear respirators shall be permitted to leave work areas to wash their face and respirator face piece whenever necessary to prevent skin irritation associated with respirator use.

5.4 Protective Clothing and Equipment

5.4.1 Provision and Use When an employee is exposed to lead above the PEL, without regard to the use of respirators or where the possibility of skin or eye irritation exist, and as interim protection for employees during exposure assessment, protective work clothing and equipment that prevents contamination of the employee and the employee's garments shall be provided. Such clothing and equipment shall be provided at no cost to the employee and their use enforced.

Protective clothing and equipment shall consist of, but not be limited to, the following:

— Coveralls or similar full-body work clothing

— Gloves, hats, and shoes or disposable shoe coverlets

— Face shields, vented goggles, or other appropriate protective equipment

5.4.2 Cleaning, Replacement and Disposal Protective clothing and equipment shall be issued in a clean and dry condition at least weekly and daily to employees whose exposure levels, without regard to a respirator, are over 200 $\mu g/m^3$ of lead as an 8-hour TWA.

- Protective clothing and equipment shall be repaired or replaced as needed to maintain their effectiveness.
- Protective clothing shall be removed at the completion of a work shift only in change areas provided for that purpose.
- Removal of lead from protective clothing or equipment by blowing or shaking is prohibited to minimize secondary exposures to lead.
- Contaminated protective clothing which is to be cleaned, laundered, or disposed of shall be placed in a closed container in the change area, which prevents dispersion of lead outside the container. Containers of contaminated protective clothing and equipment shall be labeled as follows:

CAUTION

CLOTHING CONTAMINATED WITH LEAD DO NOT REMOVE DUST BY BLOWING OR SHAKING DISPOSE OF LEAD-CONTAMINATED WASH WATER IN ACCORDANCE WITH APPLICABLE LOCAL, STATE,

OR FEDERAL REGULATIONS

- All persons who clean or launder protective clothing or equipment shall be informed, in writing, of the potentially harmful effects of exposure to lead.

5.5 HYGIENE FACILITIES AND PRACTICES

5.5.1 General In areas where employees are exposed to lead above the PEL without regard to the use of respirators, Shaw shall assure that food or beverages are not present or consumed, tobacco products are not present or consumed, and cosmetics are not applied.

5.5.2 Change Rooms Clean change areas shall be provided for employees whose airborne exposure to lead is above the PEL. Change areas shall be equipped with separate storage facilities for protective work clothing and equipment and for street clothes to prevent cross contamination.

Employees shall not leave the workplace wearing any protective clothing or equipment that is required to be worn during the work shift.

5.5.3 Showers and Hand Washing Facilities Shower facilities, where feasible, shall be provided for use by employees whose airborne exposure to lead is above the PEL. Employees shall shower at the end of the work shift and shall be provided with adequate supplies of cleansing agents and towels. Where showers are not provided, employees shall be provided with hand washing facilities and shall be required to wash their hands and face before eating and at the end of the shift.

5.5.4 Lunchroom Facilities Lunchroom facilities or eating areas shall be provided for use by employees whose airborne exposure to lead is above the PEL, without regard to the use of respirators. Such facilities shall be kept as free as practicable from lead contamination and shall be readily accessible to employees.

5.5.5 Housekeeping All work surfaces shall be maintained as free as practicable of accumulation of lead.

Cleanup of floors and other surfaces where lead accumulates shall, wherever possible, be cleaned by vacuums equipped with HEPA filters and used and emptied in a manner, which minimizes the reentry of lead into the workplace.

Compressed air shall not be used to remove lead from any surface unless the compressed air is used in conjunction with a ventilation system designed to capture the airborne dust created by the compressed air.

Shoveling, dry or wet sweeping, and brushing may be used only where vacuuming or other equally effective methods have been tried and found not to be effective.

5.6 Medical Surveillance

5.6.1 General

There are two levels of medical surveillance, the initial medical surveillance and the medical surveillance program.

Shaw shall provide initial medical surveillance to employees occupationally exposed on any day to lead at or above the action level. Initial medical surveillance consists of biological monitoring in the form of blood sampling and analysis for lead and zinc protoporphyrin (ZPP) levels. Biological monitoring must be repeated, at least every two months, when the blood lead level found in the initial monitoring is at or above 40 mg/dl. This frequency shall continue until two consecutive blood samples and analyses indicate a blood lead level below 40 mg/dl.

A medical surveillance program must be established for employees exposed at or above the action level for more than 30 days a year or when blood lead levels exceeding 40 mg/dl. The medical surveillance program consists of routine monitoring of the employee's blood lead and ZPP levels at least every 2 months for the first 6 months in the exposed job and every 6 months thereafter. If blood lead levels exceed 40 mg/dl, biological monitoring must be performed, at least every 2 months, until levels drop below 40 mg/dl. This frequency shall continue until two consecutive blood samples and analyses indicate a blood lead level below 40 mg/dl.

5.6.2 Biological Monitoring Whenever the results of a blood lead level test indicate that an employee's blood level exceeds the numerical criterion for medical removal, a second (follow-up) blood sampling test shall be provided within two weeks after receiving the results of the first blood sampling test. For each employee who is removed from exposure to lead due to an elevated blood lead level, biological monitoring must be performed at least monthly during the removal period. This frequency shall continue until two consecutive blood samples and analyses indicate a blood lead level below 40 mg/dl.

- Shaw shall assure that all-medical examinations and procedures are performed by or under the supervision of a licensed physician. All such medical examinations and procedures shall be performed at no cost to the employee and at a reasonable time and place.

- Blood lead level sampling and analysis provided pursuant to this procedure shall have an accuracy (to a confidence level of 95 percent) within plus or minus 15 percent or 6 mg/dl, whichever is greater, and shall be conducted by a laboratory approved by OSHA.
- Within five working days after the receipt of biological monitoring results,

Shaw shall notify each employee, in writing, of his or her blood lead level.

- Shaw shall notify each employee whose blood lead level exceeds 40 mg/dl that the OSHA standard requires temporary medical removal with Medical Removal Protection benefits when and employee's blood lead level exceeds the numerical criterion for medical removal.

5.6.3 Medical Examinations and Consultations Shaw shall make available medical examinations and consultations to each employee, as required, on the following schedule:

— At least annually for each employee for whom a blood sampling test conducted at any time during the preceding 12 months indicated a blood lead level at or above 40 mg/dl.

— As soon as possible, upon notification by an employee that the employee has developed signs or symptoms commonly associated with lead intoxication, that the employee desires medical advice concerning the effects of current or past exposure to lead on the employee's ability to procreate a healthy child, that the employee is pregnant, or that the employee has demonstrated difficulty in breathing during a respirator fitting test or during use.

— As medically appropriate for each employee either removed from exposure to lead due to a risk of sustaining material impairment to health or otherwise limited pursuant to a final medical determination.

5.6.4 Content of Medical Examinations The content of medical examinations shall be determined by an examining physician and, if requested by an employee, shall include pregnancy testing or laboratory evaluation of male fertility. Medical examinations shall include the following elements:

- A detailed work history and a medical history, with particular attention to past lead exposure (occupational and non-occupational), personal habits (smoking, hygiene), and past gastrointestinal, hematological, renal, cardiovascular, reproductive, and neurological problems.
- A thorough physical examination, with particular attention to teeth, gums, hematological, gastrointestinal, renal, cardiovascular, and neurological systems. Pulmonary status should be evaluated if respiratory protection will be used.
- A blood pressure measurement.
- A blood sample and analysis which determines:
  - Blood lead level
  - Hemoglobin and hematocrit determinations, red cell indices, and

examination of peripheral smear morphology

- Zinc protoporphyrin
- Blood urea nitrogen
- Serum creatinine

- A routine urinalysis with microscopic examination.
- Any laboratory or other test relevant to lead exposure, which the examining physician deems necessary by sound medical practice.

5.6.5 Multiple Physician Review

If Shaw selects the initial physician who conducts any medical examination or consultation provided to an employee, the employee may designate a second physician:

- To review any findings, determinations, or recommendations of the initial physician. To conduct such examinations, consultations, and laboratory tests as the second physician deems necessary to facilitate the review.

Shaw shall promptly notify an employee of the right to seek a second medical opinion after each occasion that an initial physician conducts a medical examination or consultation. Shaw may condition its participation in, and payment for, the multiple physician review mechanism upon the employee doing the following within fifteen (15) days after receipt of the foregoing notification or receipt of the initial physician's written opinion, whichever is later:

- The employee informing Shaw that he or EH&S intends to seek a second medical opinion

- The employee initiating steps to make an appointment with a second physician

If the findings, determinations, or recommendations of the second physician differ from those of the initial physician, Shaw and the employee shall assure that efforts are made for the two physicians to resolve any disagreement.

If the two physicians have been unable to quickly resolve their disagreement, Shaw and the employee, through their respective physicians, shall designate a third physician:

- To review any findings, determinations, or recommendations of the prior physicians

- To conduct such examinations, consultations, laboratory tests, and discussions with the prior physicians as the third physician deems

necessary to resolve the disagreement of the prior physicians

Shaw and the employee shall act consistently with the findings, determinations, and recommendations of the third physician, unless Shaw and the employee reach an agreement, which is otherwise consistent with the recommendations of at least one of the three physicians.

Shaw shall provide an initial physician conducting a medical examination or consultation with the following information:

- A copy of the OSHA Standard for lead, including all Appendixes
- A description of the affected employee's duties as they relate to the employee's exposure to lead
- The employee's exposure level or anticipated exposure level to lead and to any other toxic substances, if applicable
- A description of any personal protective equipment used or to be used
- Prior blood lead determinations
- All prior written medical opinions concerning the employee in Shaw's possession or control

Shaw shall provide the foregoing information to a second or third physician conducting a medical examination or consultation upon request by either the second or the third physician or by the employee.

5.6.6 Written Medical Opinion Shaw shall obtain and furnish the employee with a copy of a written medical opinion from each examining or consulting physician, which contains only the following information:

- The physician's opinion as to whether the employee has any detected medical condition which would place the employee at increased risk of material impairment of the employee's health from exposure to lead
- Any recommended special protective measures to be provided to the employee, or limitations to be placed upon the employee's exposure to lead.
- Any recommended limitation upon the employee's use of respirators, including a determination of whether the employee can wear a powered air purifying respirator if a physician determines that the employee cannot wear a negative pressure respirator.
- The results of the blood lead determination

Shaw shall instruct each examining and consulting physician to:

- Not reveal, either in the written opinion or orally, or in any other means of communication with Shaw, findings, including laboratory results, or diagnoses unrelated to an employee's occupational exposure to lead

- Advise the employee of any medical condition, occupational or non-occupational, which dictates further medical examination or treatment

  If therapeutic or diagnostic chelation is to be performed, Shaw shall assure that it is done under the supervision of a licensed physician in a clinical setting with thorough and appropriate medical monitoring and that the employee is notified in writing prior to its occurrence.

5.6.7 Medical Removal Protection

Shaw shall remove an employee from work having an exposure to lead at or above the action level on each occasion that a periodic and a follow-up blood sampling test conducted indicate that the employee's blood lead level is at or above 50 mg/dl.

Shaw shall remove an employee from work having an exposure to lead at or above the action level on each occasion that a final medical determination results in a medical finding, determination, or opinion that the employee has a detected medical condition which places the employee at increased risk of material impairment to health from exposure to lead.

For an employee removed from work due to a blood lead level at or above 50 mg/dl, return to work is contingent upon two consecutive blood samples with lead levels at or below 40 mg/dl.

For an employee removed from work due to a final medical determination, return to work is contingent upon subsequent final medical determination results in a medical finding, determination, or opinion that the employee no longer has a detected medical condition which places the employee at increased risk of material impairment to health from exposure to lead.

Shaw shall provide an employee up to 18 months of medical removal protection benefits on each occasion that an employee is removed from exposure to lead or otherwise limited pursuant to this procedure.

Note: For the purposes of this section, the requirement that Shaw provide medical removal protection benefits means that, as long as the job the employee was removed from continues, Shaw shall maintain the total normal earnings, seniority, and other employment rights and benefits of and employee, including the employee's right to his or her former job status as

though the employee had not been medically removed from the employee's job or otherwise medically limited.

5.7 EMPLOYEE INFORMATION AND TRAINING

5.7.1 General Shaw shall communicate information concerning lead hazards according to the requirements of OSHA's Hazard Communication Standard for the construction industry, 29 CFR 1926.59, including, but not limited to, the requirements concerning warning signs and labels, Material Safety Data Sheets (MSDS), and employee information and training.

5.7.2 Training Program Training shall be conducted for all employees who are subject to exposure to lead at or above the action level on any day or who are subject to exposure to lead compounds which may cause skin or eye irritation.

Training shall be provided prior to job assignment and annually thereafter for all employees who are subject to lead exposure at or above the action level on any day.

Shaw's training program shall consist of the following:

- The content of OSHA's lead standard and its appendixes
- The specific nature of the operations which could result in exposure to lead above the action level
- The purpose, proper selection, fitting, use, and limitations of respirators
- The purpose and a description of the medical surveillance program and the medical removal protection program, including information concerning the adverse health effects associated with excessive exposure to lead
- The engineering controls and work practices associated with the employee's job assignment
- The contents of this procedure and its appendixes
- Instructions to employees that chelating agents should not routinely be used to remove lead from their bodies and should not be used at all except under the direction of a licensed physician
- The employee's right of access to records under 29 CFR 1910.20

Shaw shall make readily available to all affected employees a copy of the lead standard (29 CFR 1926.62) and its appendices.

Shaw shall provide, upon request, all materials relating to the employee information and training program to affected employees and their designated representatives.

5.7.3 Signs Shaw shall post warning signs in each work area where an employee's exposure to lead is above the PEL. The signs shall state:

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

Shaw shall assure that all signs are illuminated and cleaned as necessary so that the legend is readily visible.

5.8 RECORDKEEPING

5.8.1 Exposure Monitoring Shaw shall establish and maintain an accurate record of all monitoring and other data used in conducting employee exposure assessments as required by this procedure. Exposure monitoring records shall include:

- The date(s), number, duration, location, and results of each of the samples taken, if any, including a description of the sampling procedure used to determine representative employee exposure where applicable.
- A description of the sampling and analytical methods used and evidence of their accuracy
- The type of respiratory protective devices worn, if any
- Name, social security number, and job classification of the employee monitored and of all other employees whose exposure the measurement is intended to represent
- The environmental variables that could affect the measurement of employee exposure

5.8.2 Medical Surveillance Shaw shall establish and maintain an accurate record for each employee subject to medical surveillance as required by this procedure. This record shall include:

- The name, social security number, and description of the duties of the em-

ployee
- A copy of the physician's written opinions
- Results of any airborne exposure monitoring done on or for that employee and provided to the physician
- Any employee's medical complaints related to exposure to lead
- Monitoring and other exposure records in accordance with the provisions of 29 CFR 1910.20

5.8.3 Medical Records Shaw shall keep the following medical records:

- A copy of the medical examination results, including medical and work history required by this procedure

- A description of the laboratory procedures and a copy of any standards or guidelines used to interpret the test results or references to that information

- A copy of the results of biological monitoring

- Other medical records in accordance with the provisions of 29 CFR 1910.20

Shaw shall establish and maintain an accurate record for each employee removed from current exposure to lead pursuant to this procedure. Each record shall include:

– The name and social security number of the employee

– The date of each occasion that the employee was removed from current exposure to lead, as well as the corresponding date on which the employee was returned to his or her former job status

– A brief explanation of how each removal was or is being accomplished

– A statement with respect to each removal indicating whether or not the reason for the removal was an elevated blood lead level

5.8.4 Availability All biological and environmental records used in conducting employee assessment of exposure to lead shall be kept for the duration of employment plus 30 years. Records concerning temporary medical removal of employees from lead exposure shall be maintained for at least the duration of employment.
These records shall be available to affected employees, former employees, and their representatives upon request.

5.9 Observation of Monitoring

5.9.1 Associate Observation Shaw shall provide affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to lead.

5.9.2 Observation Procedure Whenever observation of the monitoring of employee exposure to lead requires entry into an area where the use of respirators, protective clothing, or equipment is required, Shaw shall provide the observer with and assure the use of such respirators, clothing, and equipment and shall require the observer to comply with all other applicable safety and health procedures.

Without interfering with the monitoring, observers shall be entitled to:

- Receive an explanation of the measurement procedures.
- Observe all steps related to the monitoring of lead performed at the place of exposure.
- Record the results obtained or receive copies of the results when returned by the laboratory.

6.0 EXCEPTION PROVISIONS

(None Permitted)

7.0 CROSS REFERENCES

HS100	Medical Policies and Procedures
HS 102	Management of Employees Exposure and Medical Records
HS104	Employee Notification of Industrial Hygiene

29 CFR 1926.62	Appendix A: Substance Data Sheet for Occupational Exposure to Lead
29 CFR 1926.62	Appendix B: Employee Standard Summary
29 CFR 1926.62	Appendix C: Medical Surveillance Guidelines

8.0 ATTACHMENTS

1. Responsibility Matrix
2. 29 CFR 1926.62 TABLE I - Reparatory Protection For Lead Aerosols

ATTACHMENT 1

Responsibility Matrix

Action	Procedure Section	*Responsible Party*	
		Project Manager	**Site Safety Officer**
Implement the provisions of this document as appropriate for a particular project.	1.0	X	X

ATTACHMENT 2

RESPIRATORY PROTECTION FOR LEAD AEROSOLS

Airborne Concentration of Lead or Condition of Use	Required Respirator
Not in excess of 0.5 mg/m3 (10X PEL)	A half mask, air-purifying respirator equipped with a HEPA filter. 2, 3
Not in excess of 2.5 mg/m3 (50X PEL)	A half mask, air-purifying respirator equipped with a HEPA filter. 2, 3
Not in excess of 50 mg/m3 (1000X PEL)	1) Any powered air-purifying respirator with HEPA filter, 3 or (2)Half-Mask supplied-air respirator operated in the positive- pressure mode. 2
Not in excess of 100 mg/m3 (2000X PEL)	A supplied-air respirator with full-face piece, hood, helmet, or suit, operated in positive pressure mode.
Greater than 100 mg/m3, unknown concentration or fire fighting	Full-face piece, self-contained breathing apparatus operated in positive-pressure mode.

1 Respirators specified for high concentrations can be used at lower concentrations of lead
2 Full face-piece is required if the lead aerosol cause eye or skin irritation at the use concentrations.
3 A high efficiency particulate air (HEPA) filter means 99.97 percent efficient against 0.3 micron size particulates.

ATTACHMENT 3

LEAD EXPOSURE CONTROL CHECKLIST

COMPETENT PERSON		**YES**	**NO**	**N/A**
1.	On Site	___	___	___
2.	Trained to Recognize Potential Hazards	___	___	___
3.	Authority to Correct Hazards	___	___	___
4.	Conducts Regular Scheduled Inspections	___	___	___
5.	Review and Approve Lead Exposure Control Plan	___	___	___
6.	Ensure Exposure Assessment and Monitoring Program	___	___	___
7.	Ensure PPE is used and Employees are Trained	___	___	___
8.	Hygiene Facilities, and Engineering Controls in Use	___	___	___

METHOD (S) OF LEAD DETERMINATION		**YES**	**NO**	**N/A**
1.	Owner/Client Documentation	___	___	___
2.	Project Specifications	___	___	___
3.	Prior Maintenance Records	___	___	___
4.	Other Documentation	___	___	___
5.	Sampling by X-ray Fluorescence	___	___	___
6.	Bulk Samples	___	___	___
7.	Lead Check Test Kit	___	___	___
8.	Other Sample Methods	___	___	___

EMPLOYEE LEAD EXPOSURE ASSESSMENT METHOD (S)		**YES**	**NO**	**N/A**
1.	OSHA List of Specific Task	___	___	___
2.	Objective Data	___	___	___
3.	Historical Monitoring Data (< 12 Months)	___	___	___
4.	Current Employee Exposure Monitoring	___	___	___

LEAD EXPOSURE CONTROL PLAN CONTENT		**YES**	**NO**	**N/A**
1.	Tasks/Activities Emitting Lead	___	___	___
2.	Engineering Controls	___	___	___
3.	Administrative Controls	___	___	___
4.	Work Practices	___	___	___
5.	Personal Protective Equipment	___	___	___

		YES	NO	N/A
6.	Respiratory Protection	___	___	___
7.	Medical Surveillance	___	___	___
8.	Exposure Monitoring Data	___	___	___
9.	Multi-contractor Communication	___	___	___
10.	Employee Training	___	___	___
11.	Competent Person Review (< 6 Months)	___	___	___
ENGINEERING CONTROLS UTILIZED		**YES**	**NO**	**N/A**
1.	Manual Scrapping/Sanding	___	___	___
2.	Long Handle Cutting Torch	___	___	___
3.	Needle Guns	___	___	___
4.	Sheathed and Exhausted Tools (Grinders, Blasters)	___	___	___
5.	Local Exhaust Ventilation	___	___	___
6.	Hydraulic Shears	___	___	___
7.	Chemical Removal of Paint	___	___	___
8.	Water Blasting	___	___	___
9.	Vacuum Blasting	___	___	___
10.	Wetting Agents	___	___	___
11.	HEPA Vacuum Cleanup	___	___	___
12.	Unbolt, Remove, Replace	___	___	___
13.	Others _____	___	___	___
ADMINISTRATIVE CONTROLS UTILIZED		**YES**	**NO**	**N/A**
1.	Employee Rotation	___	___	___
2.	Rotation Schedule in Lead Exposure Control Plan	___	___	___
WORK PRACTICES		**YES**	**NO**	**N/A**
1.	Regulated Work Areas Established	___	___	___
2.	Work Plan Developed	___	___	___
3.	Housekeeping Plan	___	___	___
PERSONAL PROTECTIVE EQUIPMENT (GENERAL)		**YES**	**NO**	**N/A**
1.	Head Protection/Covering	___	___	___
2.	Eye Protection	___	___	___

		YES	NO	N/A
3.	Hand Protection (Gloves)	___	___	___
4.	Foot Protection/Covering	___	___	___
5.	Protective Clothing (Coveralls)	___	___	___
6.	Special Clothing (Flame Resistant)	___	___	___
7.	Disposal/Decontamination Procedures	___	___	___

RESPIRATORY PROTECTION		**YES**	**NO**	**N/A**
1.	Written Program Established	___	___	___
2.	Designated Program Administrator (Competent Person)	___	___	___
3.	Employee Medical Qualification	___	___	___
4.	Employee Fit Test (Negative Pressure Respirator)	___	___	___
5.	NIOSH/MSHA Approved Respirators	___	___	___
6.	Cleaning, Maintenance, and Storage Procedures	___	___	___
7.	Grade D Air Supply for Supplied Air Respirators	___	___	___
	Program Audits	___	___	___

PERSONAL HYGIENE		**YES**	**NO**	**N/A**
1.	Hand Washing Area (Regardless of Exposure Level)	___	___	___
2.	Shower and Change Room (Exposure Over PEL)	___	___	___
3.	Hot and Cold Water (Water Filter 5 Micrometers)	___	___	___
4.	Soap and Towels	___	___	___
5.	Lunch Room/Area Wet Wipe/Mop Daily	___	___	___
6.	Wipe Samples in Lunch Room/Area Weekly (200 µg/Ft2)	___	___	___
7.	No Food, Cigarettes, Chew or Cosmetics in Work Area	___	___	___
8.	Parking Area Protected from Contamination	___	___	___
9.	Personnel Decontamination Techniques Established	___	___	___

MEDICAL SURVEILLANCE		**YES**	**NO**	**N/A**
1.	Medical Advisor Supervising Program (Provided with required information)	___	___	___
2.	Initial Biological Monitoring (Exposure at or > 30 µg/m3)	___	___	___
3.	Repeat Biological Monitoring (Every 2 Months when blood lead level at or > 40 µg/dl)	___	___	___

		YES	NO	N/A
4.	Medical Surveillance Program (Exposure at or > 30 µg/m3 > 30 days or when blood lead level > 40 µg/dl)	___	___	___
5.	Blood Lead Laboratory Approved by OSHA	___	___	___
6.	Employee(s) Provided Monitoring Results Within 5 Days	___	___	___
7.	Employee Medical Examination and Consultation (Blood Lead Level > 40 µg/dl or lead poisoning symptoms)	___	___	___
MEDICAL REMOVAL PROTECTION		**YES**	**NO**	**N/A**
1.	Medical Removal Plan Established (Blood lead level at or > 50 µg/dl)	___	___	___
2.	Employee(s) Notified of Medical Removal Provision	___	___	___
EMPLOYEE INFORMATION AND TRAINING		**YES**	**NO**	**N/A**
1.	HAZCOM Training Provided All Employees	___	___	___
2.	Lead Hazard Awareness Training (All employees subject to exposure at or > 30 µg/dl)	___	___	___
SIGNS		**YES**	**NO**	**N/A**
1.	Containers of Contaminated Clothing Labeled	___	___	___
2.	Work Areas Posted	___	___	___
RECORDKEEPING		**YES**	**NO**	**N/A**
1.	Lead Exposure Control Plan	___	___	___
2.	Exposure Assessment	___	___	___
3.	Medical Surveillance Records	___	___	___
4.	Medical Removal Records	___	___	___
5.	Employee Training Records	___	___	___
ENVIRONMENTAL		**YES**	**NO**	**N/A**
1.	RCRA Generator Permit Required	___	___	___
2.	RCRA Disposal Permit Required	___	___	___
3.	RCRA Licensed Transporter	___	___	___
ADDITIONAL REQUIREMENTS		**YES**	**NO**	**N/A**
1.	Heat Stress Monitoring	___	___	___
2.	Heat Stress Training	___	___	___

STANDARD OPERATING PROCEDURE

Subject: Benzene Compliance Plan

1. PURPOSE

The purpose of this procedure is to provide guidelines for the protection of company employees against the hazards associated with benzene, and to comply with local, state, and federal requirements.

2. SCOPE

This program applies to all employees who work in locations that use benzene or benzene-containing solutions. It does not apply to the storage, dispensing, sale, or use of gasoline, motor fuels or other fuels containing benzene.

3. REFERENCES

- Shaw, HS060, *Hazard Communication Program*
- Shaw, HS100, *Medical Policies and Procedures*
- Shaw, HS500, *OSHA Regulated Toxic and Hazardous Chemicals*
- Shaw, HS601, *Respiratory Protection Program*
- Title 29 Code of Federal Regulations Part 1910.1028, *Benzene*
- Title 29 Code of Federal Regulations Part 1910.1200, *Hazard Communication*
- Title 29 Code of Federal Regulations Part 1910.133, *Eye and Face Protection*
- Title 29 Code of Federal Regulations Part 1910.134, *Respiratory Protection Standard*

4. DEFINITIONS

Affected Employee—Any company employee who may be exposed to benzene under normal operating conditions or in foreseeable emergencies.

Action Level—A concentration for a specific substance, calculated as an eight- (8) hour time-weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance. Typically it is one-half that of the Permissible Exposure Limit (PEL) for that substance.

Company—All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E&I)

Hazardous Chemical—Any chemical, which poses a physical or health hazard.

Health Hazard—A chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. Health hazards include chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers,

hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes.

Local Health and Safety Representative—The person who is responsible for the management and/or oversight of health and safety activities at a particular workplace. He/she may be assigned as a site health and safety officer or act as a home office health and safety manager who is responsible for multiple workplaces. This person does not necessarily need to be physically located at a workplace in which they are responsible for ensuring that the requirements of this procedure are fulfilled. The local health and safety representative may designate another qualified individual to assume some or all of the responsibilities delineated in this procedure.

ppm—parts per million

Permissible Exposure Limit (PEL)—An occupational exposure limit to specific chemicals and hazardous dusts that is published and enforced by the U.S. Occupational Safety and Health Administration (OSHA) as a legal standard.

Physical Hazard—A chemical for which there is scientifically valid evidence that it is a combustible liquid, compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable, or reactive.

Responsible Party—The entity responsible for preparation or distribution of Material Safety Data Sheets (MSDS) that can provide additional information on the hazardous chemical and appropriate emergency procedures.

Shaw E&I—Shaw Environmental & Infrastructure, Inc.

Short Term Exposure Limit (STEL)—The maximum concentration to which workers can be exposed to a substance averaged over any 15 minute period.

Time weighted average (TWA)—the average amount of exposure to a substance of an employee over an 8 hour work day.

5. RESPONSIBILITIES

5.1 Senior Director of Health and Safety

The Senior Director of Health and Safety is responsible for issuing, revising, and maintaining this procedure.

5.2 Purchaser

The Purchaser is responsible for:

- Reviewing and understanding this procedure

5.3 Receiver

The Receiver is responsible for:

- Reviewing and understanding this procedure

5.4 Affected Employee

The affected employee is responsible for:

- Reviewing and understanding this procedure

- Receiving Hazard Communication training

5.5 Local Health and Safety Representative

The Health and Safety Representative is responsible for:

- Understanding and complying with Federal, state and/or local regulations
- Reviewing and understanding this procedure
- Establishing, updating, and revising MSDS binder
- Performing an initial review of MSDSs
- Providing HAZCOM training
- Transmitting MSDSs to contractors
- Obtaining MSDSs from other entities

6. COMPLIANCE PROGRAM

6.1 General

In the event that benzene becomes a health hazard or potential health hazard at any Shaw jobsite, implementation of engineering controls, work practice controls, or respiratory protection or any combination of these controls will be conducted to reduce employee exposure to benzene to at or below the PEL.

6.2 Hazard Data

Benzene can affect your body through inhalation, skin/eye contact or accidental ingestion. Benzene has a pleasant, sweet odor, but the odor does not provide adequate warning of its hazard.

1. Acute Health Effects

Inhalation—Exposure to high concentrations of benzene may cause breathlessness, irritability, euphoria or giddiness. It may cause irritation of the eyes, nose and respiratory tract. It may also cause headache, dizziness, nausea or intoxication. Severe exposures can lead to convulsions and loss of consciousness.

Skin Absorption/Eye Contact—Contact with benzene may cause irritation of the skin and eyes. Benzene can be absorbed into the skin and cause dermatitis. Eye contact may result in temporary corneal damage.

Ingestion—Benzene ingestion may cause nausea, vomiting, headache, dizziness and gastrointestinal irritation.

2. Chronic Health Effects

Repeated or prolonged exposure to benzene, even at relatively low concentrations, may result in various blood disorders, ranging from anemia to leukemia. Benzene has been shown to cause cancer in humans. Benzene exposure has been associated with cancers such as myeloid leukemia, Hodgkin's disease and lymphomas. Many blood disorders associated with benzene exposure may occur without symptoms.

3. Physical Hazards

Benzene poses a serious fire and explosion hazard when exposed to heat or flame. Benzene vapor is heavier than air and may collect in low areas. Vapors can also travel for some distance and may come into contact with ignition sources.

6.3 PERMISSIBLE EXPOSURE LIMITS

OSHA has issued the following exposure limits to reduce the potential for adverse health effects:

Action Level–The concentration of a chemical in air, calculated as an 8-hour time-weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance. **The action level for benzene is 0.5 parts per million (0.5 ppm)**.

Permissible Exposure Limit (PEL)–The greatest concentration, calculated as an 8-hour time-weighted average, to which nearly all workers may be repeatedly exposed during their 8-hour work schedule without experiencing adverse health effects. **The PEL for benzene is 1 part per million (1 ppm)**.

Short Term Exposure Limit (STEL)–The greatest concentration which nearly all workers may be exposed during any one 15-minute period without experiencing adverse health effects. **The STEL for benzene is 5 parts per million (5 ppm)**.

7. PERSONAL PROTECTIVE EQUIPMENT

Eye or skin contact with liquids containing benzene will be prevented by the use of protective garments and equipment which are impervious to benzene. The type of Personal Protective Equipment (PPE) necessary will vary depending on the concentration, amount used and the potential for splashing. It may include goggles, face shields, gloves, gowns, lab coats, aprons and arm sleeves.

PPE contaminated with benzene shall not be brought home by employees. All Personal Protective Equipment must be inspected by employees prior to each use. Personal Protective Equipment must be stored in a clean and sanitary manner.

Respirators shall be inspected on a monthly basis to ensure they are being used, stored and cleaned properly. Shaw shall provide protective clothing and equipment at no cost to the employee and assure its use where appropriate. Proper eye and face protection equipment is addressed within HS600 and must meet the requirements of 29 CFR 1910.133.

8. RESPIRATORY PROTECTION

If employee exposures are found to exceed the PEL or STEL, proper respiratory protection shall be provided until feasible engineering or administrative controls can be implemented. Employees working in areas with exposure to benzene shall receive appropriate respiratory protection provided by Shaw. Respirators shall be used during the following:

- Periods necessary to install or implement feasible engineering and work-practice controls.
- Work operations for which the employer establishes that compliance with either the TWA or STEL through the use of engineering and work-practice controls is not feasible; including but not limited to: maintenance and repair activities, vessel repair/cleaning or other operations for which engineering and work-practice controls are infeasible because exposures are intermittent and limited in duration.
- Emergencies involving benzene discharge/spill.
- .

•

Respiratory protection shall be selected according to airborne concentrations of benzene. Refer to Attachment 1 for proper selection and reference 29 CFR 1910.134 for additional information.

9. SIGNAGE AND LABELING

9.1 Regulated Areas

Areas where the airborne concentrations of benzene are found to exceed the PELs will be designated as regulated areas. Access to these areas will be limited to persons trained to recognize the hazards of benzene. All entrances and accessways will be posted with signs bearing the following information:

DANGER

Benzene

Cancer Hazard

Flammable-No Smoking

Authorized Personnel Only

Respirator Required

9.2 Container Labels

If benzene is transferred into a container other than the original, it must be labeled with the following information:

DANGER

Contains Benzene

Cancer Hazard

Labels will be provided upon request. . Refer to HS060 Hazard Communication Program for more information.

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10. MONITORING

In areas where employees are subject to benzene exposure, monitoring shall be conducted to determine the employees' exposure level. Breathing zone measurements shall be collected that

represent an average 8-hour exposure. In addition, 15 minute breathing zone samples must be collected to determine STEL compliance where there is reason to believe exposures are high.

Sampling and analysis of benzene samples may be conducted by the absorption of benzene on charcoal tubes followed by chemical analysis by gas chromatography. Portable monitors, continuous monitoring and passive dosimeters are also methods of sampling and monitoring. **Monitoring must have an accuracy to a 95% confidence level of not less than +/- (plus or minus) 25% for concentrations of benzene greater than or equal to 0.5 ppm.** For more specific monitoring requirements and air sample methods refer to CFR 1910.1028, Appendix D.

11. EMPLOYEE INFORMATION AND TRAINING

Every employee working with benzene must receive training on its hazards. The following information shall be reviewed with employees prior to and annually when working with or around benzene. This information contains the following:

- Requirements of the OSHA Standard-29 CFR 1910.1028; Appendix A;
- Explanation of this procedure HS503
- Contents of the Material Safety Data Sheet
- Description of the medical surveillance program
- Description of the health hazards associated with exposure
- Signs and symptoms of exposure
- Instructions to report any signs or symptoms that may be attributable to benzene exposure
- Description of the operations in the work area where benzene is present
- Work practices to reduce exposure, including engineering and administrative controls and Personal Protective Equipment required
- Instructions for handling spills and emergency procedures
- Review owner's contingency plan for additional site specific safety rules

This training must be conducted whenever a new hazard is introduced into the work area, when the employee transfers to another job, and whenever the employee demonstrates behavior that indicates a lack of understanding of the safe handling of chemicals.

Supervisors are responsible for ensuring that employees with potential exposure to benzene receive the appropriate training prior to working with the substance.

The individual presenting the training session must document all training and a copy of the records will be submitted to Health & Safety representative.

12. MEDICAL SURVEILLANCE

Employees who are, or may be exposed to benzene and meet the following requirements must be involved in a medical surveillance program at no cost to the employee.

- Exposed at or above the action level for 30 or more days per year
- Exposed or has the potential for exposure at or above the PELs 10 or more days a year
-

These employees will complete a medical questionnaire annually and receive a medical examination. The examination will include blood testing and a review of occupational history.

Employees exposed to benzene must receive medical attention under the following circumstances:

- Whenever an employee has developed signs or symptoms associated with exposure to benzene; and/or
- Whenever an employee is involved in a spill, leak or other occurrence resulting in a possible overexposure to benzene.

It is the intent of Shaw to provide a work environment which does not compromise the health of any employee. For more information on Medical Surveillance refer to HS100 Medical Policy and Procedures. Also refer to 29 CFR 1910.1028 for additional information.

13. EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

14. ATTACHMENTS

- Attachment 1. Respiratory Protection for Benzene

15. FORMS

None.

Attachment 1
Respiratory Protection for Benzene

*Any employee who cannot use a negative-pressure respirator must be allowed to use a respirator with less breathing resistance, such as a powered air-purifying respirator or supplied-air respirator

Airborne Concentration of Benzene or Condition of Use	Required Respirator
Less than or equal to 10 ppm	(1) A half mask, air-purifying respirator equipped with organic vapor cartridges
Less than or equal to 50 ppm	(1) A fullfacepiece with organic vapor cartridges full-face gas mask with chin style canister
Less than or equal to 100 ppm	(1) A fullfacepiece powered air-purifying respirator with organic vapor canister
Less than or equal to 1,000 ppm	(1) A supplied-air respirator with fullfacepiece, operated in positive pressure mode.
Greater than 1,000 ppm or unknown concentration.	(1) A self-contained breathing apparatus with fullfacepiece operated in positive pressure mode (2) Fullfacepiece positive-pressure supplied air respirator with auxiliary self-contained air supply
Escape	(1) Any organic vapor gas mask; or (2) Any self-contained breathing apparatus with full facepiece.
Fire fighting	(1) Full facepiece self-contained breathing apparatus in positive pressure mode

1 Canisters must have a minimum service life of four (4) hours when tested at 150 ppm benzene, at a flow rate of 64 LPM, 25deg. C. and 84% relative humidity for non-powered air purifying respirators. The flow rate shall be 115 LPM and 170 LPM respectively for light fitting and tight fitting powered air-purifying respirators.

PROCEDURE

Subject: ASBESTOS COMPLIANCE PLAN

1.0 PURPOSE AND SUMMARY

The purpose of this program is to establish guidelines and procedure operations which involve asbestos containing materials. These guidelines and procedures have been put in place to protect all employees, sub-contractors, visitors and vendors from potential health hazards of asbestos related exposure. This program applies to all employees and sub contractors who may come into contact with or disturb asbestos-containing materials during the removal, abatement process.

It is the policy of Shaw Environmental & Infrastructure, Inc. that only qualified employees shall be involved in any asbestos repairs, maintenance or removal. All unqualified employees shall be protected from exposure to asbestos fibers by isolating and controlling access to all affected areas during asbestos work. All tasks involving the disturbance of asbestos containing material will be conducted only after appropriate work controls have been identified and implemented. A qualified supervisor shall be available at asbestos controlled work sites during all activities. Proper personal protective equipment, vacuums and hepa filters shall be used and properly maintained. If outside contractors are used, the company shall ensure all contractor employees have been properly trained and have been issued proper equipment and protective gear.

It is the responsibility of the Project Manager (PM) and Site Safety Officer (SSO) to implement the provisions of this document as appropriate for a particular project. This document shall work in conjunction with the site-specific HASP. Topics which must be addressed are listed below:

- Ensure all Asbestos Containing Material is identified and labeled
- Ensure training is effective for authorized employees
- Conduct medical surveillance of affected employees
- Establish engineering controls for all work with asbestos containing material
- Provide adequate and proper equipment and personal protective gear
- Ensure proper disposal of all asbestos containing material
- Qualified supervisors shall provide effective on-site management during work with asbestos containing material
- Qualified employees must follow the exact procedures for repair or removal of asbestos containing material, including proper use of containment equipment, clean up equipment and personal protective gear.
- Unqualified employees are to stay clear of all asbestos work areas and report any damaged asbestos containing material to their supervisor

2.0 TABLE OF CONTENTS

3.0 Responsibility Matrix

3.1 Procedure Responsibility

The Corporate Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1

4.0 DEFINITIONS

Asbestos - Asbestos is a generic term describing a family of naturally occurring fibrous silicate minerals. As a group, the minerals are noncombustible, do not conduct heat or electricity and are resistant to many chemicals. Although there are several other varieties that have been used commercially, the most common asbestos mineral types likely to be encountered in buildings are chrysotile (white asbestos), amosite (brown asbestos), and crocidolite (blue asbestos). Among these, white asbestos is by far the most common asbestos mineral present in buildings.

(ACM) - Asbestos Containing Material

Friable Asbestos - Friable asbestos material means finely divided asbestos or asbestos-containing material or any asbestos-containing material that can be crumbled, pulverized or powdered by hand pressure. Individual fibers in friable asbestos-containing material can potentially become airborne and can then present a health hazard. Three types of friable material commonly used in buildings are:

- Sprayed fibrous fireproofing;
- Decorative or acoustic texture coatings;
- Thermal insulation.

Non-friable Asbestos - Non-friable asbestos includes a range of products in which asbestos fiber is effectively bound in a solid matrix from which asbestos fiber cannot normally escape. Non-friable asbestos includes a variety of products including asbestos cement tiles and boards and asbestos reinforced vinyl floor tiles. Cutting, braking, sanding, drilling of similar activities can release asbestos fiber from even non-friable asbestos materials.

5.0 TEXT

5.1 Monitoring

All employees working either with or within the area of asbestos shall not be exposed to an airborne concentration of asbestos in excess of 0.1 fiber per cubic centimeter of air as an eight (8)-hour time-weighted average (TWA) as determined by CFR 1910.1001 Appendix A. No employee shall be exposed to an airborne concentration of asbestos in excess of 1.0 fiber per cubic centimeter of air as averaged over a sampling period of thirty (30) minutes as determined by CFR 1910.1001 Appendix A.

5.2 Exposure Monitoring

Determining the level of employee exposure shall be made from breathing zone air samples that are representative of the 8-hour (TWA) and 30-minute short-term exposures of each employee.

5.3 Asbestos Work Categories

5.3.1 **Category 1** work includes the installation or removal of non-friable asbestos in which the asbestos fiber is locked in a binder such as cement, vinyl or asphalt which holds the material together.

5.3.2 **Category 2** work involves work with friable asbestos that is of short duration in situations which create low levels of airborne asbestos. Example of category 2 work are enclosure of friable asbestos, application of tape or sealant to asbestos containing pipe insulation and minor removal of friable asbestos and minor installation, maintenance or repair work above false ceilings where sprayed asbestos fireproofing is present on beams.

5.3.3 **Category 3** work involves possible exposure to friable asbestos over long periods of time or work that generates high levels of asbestos. Included in category 3 work are removal projects where relatively large amounts of asbestos are removed from a building including removal of friable asbestos from structural material, cleaning or removal of heating or air handling equipment that has been insulated with asbestos. Also included in category 3 work are cutting or grinding of asbestos-containing materials using power tools.

5.4 Hazards

Asbestos is a common, naturally occurring group of fibrous minerals. Asbestos fibers have been used in a variety of building materials. Generally, most asbestos is found in pipe insulation, doors, textured paints and plasters, structural fireproofing, and floor tiles. Friable asbestos (that is, material that contains more than 0.1% asbestos by weight and can be crumbled by hand) is a potential hazard because it can release fibers into the air if damaged. Long term exposure to airborne asbestos is necessary for chronic lung disease.

Significant and long-term exposure to asbestos from activities that directly disturb asbestos-containing materials (such as asbestos mining) can lead to a variety of respiratory diseases, including asbestosis and mesothelioma (cancer of the lung lining). Asbestosis is a non-malignant, irreversible disease resulting in fibrosis of the lung. Asbestos-related cancers tend also to result from substantial long-term exposure, however, mesothelioma may result from much smaller exposures to asbestos.

5.4.1 Hazard Control

Engineering Controls - Engineering controls include the use of enclosures such as monitoring equipment, glove bags, tenting, negative pressure work areas, HEPA filters, controlled vacuums, water misters and other equipment to ensure containment and clean up of asbestos work areas.

Administrative Controls - All qualified workers shall be issued proper personal protective equipment, such as respirators, disposable coveralls, gloves, etc. Written procedures and management authorizations are required for all work involving asbestos containing material

Training Controls - All qualified employees, supervisors and managers shall receive the proper level of training, as outlined in this program.

5.4.2 General Rules

When in doubt, treat all material as containing asbestos and comply with all applicable rules and regulations and protective measures.

All Asbestos Containing Material (ACM) will be handled by certified and licensed asbestos abatement personnel. The friability of the ACM will dictate the type of removal/maintenance required.

Employees who are uncertified and unlicensed will not handle any ACM >1%. This will include encapsulation projects, renovation/removal and/or demolition of any type of structure. This will prevent the potential for accidental exposure from the mishandling of any ACM.

When an uncertified, unlicensed employee questions whether they may be handling suspect ACM, the employee will immediately contact their supervisor. The employee shall not resume working at the site until the area has been checked to verify the material is not ACM.

Uncertified, unlicensed employees will not cross over a barrier/containment area where asbestos projects are in progress.

Any employee who discovers ACM or suspect ACM in damaged or poor condition should report it to their supervisor so the identified material is

repaired.

5.5 Medical Examinations

Employees assigned to asbestos removal will be given medical examinations at Company expense in compliance with 29 CFR 1926.1101 and 40 CFR 763 - Subpart G.

- Within 30 days of first employment or assignment to a job exposing the employee to asbestos containing material.
- Annually.
- Within 30 days of termination of employment.
- Medical examination for employees assigned to asbestos removal will include:
- Medical and work history with special emphasis directed to symptoms of the respiratory system, cardiovascular system and digestive tract.
- Medical questionnaire contained in 29 CFR 1926.1101.

A physical examination including a chest roentgenogram and pulmonary function test that includes measurement of the employee's forced vital capacity and expiratory volume. No employee shall be assigned to tasks requiring the use of respirators if an examining physician determines the employee will be unable to function normally while using it or that the employee might otherwise be impaired. Records of all physical examinations performed for asbestos work related activities will be maintained permanently by the Company.

Asbestos Identification - Asbestos identification system is used to alert people to the presence of asbestos. Asbestos is identified by tags, stickers, pipe labels, signs and other high visibility means. Where feasible, stickers indicate the presence of asbestos in thermal insulation, in asbestos board and tiles and in other locations. Warnings may also be placed near the entrances of rooms -particularly mechanical rooms where unusually large amounts of asbestos may be present.

5.6 Access Control

Access to mechanical and electrical rooms, service shafts, tunnels and other locations is to be restricted where asbestos may be present in unusually large amounts and where other hazards may also be present. Such areas are locked and accessible only to authorized personnel. Where sprayed asbestos-containing fireproofing is present in a building above a false ceiling, access to the space is restricted to Maintenance Department employees, Communications Services or authorized contractors.

5.7 Repair and Maintenance of ACM

Should an employee or a contractor encounter material which is not identified and is not listed in the Asbestos Inventory and which might reasonably be expected to be asbestos, the person will stop any work which could create airborne asbestos and report the discovery to a supervisor. Where it is determined that friable asbestos-containing material is in a condition that could likely lead to inhalation exposure, the supervisor will

immediately limit access to the location and initiate repairs, removal or encapsulation. Where there is reasonable doubt about the composition of a friable material, it will be treated as asbestos until testing demonstrates that asbestos is present at levels below 1%. Cleanup and repair of asbestos-containing material will only be carried out by the appropriate clean up procedure by employees or contractors who have been properly trained.

When routine work is to take place in an area where asbestos is present or when the work might disturb friable asbestos, employees will be informed of the potential for exposure through a notation on the work order. If upon reviewing the work situation, the employee believes that normal work practices do not provide an adequate measure of safety, the employee will report these concerns to the supervisor. The supervisor will review the work situation and authorize any required additional precautions. All employees, visitors, vendors and contractors will be notified in advance when work involving asbestos is to be carried out in any area.

5.8 Clean up of ACM

Asbestos only poses a health hazard when it becomes airborne and people inhale the fiber. When asbestos-containing material has been disturbed, effective clean up will ensure that asbestos does not present a health hazard. Clean up of dust which might contain traces of asbestos, such as a custodian might encounter in routine cleaning in buildings where asbestos is present, will not require special precautions. To ensure that clean up of significant quantities of asbestos will not cause a health hazard, the following procedure will be followed:

Clean up of significant amounts of asbestos containing material will be only be done by Employees who have been trained and who are wearing appropriate protective clothing and a fitted, air-purifying respirator.

Dry sweeping of asbestos-containing waste or other clean up activities which will create airborne dust are not permitted

Large pieces of asbestos containing material will be collected by hand and properly bagged in accord with the disposal procedure.

When ever possible, asbestos dust will be thoroughly wetted and clean up with a wet mop or a wet vac. Contaminated water will be discharged to a sewer. Containers, mops and other equipment which might be contaminated with asbestos will be rinsed with water and the rinse water discharged to a sewer.

If additional clean up is need it will be carried out using a vacuum equipped with a HEPA filter. Within Maintenance Department there is one vacuum assigned for asbestos clean up.

Non-friable ACM Work

Asbestos that is effectively bonded in a non-asbestos matrix cannot easily become airborne. As such, provided the material is not broken or abraded, there is little risk of inhalation exposure to asbestos. To ensure that minor work involving non-friable asbestos (including vinyl asbestos tile, asbestos asphalt roofing, and asbestos ceiling and wall tile) the following procedure will be followed.

Procedure:

- Before beginning the work the worker will carefully inspect the asbestos- containing material to ensure that the planned work will not create airborne asbestos dust.

- Where dust that might contain asbestos fiber is present, the worker will clean the material using a wet method or a HEPA filtered vacuum.

- Following completion of the task the worker will carry out any required clean wet methods or a HEPA filtered vacuum and will then carefully bag for disposal all asbestos containing waste.

5.9 Work Above False Ceilings

Only workers who have successfully completed Level 2 Asbestos Safety Training and who are authorized to do so by Maintenance Department may move ceiling tiles or perform work above the dropped ceilings where asbestos insulation is present on building structure. The following procedure shall be used whenever minor work such as installation of telephone or computer lines, or servicing of ventilation or lighting system components requires work above the suspended ceiling:

Procedure:

- Before removing a ceiling tile, the area around the tile shall be isolated by creating a an enclosure of 4 mil or heavier polyethylene sheeting. The sheeting shall be taped to the ceiling t-bar and the floor using duct tape.

- Those working within the enclosure shall wear a properly fitted, air purifying respirator equipped with a particulate filter designed to remove asbestos fibers from inhaled air and a pair of coveralls.

- Air supply or return grills located within the enclosure shall be sealed with 4 mil or thicker polyethylene sheeting to prevent contamination of the ventilation system.

- The ceiling tile shall be carefully removed and the upper surface vacuumed with a vacuum fitted with a HEPA filter.

- The worker shall then carefully vacuum the upper surface of surrounding tiles before carrying out the assigned task.

- Following completion of the above-the-ceiling work, the removed ceiling tile shall be replaced and the interior of the enclosure carefully cleaned using wet cleaning techniques or a HEPA filtered vacuum.

5.10 Single Use Glove Bag Procedure

The following procedure will be followed when single-use asbestos removal glove bags are used. The procedure may only be used on tasks that are small enough to be

completely enclosed in the glove bag and which do not leave exposed asbestos in place when the bag is removed.

5.10.1 Preparation:

Only a Employee who has completed level 3 training and who is wearing appropriate coverall and an air purifying respirator (3M 6000 Series with a purple, 6240 particulate filter or equivalent) will carry out glove bag removal of asbestos.

Before beginning removal work, access to the area will be restricted. If the work site is located in areas where other Maintenance Department Employees might be exposed to asbestos and in all work sites located in publicly accessible areas, warning notices will be posted.

Steps will be taken to prevent accidental movement, contact with heat, cold or electricity, or release of chemicals.

The work area will be cleaned using a HEPA filtered vacuum or wet cleaning to remove asbestos-containing material contaminating the immediate work area. Where possible a plastic sheet will then be placed beneath the pipe or fitting from which the asbestos is to be removed.

Steps will be taken to prevent exposure where damage to the insulation might allow release of fibers. Steps include making temporary repairs using duck tape or wetting the exposed fiber using amended water.

5.10.2 Glove Bag Removal

The asbestos-containing material will be thoroughly wetted using amended water.

With tools in bag, the single-use bag will be positioned and secured using adhesive and tape as necessary.

Working through the gloves, the asbestos will be removed exercising care to avoid puncturing the bag.

When removal is compete or bag is full, sprayer (containing amended water) will be inserted into the bag and the pipe or fitting, tools and the bag interior will be washed. Tools will then be placed in an inverted glove withdrawn from bag and the glove sealed from the bag using duct tape.

The tools will then be removed by cutting through the duct tape ensuring that both the bag and the glove remain sealed.

The tools will then be submerged in water and the glove opened. Tools will be

cleaned under water.

The glove bag will then be carefully removed, sealed and placed in a sealed container pending packaging for disposal.

5.10.3 Clean Up:

The surface of the pipe or fitting will be carefully wet wiped and treated with sealer.

The plastic sheet will then be carefully wet wiped and rolled up.

All solid waste created during removal jobs including glove bags, disposable coveralls, wipe rags and plastic sheeting will be treated as asbestos containing waste and handled as detailed in the disposal procedure.

5.11 Multiple-Use Glove Bag Procedure

This procedure describes the use of multiple use glove bags. It may be used on tasks that require the bag to be repositioned to complete the entire job.
Preparation:

Only a Employee who has completed level 3 training and who is wearing appropriate coverall and an air purifying respirator (3M 6000 Series with a purple, 6240 particulate filter or equivalent) will carry out glove bag removal of asbestos.

Before beginning removal work, access to the area will be restricted. If the work site is located in areas where other Maintenance Department Employees might be exposed to asbestos and in all work sites located in publicly accessible areas, warning notices will be posted.

Steps will be taken to prevent accidental movement, contact with heat, cold or electricity, or release of chemicals.

The work area will be cleaned using a HEPA filtered vacuum or wet cleaning to remove asbestos-containing material contaminating the immediate work area. Where possible a plastic sheet will then be placed beneath the pipe or fitting from which the asbestos is to be removed.

Steps will be taken to prevent exposure where damage to the insulation might allow release of fibers. Steps include making temporary repairs using duck tape or wetting the exposed fiber using amended water.

5.11.1 Glove Bag Removal

The asbestos containing material will be thoroughly wetted using amended water.

With tools in bag, the bag will be positioned and secured using adhesive and tape as necessary.

Working through the gloves, the asbestos will be removed exercising care to avoid puncturing the bag.

When removal is compete or bag is full, sprayer (containing amended water) will be connected to the valve and the pipe or fitting, tools and the bag interior will be washed. If the bag is to repositioned to remove additional asbestos, remaining exposed ends of asbestos will be thoroughly damped.

Tools will then be placed in an inverted glove withdrawn from bag and the glove sealed from the bag using duct tape.

The tools will then be removed by cutting through the duct tape ensuring that both the bag and the glove remain sealed.

The tools will then be submerged in water and the glove opened. Tools will be cleaned under water.

The glove bag will then be removed and placed in a sealed container pending packaging for disposal.

5.11.2 Clean Up

The surface of the pipe or fitting will be carefully wet wiped and treated with sealer.

The plastic sheet will then be carefully wet wiped and rolled up.

All solid waste created during removal jobs including glove bags, disposable coveralls, wipe rags and plastic sheeting will be treated as asbestos containing waste and handled as detailed in the disposal procedure.

5.12 Modified Enclosure Procedure

The following Modified Enclosure Method my be used for removal of asbestos from ceilings, walls, beams pipes or other equipment providing that the job is small enough that it can be completed within one shift without the need for repeated entry into the work area.
The method may not be used for jobs involving:

- Amosite
- Crocidolite

- Friable asbestos of any type.

Additional precautions will be required if the exhaust air cannot be discharged outdoors. Modified enclosure removals may only be undertaken by Employees who have completed level three training and who have received modified enclosure removal training.

5.12.1 Preparation

If dust which might contain asbestos is present, pre clean the work site using wet cleaning or HEPA vacuum cleaning.

Protect floor, walls equipment within the work area which might be damaged by water.

Ensure that steps are taken to protect workers from any energized equipment or systems located within the work area.

Post signs and restrict access to work area.

Seal area to prevent air leakage into adjacent areas or air handling system using framing as necessary, 150 mil plastic sheeting, tape, sealants and caulking as required. Construct an overlapping, double curtained entrance to work area.

Install HEPA filtered negative air unit in work area. Unit must provide 4 air changes per hour while maintaining a pressure difference of -0.02 inches of water. Direct filtered exhaust air outdoors.

5.12.2 Removal

Employees entering the work are shall wear a disposable Tyvek type suit including a head cover and a an air purifying respirator (3M 6000 Series with a purple, 6240 particulate filter or equivalent).

With the area sealed and negative air unit in operation, saturate asbestos-containing material with amended water using airless sprayer.

Remove asbestos using additional amended water as needed being careful not to create airborne dust

Brush the area from which asbestos has been removed and then wet wipe or vacuum to remove final traces of asbestos. Following removal of asbestos, treat the area with slow dry sealer.

5.12.3 Clean up

Place all waste in specially marked heavy duty asbestos waste disposal bags. Seal waste bags securely using duct tape before removing from the enclosure. Wipe a tools with a damp cloth to remove traces of asbestos contamination before removing them from the enclosure.

Wet wipe or vacuum (using the designated shop vac marked ASBESTOS ONLY) all areas within the enclosure not covered by plastic to remove traces of asbestos.

If a HEPA filtered shop vac was used, it shall be wiped with a damp cloth and the hose end covered with tape before being removed from the enclosure. If the vac is to be opened to change a filter or bag, the work will be carried out in an enclosure under negative pressure with HEPA filtered air exhausted outdoors.

Wet wipe the interior of plastic sheeting used to form the enclosure. Remove plastic by rolling, wet wiping any visible particulate matter that make be visible. Wet wipe the disposable Tyvek suit and remove. Place the plastic sheeting, the suit and the used respirator cartridges in an asbestos waste bag along with other remaining contaminated material.

Arrange for reconnection of any services running through the work area which were disconnected to accommodate removal work.

5.13 Disposal of Asbestos Containing Waste Materials

Handling and disposal of asbestos containing waste is regulated by both State and Federal regulations. To ensure compliance with these regulations and to ensure that no-one is exposed to asbestos the following procedure is to be followed:

Only a Employee who has completed Level 2 training and who is wearing appropriate air purifying respirator will package asbestos waste.

Waste asbestos will be thoroughly wetted and then placed in specially labeled 6 mil plastic bags. The bag will be securely sealed using duct tape. The bagged asbestos will then be placed in a second, labeled 6 mil plastic gab which is again taped closed

Asbestos waste may be transported from the location where it was produced to an interim storage location if the bags are free from punctures or tears and if the outside of the bag is free of asbestos. Asbestos waste will be transported in an enclosed vehicle or beneath a secured tarpaulin. No other cargo may be carried while the waste asbestos is being moved. After the waste asbestos is moved to an interim storage site, the driver will, if necessary clean the vehicle to remove asbestos contamination.

Asbestos waste must be disposed of at a waste disposal site which is approved to receive asbestos by the State Department responsible.

Shipment of waste asbestos must be coordinated with the waste disposal site which is to receive the waste. Asbestos disposal will normally be carried out by external contractors

Shipments for disposal must be done in accord with local, state and Federal DOT regulations and must be accompanied by a properly completed shipping document.

6.0 Training

All Shaw Environmental & Infrastructure, Inc. employees who remove, repair or work around friable asbestos and those whose work might disturb friable asbestos-containing material will be trained to carry out their work without endangering themselves, their coworkers or others within the area. All training shall be completed prior to any work by employees associated with asbestos.

6.1 Levels of Training

6.1.1 Level 1 Training

All affected employees who do not receive levels 2 or 3 training will receive Level 1 training which will acquaint them with:
The types, properties and uses of asbestos

Ways to recognize asbestos

The hazards of asbestos fiber inhalation

Types of activities which could release asbestos fibers

Asbestos Inventory and Asbestos Identification

State and Federal regulations regarding work with asbestos and disposal of asbestos-containing waste

Refresher training will be provided every second year. Only those with Level 1 training will be allowed to carry out or supervise Category 1 asbestos work.

6.1.2 Level 2 Training

All employees who conduct or may be expected to conduct Category 2 or 3 work will receive training in:

All Level 1 topics

Ways to recognize and avoid damage to asbestos-containing material

The use, fitting, limitations, care and disposal of protective equipment

Asbestos containment and ventilation during removal

Wet and dry clean up procedures

Refresher training will be provided every second year. Except for actual asbestos removal, only those with Level 2 training will be allowed to carry out or supervise Category 2 asbestos work.

6.1.3 Level 3 Training

Level 3 training will be provided for insulators and others who are authorized to remove friable asbestos and for those who supervise asbestos removal work that is performed.

Level 3 training provides practical hands-on experience in all phases of small and medium scale asbestos removal. Those who will carry out small scale asbestos removal work, will receive additional on-the-job training working with experienced asbestos workers.

7.0 EXCEPTION PROVISIONS

(None Permitted)

8.0 CROSS REFERENCES

29 CFR 1910.1001

9.0 ATTACHMENTS

Responsibility Matrix

ATTACHMENT 1
ASBESTOS COMPLIANCE PLAN

Responsibility Matrix

Action	Procedure Section	*Responsible Party*			
		Manager/ Supervisor	**H&S Representative**	**H&S Manager**	**Affected Employee**
Responsible for implementing and enforcing procedure	3.1	X			
Monitoring for compliance with the procedure.	3.1		X	X	
Insurance , revision, and maintenance of procedure	3.1				X
Review and understand this procedure	5.0				X
Provide required training	6.0		X		

STANDARD OPERATING PROCEDURE

Subject: HEXAVALENT CHROMIUM PROTECTION

1.0 PURPOSE

The purpose of this procedure is to provide the minimum requirements for reducing employee exposure to hexavalent chromium [Cr (VI)]. Hexavalent chromium, Cr (VI), is a potential health hazard associated with the welding and cutting of stainless and alloy steels and many non-ferrous alloys, specialty paints and pigments and chrome plating.

This procedure was developed to facilitate compliance with the Cr (VI) Occupational Safety and Health Administration (OSHA) standards for construction (Title 29 Code of Federal Regulations [CFR] Part 1926 Subpart Z, *Toxic and Hazardous Substances* [29 CFR 1926.1126]) and general industry (29 CFR Part 1910 Subpart Z, *Toxic and Hazardous Substances* [29 CFR 1910.1026]). This procedure incorporates the applicable OSHA language into this procedure. This procedure should be referenced and not duplicated in project or facility-specific health and safety plans (HASPs) as applicable.

2.0 SCOPE

This procedure applies to projects and facilities where the potential for exposure to Cr (VI) exists due to operations involving welding and cutting of stainless and alloy steels and many non-ferrous alloys, specialty paints and pigments, and chrome plating.

3.0 REFERENCES

3.1 External References

- Title 29 Code of Federal Regulations Part 1910, Subpart Z, *Toxic and Hazardous Substances* (29 CFR 1910.1026)
- Title 29 Code of Federal Regulations Part 1926, Subpart Z, *Toxic and Hazardous Substances*, (29 CFR 1926. 1126)

3.2 Internal References

- HS013, *Health & Safety Procedure Variances*
- HS601, *Respiratory Protection Program*

4.0 DEFINITIONS

Action Level (AL)—A concentration of airborne Cr (VI), without regard to the use of respirators, of 2.5 micrograms per cubic meter of air (2.5 µg/m^3) calculated as an 8-hour time-weighted average (TWA).

Chromium (VI)—Chromium with a valence of positive six, in any form and in any compound. Other chromium valence states are less toxic, however, chromium can change valence states from non-Cr (VI) to Cr (VI) during heating or chemical processing.

Objective Data—Information such as air monitoring data from industry-wide surveys or calculations based on composition or chemical or physical properties of a substance demonstrating the worker exposure to Cr (VI) associated with a particular operating condition. The data must reflect workplace

conditions closely resembling the processes, types of materials, control methods, work practices, and environmental conditions in the project's current operations.

Permissible Exposure Limit (PEL)—An airborne concentration of Cr (VI) of 5 µg/m³, calculated as an 8-hour TWA, which is not to be exceeded.

Regulated Area—An area, demarcated by the employer, where an employee's exposure to airborne concentrations of Cr (VI) exceeds, or can reasonably be expected to exceed, the PEL.

5.0 RESPONSIBILITIES

5.1 Director of Health & Safety

The Director of Health & Safety is responsible for issuing, revising, and maintaining this procedure.

5.2 Project Manager/Facility Manager

The Project Manager/Facility Manager is responsible for ensuring compliance with this procedure.

6.0 PROCEDURE

6.1 CR (VI) Identification

The project manager/facility manager is responsible for having each work scope presenting the potential for Cr (VI) exposures reviewed by a knowledgeable Health and Safety Professional. This review should include Material Safety Data Sheet (MSDS) reviews of metal and paint compositions for welding, cutting, grinding, and abrasive blasting operations as well as process operations, chrome plating operations, and painting where Cr(VI) may be present, e.g., chromate pigments in paint formulations.

Note that chromium in most metal alloys is not present in a Cr (VI) state; however, during heating operations, such as welding, the chromium fume or dust is converted to Cr (VI). As a result, MSDSs may not identify Cr (VI) as a constituent although chromium in another valence state may be present.

6.2 Health Hazards

Cr(VI) exposure is associated with increased risk of lung cancer, asthma, nasal septum ulcerations and perforations, skin ulcerations, and allergic and contact dermatitis.

6.3 Allowable Levels of Exposure

The PEL is 5µg/m³ calculated as an 8-hour TWA and OSHA requires that no worker be exposed to Cr(VI) at concentrations above the PEL.

The action level established by OSHA is 2.5 µg/m³, calculated as an 8-hour TWA. This action level must be observed even if respiratory protection is provided to workers.

Exposures below 0.5 µg/m³ exempt site or facility operations from the requirements of this procedure.

6.4 Personal Exposure Determinations

Personal exposure monitoring will be the primary method for determining employee exposure to Cr(VI) and for evaluating the need to implement exposure controls. Each project manager or facility managerthat manages work that has the potential to expose personnel to Cr(VI), are responsible for insuring that initial exposure assessments are conducted at their locations per Section 6.4.1.

6.4.1 Initial Exposure Assessment

For Cr(VI) related operations, affected work categories shall be evaluated for potential Cr(VI) exposure. An initial Cr(VI) personal monitoring strategy must be developed for each project or facility

based on the work categories identified. For each separate job classification, at least one representative potentially highest exposed worker shall be selected to be monitored. If the work location or shift-work presents a significantly different exposure potential, additional personal monitoring must be conducted to include these variables.

If historical personal monitoring data is available for an operation, that data may be used provided the sampling and analytical sensitivity meets the requirements presented in the Exposure Monitoring Requirements outlined in Section 6.4.3.

Objective data may be used in lieu of exposure monitoring for specific operations. If objective data is used to determine the level of exposure, the responsible H&S Manager must be notified and must approve the use of this data.

The exposure assessment assumes the worker exposure which would occur without the use or benefit of a respirator.

6.4.2 Exposure Monitoring Program

Based on the monitoring results from the initial exposure assessment, the following sampling program must be implemented to evaluate the potentially highest exposed worker(s) in each job category:

- If the results are above the PEL, periodic sampling must be repeated every three (3) months.
- If the results are at or above the Action Level but less than the PEL, periodic sampling must be repeated every six (6) months.
- Job categories with exposure levels below the Action Level are exempt from exposure monitoring.

If the results for ongoing exposure monitoring are below the Action Level, sampling may be discontinued for workers in that job category if a confirmatory sample is collected and verifies that results are below the Action Level. The confirmatory sample must be collected not less than seven (7) days after the initial finding.

If changes are made to the process or work practice that could result in a potential increase in Cr(VI) exposure, the exposure assessment must be repeated utilizing the steps outlined in this section and Section 6.4.1.

6.4.3 Exposure Monitoring Requirements

Personal exposure monitoring shall be conducted for a full work shift. Sampling and analysis shall be performed in accordance with OSHA ID-215 method or equivalent and comply with the appropriate field sampling methodology.

If a different method is used, method documentation must demonstrate statistical accuracy of plus or minus 25 percent with a confidence level of 95 percent at or above the Action Level.

All air samples shall be analyzed by an AIHA accredited laboratory.

Samples shall be collected from outside of any respiratory protection being used and from under welding protective equipment if it covers the nose and mouth area. Results of personal monitoring must be provided to affected employees or their designated representatives.

6.4.4 Employee Notification of Exposure Results

For exposure results exceeding the PEL, the affected employee or employees shall be notified of the results by the H&S Manager per HS104. This notification shall either be in writing or the results shall be posted in the workplace. The notification shall be made not more than (5) days after the receipt of the analytical results. The notification shall also include the initial corrective action to be taken to reduce affected worker exposure below the PEL.

6.5 Exposure Control

Appropriate control methods to reduce exposures below the exposure limits are presented in the following sections.

6.5.1 Engineering and Work Practice Controls

Engineering and work practice controls shall be used as the primary means to reduce Cr(VI) exposures to below the PEL. Engineering controls include:

- Ventilation
- Isolation of the worker from the Cr(VI) source
- Substitution of the Cr(VI) source material with a non-Cr(VI) source or one with a lower Cr(VI) content

Worker rotation shall not be used to reduce exposures to meet PEL requirements.

6.5.2 Respiratory Protection

Where engineering controls and work practices are not sufficient to reduce exposures to below the PEL, they shall be supplemented with respiratory protection. This finding must be documented in writing and verified with Cr(VI) sampling data. Respiratory protection may also be used while engineering controls and work practices are being implemented.

Personnel required to wear a respirator will do so in accordance with HS601, *Respiratory Protection Program*.

The respiratory protection factors presented in Attachment 1, Respirator Requirements Based on Airborne Cr(VI) Concentrations, shall be used as minimum protection guidelines for selecting specific respiratory protection.

6.5.3 Protective Work Clothing and Equipment

A hazard assessment of individual Cr(VI) related tasks shall be conducted by the project manager or facility manager and the H&S Manager to determine if skin exposure hazards exist. If there is a significant skin or eye exposure hazard from Cr(VI) contact, a protective clothing and equipment program shall be instituted. Examples of the protective clothing and equipment that may be necessary include gloves, aprons, coveralls, foot coverings, and goggles.

If protective clothing is required to be worn, a worker change room shall be provided and procedures must be established to prevent Cr(VI) contamination from leaving the workplace or contaminating other worker's clothing.

For reusable protective clothing programs, contaminated clothing must be placed into a closed container to avoid the dispersion of the Cr(VI) outside the change area. Hazard warning labels are required on the containers to identify that the contents are contaminated with Cr(VI). Disposable overalls, such as Tyvek, must be disposed of in sealed and labeled containers. When protective clothing is forwarded to a laundry service, the laundering facility should be notified of the Cr(VI) contamination.

The removal of Cr(VI) from protective clothing and equipment by blowing, shaking, or any other means that disperses Cr(VI) into the air or onto an employee's body is prohibited.

6.5.4 Hygiene Areas and Practices

For work involving Cr(VI) exposures above the Action Level:

- A worker change room shall be provided when protective clothing is required as a result of the skin exposure assessment referenced in Section 6.5.3. Change rooms shall provide separate storage

facilities to segregate work clothes from street clothing and be designed to prevent cross-contamination.

- Washing facilities shall be provided for employees to wash their hands and faces at the end of each work shift and prior to eating, drinking, smoking, chewing tobacco or gum, applying cosmetics, or using the toilet.

- Before entering eating and drinking areas, protective clothing or equipment contaminated with Cr(VI) shall have Cr(VI) removed by vacuuming with a high-efficiency particulate air (HEPA) filtered attachment and/or wet methods, i.e., methods that do not spread contamination.

6.5.5 Regulated Areas and Housekeeping

Work areas with potential Cr(VI) exposure levels above the PEL shall be identified as Regulated Areas, barricaded, and have hazard warning signage to restrict access to workers in the Cr(VI) medical surveillance and exposure monitoring program.

For work locations in which worker Cr(VI) exposure exceeds the Action Level, work areas and surfaces shall be cleaned regularly, where feasible, to minimize the accumulation of Cr(VI) dust. Vacuuming with HEPA filter attachment and wet methods should be considered.

Waste, scrap, debris, and any other materials contaminated with Cr(VI) that are consigned for disposal must be disposed of in sealed, impermeable bags or other closed, impermeable containers. Hazard warning labels on the bags or containers are required to identify that it is contaminated with Cr(VI).

6.6 Medical Surveillance

Medical surveillance for Cr(VI) shall be provided to workers, who

- Are exposed to Cr(VI) at or above the Action Level for thirty (30) days or more a year

- Are experiencing health effects associated with Cr(VI) exposure

- Are exposed to Cr(VI) in an emergency

Examinations shall be provided within thirty (30) days of assignment, annually, at termination, within thirty (30) days of emergency exposure, or thirty (30) days after a medical opinion recommending additional testing.

6.6.1 Contents of Examination

The medical examination will include:

- A medical and work history, with emphasis on:
  - Past, present, and anticipated future exposure to Cr(VI)
  - Any history of respiratory system dysfunction
  - Any history of asthma, dermatitis, skin ulceration, or nasal septum perforation
  - Smoking status and history

- A physical examination of the skin and respiratory tract

- Any additional tests deemed appropriate by the examining physician

6.6.2 Information Provided to the Physician

The H&S Manager or the contracted medical surveillance provider shall ensure that the examining physician has a copy of this standard and shall provide the following information:

- A description of the affected employee's former, current, and anticipated duties as they relate to the employee's occupational exposure to Cr(VI).
- The employee's former, current, and anticipated levels of occupational exposure to Cr(VI).
- A description of any personal protective equipment used or to be used by the employee, including when and for how long the employee has used that equipment.
- Information from records of employment-related medical examinations previously provided to the affected employee and currently within the control of the employer.

6.6.3 Physician's Written Medical Opinion

The H&S Manager shall obtain a written medical opinion from the physician within thirty (30) days for each medical examination performed on each employee, which contains:

- The physician's opinion as to whether the employee has any detected medical condition(s) that would place the employee at increased risk of material impairment to health from further exposure to Cr(VI).
- Any recommended limitations upon the employee's exposure to Cr(VI) or upon the use of personal protective equipment such as respirators.
- A statement that the physician has explained to the employee the results of the medical examination, including any medical conditions related to Cr(VI) exposure that require further evaluation or treatment, and any special provisions for use of protective clothing or equipment.

The Physician shall not reveal to the employer specific findings or diagnoses unrelated to occupational exposure to Cr(VI).

The H&S Manager shall provide a copy of the physician's written medical opinion to the examined employee within two (2) weeks after receiving it.

The written medical opinion from the Physician shall be retained with the Shaw E & I contracted medical surveillance provider.

6.7 Hazard Communication and Training

Employees working on tasks that have the potential to be exposed to Cr(VI) at or above the Action Level or above 0.5 µg/m^3 shall attend annual Hazard Communication training on Cr(VI). This training shall also include the following minimum topics:

- Content of this procedure.
- Location, manner of use and release of hexavalent chromium in the workplace
- The hazards associated with exposure to hexavalent chromium and its effects on health.
- Safe work practices and engineering controls to minimize exposure.
- Respirator selection and proper use.
- Medical surveillance program.

- Protective measures employees can take to protect themselves, including modification of personal hygiene and habits such as smoking.
- Emergency procedures
- The employee's right of access to medical and exposure records

Employees shall also be advised where a copy of OSHA 29 CFR 1910.1026 or 29 CFR 1926.1126 is available for their review.

6.8 Recordkeeping

All personal air monitoring records collected to document potential Cr(VI) exposure shall be maintained as long-term records as set forth in the Shaw Record Retention Policy.

When historical data or objective data are used for compliance with this program, those records shall also be maintained as long-term records.

Medical records shall be retained for the duration of employment plus thirty (30) years.

6.9 Project-Specific Written Program

All projects that may potentially expose personnel to Cr(VI), per Section 6.1, shall address the required elements of this procedure in the Site-Specific HASP.

6.10 Program Implementation

All requirements of this procedure, except engineering controls, must be implemented by November 27, 2006. The engineering controls described in Section 6.5.1 must be in place by May 31, 2010.

6.11 EXCEPTION PROVISIONS

Variances to this procedure shall be processed in accordance with procedure HS013, *Health & Safety Procedure Variances*.

7.0 ATTACHMENTS

- Attachment 1, Respirator Requirements Based on Airborne Cr(VI) Concentrations

8.0 FORMS

None.

Attachment 1
Respirator Requirements Based on Airborne Cr(VI) Concentrations

Airborne Cr(VI) Concentration	Required Respirator
Half-mask, air-purifying respirator equipped with high efficiency filters	Between 5 μg/m^3 and less than 50 μg/m^3 (10x the PEL)
Full-face piece, air-purifying respirator with high efficiency filters	Between 50 μg/m^3 and less than 250 μg/m^3 (50x the PEL)
Any air-powered, air-purifying respiratory with high efficiency filters, or half-mask supplied air respirator operated in a positive-pressure mode	Between 250 μg/m^3 and less than 500 μg/m^3 (100x the PEL)
Air respirators with full-face piece, hood, helmet, or suit operated in positive-pressure mode	Less than 500 μg/m^3 (100x the PEL)

PROCEDURE

Subject: HANDLING OF BLOOD OR OTHER POTENTIALLY INFECTIOUS MATERIAL

1.0 PURPOSE AND SUMMARY

The potential for accidental transmission of infectious agents to persons handling infectious materials in the workplace has prompted various governmental agencies to adopt recommended work practices and regulations to govern this area. Shaw Environmental & Infrastructure, Inc. (Shaw E & I) encounters potentially infectious agents in various types of work, including:

- Packaging, handling, and disposal of biological wastes at clandestine and legal laboratory operations:
- Work in areas with exposed human or animal excrement, or where materials contaminated with body fluids are found; and
- Emergency response operations involving infectious wastes or other potentially infectious materials.

Exposure control programs must address at least the following:

- Exposure determination,
- Exposure control plan,
- Medical surveillance and prophylactic measures,
- Personal protective equipment,
- Training,
- Work practices, and
- Accidental exposure follow-up

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Vice President of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1 in Section 8.0.

4.0 DEFINITIONS

Blood- Human blood, human blood components and products made from human blood.

Blood-borne Pathogens- Pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV) and human immunodeficiency virus (HIV).

Disinfect- To inactivate all recognized pathogenic microorganisms but not necessarily all microbial forms (e.g. bacterial endospores) on inanimate objects.

Exposure Incident- A specific eye, mouth, other mucous membrane, non-intact skin, or parenteral contact with blood or other potentially infectious materials that results from the performance of an employee's duties.

Infectious Waste- Blood and blood products, contaminated sharps, pathological wastes and microbiological wastes.

Occupational Exposure- Reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties. This definition excludes incidental exposures that may take place on the job, and that are neither reasonably nor routinely expected and that the worker is not required to incur in the normal course of employment.

Other Potentially Infectious Materials- (1) The following body fluids: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, and any body fluid that is visibly contaminated with blood. (2) Any unfixed tissue or organ (other than intact skin) from a human (living or dead). (3) HIV- or HBV-containing cell or tissue cultures, organ cultures, and culture medium or other solutions; and blood, organs or other tissues from experimental animals infected with HIV or HBV. (4) Any experimental animal tissue or cultures.

Parenteral- Exposure occurring as a result of piercing the skin barrier (e.g. subcutaneous, intramuscular, intravenous routes).

Patient- Any individual, living or dead, whose blood, body fluids, tissues, or organs may be a source of exposure to the employee. Examples include, but are not limited to, hospital and clinic patients; clients in institutions for the mentally impaired or mentally disabled; trauma victims; clients of drug and alcohol treatment facilities; residents of hospices and nursing homes; human remains prior to embalming; and individuals who donate or sell blood or blood components.

Personal Protective Equipment- Specialized clothing or equipment worn by an employee to protect him/her from a hazard.

Sharps- Any object that can penetrate the skin including, but not limited to, needles, scalpels, and broken capillary tubes.

Sterilize- The use of a physical or chemical procedure to destroy all microbial life including highly resistant bacterial endospores.

Universal Precautions- A method of infection control in which all human blood and certain human body fluids are treated as if known to be infectious for HIV, HBV, and other blood-borne pathogens.

Work Practice Controls- Controls that reduce the likelihood of exposure by altering the manner in which a task is performed.

5.0 TEXT

5.1 Exposure Control Plan

Each project, including emergency response, involving potential for occupational exposure shall have, as part of the site-specific health and safety plan, a written exposure control plan designed to minimize or eliminate employee exposure. This plan shall be prepared prior to the commencement of work, and shall contain as a minimum:

5.1.1 Exposure Determination. Each task or procedure where occupational exposure may take place must be identified and documented. Such determination of potential exposure shall be made without regard to the use of personal protective equipment.

5.1.2 Schedule of Implementation. The schedule and method of implementation of the Exposure Control Plan must be specified.

5.1.3 Exposure Evaluation. Each plan shall reflect the requirements in 29CFR1910.1030(c)(2) and (f)(3), covering evaluations of an exposure incident.

5.1.4 Review and Update. Provision must be made for the review and update of the Exposure Control Plan.

5.1.5 Protective Measures. Work practices and personal protective equipment shall be specified for each task or procedure where an occupational exposure may occur.

5.2 Methods of Compliance

5.2.1 General. Universal Precautions as described below shall be observed to prevent contact with blood and other potentially infectious materials.

Universal Precautions

- All workers shall routinely use appropriate barrier precautions to prevent skin and mucous-membrane exposure when contact with blood or other body fluids is anticipated. Gloves should be worn for touching blood and body fluids, mucous membranes, or non-intact skin for handling items or surfaces soiled with blood or body fluids. Masks (as selected and approved by health and safety) and protective eye wear or face shields shall be worn during procedures that are likely to generate droplets of blood or other body fluids to prevent exposure of mucous membranes of the mouth, nose, and eyes. Protective suits shall be worn during procedures that are likely to generate splashes of blood or other body fluids.

- Hands and other skin surfaces shall be washed immediately and thoroughly if contaminated with blood or other body fluids. Hands shall be washed immediately after gloves are removed, using a disinfectant soap.

- All workers shall take precautions to prevent injuries caused by needles, scalpels, and other sharp instruments or devices during handling. To prevent needle stick injuries, needles should not be recapped, purposely bent or broken by hand, removed from disposable syringes, or otherwise manipulated by hand. Disposable syringes and needles, scalpels, blades, and other sharp items shall be placed in puncture-resistant containers for disposal.

- Mouthpieces, resuscitation bags, or other ventilation devices should be available for use in areas in which the need for resuscitation is foreseeable.

- Workers who have exudative lesions or weeping dermatitis shall be excluded from handling potentially infectious materials until the condition resolves.

- Pregnant workers should be especially familiar with and strictly adhere to precautions to minimize the risk of transmission.

5.2.2 Engineering and Work Practice Controls. Universal precautions shall be supplemented by the following work practice controls:

- All personal protective equipment shall be removed immediately upon leaving the work area, or as soon as possible if overtly contaminated, placed in an appropriately designed area or container for storage, decontamination or disposal.

- Eating, drinking, smoking, applying cosmetics or lip balm, and handling contact lenses are prohibited in work areas where there is a potential for occupational exposure.

- Food and drink shall not be stored in refrigerators, freezers, or cabinets where blood or other potentially infectious materials are stored or in other areas of possible contamination.

- All procedures involving blood or other potentially infectious materials shall be performed in such a manner as to minimize splashing, spraying, and aerosolization of these substances.

- Mouth pipetting is prohibited.

5.2.3 Housekeeping

- A written schedule of routine cleaning and disinfection shall be established, as appropriate, for each facility or operation.

- Work surfaces shall be decontaminated immediately after any spill of potentially infectious materials, and at the end of the work shift. An effective disinfection solution can be prepared by diluting household chlorine bleach with water to make a 10% bleach solution (1 part bleach + 9 parts water).

- Reusable items contaminated with potentially infectious materials shall be decontaminated prior to washing and/or reuse.

- All bins, pails, cans, and similar receptacles intended for reuse which have a potential for becoming contaminated with blood or other potentially infections materials shall be inspected, cleaned, and disinfected on a regularly scheduled basis and cleaned and disinfected immediately or as soon as possible upon visible contamination.

- Broken glassware which may be contaminated shall not be picked up directly with the hands. It shall be cleaned up using mechanical means.

5.2.4 Personal Protective Equipment

- Protection for the eyes, face, hands, body, feet, and against inhalation hazards shall be provided as appropriate for each job.

- Gloves shall be worn when employee has the potential for the hands to have direct skin contact with blood, other potentially infectious materials, mucous membranes, non-intact skin, and when handling items or surfaces soiled with blood or other potentially infectious materials.

- Disposable (single use) gloves, such as surgical or examination gloves, shall be replaced when visibly soiled, torn, punctured, or when their ability to function as a barrier is compromised. They shall not be washed or disinfected for re-use.

- Utility gloves may be disinfected for re-use if the integrity of the glove is not compromised; however, they must be discarded if they are cracked, peeling, discolored, torn, punctured, or exhibit other signs of deterioration.

- Masks and eye protection or chin-length face shields shall be worn whenever splashes, spray, splatter, droplets, or aerosols of blood or other potentially infectious materials may be generated and there is a potential for eye, nose, or mouth contamination.

- Fluid-resistant clothing (e.g. coated Tyvek suits) shall be worn if there is a potential for splashing or spraying of blood or potentially infectious materials.

- Surgical caps or hoods shall be worn if there is a potential for splashing or splattering of blood or potentially infectious materials on the head.

- Fluid-proof clothing (e.g. coated Tyvek suits) shall be worn if there is a potential for clothing becoming soaked with blood or other potentially infectious materials.

- Fluid-proof shoe covering shall be worn if there is a potential for shoes to become contaminated and/or soaked with blood or other potentially infectious materials.

- **Emergency Response.** During emergency operations involving potentially infectious materials 29CFR1910.120 is controlling. This regulation requires the use of NIOSH approved respirators for aerosol protection, not "masks".

5.2.5 Infectious Waste Disposal

- All infectious waste destined for disposal shall be placed in closable, leakproof containers or bags that are color coded or labeled as required by paragraph 5.2.7 of this procedure.

  If outside contamination of the container or bag is likely to occur then a second leakproof container or bag which is closable and labeled or color-coded as described in paragraph 5.2.7 shall be placed over the outside of the first and closed to prevent leakage during handling, storage, and transport.

  Disposal of all infectious waste shall be in accordance with applicable Federal, State and local regulations.

- Sharps shall be disposed of in closable, puncture resistant, disposable containers which are leakproof on the sides and bottom and that are labeled or color-coded according to paragraph 5.2.7.

  These containers shall be easily accessible to personnel and located in the immediate area of use.

  These containers shall be replaced and not allowed to overfill.

5.2.6 Laundry. Laundry from workplaces with employees covered under this policy that is contaminated with blood or other potentially infectious materials or may contain contaminated sharps shall be treated as if it were contaminated and shall be handled as little as possible and with minimum of agitation.

Contaminated laundry shall be bagged at the location where it is used and shall not be sorted or rinsed.

Contaminated laundry shall be placed and transported in bags that are labeled or color-coded as described in paragraph 5.2.7. Whenever this laundry is wet and presents the potential for soak-through or leakage from the bag, it shall be placed and transported in leakproof bags.

5.2.7 Communication of Hazards

5.2.7.1 Signs and Labels

- All work areas where potentially infectious agents are present shall be posted with signs bearing the following legend:

[Name of the Infectious Agent]
[Special requirements for entering area]
[Name, telephone number of the laboratory director or other responsible person]

- Warning labels shall be affixed to containers of infectious waste; refrigerators and freezers containing blood and other potentially infectious materials; and other containers used to store or transport blood or other potentially infectious materials.

Labels shall include the following legend:

These labels shall be fluorescent orange or orange-red or a similar predominant color, with lettering or symbols in a contrasting color.

Labels shall either be an integral part of the container or shall be affixed as close as safely possible to the container by string, wire, adhesive, or other method that prevents their loss or unintentional removal.

- Red bags or red containers may be substituted for labels on containers of infectious waste.

5.2.8 Training. All employees assigned to jobs with occupational exposure to potentially infectious materials shall receive specialized training prior to commencement of work and at least annually thereafter, covering the following elements:

- A copy of 29CFR1910.1030 and this procedure including an explanation of the contents;
- A general explanation of the epidemiology and symptoms of bloodborne diseases;
- An explanation of the modes of transmission of bloodborne pathogens;
- An explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials;
- An explanation of the use and limitations of practices that will prevent or reduce exposure including appropriate engineering controls, work practices, and personal protective equipment;
- Information of the types, proper use, location, removal, handling, decontamination and/or disposal of personal protective equipment;
- An explanation of the basis for selection of personal protective equipment;
- Information on the hepatitis B vaccine, including information on its efficacy, safety, and the benefits of being vaccinated;
- Information on the appropriate actions to take and persons to contact in an emergency;
- An explanation of the procedure to follow if an exposure incident occurs including the method of reporting the incident and the medical follow-up that will be made available. Also information on the medical counseling that is provided for exposed individuals; and
- An explanation of required signs and labels.

5.2.9 Training Records. Training records shall include the following information and be maintained for five (5) years:

- The date of the training sessions;
- The contents or a summary of the training sessions;
- The names of persons conducting the training; and
- The names of all persons attending the training sessions.

5.2.10 Medical Requirements

5.2.10.1 Medical Evaluations. All employees will receive medical evaluations in accordance with Shaw E & I Procedure HS100, and records will be maintained per Shaw E & I Procedure HS102.

5.2.10.2 Vaccinations. All employees with occupational exposure shall receive the hepatitis B vaccination (HBV) and tetanus vaccination prior to workplace exposure, unless they read and sign the Hepatitis B and Tetanus Vaccination Declination Form (Attachment 3).

- Hepatitis B Vaccination. Recombivax or Accelerated Recombivax vaccines shall be utilized. If the employee has received the HBV previously and/or antibody testing reveals that the employee is immune, a new vaccination is not required.

  Employees may be subjected to occupational exposure after receiving the first shot in the HBV series. Antibody testing shall be performed 30 days after completing the HBV series. Employees unable to develop immunity shall be precluded from further occupational exposure.

  Should a booster dose(s) be recommended by a physician, they shall be provided according to standard recommendations for medical practice.

- Tetanus Vaccination. Current status for tetanus vaccination is within 5 years. Documentation of current status shall be maintained for all employees subject to this policy.

- Post-exposure evaluation and follow-up. All exposure incidents shall be reported as an industrial injury. The Corporate Medical Director shall be advised immediately via the Corporate H&S office. Following a report of an exposure incident, the employer shall make available to each employee a confidential medical evaluation and follow-up including at least the following elements:

- Documentation of the route(s) of exposure, HBV and HIV antibody status of the source patient(s) (if known), and how the exposure occurred. The medical confidentiality rights of the source patient shall be preserved at all times.

- If the source patient can be determined and permission is obtained, collection of and testing of the source patient's blood to determine the presence of HIV or HBV infection shall be conducted under the direction of the attending physician.

- Collection of blood from the exposed employee as soon as possible after the exposure incident for the determination of HIV and/or HBV status. Actual core antibody and surface antigen testing of the blood or serum sample may be done at that time or at a later date if the employee so requests. If the test is deferred, arrangements shall be made through the attending physician to properly archive the specimen.

- Follow-up of the exposed employee including antibody and antigen testing, counseling, illness reporting, and safe and effective post-exposure prophylaxis, according to standard recommendations for medical practice as defined by the Corporate Medical Director.

5.2.10.3 Physician Information. Information provided to the physician. The employer shall provide the following information to the evaluating physician:

- A copy of 29CFR1910.1030 and its appendices, and

- A description of the affected employee's duties as they relate to the employee's occupational exposure.

5.2.10.4 Physician Opinion. Physician's written opinion. For each evaluation, obtain and provide the employee with a copy of the evaluating physician's written opinion within 15 working days of the completion of the evaluation. The written opinion shall be limited to the following information:

- The physician's recommended limitations upon the employee's ability to receive hepatitis B vaccination.

- A statement that the employee has been informed of the results of the medical evaluation and that the employee has been told about any medical conditions resulting from exposure to blood or other potentially infectious materials which require further evaluation or treatment.

- Specific findings or diagnoses, which are related to the employee's ability to receive HBV vaccination. Any other findings and diagnoses shall remain confidential.

5.3 First Aid/CPR Trained Personnel

This procedure is applicable to personnel designated as first aid/CPR providers when it is determined that the facility or project location cannot comply with the requirement to be in "close proximity" to professional medical aid under 29CFR1910.151. (NOTE: This requirement is generally met if a "911" paramedic response system or equivalent serves the area.)

Except where Shaw E & I is required to provide designated first aid/CPR providers under 29CFR1910.151, it is our policy to train a broad base of employees who render emergency assistance on a voluntary basis. Where designated responders are required, a minimum of two persons per shift shall be qualified in accordance with this procedure. Small locations or projects may reduce this number to one per shift with the prior approval of the regional or divisional HS Manager.

When voluntary or non-designated first aid/CPR providers are used, the special provisions listed below shall be followed.

- The Exposure Control Plan shall provide for offering the hepatitis B vaccination, within twenty-four hours, to any unvaccinated first aid/CPR provider rendering aid in an incident involving the presence of blood or other potentially infectious materials.

- A Supervisor's Employee Injury Report (SEIR) shall be completed for all first aid/CPR providers involved in an incident with blood or other potentially infectious materials. The manager or HS professional MUST specifically indicate whether an "exposure incident" as defined in section 4.4 of this procedure took place, and what protective equipment was used.

- Each location shall maintain a list of all such first aid incidents as an attachment to their OSHA Log of Occupational Injuries and Illnesses. The log and first aid incident list (or copies) shall be forwarded to the corporate HS office on February 1 of the following year.

- All associates who are first aid/CPR trained and may provide assistance, shall be trained in these requirements for voluntary providers and the general provisions of this procedure.

6.0 EXCEPTION PROVISIONS

All exceptions to established policy shall follow the provisions of Shaw E & I Procedure HS013: Health and Safety Procedure Variance.

7.0 CROSS REFERENCES

HS101 Management of Employee Exposure & Medical Records
HS102 Drug & Alcohol Testing

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Personal Protection Equipment Matrix
3. Hepatitis B Vaccination Declination Form

ATTACHMENT 1
HANDLING OF BLOOD OR OTHER POTENTIALLY INFECTIOUS MATERIALS

Responsibility Matrix

Action	Procedure Section	*Responsible Party*		
		Manager	**HS**	**Associates**
Develop and implement Exposure Control Plans	5.1	X	X	X
Require use of work practices and other controls	5.2-5.6	X		
Use proper work practices and controls, as described	5.2-5.6, 5.8, 5.10			X
Post areas	5.7	X		
Provide and attend training	5.8	X	X	X
Maintain training and medical records	5.9-5.10		X	
Coordinate medical requirements	5.10		X	

ATTACHMENT 2

BIOWASTE PPE MATRIX

	Minimal[1] Exposure Potential	Slight[2] Exposure Potential	Moderate[3] Exposure Potential
Respirator Protection	None	Surgical mask or half mask with HEPA filters	Full facepiece APR with HEPA filters
Eye Protection	Glasses or safety glasses	Goggles	N/A
Face Protection	None	Face shield	N/A
Head Protection	Hardhat	Hardhat	Hardhat and fluid resistant hood
Hand Protection	Fluid resistant[4] gloves	Cut resistant[5] outer glove and fluid resistant inner glove	Cut resistant outer glove and fluid resistant inner glove
Body Protection	Work uniform or coveralls	Work uniform and Tyvek[6] coveralls	Work uniform and poly-Tyvek type coveralls
Footwear	PVC or Nitrile boots	PVC or Nitrile boots	PVC or Nitrile boots

1 Minimal Exposure: Handling boxed wastes, not cut or splash potential.

2 Slight Exposure: Handling bagged wastes, slight cut or splash potential.

3 Moderate Exposure: Handling loose wastes, slight cut and moderate to high splash potential.

4 Fluid resistant means able to prevent penetration of undamaged glove by liquids likely to be encountered. NOTE: Surgical or exam gloves alone **do not** meet this requirement.

5 Cut resistant means able to resist mechanical damage from accidental contact with sharps and from routing work activities. Leather or heavy canvas gloves will usually be acceptable; specialized gloves (Kelvar, knitted steel, etc.) may be required for specific tasks.

6 Mention of a specific trade name does not require the use of the product; it is intended only for illustrative reasons.

ATTACHMENT 3
HEPATITIS B AND TETANUS VACCINATION DECLINATION

Due to the potential for you to have occupational exposure to potentially infectious materials in your work, the company will provide and encourages you to accept, vaccination for Hepatitis B and Tetanus. Information to assist you in this decision is provided below.

Tetanus

- A bacterial disease causing muscle spasms, seizures, and "lockjaw".
- This single injection vaccination has few side effects.
- There is minimal loss in protection if the vaccination is given at the time of an exposure/injury rather than in advance.

Hepatitis B

- A viral infection of the liver.
- About 9,500 occupational cases occur annually, mostly in health care workers, with about 200 deaths.
- This three injection vaccination has few side effects.
- Vaccination is 90% effective for at least seven years when given prior to exposure.
- Vaccination is 70-88% effective when given within one week of exposure.
- Hepatitis B can survive in the environment for 24-48 hours after drying.
- Risk of infection from one cut or puncture wound from a contaminated object:
  - Hepatitis B Virus 6-30%
  - Human Immunodeficiency Virus (AIDS) 0.5%

If you wish to talk to a company doctor before making your decision, please ask the Health and Safety department to make arrangements for you. *If you choose to decline vaccination at this time, you must print and sign your name, and date the bottom of this form.*

Elayne Theriault, M.D.

Warren Houseman
Vice President, Health & Safety

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring Hepatitis B Virus (HBV) infection.

I have been given the opportunity to be vaccinated by hepatitis B vaccine, at no charge to myself. However, I decline Hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring Hepatitis B, a serious disease.

If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with Hepatitis B vaccine, I can receive this vaccination series at no charge to me.

~~Name (print)~~ _____

Signature _____ Date _____

PROCEDURE

Subject: PERSONAL PROTECTIVE EQUIPMENT

1.0 PURPOSE AND SUMMARY

This procedure stipulates that the company will provide the personal protective equipment necessary for employees to perform their work safely, as established by the Health & Safety Department. Head, eye, body, and foot protection are discussed in this procedure. The language covering respiratory and hearing protection is cross referenced to the appropriate company procedures.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of H&S is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Company – All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc (Shaw E & I).

5.0 TEXT

The company will provide suitable personal protective equipment as required for the nature of the job being performed, such as, but not limited to, rubber boots, protective clothing covering (e.g. Tyvek), respirators, face shields, safety eyewear, respirator ophthalmic hanger devices, hard hats, and gloves. This personal protective equipment will be specified by the Health & Safety Department prior to use, subject to an assessment of the hazards to which employees will be potentially exposed. Documentation shall be in the project-specific Health and Safety Plan (HASP) or equivalent document.

Employees shall use approved protective equipment on any task where there is potential exposure to: physical hazards such as equipment operation, objects dropping from above, or flying particles; or exposure to toxic or irritating gases, fumes, vapors, liquids, or other materials which might cause respiratory distress or skin irritation.

Employees shall be trained in the proper use, maintenance, and limitations of protective equipment. Safety equipment shall be replaced when it is damaged, contaminated, or has worn out. Training requirements are summarized in company Procedure HS050.

Employees shall wear hard hats, eye protection, and steel-toed foot protection (chemical resistant when required) at all job sites and industrial facilities, unless HASP/site rules provide exemption. It is the responsibility of all employees to report to any work site prepared to work in Level D PPE. All other protective equipment is the responsibility of the project.

5.1 Eye Protection

All employees engaged in or working in areas adjacent to eye-hazardous activities or operations shall wear appropriate eye protection.

- Safety glasses are required for impact protection, and shall meet ANSI Standard Z87.1 requirements and must include rigid side shields
- "Over the Glasses" safety glasses shall be provided to employees that require the use of prescription eyewear. Should an employee purchase their own Z87.1 prescription eyewear, the "Over the Glasses" style protective eyewear will not be required.
- No contact lenses are to be worn in work areas unless required for medical reasons and approved by the site safety officer.
- Chemical goggles are required for protection against chemical splash.
- Face shields are required for face protection from chemical splash and are not a substitute for eye protection.
- Full-face respirators can provide eye and face protection in lieu of safety glasses, goggles, or face shields.

5.1.1 Prescription Eye Protection. The company will provide all employees with protective eyewear meeting the ANSI Z87.1 standard. Should an employee

require prescription eyewear, he/she shall have two options: 1) the employee shall purchase and use approved Z87.1 prescription lenses, or; 2) the employee may purchase and use prescription eyewear that is not rated as ANSI Z87.1 and the company shall provide the employee with protective "Over the Glasses" safety glasses (meeting ANSI Standard Z87.1). In all cases, lenses shall be clear polycarbonate or plastic, the manufacturer of the glasses must be clearly marked on the frames and the Z87.1 lettering must also be clearly visible. Special tints or dark lenses can be used for special applications (e.g., extended outdoor work) with prior written approval from the local Health & Safety representative.

There are some cases whereby employees, requiring corrective lenses, are assigned to projects requiring the use of full face respirators. Many times, the employee's corrective lenses are sized such that they fit within the respirator. In those cases where the employees' glasses do not fit, the company shall purchase lenses and frames sized for respirators and the respirator insert.

Employees should contact their supervisor and the local H&S representative (with current lens prescription), who will coordinate with the local purchasing representative to order eyewear that will fit within the respirator.

Under the limited circumstances where the company will provide prescription safety eyewear, such purchases must be approved by the project or appropriate department/local manager responsible for paying the resulting invoice. In those limited cases whereby the project approves such purchases, the local or project EHS representative should be consulted to assist and verify that the prescription safety eyewear meet ANSI requirements. Glasses shall only be provided every two years unless damaged on-the-job, or the employee exhibits a significant change of prescription.

The company will pay for fitting services and one pair of safety glasses, however, employees will arrange and pay for the eye examination portion. Employees will be reimbursed for the actual purchase price of the prescription eyewear frames and lenses up to a maximum of $70.00, following the verification that they meet applicable ANSI requirements.

5.2 Foot Protection

Employees are responsible for their own basic footwear and foot protection. Basic foot protection is required for all job sites and industrial locations. Specialized footwear shall be provided by the company as required by the nature of the work. Special foot protection may include, but is not limited to, chemically resistant, thermally shielded, metatarsal guards, etc.

5.2.1 Leather Safety Shoes. Safety shoes may be used in place of chemical resistant footwear when an employee will be working in a clean or uncontaminated work area. Generally, when the employee desires to use safety footwear other than the company provided standard chemical resistant footwear (e.g. rubber boots), the company considers it the responsibility of the employee to provide such protective footwear and ensure that it meets ANSI Standard Z41 (including a

defined heel, puncture resistant sole and protective toe cap). Company supervision will enforce the use of appropriate protective footwear per the requirements of the site-specific Health and Safety Plan.

Under the limited circumstances where the company will provide safety shoes, such purchases must be approved by the project or appropriate department/local manager. In those limited cases whereby the project approves such purchases, the local or project EHS representative should be consulted to assist and verify that the safety shoes meet ANSI requirements. The employee will be reimbursed for the actual purchase price of the shoes up to a maximum of $90.00 following the verification that they meet applicable ANSI requirements.

Athletic-style safety shoes ("safety sneakers") are <u>prohibited</u> for all field operations due to the difficulties created by these styles in supervising proper use of protective footwear. Employees in fixed laboratory operations may wear athletic-style safety shoes with the prior approval of the Lab Director or local H&S Manager.

5.3 Head Protection

Hard hats meeting ANSI Z89.1 shall be provided to protect employees from impact, penetration, falling objects, and/or limited electrical shock and burn, as appropriate for work site hazards.

5.4 Respiratory Protection

Respirators shall be provided, in accordance with Procedure HS601, Respiratory Protection Program.

5.5 Hearing Protection

Hearing protection shall be provided, in accordance with Procedure HS402, Hearing Conservation Program.

5.6 Body Protection

Protective clothing, gloves, boots, and other protective equipment shall be provided as appropriate for the hazards associated with the tasks being performed.

5.7 Providing Personal Protective Equipment to Non-Company Personnel

The following personal protective equipment may be provided to non-company personnel:

- Hard hats
- Chemical goggles
- Safety glasses (non-prescription)
- Face shields
- Chemical resistant boots
- Chemical resistant gloves
- Hearing protectors
- Disposable chemical resistant personal protective clothing

5.8 Management Duties

It is the responsibility of the Health & Safety Department to specify safety equipment requirements for each job.

It is the responsibility of project managers or location managers to provide adequate quantities of safety equipment required for their job(s) or project(s).

It is the responsibility of supervisors to verify that required safety equipment is properly used and to ensure that any employee provided protective equipment is adequate, properly maintained and in a sanitary condition.

6.0 EXCEPTION PROVISIONS

Variances and exceptions shall be permitted pursuant to the provisions of Procedure HS013, "Health & Safety Procedure Variances".

7.0 CROSS REFERENCES

HS050 Training Requirements
HS402 Hearing Conservation Program
HS601 Respiratory Protection Program
ANSI Standard Z41, *Personal Protection - Protective Footwear*
ANSI Standard Z87.0, *Practice for Occupational and Educational Eye and Face Protection*
ANSI Standard Z89.1, *Protective Headwear for Industrial Workers*

8.0 ATTACHMENTS

1. Responsibility Matrix

ATTACHMENT 1
PERSONAL PROTECTIVE EQUIPMENT

Responsibility Matrix

Action	Procedure Section	*Responsible Party*			
		Director of H&S	**Local HS Department**	**Project/ Location Managers**	**Supervisors**
Issue, revise, and maintain this procedure.	3.1	X			
Approve all personal protective equipment prior to use.	5.0		X		
Coordinate reimbursement to employee for PPE purchases.	5.1.1, 5.2.1		X		
Provide adequate quantities of safety equipment as required.	5.8			X	
Verify that required safety equipment is properly used.	5.8				X

PROCEDURE

Subject: RESPIRATORY PROTECTION PROGRAM

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to prescribe the requirements of the company Respiratory Protection Program (RPP). This procedure provides information and guidance on the proper selection, medical evaluation, training, use, and care of respiratory protective equipment and complies with the requirements of 29 CFR 1910.134 (1998).

All operations which require the use of respiratory protection are subject to the provisions of this procedure.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Vice President, Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

Program responsibilities are detailed throughout this procedure. The Responsibility Matrix summarizes these items and can be found as Attachment 1.

4.0 DEFINITIONS

Action Level (AL) - Airborne contaminant concentration which is one-half of the Permissible Exposure Guideline (PEG).

Air Purifying Respirator (APR) - Negative pressure respirator (also referred to as a cartridge respirator) which filters contaminated air through chemical or mechanical filter elements. APRs include: cartridge, canister, gas masks, and single-use respirators (single-use respirators are not approved for use by the company).

Approved Respirator - Any respirator, identified by manufacturer and model, that has been approved by NIOSH 42 CFR Part 84 and has been incorporated into the List of Approved Respiratory Protective Equipment (Attachment 2).

Assigned Protection Factor (APF) - A term that is reserved in the OSHA Standard 1910.134 (January, 1998). Attachment 3 provided PFs for the respiratory protective equipment based upon type of device and method of fit testing. The company will continue to use the PFs established by NIOSH until OSHA issues their definition of APF.

Company - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Contractor Personnel - A group of persons hired to perform a specific activity based on their expertise and ability to operate independent of direct supervision. Contractor personnel are supervised by their management group which reports to an employee of the company for project direction.

End-of-Service-Life Indicator (ESLI) - A system that warns the respirator user of the approach of the end of adequate respiratory protection, for example, that the sorbent is approaching saturation or is no longer effective.

Emergency - Emergency means any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that may or does result in an uncontrolled significant release of an airborne contaminant.

Exposure Limit - Several published airborne contaminant concentration values exist which are used in establishing acceptable personnel exposures to contaminants. OSHA publishes the Permissible Exposure Limit (PEL), NIOSH publishes the Recommended Exposure Limit (REL), and the ACGIH publishes the Threshold Limit Value (TLV). All of these exposure limits are based on an 8-hour work shift, 40-hour work week, and 40-year work life. The values may vary from contaminant to contaminant as well as between publishing bodies.

Field Office - Any office or satellite office performing field activities which may require the use of respiratory protection.

Filtering Facepiece (Dust Mask) - A negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.

Fit Factor (FF) - This term means a quantitative estimate of the fit of a particular respirator to a specific individual and typically estimates the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn. The FF incorporates a safety factor of 10 because protection factors in the workplace tend to be much lower than the fit factors achieved during fit testing. Acceptable fit factors are 100 for a tight-fitting half facepiece and 500 for a tight-fitting full facepiece respirators.

HASP - Health and Safety Plan.

Health and Safety Representative - A member of the company Health and Safety Functional Resource Group who, through credentials, training, or experience, has the necessary qualifications and authority to specify respiratory protection and evaluate respiratory protection program elements.

Immediately Dangerous to Life or Health (IDLH) - An atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.

Labor Pool Personnel - Temporary personnel hired for a given expertise or ability. Labor pool personnel report directly to an employee of the company.

Nuisance Level - Level of airborne contaminants which is below one-half the action level for that contaminant and presents no other health or safety hazard.

Permissible Exposure Guideline (PEG) - This term designates a specific exposure limit and is based on the best available information. The PEG will be the lower (more protective) of the values for the PEL and TLV. However, the REL shall take precedence for Hazardous Waste Operations (subject to 29 CFR 1910.120 or 1926.65) if no PEL exists, or for contaminants where no PEL or TLV exists. If there is no PEL, TLV, or REL, a Health and Safety Representative shall determine an appropriate permissible exposure guideline.

Permissible Exposure Limit (PEL) - An occupational exposure index promulgated by OSHA which carries the force of law. This value represents the allowable concentration to which it is believed an employee may be exposed to 8 hours a day, 40 days a week, for a 40-year working life without experiencing adverse health effects.

Positive Pressure Respirator - A respirator in which the pressure inside the respirator exceeds the ambient air pressure outside the respirator.

Powered Air Purifying Respirator (PAPR) - A positive pressure APR which incorporates a fan an battery pack unit. The system pulls contaminated air through the filter elements before delivery to the facepiece under positive pressure. Air pressure in the mask must remain above ambient pressure.

Qualitative Fit Test - A procedure for assuring that the respirator provides adequate protection based on a pass/fail fit test that relies on the individual's response to the test agent. Standard fit test protocol will utilize the irritant smoke methods as described in Attachment 4.

Quantitative Fit Test - A fit test that provides an assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

Respiratory Protection Program Coordinator (RPP Coordinator) - A person designated by the Health and Safety Representative to administer and supervise the respiratory program at a local facility or project location. This person will have the necessary training or credentials to execute this task.

Recommended Exposure Limit (REL) - An occupational exposure index published by NIOSH which is a recommended guideline for employee protection. This value represents the allowable concentration to which it is believed an employee may be exposed to 10 hours a day, 40 hours a week, for a 40-year working life without experiencing health effects.

Supplied Air Respirator (SAR) - Positive pressure respirator which supplies an independent source of breathing air to the user. Two types of SARs are available: self-contained breathing apparatus (SCBA) and airline.

Threshold Limit Value (TLV) - An occupational exposure index published by ACGIH which is recognized as an industry guideline and represents the concentration to which it is believed that nearly all employees may be exposed to 8 hours a day, 40 hours a week without experiencing adverse health effects.

5.0 TEXT

The company will employ engineering controls (e.g., enclosure, ventilation, material substitution, etc.) as the primary method to limit employee exposure. However, for those situations where engineering and administrative controls are ineffective at controlling employee exposure, the use of respiratory protective equipment may be required.

This RPP provides specific requirements for selection, assignment, training, and medical evaluation for persons expected to wear respiratory protection.

5.1 Assignment of Equipment to Contractor/Labor Pool Personnel

Contractor personnel shall provide their own respiratory protective equipment and shall also confirm meeting all other requirements of their own RPP and that of the company's RPP (i.e., medical clearance, training, etc.).

The company may provide the following respiratory protective equipment to Contractor Personnel:

- Disposable equipment such as filter elements.
- Hardware for airline systems (up to, but not including, the airline and facepiece) which employees are sharing.

The company will not provide the following respiratory protective equipment to Contractor Personnel:

- APR or PAPR facepieces.
- SCBAs, SAR respirators, or airline.

The company may provide respiratory protective equipment to Labor Pool Personnel if the following have been established:

- The labor pool personnel have successfully completed training as required by 29 CFR 1910.134 and other applicable regulations.
- The labor pool personnel have been fit tested in relation to projected exposure levels and contaminants to be encountered.
- The labor pool personnel have been medically approved to wear respirators.
- All other RPP requirements have been met.

5.2 Approval, Selection, and Purchase of Respiratory Protective Equipment

The following requirements are designed to guide correct selection of respiratory protective equipment.

5.2.1 Approval. The Vice President, Health and Safety has approved respirators manufactured by Survivair as the primary respirators for use by employees. For employees who cannot achieve a satisfactory fit or comfort factor in Survivair respirator, Mine Safety Appliance (MSA) respirators will be selected. The list of approved model respirators is included in Attachment 2. Contractor personnel may select any respiratory protective equipment that has received approval from NIOSH.

5.2.2 Selection. The Health and Safety Representative shall base the selection of respiratory protective equipment upon an assessment of potential respiratory hazards that may be encountered. This assessment may utilize a variety of written information such as the NIOSH Pocket Guide to Chemical Hazards, Material Safety Data Sheets, analytical data, air monitoring results, or other applicable information. The selection process shall incorporate the following guidelines:

- Respiratory protection is to be selected by Health and Safety Representatives only. Full facepiece respirators are the usual preference because of superior protection factor and the face/eye protection afforded. Half facepiece respirators can only be used in situations where less than one-half the PEG is expected. The type of respirator selected will be documented in the Project HASP.

- Selection of the appropriate respiratory protective equipment shall include factors such as the chemical state and physical form of the chemical contaminant, atmospheric concentration during routine and emergency events, potential physical hazards, expected job task requirements, and the performance of the respirator in providing the appropriate level of protection against these hazards.

- Consideration shall be given to the nature of the hazardous operation, location of the hazardous area relative to nonhazardous breathing air supply, duration of wear, activities to be performed, and characteristics and function of the respiratory protective equipment to be worn.

- Selected respirators (i.e., Survivair or MSA) shall be NIOSH certified and used in compliance with the conditions of its certification when employees are exposed to toxic materials or other hazardous atmospheres.

- Respirators must provide adequate face and eye protection for the expected task.

- If an APR or PAPR is used, the respirator shall be equipped with an end-of-service life-indicator (ESLI) certified by NIOSH for the contaminant. If an ESLI is not available for the contaminant, a cartridge element change schedule shall be implemented which is based on objective information or data that will ensure that canisters and cartridges are changed before the end of their service life. This information will be described in the HASP.

- The PF for the respirator selected (Attachment 3) shall be used according to the following relationship with the PEG to establish justification for selection:

PF x PEG > Maximum anticipated contaminant concentration

If this equation is false, a respirator with a greater PF must be selected. Also review Attachment 3 to determine the required fit testing for the expected maximum anticipated contaminant concentration. The Health and Safety Representative may determine that a more conservative approach (e.g., 50 percent PF) may be needed. Decision to do so should be documented in the Project HASP.

- Manufacturer-established limitations of the APR filter elements relative to the contaminants of concern shall be used to establish further justification for the selected respirator should the APR's FF not disqualify its use (e.g., maximum anticipated contaminant concentration).

5.2.3 Purchase. The purchase request of respiratory protective equipment (including cartridges, airlines, compressed air) should be reviewed by a Health and Safety Representative to indicate that the ordered material meets established requirements. **Under no circumstances may anyone (purchasing, warehouse, project manager, etc.) purchase or provide other than the specific respiratory protection equipment selected by the Health and Safety Representative.**

5.3 Medical Evaluation

No employee shall be assigned to a task that requires the use of a respirator unless it has been determined that he/she is physically able to perform the work while using the required respirator. The medical evaluation must be conducted prior to fit testing and work requiring the use of respiratory equipment.

The medical evaluation shall be performed by a physician typically in conjunction with a physical examination meeting the requirements of 29 CFR 1910.120 (f) *Medical Surveillance*. The physician will be informed of the type of work expected of the employee, the types of respiratory protection and personal protective equipment required, and other information indicating the expected stresses of the task. The company medical director shall be given a copy of the company RPP and a copy of 1910.134 (e) *Medical Evaluation*.

The company medical director shall provide a written recommendation regarding the employee's ability to use respiratory protection. The company shall ensure that the company medical director supplies the employee with a copy of this recommendation.

Additional medical evaluations will be provided to the employee if:

- Any medical signs or symptoms due to respirator use are reported by the employee, supervisory, or health and safety personnel.

- A change in workplace conditions (e.g., physical work effort, protective clothing, temperature) that may result in a substantial increase in the physiological burden placed on an employee.

5.4 General Program Requirements

5.4.1 Responsibilities. The following information describes the responsibilities for the selection, use, and maintenance of respiratory protective equipment based upon job function:

Management

- Management shall take necessary and cost-effective measures to reduce, where possible, the need for respiratory protective equipment (e.g., enclosed cabs on heavy equipment to reduce airborne dust, operations performed upwind, etc.)

- Respiratory protective equipment shall be provided by management whenever it is determined that such equipment is necessary to protect the health of the employee or when requested by an employee and approved by the Health and Safety Representative.

- Management shall assign work tasks requiring the use of respiratory protective equipment to only those employees who are medically qualified to wear respiratory protective equipment.

- Management shall ensure that employees are trained in the use of respiratory protection prior to being assigned to an activity that requires its use.

- Management shall provide the means for the maintenance of respiratory protection as required.

Health and Safety Representative

- Health and Safety Representatives shall determine appropriate respiratory protection for each job. The decision logic for this selection shall be documented in the Project HASP.

- Health and Safety Representatives shall monitor compliance with the various aspects of this program, provide technical assistance regarding respirator selection and use, evaluate the effectiveness of the RPP, and support respirator training and fit testing at locations under their control.

- Health and Safety Representatives shall conduct regular audits to determine compliance with this procedure. This audit can include a review of maintenance, training, medical and air monitoring records, and review the status of this procedure with regard to current regulatory requirements.

- Health and Safety Representatives shall maintain or oversee maintenance of all other records required by this RPP and shall provide for the training and fit testing of personnel assigned respiratory protective equipment.

- Health and Safety Representatives shall appoint a RPP Coordinator for each location which uses or may have a need to use respiratory protection. The Health and Safety Representative must assure the RPP Coordinator has the necessary training to fulfill his/her responsibilities.

RPP Coordinator

- The RPP Coordinator shall be responsible for cleaning, maintenance, and storage of all respirators not routinely used or not individually assigned.

- The RPP Coordinator shall maintain respirator supplies, including spare parts; submit purchase requests for new equipment; and assure that sufficient quantities of cartridges are available for each field office/project.

- The RPP Coordinator shall assure that air supply and emergency respiratory protection is properly inspected and maintained.

- Respirators shall be repaired by either qualified personnel under the direction of the RPP Coordinator, or by contracted supplier.

- The RPP Coordinator shall maintain models and sizes of respirators available for selection and fitting.

- The RPP Coordinator shall conduct fit testing.

Training Department

- Records pertaining to training and fit testing will be maintained by the Training Department.

Employee

- The employee shall use the provided respiratory protective equipment when instructed to do so in accordance with training received.

- The employee shall clean, disinfect, and properly store the assigned respirator, unless other arrangements are made on a project level.

- The employee shall guard against damage to the assigned respirator.

- The employee shall inspect the respirator before each use and after cleaning.

- The employee shall report any malfunction of the respirator immediately to their supervisor and/or the RPP Coordinator.

- The employee shall report to their supervisor any change in their medical status that may impact their ability to wear a respirator safely.

5.4.2 Use of Corrective Lens Eyewear. In general, contact lenses are permitted to be worn when respiratory protection is used. Although in certain instances, client- or project-specific rules may not allow for their use.

If an employee chooses not to wear contact lenses, management shall assure that the appropriate frames or ophthalmic device attachments are obtained and provided at no cost to the employee.

5.4.3 Obstruction of Face Seal. Employees who wear respirators are required to be clean shaven to the extent that there is no obstruction between the wearer's skin and the facepiece. Trimmed mustaches and facial hair which does not interfere with the seal are allowable.

In addition, respirators shall not be worn when conditions prevent a good face-to-facepiece seal such as corrective lenses or goggles, or other personal protective equipment.

5.5 Instruction, Training, and Fit Test

5.5.1 Instruction and Training. The Training Department shall provide a standard respiratory protective equipment training program for use by qualified personnel such as the Health and Safety Representative or RPP Coordinator. The Training Department will support training at the project location if the project does not have the qualified personnel and/or the equipment to support its own program. As an alternative, the project location may use a respiratory manufacturer's training program if the program meets company requirements, a competent person conducts the training, adequate equipment is available for demonstration, and fit testing is conducted along guidelines established in this procedure. The Training Department must approve all alternative training methods.

The basic respirator training program shall include, as a minimum, the following:

- Training and annual retraining of employees in the selection, use, maintenance, and limitation of each respirator type used.

- Instruction on the nature of the respiratory hazards and potential health effects resulting from exposure.

- Opportunity for "hands on" experience with the respiratory protective equipment.

- Proper fitting, including demonstrations and practice in wearing, adjusting, and determining the fit of the respirator. A selection of respirators shall be available to determine the most comfortable respirator and the best fit.

- Instruction on how to test the face-to-facepiece seal.

- A familiarization period of wear in ambient air.

- For APRs, wearing the respirator in a test atmosphere (typically irritant smoke) for qualitative fit testing. The qualitative fit test shall follow the guidelines outlined in Section 5.5.2.

- Training to recognize and cope with emergency situations (including respirator failure)

- Training and fit testing shall be repeated annually, unless specific OSHA regulations require a more frequent time period (e.g., asbestos, lead operations). Each person receiving training shall complete the Respirator Fit Test Form (Attachment 5).

- Training records will be maintained by the Training Department and the location Health and Safety Representative. On-site records of training and fit testing will be maintained as required by specific regulation (e.g., asbestos work) (refer to Section 5.8).

- It is the responsibility of the RPP Coordinator to verify that all project personnel meet the requirements of this RPP.

5.5.2 Fit Testing. Prior to the use of any negative or positive pressure tight-fitting facepiece, the employee must be fit tested.

- All employees assigned to operations requiring the use of respiratory protective equipment shall have been fit tested within 12 months, or as required by specific regulations (e.g., asbestos, lead operations). Fit test and qualification cards (or a copy of the completed Attachment 5) must be available during operations.

- The employee shall be fit tested with the same size and model as they are expected to wear.

- Qualitative fit test (QLFT) shall be used when a protection factor of 10 or less is required for a negative pressure respirator.

- Quantitative fit test (QNFT) shall be used when a protection factor of greater than 10 is required for a negative pressure respirator. When

executing the QNFT, the acceptable test result is 100 for tight fitting half-facepiece respirators and 500 for full-facepiece respirators.

- Fit testing for tight-fitting atmosphere supplying respirators and tight-fitting APRs shall be in a negative pressure mode regardless of the mode of operation that is used for respiratory protection.

- Assessment of comfort shall be made after allowing adequate time for this evaluation. This evaluation shall include reviewing the following points with the employee: positioning of the mask on nose, room for eye protection if required, room to talk, and positioning of the mask on the face and cheeks.

- The following criteria shall be used to help determine the adequacy of the respirator fit: chin properly placed, strap tension, fit across the nose bridge, and tendency to slip.

- If physical obstruction (e.g., facial hair, eyeglasses) interferes with the face-to-facepiece seal, then it shall be altered or removed so as to eliminate any interference and allow for a satisfactory fit. If the employee refuses to alter the physical obstruction, then they shall be denied a satisfactory fit report and referred to his/her supervisor for consideration.

- The fit test protocol (Attachment 4) shall be followed. The Health and Safety Representative and Training Department shall determine which fit test protocol shall be followed depending upon the situation.

5.6 Maintenance Program

Each RPP Coordinator is responsible for verifying the respirator maintenance program is implemented in an effective manner for the facility or project site, the working conditions, and the potential hazards involved. As a minimum, the following aspects must be implemented:

- Inspection
- Cleaning and sanitizing
- Repair
- Respirator storage
- Inspection and repair documentation, as required
- Compliance with manufacturer recommendations.

Detailed information regarding cleaning, inspection, maintenance, and storage is found in Attachment 7. The RPP Coordinator shall verify compliance with the maintenance program by periodic inspections and field audits.

5.6.1 Inspection

- All respiratory protective equipment systems shall be inspected by the wearer for defects and/or deterioration immediately prior to and after each use.

- Any defects shall be reported to their supervisor immediately and the respirator removed from use until it can be repaired or replaced.

- Respiratory protective equipment systems not used routinely (including all SCBAs and equipment designated only for emergency use) shall be inspected before and after each use and at least every 30 days. Cylinders shall be recharged whenever the pressure falls below 90 percent of the manufacturer's recommended pressure level. This inspection shall be documented by some method on the unit (i.e., tag). Records of inspections shall be kept through appropriate documentation. Attachment 6 provides an example of inspection documentation for SCBAs. At a minimum, these records will include: date, inspector, and any unusual finding or condition. Any repairs or modifications shall be documented in detail.

- General field inspection shall include a check of the following: tightness of all connections, facepiece, valves, and any connecting tubes or filtering elements.

- Employees who are manufacturer-qualified repair technicians shall be used for all maintenance beyond field inspections, tests, and user-performed cleaning.

- Air supplied respiratory systems shall be inspected by a manufacturer's authorized representative at the manufacturer's recommended schedule. Manufacturers typically require an annual flow test and a complete overhaul every 5 to 7 years.

- **Specific inspection procedures are outlined in Attachment 7.**

5.6.2 Cleaning and Sanitizing. Employees maintaining their own respirators shall be thoroughly briefed on how to clean and disinfect them. On projects where employees clean their own respirator, the generally accepted procedure involves washing with detergent and warm water using a soft brush, submersion in sanitizing agent, thoroughly rinsing in clean water, drying in a clean place, and storage in sealed plastic bags or equivalent. Precautions to be taken to prevent damage from rough handling during this procedure are detailed in Attachment 7.

At locations where employees share respirators, a centralized cleaning and maintenance facility with specialized equipment and/or materials and personnel

trained in respirator maintenance must be established. Cleaning and inspection is primarily the responsibility of the user.

5.6.3 Repair. The company will only use respiratory protective equipment that is physically sound.

- If defects are found during any inspection, two remedies are possible. If parts and trained personnel are available, repair and/or adjustment may be made immediately. If parts or trained repair people are unavailable, the device shall be removed from service until it can be repaired. Under no circumstances shall a device that is known to be defective remain in service.

- Replacement or repair shall be done by adequately trained personnel. For negative pressure respirators, the Health and Safety Representative or RPP Coordinator may train or supervise personnel in the replacement of items such as inhalation/exhalation valves, head harness, cartridge adapters, and lenses. For air-supplied respirators, field repairs are limited to replacement of head harness and lenses. All other work must be completed by a factory-certified repair person.

Repair shall only be made with parts designed for the respirator. Substitution of parts from a different brand or type invalidates the respirator's approval and is prohibited.

5.6.4 Storage. Respirators must be stored to protect against dust, sunlight, heat, extreme cold, excessive moisture, damaging chemicals, and mechanical damage.

- Respirators shall be stored in such a manner that the facepiece, exhalation valve, and straps are not distorted.

- Respirators shall be stored in sealable containers (e.g., ziplock bags) after cleaning and disinfecting.

- The storage location of emergency respiratory protection shall be readily accessible and prominently identified.

- Respirators shall be stored in an area free of contamination.

5.7 Field Use

The following guidelines for the use of respirators (or equivalent) shall be incorporated into the Project HASP as appropriate. Additional guidelines may be required based on working conditions and hazards involved. Each location where respiratory protective equipment is required or worn shall include in the Project HASP justification for the selected respiratory protective equipment systems worn as outlined in Section 5.2 of this procedure.

5.7.1 General Requirements. The following general requirements shall be followed whenever respiratory protection is used:

- Employees shall be allowed to leave the regulated area to readjust the facepiece or to wash their faces and to wipe clean the facepieces of their respirators in order to minimize potential skin irritation associated with respirator use.

- Respiratory protective equipment shall not be passed on from one person to another until it has been cleaned and sanitized, per program requirements.

- Respirators will be inspected, and a positive/negative pressure test performed prior to each use.

- Entry into oxygen-deficient (< 19.5 percent O_2) atmospheres, Immediately Dangerous to Life and Health (IDLH) atmospheres, or areas requiring EPA Level A protection is prohibited without the prior approval of the Vice President, Health and Safety or the CIH assigned to the business line.

- Head coverings such as Tyvek hoods shall not be allowed to pass between the face-to-facepiece seal.

- The harness straps of tight-fitting respirators shall not be positioned or worn over hard hats.

5.7.2 Specific Requirements. The following information details specific requirements by respirator class:

Air Purifying Systems

- When APRs are worn, new filter elements shall be installed at the beginning of operations. The filter elements shall be changed whenever the ESLI (color indicators) indicates that cartridge life has expired (e.g., mercury cartridges). When no ESLIs are available, filter replacement will be based on the calculations performed by the Health and Safety Representative. Additionally, the cartridges will be replaced if "breakthrough" is perceived or whenever an increase in breathing resistance is detected. In most cases, the cartridges will be replaced a minimum of once daily, usually at the end of the work shift.

Powered Air Purifying Systems

- When PAPRs are worn, employees shall change filter elements after each day's activities. The filter elements shall be changed whenever the ESLI (color indicators) indicates that cartridge life has expired (e.g., mercury

cartridges). When no ESLIs are available, filter replacement will be based on the calculations performed by the Health and Safety Representative. Additionally, the cartridges will be replaced if "break-through" is perceived or when airflow through filter elements decreases to an unacceptable level as indicated by the manufacturer's test device.

Compressed Air

- Compressed air used for breathing shall meet at least the requirements of the specification for Grade D breathing air or better (D, E, or G; not A, K, or L) as described in the American National Standard Commodity Specification for Air, ANSI/CGA G-7.1-1989. Further information is provided in Attachment 7, Guide to Respiratory Protective Equipment Cleaning, Inspection, Maintenance, and Storage.

- Breathing air suppliers must provide certification of analysis stating conformance, as a minimum, to Grade D breathing air standards as previously referenced for each cylinder and/or air lot.

- Air delivered in bulk, e.g., tube trailers, shall have each tube or unit, or a representative number of tubes or units verified as to oxygen content prior to using that tube.

- Pure oxygen shall NOT be used at any time in open-circuit SCBAs or airline respirators.

- Breathing air cylinders shall be legibly identified with the word "AIR" by means of stenciling, stamping, or labeling as near to the valve end as practical.

- Breathing air cylinders may be stored on their sides provided the valve caps are in place.

Supplied Air Breathing Systems

- Airline couplings shall be incompatible with outlets for other gas systems to prevent inadvertent servicing of airline respirators with nonrespirable gases or oxygen.

- Standard airline couplings for breathing air systems are Foster quick connect fittings with locking dots. Hansen quick connect fitting may also be used, but must not be used where they can be inadvertently actuated and disconnected. For example, Hansen fittings could be used at the regulator connection, but not on the airline unless protected from disconnection by some other means.

- The hose line length shall not exceed 300 feet from the air bank regulator to the user.

- No more than three connections, excluding the connection to the regulator and final connection to the respirator, shall be between the breathing air cylinders and the user.

- Breathing air hose shall be protected from direct contact with chemical materials which may permeate the hose. Acceptable methods of protection include suspension of the hose from the surface or covering with a commercially available sleeve or visqueen. Breathing air hose which has become contaminated will be removed from service and disposed of properly.

- The breathing air regulator shall be adjusted to provide air pressure as per the manufacturer's recommendations. For Survivair units, this pressure shall be between 80 to 125 psi pressure.

- Cascade systems shall be equipped with low pressure warning alarms or similar warning devices to indicate air pressure in the manifold below 500 psi.

- When a cascade system is used to supply breathing air, a worker outside the Exclusion Zone shall be assigned as safety standby within audible range of the low pressure alarm.

- When a cascade system is used to recharge SCBA air cylinders, it shall be equipped with a high-pressure supply hose and coupling rated at a capacity of at least 3,000 psi. The supply hose and coupling shall be relatively short ($\leq$ 3 feet) and secured to prevent whipping when pressurized.

- Large supplied air cylinders shall be stored and handled to prevent damage to the cylinder or valve. Cylinders shall be stored upright with the protective valve cover in place and in such a way (e.g., supported with substantial rope or chain in the upper one-third of the cylinder, or in racks designed for the purpose) as to prevent the cylinder from falling. Cylinders shall not be dropped, dragged, rolled, or allowed to strike each other or to be struck violently. Cylinders shall never be exposed to temperatures exceeding 125 degrees F. Cylinders with visible external damage, evidence of corrosion, or exposure to fire shall not be accepted or used.

- Only cylinders within current hydrostatic test periods shall be used. For fiber wrapped bottles designated by the DOT-E label, hydrostatic testing shall be completed every 3 years. Maximum service life for these cylinders is 15 years. Steel or aluminum cylinders shall be

hydrostatically tested every 5 years. No maximum service life is established for steel or aluminum cylinders.

- SCBAs shall only be used in the positive pressure mode when in the Exclusion Zone.

- Standby SCBA equipment must be present when air supply systems are used in IDLH or potentially IDLH atmospheres.

Escape/Egress Units

- These respirators are intended for use in areas where escape with a short-term (5 minute) air supply is necessary. They may be used as adjuncts to airline respirators as a backup air supply, or as independent emergency devices in areas where respiratory protective equipment is not normally required.

- Appropriate training shall be accomplished and documented prior to assigning employees to tasks or locations subject to the use of these respirators.

- Escape/egress units (5-minute air supply) shall never be used as primary standby respirators for confined space entry.

- Escape/egress units shall never be used to enter, or continue working in, a hazardous atmosphere.

5.7.3 IDLH Atmospheres. For all IDLH atmospheres, the company shall ensure that:

- One employee or, when needed, more than one employee is located outside the IDLH atmosphere.

- Visual, voice, or signal line communication is maintained between the employee(s) in the IDLH atmosphere and the employee(s) located outside the IDLH atmosphere.

- The employee(s) located outside the IDLH atmosphere are trained and equipped to provide effective emergency rescue.

- The employer or designee is notified before the employee(s) located outside the IDLH atmosphere enter the IDLH atmosphere to provide emergency rescue.

- The employer or designee authorized to do so by the employer, once notified, provides necessary assistance appropriate to the situation.

- Employee(s) located outside the IDLH atmosphere are equipped with:

- Pressure demand or other positive pressure SCBAs, or a pressure demand or other positive pressure supplied air respirator with escape/egress unit.

- Appropriate retrieval equipment for removing the employee(s) who enter(s) these hazardous atmospheres where retrieval equipment would contribute to the rescue of the employee(s) and would not increase the overall risk resulting from entry. Equivalent means of rescue can be considered.

5.8 Recordkeeping

The following documents must be part of the site recordkeeping program:

- Employees' medical clearances for respirator use
- Respirator training and fit testing forms.

5.9 Program Evaluation

This RPP shall be reviewed annually at the direction of the Vice President, Health and Safety.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

Title 29, Code of Federal Regulations, Section 1910.134.

AIHA, ***Respiratory Protection, A Manual and Guideline***, 1980.

American National Standards Institute Practices for Respiratory Protection Z88.2-1992 (or most recent publication)

NIOSH, ***Certified Equipment List*** (most recent version)

Company Health and Safety Procedures:

HS013 Health and Safety Procedure Variances
HS040 Stop Work Authority
HS050 Training Requirement
HS052 Health and Safety Plans
HS102 Management of Employee Exposure and Medical Records
HS104 Employee Notification of Industrial Hygiene Monitoring Records
HS300 Confined Spaces
HS304 Compressed Gas Cylinders
HS600 Personal Protective Equipment

8.0 ATTACHMENTS

1. Responsibility Matrix
2. List of Approved Respiratory Protective Equipment
3. Respirator Type, Protection Factor, and Fit Testing Method
4. Mandatory Respirator Fit Test Protocol
5. Respirator Fit Test Form
6. Emergency Respiratory Protective Equipment Monthly Inspection Checklist
7. Guide to Respiratory Protective Equipment Cleaning, Inspection, Maintenance, and Storage

ATTACHMENT 1
RESPIRATORY PROTECTION PROGRAM

Responsibility Matrix

Action	Procedure Section	*Responsible Party*					
		Employee	**Health and Safety Representative**	**Project/ Location Management**	**VP, Health and Safety**	**Training**	**RPP Coordinator**
Issue, Revise, and Maintain Procedure	3.1				X		
Assure Proper Selection of Respirators	5.2.2		X				
Review Purchase Requests for Respiratory Equipment	5.2.3		X				
Conduct Fit Testing	5.4		X				X
Assure Compliance with RPP	5.4		X	X			X
Assure Training	5.4		X	X			X
Audit Program Compliance	5.4		X		X		X
Assist/Approve Local Training Program	5.4					X	
Maintenance Program	5.6	X	X	X			X
Field Use	5.7	X	X	X			X
Recordkeeping	5.8	X	X			X	X
Program Evaluation	5.9				X		

ATTACHMENT 2

LIST OF APPROVED RESPIRATORY PROTECTIVE EQUIPMENT

AIR PURIFYING RESPIRATORS (APR)					
Respirator Class	**Respirator Type**	**Respiratory Performance**	**Manufacturer**	**Model Name**	**Model Number**
Standard APR	Half-Face	Negative Pressure	Survivair	Blue 1	2100-10 S 2200-10 M 2300-10 L
			MSA	Comfo II	479529 S 479428 M 479530 L
	Full-Face	Negative Pressure	Survivair	20/20	202062 S 202072 M 202082 L
			MSA	Ultra Twin	480263 S 480259 M 480267 L
Powered APR	Hood	Continuous Positive Pressure	Survivair	PAPR	5200-15
			MSA	Optimair 6	480251 S 480247 M 480255 L

SUPPLIED AIR RESPIRATORS (SAR)					
Respirator Class	**Respirator Type**	**Respiratory Performance**	**Manufacturer**	**Model Name**	**Model Number**
Airline SAR	Full-Face	Positive Pressure Demand	Survivair	Panther	P968455
			MSA	Premaire	497291
SCBA SAR	Full-Face	Positive Pressure Demand	Survivair	Cougar	P 9643310
			MSA	MMR WorkMask 2216	Varies on Components
Emergency	Escape/Egress Unit	Continuous Flow	Survivair	5 min. EEGA	9750870
			MSA	Custom Air V	484353

ATTACHMENT 3

RESPIRATOR TYPE, PROTECTION FACTOR, AND FIT TESTING METHOD

Respirator Type	Protection Factor	QLFT	QNFT
Half-Face, Negative Pressure (<100 Fit Factor)[1]	10	Yes	Yes
Full-Face, Negative Pressure (<100 Fit Factor) Used in Atmosphere up to 10 Times the PEG	10	Yes	Yes
Full-Face, Negative Pressure (>100 Fit Factor) Used in Atmospheres Over 10 Times the PEG[2]	50	No	Yes
PAPR	100	Yes	Yes
SCBA/SAR Used in Positive Pressure (Pressure Demand Mode)	10,000	Yes	Yes

Footnotes:

1. If quantitatively fit tested, the device must demonstrate a fit factor of at least 100.
2. If quantitatively fit tested, the device must demonstrate a fit factor of at least 500.

ATTACHMENT 4

MANDATORY RESPIRATOR FIT TEST PROTOCOL

OSHA-Accepted Fit Test Protocols

A. Fit Testing Procedures - General Requirements

The company shall conduct fit testing using the following procedures. The requirements in this attachment apply to all OSHA-accepted fit test methods, both QLFT and QNFT. There are several OSHA-accepted fit test protocols for QLFT. This procedure includes only the irritant smoke protocol since it requires less equipment and is more practical for field use.

1. The test subject shall be allowed to pick the most acceptable respirator from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.

2. Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension, and how to determine an acceptable fit. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This instruction may not constitute the subject's formal training on respirator use, because it is only a review.

3. The test subject shall be informed that he/she is being asked to select the respirator that provides the most acceptable fit. Each respirator represents a different size and shape, and if fitted and used properly, will provide adequate protection.

4. The test subject shall be instructed to hold each chosen facepiece up to the face and eliminate those that obviously do not give an acceptable fit.

5. The more acceptable facepieces are noted in case the one selected proves unacceptable; the most comfortable mask is donned and worn at least five minutes to assess comfort. Assistance in assessing comfort can be given by discussing the points in the following Item A.6. If the test subject is not familiar with using a particular respirator, the test subject shall be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.

6. Assessment of comfort shall include a review of the following points with the test subject and allowing the test subject adequate time to determine the comfort of the respirator:
   a. Position of the mask on the nose;
   b. Room for eye protection;
   c. Room to talk; and
   d. Position of mask on face and cheeks.

7. The following criteria shall be used to help determine the adequacy of the respirator fit:
   a. Chin properly placed;
   b. Adequate strap tension, not overly tightened;
   c. Fit across nose bridge;
   d. Respirator of proper size to span distance from nose to chin;
   e. Tendency of respirator to slip; and
   f. Self-observation in mirror to evaluate fit and respirator position.

8. The test subject shall conduct a user seal check, either the negative and positive pressure seal checks. Before conducting the negative and positive pressure checks, the subject shall be told to seat the mask on the face by moving the head from side-to side and up and down slowly while taking in a few slow deep breaths. Another facepiece shall be selected and retested if the test subject fails the user seal check tests.

9. The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface, such as stubble beard growth, beard, mustache, or sideburns which cross the respirator sealing surface. Any type of apparel which interferes with a satisfactory fit shall be altered or removed.

10. If a test subject exhibits difficulty in breathing during the tests, he/she shall be referred to a physician or other licensed health care professional, as appropriate, to determine whether the test subject can wear a respirator while performing his/her duties.

11. If the employee finds the fit of the respirator unacceptable, the test subject shall be given the opportunity to select a different respirator and to be retested.

12. *Exercise Regimen*: Prior to the commencement of the fit test, the test subject shall be given a description of the fit test and the test subject's responsibilities during the test procedure. The description of the process shall include a description of the test exercises that the subject will be performing. The respirator to be tested shall be worn for at least 5 minutes before the start of the fit test.

13. The fit test shall be performed while the test subject is wearing any applicable safety equipment that may be worn during actual respirator use which could interfere with respirator fit.

14. *Test Exercises*: The following test exercises are to be performed for all fit testing methods prescribed in this attachment, except for the controlled negative pressure (CNP) method. A separate fit testing exercise regimen is contained in the CNP protocol.

    Each test exercise shall be performed for one minute, except for the grimace exercise which shall be performed for 15 seconds. The test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried. The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

    The test subject shall perform exercises, in the test environment, in the following manner:

    a. *Normal Breathing*: In a normal standing position, without talking, the subject shall breathe normally.

    b. *Deep Breathing*: In a normal standing position, the subject shall breathe slowly and deeply, taking caution so as not to hyperventilate.

    c. *Turning Head Side to Side*: Standing in place, the subject shall slowly turn his/her head from side to side between the extreme positions on each side. The head shall be held at each extreme momentarily so the subject can inhale at each side.

d. *Moving Head Up and Down*: Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).

e. *Talking*: The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can count backward from 100, recite a memorized poem or song or read from a prepared text such as the Rainbow Passage.

> Rainbow Passage:
>
> When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.

f. *Grimace*: The test subject shall grimace by smiling or frowning. (This applies only to QNFT testing; it is not performed for QLFT.)

g. *Bending Over*: The test subject shall bend at the waist as if he/she were to touch his/her toes. Jogging in place shall be substituted for this exercise in those test environments such as shroud type QNFT or QLFT units that do not permit bending over at the waist.

h. *Normal Breathing*: Same as Item A.14.a.

B. Qualitative Fit Test (QLFT) Protocols

1. General:

   a. The employer shall ensure that persons administering QLFT are able to perform tests properly, recognize invalid tests, and ensure that test equipment is in proper working order.

   b. The employer shall ensure that QLFT equipment is kept clean and well maintained so as to operate within the parameters for which it was designed.

2. Irritant Smoke (Stannic Chloride) Protocol: This qualitative fit test uses a person's response to the irritating chemicals released in the "smoke" produced by a stannic chloride ventilation smoke tube to detect leakage into the respirator.

   a. General Requirements and Precautions:

      1. The respirator to be tested shall be equipped with high efficiency particulate air (HEPA) or P100 series filter(s).

      2. Only stannic chloride smoke tubes shall be used for this protocol.

      3. No form of test enclosure or hood for the test subject shall be used.

4. The smoke take precautions to minimize the test subject's exposure to irritant smoke. Sensitivity varies, and certain individuals may respond to a greater degree to irritant smoke. Care shall be taken when performing the sensitivity screening checks that determine whether the test subject can detect irritant smoke to use only the minimum amount of smoke necessary to elicit a response from the test subject.

5. The fit test shall be performed in an area with adequate ventilation to prevent exposure of the person conducting the fit test or the buildup of irritant smoke in the general atmosphere.

b. Sensitivity Screening Check: The person to be tested must demonstrate his/her ability to detect a weak concentration of the irritant smoke.

1. The test operator shall break both ends of a ventilation smoke tube containing stannic chloride, and attach one end of the smoke tube to a low flow air pump set to deliver 200 milliliters per minute, or an aspirator squeeze bulb. The test operator shall cover the other end of the smoke tube with a short piece of tubing to prevent potential injury from the jagged end of the smoke tube.

2. The test operator shall advise the test subject that the smoke can be irritating to the eyes, lungs, and nasal passages and instruct the subject to keep his/her eyes closed while the test is performed.

3. The test subject shall be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its irritating properties and to determine if he/she can detect the irritating properties of the smoke. The test operator shall carefully direct a small amount of the irritant smoke in the test subject's direction to determine that he/she can detect it.

c. Irritant Smoke Fit Test Procedure:

1. The person being fit tested shall don the respirator without assistance, and perform the required user seal check(s).

2. The test subject shall be instructed to keep his/her eyes closed.

3. The test operator shall direct the stream of irritant smoke from the smoke tube toward the face seal area of the test subject, using the low flow pump or the squeeze bulb. The test operator shall begin at least 12 inches from the facepiece and move the smoke stream around the whole perimeter of the mask. The operator shall gradually make two more passes around the perimeter of the mask, moving to within 6 inches of the respirator.

4. If the person being tested has not had an involuntary response and/or detected the irritant smoke, proceed with the test exercises.

5. The exercises identified in Item A.14 of this attachment shall be performed by the test subject while the respirator seal is being continually challenged by the smoke, directed around the perimeter of the respirator at a distance of six inches.

6. If the person being fit tested reports detecting the irritant smoke at any time, the test is failed. The person being retested must repeat the entire sensitivity check and fit test procedure.

7. Each test subject passing the irritant smoke test without evidence of a response (involuntary cough, irritation) shall be given a second sensitivity screening check, with the smoke from the same smoke tube used during the fit test, once the respirator has been removed, to determine whether he/she still reacts to the smoke. Failure to evoke a response shall void the fit test.

8. If a response is produced during this second sensitivity check, then the fit test is passed.

C. Quantitative Fit Test (QNFT) Protocols

The following quantitative fit testing procedures have been demonstrated to be acceptable: quantitative fit testing using a nonhazardous test aerosol (such as corn oil, polyethylene glycol 400 [PEG 400], di-2-ethyl hexyl sebacate [DEHS], or sodium chloride) generated in a test chamber, and employing instrumentation to quantify the fit of the respirator; quantitative fit testing using ambient aerosol as the test agent and appropriate instrumentation (condensation nuclei counter) to quantify the respirator fit; quantitative fit testing using controlled negative pressure and appropriate instrumentation to measure the volumetric leak rate of a facepiece to quantify the respirator fit.

1. General:

   a. The employer shall ensure that persons administering QNFT are able to calibrate equipment and perform tests properly, recognize invalid tests, calculate fit factors properly, and ensure that test equipment is in proper working order.

   b. The employer shall ensure that QNFT equipment is kept clean, and is maintained and calibrated according to the manufacturer's instructions so as to operate at the parameters for which it was designed.

2. Ambient Aerosol Condensation Nuclei Counter (CNC) Quantitative Fit Testing Protocol: The ambient aerosol CNC quantitative fit testing (Portacount®) protocol quantitatively fit tests respirators with the use of a probe. The probed respirator is only used for quantitative fit tests. A probed respirator has a special sampling device, installed on the respirator, that allows the probe to sample the air from inside the mask. A probed respirator is required for each make, style, model, and size that the employer uses and can be obtained from the respirator manufacturer or distributor. The CNC instrument manufacturer, TSI Inc., also provides probe attachments (TSI sampling adapters) that permit fit testing in an employee's own respirator. A minimum fit factor pass level of at least 100 is necessary for a half-mask respirator and a minimum fit factor pass level of at least 500 is required for a full facepiece negative pressure respirator. The entire screening and testing procedure shall be explained to the test subject prior to conducting the screening test.

   a. Portacount® Fit Test Requirements:

      1. Check the respirator to make sure the sampling probe and line are properly attached to the facepiece and that the respirator is fitted with a particulate filter capable of preventing significant penetration by the ambient particles used for the fit test (e.g., NIOSH 42 CFR 84 Series 100, Series 99, or Series 95 particulate filter) per manufacturer's instruction.

      2. Instruct the person to be tested to don the respirator for five minutes before the fit test starts. This purges the ambient particles trapped inside the respirator and permits the

wearer to make certain the respirator is comfortable. This individual shall already have been trained on how to wear the respirator properly.

3. Check the following conditions for the adequacy of the respirator fit: chin properly placed; adequate strap tension, not overly tightened; fit across nose bridge; respirator of proper size to span distance from nose to chin; tendency of the respirator to slip; and self-observation in a mirror to evaluate fit and respirator position.

4. Have the person wearing the respirator do a user seal check. If leakage is detected, determine the cause. If leakage is from a poorly fitting facepiece, try another size of the same model respirator, or another model of respirator.

5. Follow the manufacturer's instructions for operating the Portacount® and proceed with the test.

6. The test subject shall be instructed to perform the exercises in Item A.14 of this attachment.

7. After the test exercises, the test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried.

b. Portacount® Test Instrument:

1. The Portacount® will automatically stop and calculate the overall fit factor for the entire set of exercises. The overall fit factor is what counts. The Pass or Fail message will indicate whether or not the test was successful. If the test was a Pass, the fit test is over.

2. Since the pass or fail criterion of the Portacount® is user programmable, the test operator shall ensure that the pass or fail criterion meet the requirements for minimum respirator performance in this attachment.

3. A record of the test needs to be kept on file, assuming the fit test was successful. The record must contain the test subject's name; overall fit factor; make, model, style, and size of respirator used; and date tested.

3. Controlled Negative Pressure (CNP) Quantitative Fit Testing Protocol - The CNP protocol provides an alternative to aerosol fit test methods. The CNP fit test method technology is based on exhausting air from a temporarily sealed respirator facepiece to generate and then maintain a constant negative pressure inside the facepiece. The rate of air exhaust is controlled so that a constant negative pressure is maintained in the respirator during the fit test. The level of pressure is selected to replicate the mean inspiratory pressure that causes leakage into the respirator under normal use conditions. With pressure held constant, air flow out of the respirator is equal to air flow into the respirator. Therefore, measurement of the exhaust stream that is required to hold the pressure in the temporarily sealed respirator constant yields a direct measure of leakage air flow into the respirator. The CNP fit test method measures leak rates through the facepiece as a method for determining the facepiece fit for negative pressure respirators. The CNP instrument manufacturer, Dynatech Nevada, also provides attachments (sampling manifolds) that replace the filter cartridges to permit fit testing in an employee's own respirator. To perform the test, the test subject closes his/her mouth and holds his/her breath, after which an air pump removes air from the respirator facepiece at a pre-selected constant pressure. The facepiece fit is expressed as the leak rate through the facepiece, expressed as milliliters per minute. The quality and validity

of the CNP fit tests are determined by the degree to which the in-mask pressure tracks the test pressure during the system measurement time of approximately five seconds. Instantaneous feedback in the form of a real-time pressure trace of the in-mask pressure is provided and used to determine test validity and quality. A minimum fit factor pass level of 100 is necessary for a half-mask respirator and a minimum fit factor of at least 500 is required for a full facepiece respirator. The entire screening and testing procedure shall be explained to the test subject prior to conducting the screening test.

a. CNP Fit Test Requirements:

1. The instrument shall have a non-adjustable test pressure of 15.0 mm water pressure.

2. The CNP system defaults selected for test pressure shall be set at 15 mm of water (-0.58 inches of water) and the modeled inspiratory flow rate shall be 53.8 liters per minute for performing fit tests.

   (Note: CNP systems have built-in capability to conduct fit testing that is specific to unique work rate, mask, and gender situations that might apply in a specific workplace. Use of system default values, which were selected to represent respirator wear with medium cartridge resistance at a low-moderate work rate, will allow inter-test comparison of the respirator fit.)

3. The individual who conducts the CNP fit testing shall be thoroughly trained to perform the test.

4. The respirator filter or cartridge needs to be replaced with the CNP test manifold. The inhalation valve downstream from the manifold either needs to be temporarily removed or propped open.

5. The test subject shall be trained to hold his/her breath for at least 20 seconds.

6. The test subject shall don the test respirator without any assistance from the individual who conducts the CNP fit test.

7. The QNFT protocol shall be followed according to Item C.1 of this attachment with an exception for the CNP test exercises.

b. CNP Test Exercises:

1. Normal Breathing: In a normal standing position, without talking, the subject shall breathe normally for 1 minute. After the normal breathing exercise, the subject needs to hold head straight ahead and hold his/her breath for 10 seconds during the test measurement.

2. Deep Breathing: In a normal standing position, the subject shall breathe slowly and deeply for 1 minute, being careful not to hyperventilate. After the deep breathing exercise, the subject shall hold his/her head straight ahead and hold his/her breath for 10 seconds during test measurement.

3. Turning Head Side to Side: Standing in place, the subject shall slowly turn his/her head from side to side between the extreme positions on each side for 1 minute. The head shall be held at each extreme momentarily so the subject can inhale at each side. After the

turning head side to side exercise, the subject needs to hold head full left and hold his/her breath for 10 seconds during test measurement. Next, the subject needs to hold head full right and hold his/her breath for 10 seconds during test measurement.

4. Moving Head Up and Down: Standing in place, the subject shall slowly move his/her head up and down for 1 minute. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling). After the moving head up and down exercise, the subject shall hold his/her head full up and hold his/her breath for 10 seconds during test measurement. Next, the subject shall hold his/her head full down and hold his/her breath for 10 seconds during test measurement.

5. Talking: The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song for 1 minute. After the talking exercise, the subject shall hold his/her head straight ahead and hold his/her breath for 10 seconds during the test measurement.

6. Grimace: The test subject shall grimace by smiling or frowning for 15 seconds.

7. Bending Over: The test subject shall bend at the waist as if he/she were to touch his/her toes for 1 minute. Jogging in place shall be substituted for this exercise in those test environments such as shroud-type QNFT units that prohibit bending at the waist. After the bending over exercise, the subject shall hold his/her head straight ahead and hold his/her breath for 10 seconds during the test measurement.

8. Normal Breathing: The test subject shall remove and re-don the respirator within a one-minute period. Then, in a normal standing position, without talking, the subject shall breathe normally for 1 minute. After the normal breathing exercise, the subject shall hold his/her head straight ahead and hold his/her breath for 10 seconds during the test measurement. After the test exercises, the test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of a respirator shall be tried.

c. CNP Test Instrument:

1. The test instrument shall have an effective audio warning device when the test subject fails to hold his/her breath during the test. The test shall be terminated whenever the test subject failed to hold his/her breath. The test subject may be refitted and retested.

2. A record of the test shall be kept on file, assuming the fit test was successful. The record must contain the test subject's name; overall fit factor; make, model, style, and size of respirator used; and date tested.

ATTACHMENT 5
RESPIRATOR FIT TEST FORM

NAME (Please Print): _____ SIGNATURE: _____

SSN: _____-_____-_____ HOME DEPT: _____ DATE: _____

CONDUCTED BY: _____ LOCATION: _____

FIT TEST PROTOCOL

QUANTITATIVE:
Fit Factor _____

QUALITATIVE:
Irritant Smoke:
Other (specify):

TYPE OF RESPIRATOR
(Circle Appropriate One)

APR/HF APR/FF SCBA
SAR/EGS PAPR OTHER

Respirator Manufacturer: _____
Model: _____
Size: _____

		INITIAL:
1.	I understand why respiratory protection is needed and where and when it should be used.	
2.	I know how to use this respirator properly.	
3.	I know how to clean and inspect this respirator.	
4.	I understand the limitations and restrictions of this respirator.	
5.	I wore this respirator in normal air and performed the user seal.	
6.	I wore this respirator equipment in a test atmosphere.	
7.	I understand that a good gas-tight face seal cannot be achieved with obstructions such as facial hair or glasses.	
8.	I understand that corrective lenses compatible with the full facepiece are available by my manager.	

ATTACHMENT 6

EMERGENCY RESPIRATORY PROTECTIVE EQUIPMENT MONTHLY INSPECTION CHECKLIST

INSPECTED BY (Print):_____ DATE:

BACKPACK#: _____ AIR CYLINDER#:

			PASS	FAIL
A. Backpack and Harness Assembly	1. Straps	Inspect for complete set	☐	☐
		Inspect for damaged straps	☐	☐
	2. Buckles	Inspect for mating ends	☐	☐
		Check locking function	☐	☐
	3. Backplage and Cylinder Lock	Inspect backplage for cracks, missing screws/rivets	☐	☐
		Inspect cylinder hold down strap	☐	☐
		Inspect strap tightener	☐	☐
B. Cylinder and Cylinder Valve Assembly	1. Cylinder	Cylinder tight to backplate	☐	☐
		Current Hydrostatic Test	☐	☐
		Inspect cylinder for dents, gouges	☐	☐
		Is cylinder at least 90% filled?	☐	☐
	2. Head and Valve Assembly	Inspect cylinder valve lock for presence	☐	☐
		Inspect cylinder gauge for condition	☐	☐
		Proper function of cylinder valve lock	☐	☐
		Test for cylinder leakage	☐	☐
C. Regulator and High Pressure Hose	1. High Pressure Hose and Connector	Leakage in hose	☐	☐
		Leakage in hose to cylinder connector	☐	☐
	2. Regulator and Low Pressure Alarm	Read regulator gauge (at least 1,000 psi)	☐	☐
		Low pressure alarm sounds at 500 psi	☐	☐
		Test integrity of diaphragm	☐	☐
		Test for positive pressure	☐	☐
		Test bypass system	☐	☐
D. Facepiece and Corrugated Breathing Tube	1. Facepiece	Inspect harness for deterioration	☐	☐
		Inspect facepiece body for deterioration	☐	☐
		Inspect lens	☐	☐
		Inspect exhalation valve	☐	☐
	2. Breathing Tube and Connector	Inspect breathing tube for deterioration	☐	☐
		Inspect connector for threads and gasket	☐	☐
	3. Leak Test and Cleaning	Perform negative pressure test on facepiece/ breathing tube	☐	☐
		Clean and sanitize facepiece	☐	☐

Note: Any item marked ☛Fail☚ will place the equipment out of service until repaired or replaced.

ATTACHMENT 7

GUIDE TO RESPIRATORY PROTECTIVE EQUIPMENT: CLEANING, INSPECTION, MAINTENANCE, AND STORAGE

A program for the maintenance of respirators shall include the following:

- Cleaning and sanitizing
- Inspection for defects
- Maintenance and repair
- Storage
- Assurance of breathing air quality.

The following maintenance, inspection, and storage program is recommended.

1. Cleaning and Sanitizing

Respirators issued to an individual shall be cleaned and sanitized regularly. Each respirator shall be cleaned and sanitized before being worn by different individuals. Respirators intended for emergency use shall be cleaned and sanitized after being used. The following shall be completed in addition to the manufacturer's instruction for cleaning:

a. Remove, when necessary, the following components of respiratory inlet covering assemblies before cleaning and sanitizing:

   1. Filters, cartridges, canisters
   2. Speaking diaphragms
   3. Valve assemblies
   4. Any components recommended by the respirator manufacturer.

b. Wash respiratory inlet covering assemblies in warm (43 degrees C or 110 degrees F maximum temperature) cleaner sanitizer solution. A stiff bristle (not wire) brush may be used to facilitate removal of dirt or other foreign material.

c. Rinse the respirator inlet covering assemblies in clean, warm (43 degrees C or 110 degrees F maximum temperature) water.

d. Drain all water, and air dry the respiratory inlet covering assemblies.

e. Clean and sanitize all parts removed from the respiratory inlet covering assemblies as recommended by the manufacturers

f. If necessary to remove foreign material, hand wipe respiratory inlet covering assemblies, all parts, and all gasket- and valve-sealing surfaces with damp, lint-free cloth.

g. Inspect parts and replace any that are defective.

h. Reassemble parts on respirator inlet covering assemblies.

i. Visually inspect and, where possible, test parts and respirator assemblies for proper function.

j. Place assembled respirators in appropriate containers for storage.

Machines may be used to expedite the cleaning, sanitizing, rinsing, and drying of large numbers of respirators. Extreme care shall be taken to ensure against tumbling, agitation, or exposure to temperatures above those recommended by the manufacturer (normally 43 degrees C or 100 degrees F maximum), as these conditions are likely to result in damage to the respirators.

Ultrasonic cleaners, clothes washing machines, dishwashers, and clothes dryers have been specially adapted and successfully used for cleaning and drying respirators.

Cleaner sanitizers that effectively clean the respirator and contain a bactericidal agent are commercially available. The bactericidal agent frequently used is a quaternary ammonium compound. Strong cleaning and sanitizing agents and many solvents can damage rubber or elastomeric respirator parts. These materials must be used with caution.

Alternatively, respirators may be washed in a detergent solution and then sanitized by immersion in a sanitizing solution. Some sanitizing solutions that have proven effective are: (a) a hypochlorite (bleach) solution (50 parts per million chlorine), 2-minute immersion; (b) an aqueous iodine solution (50 parts per million of iodine), 2-minute immersion; or (c) a quaternary ammonium solution (200 parts per million of quaternary ammonium compounds in water with less than 500 parts per million total hardness), 2-minute immersion.

Inflammation of the skin of the respirator user (dermatitis) may occur if the quaternary ammonium compounds are not completely rinsed from the respirator. The hypochlorite and iodine solutions are unstable and break down with time; they may cause deterioration of rubber or other elastomeric parts and may be corrosive to metallic parts. Immersion times should not be extended beyond the mentioned time periods, and the sanitizers shall be thoroughly rinsed from the respirator parts.

Respirators may become contaminated with toxic materials. If the contamination is light, normal cleaning procedures should provide satisfactory decontamination; otherwise, separate decontamination steps may be required before cleaning.

2. Inspection

The user shall inspect the respirator immediately prior to each use to ensure that it is in proper working condition. After cleaning and sanitizing, each respirator shall be inspected to determine if it is in proper working condition, if it needs replacement parts or repairs, or if it should be discarded. Each respirator stored for emergency or rescue use shall be inspected at least monthly.

Respirator inspection shall include a check for tightness of connections; for the condition of the respiratory inlet covering, head harness, valves, connecting tubes, harness assemblies, hoses, filters, cartridges, canisters, end-of-service indicators, electrical components, and shelf-life date(s); and for the proper function of regulators, alarms, and other warning systems. Each rubber or other elastomeric part shall be inspected for pliability and signs of deterioration. Each air and oxygen cylinder shall be inspected to ensure that it is fully charged according to the manufacturer's instructions.

A record of inspection dates shall be kept for each respirator maintained for emergency or rescue use. Respirators that do not meet applicable inspection criteria shall be immediately removed from service (a temporary replacement assigned) and repaired or permanently replaced.

Inspection of hoop-wrapped air cylinders will follow the recommendations set forth in the Compressed Gas Association, Inc. publication CGA C-6.2-1988, "Guidelines for Visual Inspection & Requalification of Fiber Reinforced High Pressure Cylinders," and will be examined for the following five types of damage:

- Abrasion is damage caused by wearing, grinding, or rubbing away by friction. Abrasions less than 0.005 inch (0.127 mm) deep are acceptable and should have no adverse effects on the safety of the cylinder. Abrasions with isolated groups of fibers exposed or flat spots with a depth greater than 0.005 inch (0.127 mm) but less than 0.0075 inch (0.191 mm) are acceptable if the damage is repaired. Cylinders abraded in excess of 0.0075 inch (0.191 mm) should be taken out of service until professionally inspected.

- Cuts are damage inflicted by a sharp object. Cuts or scratches less than 0.005 inch (0.127 mm) deep are acceptable regardless of length, number, or direction. For cuts greater than 0.005 inch (0.127 mm) deep and up to a depth of 0.015 inch (0.038 mm) with a maximum 1- or 2-inch (25.4 mm or 50.8 mm) length transverse to the fiber direction, the cylinder should be removed from service until repaired. Cylinders with cuts greater than 0.015 inch (0.038 mm) with a maximum greater than 2 inches (50.8 mm) length transverse to the fiber direction or with bare metal showing through must be condemned.

- Impact damage is caused by a cylinder striking or being struck by another object. Impact damage is considered slight if a frosted area is noted in the impact area. These cylinders may be returned to service. Impact damage is severe if evidence of fiber cutting, delamination, and possible structural damage is apparent. Cylinders sustaining severe impact damage should be evaluated using the guidelines for cuts and structural damage.

- Structural damage is damage which causes a visual change in original cylinder configuration. This change can include any evidence of bulges, a cocked end fitting, concave areas on the domes or on the cylinder section, or, if by visual inspection of the cylinder interior, there is evidence of damage involving deformation of the liner. Structurally damaged cylinders must be immediately removed from service and condemned.

- Heat or fire damage to a cylinder is evident by discoloration, charring, or burning of the composite, labels, paint, or plastic components of the valve. Such damage would cause a cylinder to be removed from service and condemned. Note: If the cylinder is only soiled from smoke or other debris and is found to be intact underneath, it may be returned to service.

3. Maintenance and Repair

Replacement of parts or repairs shall be done only be persons trained in proper respirator maintenance and assembly. Replacement parts shall be only those designated for the specific respirator repaired. Reducing or admission valves, regulators, and alarms shall be adjusted or repaired by the respirator manufacturer or a technician trained by the manufacturer. Instrumentation for valve, regulator, and alarm adjustments and tests should be calibrated to a standard traceable to the National Institute of Standards and Technology (NIST), at a minimum of every 3 years.

4. Storage

Respirators shall be stored in a manner that will protect them against physical and chemical agents such as vibration, shocks, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. Respirators shall be stored to prevent distortion of rubber or other elastomeric parts. Respirators shall not be stored in such places as lockers and tool boxes, unless they are protected from contamination, distortion, and damage. Emergency and rescue respirators that are placed in the work areas shall be quickly accessible at all times, and the storage cabinet or container in which they are stored shall be clearly marked.

5. Assurance of Breathing Air Quality

Compressed gaseous air, compressed gaseous oxygen, liquid air, and liquid oxygen used for respiration shall be of high purity. Compressed gaseous air shall meet at least the requirements of the specification for Type I-Grade D breathing air, and liquid air shall meet at least the requirements for Type II-Grade B breathing air as described in ANSI/CGA G-7.1-1989.

The CGA designation for Grade D and Grade E breathing air is as follows:

- Grade D breathing air, as per ANSI/CGA G-7.1-1989, shall contain between 19.5 and 23.5 percent oxygen with the balance predominantly nitrogen, a maximum of 5 mg/m^3 oil (condensed), a maximum of 10 ppm carbon monoxide, no pronounced odor, and a maximum of 1,000 ppm carbon dioxide.

- Grade E breathing air, as per ANSI/CGA G-7.1-1989, shall contain between 20 and 22 percent oxygen with the balance predominantly nitrogen, a maximum of 5 mg/m^3 oil (condensed), a maximum of 10 ppm carbon monoxide, no pronounced odor, a maximum of 500 ppm carbon dioxide, and 25 ppm total hydrocarbon content (as methane).

- Note: The quality verification for oil is not required for synthesized air whose oxygen and nitrogen components are produced by air liquefaction. Carbon monoxide quality verification is not required for Grade D breathing air if synthesized air when nitrogen component was previously analyzed and meets National Foundry (NF) specification and

when the oxygen component was produced by air liquefaction and meets United States Pharmacopeia (USP) specification.

Compressed gaseous air may contain low concentrations of oil introduced from equipment during processing or normal operation. If high-pressure oxygen passes through an oil- or grease-coated orifice, an explosion or fire may occur. Therefore, compressed gaseous oxygen shall not be used in supplied air respirators or in open-circuit type self-contained breathing apparatus that have previously used compressed air. Oxygen concentrations greater than 23.5 percent shall be used only in equipment designed for oxygen service or distribution.

The dew point of air used to recharge self-contained breathing apparatus shall be –65 degrees F or lower (less than 25 ppm water vapor). The driest air obtainable (dew point of –100 degrees F or lower) should be used for recharging SCBA cylinders to be used in environments with ambient temperatures below –25 degrees F. The dew point of breathing air used with supplied air respirators should be lower than the lowest ambient temperature to which any regulator or control valve on the respirator or air-supplied system will be exposed.

Breathing air couplings shall be incompatible with outlets for nonrespirable plant air or other gas systems to prevent inadvertent servicing of supplied air respirators with nonrespirable gases. **It is recommended that Foster or Hansen fittings be reserved for breathing air systems.** Breathing air outlets shall be labeled.

Breathing air may be supplied to supplied air respirators from cylinders or air compressors. Cylinders shall be tested and maintained in accordance with applicable DOT specifications for shipping containers (49 CFR 173 and 178). Breathing gas containers shall be marked in accordance with ANSI/CGA C-4-1990. Specific test recommendations for purchased breathing air are given in the following table.

Method of Preparation	Analysis Recommended
Compression: Supplier does not fill cylinders with any other gases.	Check 10% of cylinders from each lot for ppm CO and odor.
Compression: Supplier fills cylinders with gases other than air.	Analyze all cylinders for percent oxygen. Check 10% of cylinders from each lot for ppm CO and odor.
Reconstitution.	Analyze all cylinders for percent oxygen. Check 10% of cylinders from each lot for ppm CO and odor.

A compressor shall be constructed so as to avoid entry of contaminated air. For all air compressors, including portable types, the air intake location shall be carefully selected, and monitored closely to ensure continued quality of air supply to the compressor. The system shall be equipped as necessary with a suitable in-line air-purifying sorbent bed and filter to further assure breathing air quality. Maintenance and replacement/refurbishment of compressor and associated air-purifying/filter media shall be performed periodically, by trained personnel following manufacturer's recommendations and instructions.

As part of acceptance testing, and prior to initial use, representative sampling of the compressor air output shall be performed to ensure that it complies with the requirements in Paragraph 1 of this section. To ensure a continued high-quality air supply, and to account for any distribution system contaminant input, a representative sample should be taken at distribution supply points. Samples should be collected on a periodic basis, as directed by the Program Coordinator. Specific test recommendations are given in the following table.

Type/Sample	Oil Lubricated	Non-Oil Lubricated	Combustion Engine Powered
Water Vapor	☒	☒	☒
Carbon Monoxide	☒		☒
Condensed Hydrocarbon	☒		☒
Carbon Dioxide			☒
Odor	☒	☒	☒

NOTES:

1. When using air compressors, intake location shall be carefully selected and monitored closely to ensure air supplied to the compressor is of adequate quality.

2. No frequency for periodic checks of air quality is specified, due to wide variation in equipment types, use, working environments, and operating experience.

3. Continuous monitoring of temperature and carbon monoxide are not required.

4. For non-oil lubricated compressors that operate at less than 35 psi, no sampling for water is required.

5. These requirements apply to systems designed for breathing air, other air-supply systems need to be evaluated on a case-by-case basis for the type and frequency of testing.

Further details on sources of compressed air and its safe use can be found in CGA G-7-1988.

PROCEDURE

Subject: Policy & Guidance for Developing Radiation Protection Plans

UNCONTROLLED WHEN PRINTED

1.0 PURPOSE

This Program establishes the policy and shall be used to assist in the development and implementation of Project or Site-Specific Radiation Protection Plans (RPP) that will ensure safe and effective work with radioactive material and sources of ionizing radiation. All project, site and/or license specific RPPs shall be approved and in accordance with the requirements set forth in this program including sub tier procedure HS700.5.24, "Reviews and Approvals of Radiation Protection Programs" before work with radioactive materials or ionizing radiation may begin.

1.1 Policy

It is Shaw's policy that all work with radioactive materials or ionizing radiation be purposeful and performed in a manner that protects workers, members of the general public and the environment. As a pre-eminent provider of services to nuclear and nuclear-related industries, Shaw employs and develops personnel with the requisite skills and knowledge to ensure that radiological work is in accordance with all applicable regulations, codes and standards. Shaw is committed to work with our clients to create a work environment that will continually challenge and refine our capabilities to work with radioactive materials. Since we respect even low levels of radiation, work involving radiological hazards may not begin unless that work can be performed in a safe and compliant manner. Shaw endorses and applies ALARA principles to radiological work so that personnel exposures to radiation are maintained as low as reasonably achievable (ALARA).

1.2 Scope

This document prescribes the requirements for Radiation Protection Programs that are to be developed and implemented for all Shaw Environmental & Infrastructure, Inc. (Shaw E&I) projects and licensed activities that involve the possession, use or work with potential for exposure to sources of ionizing radiation.

1.3 Applicability

All company activities, sites, projects, and facilities where work-related activities may result in workers and/or the public being exposed to ionizing radiation above background levels are required to implement the requirements in the this Plan.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITIES

3.1 The Presidents of Federal and CS&L (Commercial State & Local) business lines of Shaw E&I

- Review and approve the Radiation Safety Committee (RSC) Charter
- Appoint Chairman to the RSC

3.2 Radiation Safety Committee (RSC)

- The RSC shall provide executive oversight for the Corporate Radiation Protection Program (RPP), including assurance that exposures to ionizing radiation are maintained ALARA.
- The RSC oversees the review, approval and implementation of all RPPs.
- A copy of the RSC Charter is provided as Attachment 1.

3.3 Shaw E&I Safety Director

- Senior Environmental Health and Safety management representative for Shaw E&I activities
- Responsible to ensure that radiation safety issues are addressed in a timely fashion.
- Authorizes changes to the Radiation Protection Program for the Shaw E&I Division.
- Ensure that the radiation safety organization maintains sufficient organizational independence to review and evaluate company activities involving the use of radioactive materials, radiation-producing machines, and project sites where radioactive materials are present.
- Responsible to ensure that lessons learned from industrial safety programs and radiological safety programs are shared and applied as appropriate on projects.

3.4 Radiation Safety Manager (RSM)

- The Radiation Safety Manager (RSM) shall act as Secretary to the RSC.
- Guide the development, management, and implementation of a Radiation Protection Plan that provides a framework for compliance with regulatory requirements and standard industry practice.
- Interact with Project Managers to ensure that radiation safety issues are addressed in a timely fashion.
- Coordinate the periodic review of the Shaw E&I RPP.
- Direct independent safety assessment reviews of Shaw E&I projects, sites, and licenses for which an RPP is required. This includes pre-operation, periodic, and episodic reviews.
- Review and approve requisitions for services and materials involving potential exposure to ionizing radiation or radioactive materials.
- Review and approve radiation protection plans developed for projects, licenses, sites, task orders, etc.

3.5 Radiation Operations Manager (ROM)

- The ROM shall act as alternate secretary for the RSC.
- Identify and coordinate radiation safety personnel for projects.
- Interact with Project Managers to ensure that radiation safety issues are addressed in a timely fashion.
- Direct independent operational assessment reviews of Shaw E&I projects, sites, and licenses for which an RPP is required. This includes pre-operation, periodic, and episodic reviews.
- Provide direction and interact with project and site Radiation Protection Managers (RPMs), Radiation Safety Officers (RSOs), and other project staff with responsibilities for radiation protection and nuclear safety.
- Review and approve radiation protection aspects of client proposals, review and approve project radiation protection plans and procedures.
- Review and approve task and work activity related work plans, the execution of which has the potential to exceed the project or task authorization/radiological safety basis.

3.6 Radiation Protection Manager (RPM)/Radiation Safety Officers (RSO)

- The RPM / RSO is that individual assigned authority to implement a site, project or task order specific RPP.
- Under the direction of the Project Manager (PM) implement the RPP, including task specific activities.
- Responsible to ensure exposure to radiation is maintained ALARA.
- Ensure appropriate instrumentation, protective devices, dosimetry, training and other items needed to perform work in accordance with the RPP elements are available.
- The RPM / RSO is authorized to “Stop Work” if needed to ensure radiation safety.
- The RPM / RSO is responsible to exercise independent lines of communication to the ROM or RSM as needed to ensure the RPP is fully implemented.
- Participate in the periodic review of RPP content and implementation with the ROM and/or RSM.
- Prepare and maintain reports and notices as required by the RPP.
- Act as a primary project point of contact for radiation safety related communications. Communications external to the project will be in accordance with sub tier procedure HS700.5.22, Reports and Notifications.

3.7 Project Managers (PM)

- Project Managers are responsible for ensuring that work is conducted safely and in compliance with all applicable permits, licenses, client contracts and other applicable controlling documents.
- Ensure that the RPP is developed and approved in a timely fashion.
- Responsible to ensure exposure to radiation is maintained ALARA.
- Ensure that adequate resources and staffing are available to develop and implement the RPP in compliance with applicable regulations, requirements and commitments.

3.8 Business Division Management

- Ensure Project Managers are provided the necessary resources to safely and compliantly execute projects and contracts in accordance with the RPP.
- Ensure radiological issues are adequately addressed during proposal development.

4.0 ABBREVIATIONS, ACRONYMS, AND DEFINITIONS

Abbreviations, Acronyms, and Definitions applicable to this document are found in the latest revision of HS700.4.1 “Abbreviations, Acronyms, and Definitions”. Most Abbreviations and Acronyms are also defined throughout the text.

5.0 DEVELOPMENT OF PROJECT SPECIFIC RADIATION PROTECTION PLANS (RPP)

This section describes key elements required for a RPP. The functions of the RPP and associated procedures provide information to meet project or license specific requirements, regulations, and commitments. At a minimum, the RPP shall define and quantify sources of radiation and identify risks to occupational workers and members of the public. Controlling documents shall be identified and incorporated into the RPP as appropriate. Project specific procedures shall be developed and applied as necessary to ensure safe handling of radioactive material and control personnel exposure to ionizing radiation.

5.1 Identification of Radiation Hazards – Reference Sub Tier HS700.5.1

The RPP shall be developed from the best available information about the radiation sources involved. This will include information about quantities and concentrations of the specific radionuclides to be handled and the characteristics of any devices, which may produce ionizing radiation when energized. If conditions change or additional information becomes available review and revision of the RPP may be needed. If the available information is not conclusive, conservative assumptions shall be made.

5.2 Identification of Controlling Agencies and Documents – Reference HS700.5.2

Controlling documents may include contracts, licenses, regulations, client RPPs regulatory guides and other documents. These documents are to be examined and compatibility with corporate requirements assessed.

Copies of controlling documents are to be maintained as part of the RPP until conclusion of the program or project or termination of the applicable license.

5.3 Evaluation of Potential Exposure to Workers – Reference Sub Tier HS700.5.3

All RPPs must include an evaluation of external exposures that are likely to occur during routine operations. This is a key step in development of site-specific radiation protection procedures. The higher the likely exposures the more detail will be required in the RPP. RPPs for activities which involve the use of radioactive material other than sealed sources must include an evaluation of intakes which are likely to occur during normal operations. These projections drive the development of the bioassay and air sampling programs, engineering controls, personal protective equipment (PPE), etc

5.4 Evaluation of Public Dose – Reference Sub Tier HS700.5.4

Each RPP shall include a procedure for demonstrating compliance with internal and external public dose limits and commitments.

5.5 Training Program Development – Reference Sub Tier HS700.5.5

All RPPs shall include procedures for the training of personnel. The level of training for different groups shall be commensurate with the level of exposure anticipated and shall be compliant with applicable regulations, requirements, and commitments. Outlines of topics to be covered shall be developed and trainers identified. A system of documenting training and, as applicable, examination results shall be established and maintained. Periodic retraining shall be established. Groups for whom training programs should be established include general employees, radiation workers, and visitors.

5.6 Declared Pregnant Woman Program – Reference Sub Tier HS700.5.6

RPPs shall include provisions allowing women to declare pregnancy in writing. These programs shall be developed so as to comply with 10 CFR 20, USNRC Regulatory Guides 8.13 and 8.29, and any other applicable regulations, requirements, and commitments.

5.7 ALARA Program - Reference Sub Tier HS700.5.7

ALARA principles shall be incorporated into all RPPs. All RPPs shall include a written program for review of ALARA efforts. The resources directed towards dose reduction should be proportional to the magnitude of the potential reduction and should be focused on those areas in which the greatest potential dose reduction exists. An ongoing ALARA review program is required; the frequency of ALARA reviews shall be, at a minimum, annual.

5.8 External Exposure Control - Reference Sub Tier HS700.5.8

All RPPs shall include provisions for reducing external exposure. In addition to time distance and shielding, provisions should include practice in the form of mockups and dry runs before high activity sources are manipulated. Special consideration needs to be given to storage areas. Provisions for documented periodic and episodic measurements of radiation fields are essential. The extent of this portion of the RPP should reflect the dose evaluations developed in accordance with Section 5.3 above. Engineering controls are the preferred method of reducing external exposure risk and must be evaluated.

5.9 Internal Exposure Control - Reference Sub Tier HS700.5.9

All RPPs for activities in which unsealed radioactive material is handled shall include provisions for reducing intakes of radioactive material. Engineering controls such as dust suppression and air handling are the preferred means of reducing risks of intakes and shall be evaluated. In addition, PPE in the form of gloves and over garments such as jumpsuits and shoe covers may be used. When engineering controls cannot meet exposure reduction goals for airborne material, respiratory protective equipment (RPE) may be used in conjunction with an approved, documented RPE program. The extent of this portion of the RPP should reflect the dose evaluations developed in accordance with Section 5.4 above.

5.10 Monitoring and Measuring External Exposure - Reference Sub Tier HS700.5.10

Each RPP shall include a procedure for assigning external dosimetry to individuals based upon evaluations of the likely external exposures. As appropriate, external dosimetry obtained from and processed by a National Voluntary Laboratory Accreditation Program (NVLAP) or Department of Energy Laboratory Accreditation Program (DOELAP) certified dosimeter processor shall be furnished. Dosimetry reports shall be promptly reviewed by the RPM/RSO on receipt and actions are to be taken as required in the RPP ALARA program.

5.11 Monitoring and Measuring Internal Exposure - Reference Sub Tier HS700.5.11

Each RPP for activities in which unsealed radioactive material is handled shall include a procedure for assessing internal exposure. Determination of intakes may be made by bioassay (direct or indirect measurement) or determining airborne levels of radioactive material in an individual breathing zone or by a combination of the above. Refer to regulations, requirements and commitments for preferred methods.

5.12 Surveys and Monitoring - Reference Sub Tier HS700.5.12

Each RPP shall include requirements to evaluate and document radiological hazards which may be present. Methods used to perform these surveys include air sampling; smear testing, collection and analysis of samples, measurement of the intensity of radiation fields, calculations and observations. Surveys as used in this context may be routine periodic occurrences, or may be prompted by an event such as movement of a source, shielding redesign, or request to move equipment from a contamination zone (CZ). A schedule for performing surveys of various types shall be established. A technical basis showing that instruments have the required sensitivity and range shall be used for selecting instruments used for measurement and monitoring.

5.13 Contamination Control - Reference Sub Tier HS700.5.13

Each RPP shall include provisions for limiting the spread of radioactive contamination. The key component of contamination control is the identification and demarcation of zones where contamination is likely. Contamination control shall emphasize controlling the flow of personnel, equipment, and supplies into and out of these areas.

5.14 Instrumentation - Reference Sub Tier HS700.5.14

The RPP shall include a section in which radiation detection instruments suitable for the required measurements are listed. A technical basis for verifying that the instruments used have sufficient sensitivity for the required measurements and monitoring shall be included. Operating instructions, calibration and quality assurance procedures shall be maintained for each instrument. This requirement applies to portable and fixed instruments.

5.15 Radiological Areas and Posting - Reference Sub Tier HS700.5.15

Each RPP shall include provisions to identify and post radiologically controlled areas. The results of surveys shall be used to bound radiological areas. Radiological areas shall be posted as required by the controlling documents.

5.16 Control of Radiological Work - Reference Sub Tier HS700.5.16

Control of work involving radioactive materials is accomplished by establishing radiological standards and responsibilities, using first-line supervisors and radiological protection personnel to monitor performance of radiological work, training workers in radiation hazards, and providing personnel with operating procedures and/or Radiation Work Permits (RWPs) that include the radiological protection measures and controls necessary for safe and compliant completion of the job.

5.17 Credentialing of Staff - Reference Sub Tier HS700.5.17

Each RPP shall include a procedure for a documented review of the credentials of health physics staff.

5.18 Procurement, Receipt, and Inventory - Reference Sub Tier HS700.5.18

Each RPP shall include a procedure for maintaining an inventory of radioactive material under its control. As appropriate, the procedure shall include provisions for procuring, receiving, and checking-in shipments of radioactive material in accordance with the requirements of the controlling documents. Transfers of radiation sources to others must be documented in accordance with the requirements of the controlling documents.

5.19 Shipping and Transportation of Radioactive Materials - Reference Sub Tier HS700.5.19

Each RPP shall contain procedures for shipping and transportation of radioactive material. Radioactive material which is shipped from the company shall be packaged, surveyed, and labeled in accordance with USDOT regulations, found in Title 49 CFR and in accordance with any other applicable regulations such as Part 71 of Title 10 CFR.

5.20 Control of Radioactive Waste - Reference Sub Tier HS700.5.20

Each RPP shall include procedures for minimizing the amount of waste generated. The amount of waste which must be disposed of on-site or that must be sent off site to licensed disposal facilities shall also be minimized. Disposal of radioactive waste may be done only as allowed by the controlling documents.

5.21 Radiation Protection Records - Reference Sub Tier HS700.5.21

Records shall be maintained in order to document implementation of this CRPP, the RPP and to demonstrate compliance with regulations, requirements, and commitments. Records relating to a license program shall be maintained for the duration of the USNRC or state license, or disposed of as authorized by the USNRC or applicable state agency. Record retention requirements should be determined by examination of controlling documents.

5.22 Reports and Notifications - Reference Sub Tier HS700.5.22

Each RPP shall include procedures for developing, communicating, and delivering required reports and notification. These procedures shall include provisions to notify the RSM of all incidents and notifications and reports to regulators. Each RPP shall include provisions for dealing with radiological occurrences including the issuance and distribution Radiological Occurrence Reports (RORs). In addition, the RSM shall be informed of all regulatory inspections, proposed Notices of Violation (NOV), fines, or escalated enforcement actions. As appropriate these procedures should include provisions for required reports to workers.

5.23 Licenses - Reference Sub Tier HS700.5.23

All aspects of licenses, including the RPP are considered contractual agreements between the company and the licensing agency. All licensing actions are subject to review by the RSM prior to submission to the Regulator.

5.24 Review and Approvals of RPPs - Reference Sub Tier HS700.5.24

Each RPP shall be reviewed and approved in writing by the Project Manager, Site Safety Professional, RSO, and RSM or designee prior to use. Scheduling for the development of the RPP must include sufficient time for the required reviews.

The method for revision of the RPP shall be included as part of the RPP. The level of approval required for changes should be proportional to the change.

5.25 Planned Special Exposures (PSE) - Reference Sub Tier HS700.5.25

RPP that shall include provisions for allowing planned special exposures shall require the written approval of the RSO, PM (Project Manager or Program Manager), and the RSM. The RSC shall be involved in all decisions regarding PSEs.

6.0 SELF-ASSESSMENT, REVIEWS, AND CORRECTIVE ACTIONS -- REFERENCE SUB TIER HS700.6.1

6.1 Self-Assessment

Periodic self-assessments shall be conducted in accordance with ALARA goals. The RPP ALARA program will be used as a management tool for involving all site workers in improving radiological performance and for measuring program effectiveness.

6.2 Periodic Reviews

The RSM shall direct a periodic review of RPP content and implementation. A report listing findings and recommendations for program improvements shall be issued promptly. The frequency of reviews shall reflect radiological risks, and regulatory and client requirements.

6.3 Responses and Corrective Actions

Corrective actions must be taken in a timely manner. If serious deficiencies are noted, immediate action will be required. For uncontested findings, the RSO and PM shall develop and implement a corrective action plan with specifically assigned tasks and a schedule for completion. The corrective action plan is subject to review by the RSM and RSC.

7.0 CROSS REFERENCES – HS700 SUB TIER PROCEDURES

HS700.4.1 Abbreviations, Acronyms, & Definitions

HS700.5.1 Identifying Hazards

HS700.5.2 Controlling Agencies and Documents

HS700.5.3 Evaluating Potential Exposures

HS700.5.4 Evaluation of Public Dose

HS700.5.5 Training Program Development

HS700.5.6 Declared Pregnant Women Program

HS700.5.7 ALARA Program

HS700.5.8 External Exposure Control

HS700.5.9 Internal Exposure Control

HS700.5.10 Monitoring and Measuring External Exposure

HS700.5.11 Monitoring and Measuring Internal Exposure

HS700.5.12 Surveys and Monitoring

HS700.5.13 Contamination Control

HS700.5.14 Instrumentation

HS700.5.15 Radiological Areas and Postings

HS700.5.16 Radiation Work Permits

HS700.5.17 Credentialing Personnel

HS700.5.18 Procurement, Receipt, Transfer, Inventory of Radioactive Sources

HS700.5.19 Shipping and Transportation of Radioactive Material

HS700.5.20 Radioactive Waste Control

HS700.5.21 Radiation Protection Program Record Keeping

HS700.5.22 Incidents, Reports, & Notifications

HS700.5.23 Licenses

HS700.5.24 Reviews and Approvals of Site-specific Radiation Protection Programs

HS700.5.25 Planned Special Exposures

HS700.6.1 Self-Assessment of the Radiation Protection Program

8.0 ATTACHMENTS

8.1 Shaw Environmental & Infrastructure, Inc. - Radiation Safety Committee Charter

ATTACHMENT 1
Shaw Environmental & Infrastructure, Inc.
Radiation Safety Committee Charter

1.0 SHAW E&I RADIATION SAFETY COMMITTEE AUTHORITY

The Radiation Safety Committee (RSC) is authorized by the Presidents of the Federal and CS&L (Commercial State & Local) business lines of Shaw E & I. The purpose and scope of the RSC is to provide executive oversight of the administration of the SEI Radiation Protection Program (RPP). Additionally, the RSC provides methods to review and resolve operational compliance issues that require executive management review. The RSC's scope includes:

- Ensure the establishment and maintenance of Radiation Protection and applicable Price Anderson Amendments Act (PAAA) compliance programs are in place during all Shaw E & I activities which involve the possession or use of radioactive material and/or ionizing radiation sources. Ensure that Shaw E & I projects are executed in compliance with applicable statutes and agency regulations and policies; internal policies, plans, and procedures; terms and conditions of client contracts and radioactive material license conditions.

- Provide a forum to evaluate issues that may require input from multiple organizational "stakeholders" (functions), in addition to Radiation Protection, e.g., Legal, EH&S, QA, HR, other business lines, etc.

2.0 COMPOSITION/MEMBERSHIP

Chaired by the President of the Federal or CS&L business lines, or their designee with standing membership including the Radiation Safety Manager (RSM), Radiological Operations Manager (ROM), Director EH&S, Sr. VP Operations Manager and other representatives of management from the Federal, CS&L and S & T business lines

- Members will be nominated by the head of the business line or functional organization and be approved by the Chair of the RSC.

- Term of membership will typically be for three years.

- Members shall be appointed based on having sufficient authority and appropriate experience.

3.0 MEETINGS

A Quorum is a simple majority of members (includes provision for conference call meetings) and must include the RSC Chair or designee and the Secretary.

The secretary will be the RSM with the ROM as alternate, who will document and distribute meeting minutes and communicate other actions of the committee.

The RSC will convene quarterly or as needed.

4.0 SUBCOMMITTES

The RSC may appoint subcommittees at any time and for any duration to address specific ad-hoc issues. Subcommittees will be comprised of personnel with the requisite experience and qualifications appropriate for the subject matter of interest."

Shaw Environmental &Infrastructure, Inc.
Radiation Safety Committee
Membership Appointment Form

NOMINATION

As Lead of the _____
Name of Business Line

I nominate _____
Name of Candidate

To represent our Business Division on the Radiation Safety Committee.

Signature: _____ Date: _____

ACCEPTANCE

I, _____
Name of Candidate

agree to serve on the Radiation Safety Committee.

Signature: _____ Date: _____

APPROVALS

RSM Signature: _____ Date: _____

Safety Director: _____ Date: _____

APPOINTMENT

Signature: _____ Date _____
RSC Chair

Signature
RSC Chair

STANDARD OPERATING PROCEDURE

Subject: Motor Vehicle Operation: General Requirements

UNCONTROLLED WHEN PRINTED

1. PURPOSE

This procedure prescribes the general requirements for the operation of motor vehicles on company business. All operators of company owned, leased, and rented vehicles, as well as personal vehicles used on company business, are covered by this procedure. U.S. Department of Transportation (DOT) regulated personnel must also comply with the guidelines contained in Shaw Environmental & Infrastructure, Inc. (Shaw E&I) Procedure No. HS810, "Commercial Motor Vehicle Regulations and DOT Compliance." Key elements of this procedure include:

- All employees who drive or may drive on company business must be familiar with the requirements of this procedure and certify their acceptance of the Company Rules for Motor Vehicle Operation (Attachment 1). This certification will be evaluated via the established point system to determine driving privilege status.
- All new hire candidates shall complete and be familiar with the Company Rules for Motor Vehicle Operation (Attachment 1). This certification will be evaluated via the established point system to determine driving privilege status.
- Employees must report all vehicular citations incurred while on company business to their supervisor as soon as possible, but not longer than 24 hours after the occurrence. Once reported, the established evaluation criteria in Section 6.4 will be used to determine corrective actions.
- Employees have the responsibility to keep track of their non-work related vehicular citations and utilize the established evaluation criteria found in Section 6.3 to determine if their overall Motor Vehicle Records (MVR) citations exceed the Overall Driving Record limits (see Section 6.3.2).
- Employees utilizing vehicles while on company business are required to review this procedure and attend a company-designated driver training class at least once every two years.
- Requests for the reinstatement of denied or revoked driving privileges can be made to the appropriate business line President and the Senior Director of Health and Safety.

2. SCOPE

This procedure applies to all employees who operate company owned, leased and rented vehicles, as well as personnel vehicles used on company business.

2.1 EXCEPTION PROVISIONS

Variances and exceptions, not explained herein, may be requested pursuant to the provisions of Shaw E&I Procedure No. HS013, "Health and Safety Procedure Variance."

3. REFERENCES

- Shaw E&I Procedure No. HR207, "Employee Discipline"
- Shaw E&I Procedure No. HS013, "Health and Safety Procedure Variance"

- Shaw E&I Procedure No. HS020, "Accident Prevention Program: Reporting, Investigation, and Review"
- Shaw E&I Procedure No. HS810, "Commercial Motor Vehicle Regulations and DOT Compliance"

4. DEFINITIONS

Chargeable Vehicle Accident – Any at fault vehicle accident meeting any one of the following criteria:

- An individual other than an employee of the company is a party in the accident.
- Property owned by a person or entity other than the company is damaged.
- When only company employees, company owned or leased (not rented) vehicles, and property is involved and damage exceeds $2,500.00.

Company – Shaw E & I and its subsidiaries and affiliates.

Motor Vehicle – Any passenger vehicle, including trucks, used upon the highway or in private facilities for transporting passengers and/or property. This includes personal vehicles operated on company business. For the purpose of this procedure, off-road vehicles, such as all-terrain vehicles (four wheelers) earthmoving equipment, forklifts, nonhighway use trucks, etc., are not considered vehicles.

Project Assigned Employees – Any employee that is assigned to a field operations project position. This designation includes Project Managers, Site Managers/Supervisors, Foremen, Technicians, Scientists, Geologists, Project Business Accountants, etc. This does not include employees that are typically assigned to an office but are visiting a site for brief periods of time, such as to provide technical assistance, perform audits, perform program reviews, etc.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Senior Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

5.2 Action/Approval Responsibilities

The responsibility requirements are included in Attachment 2, "Motor Vehicle Operation: General Requirements, Responsibility Matrix."

6. PROCEDURE

6.1 Company Rules for Motor Vehicle Operation

All employees who will or may be required to operate a company owned, leased, or rented motor vehicle or a personal vehicle used on company business shall acknowledge acceptance of the Company Rules for Motor Vehicle Operation (Attachment 1) prior to such operation. The signed form shall be retained by the Baton Rouge, Louisiana Health and Safety Records Department. Each year, the company shall reserve the right to require covered employees to sign a copy of the most current Company Rules for Motor Vehicle Operation.

FAILURE OF EMPLOYEES TO COMPY WITH COMPANY RULES FOR MOTOR VEHICLE OPERATION OR THIS POLICY SHALL BE SUBJECT TO DISCIPLINARY ACTION UP TO AND

INCLUDING (BUT NOT LIMITED TO) REVOCATION OF DRIVING PRIVILEGES FOR COMPANY BUSINESS AND TERMINATION OF EMPLOYMENT.

Those employees who are assigned to use an Employer vehicle, which they take home with them, must meet the following conditions:

- The Employee's supervisor signs an Authorization for Assignment Form (Attachment 3).
- The Employee signs and agrees to be bound to a Vehicle Usage Agreement (Attachment 4).

- The Employee provides proof of insurance on the Employee's personal vehicle, which lists the Employee as an insured driver on the insurance and such insurance contains minimum coverage required by law and acknowledges that the Employee's personal insurance will provide primary coverage of the Employee's use of a Company owned vehicle when such use is not in the course and scope of employment. The authorizing supervisor shall attach a copy of the proof or personal insurance to Attachment 4 for future reference.

The Vehicle Usage Agreement is an agreement by the Employee that his own personal vehicle insurance will be primary as to any claims arising from the Employee's **NON COMPANY** use of Company Vehicles.

Employees operating Company Vehicles without compliance with these requirements, as well as any supervisor who allowed or granted such use, will be deemed to be in violation of Company policy and will be subject to discipline up to and including termination from employment.

6.1.1 Project Assigned Employee Vehicle Use Requirements

The following requirements are set forth as it pertains to Project Assigned Employees.

- Project-assigned employees are not permitted to operate a company vehicle (owned, leased, or rented) on noncompany business after 10:00 p.m. without written authorization from the Project Manager or the appointed Site Manager/Supervisor with jurisdiction over the vehicle. In those cases where there is shift work, a non-traditional workday (i.e., 3 p.m. to 11 p.m. workday, etc.) or other non-typical circumstances, it is understood that the after 10:00 p.m. restriction would not be appropriate.
- Project assigned personnel that are residing in temporary housing/hotels are granted permission to drive to and from the temporary residence and work. Additionally, the Project Manager, or the appointed Site Manager/Supervisor his/her designee (Site Manager, Supervisor, etc.) is required to evaluate and optimize the potential of carpooling of project assigned personnel in an effort to reduce the number of company vehicles being driven to and from the project site.
- Project assigned employees shall not use company vehicles for sight seeing or any other personal/recreational activities.
- Vehicles may be used in support of "daily life activities" such as going to restaurants for dinner, laundromats, local retail stores, grocery stores, etc.
- A maximum distance for "daily life activity" driving shall be no further than 20-miles from the temporary housing in which an employee resides. In those cases where the maximum allowed distance does not permit daily life activities to be conducted, a written authorization, from the Project Manager or the appointed Site Manager/Supervisor, is required to travel further distances.
- For normal routine travel to and from work, employees shall utilize their own personal transportation.
- If an employee is assigned to a project site that is located within driving distance from the employee's permanent residence, but is too far away to allow for a daily commute, that employee shall utilize their own personal transportation to drive to and from their permanent residence and the project site (i.e., for initial assignment arrival to the project, trips home on rotation, etc.). Upon

arrival to the site, employees shall be allowed to use a company vehicle as required to perform project activities. In these cases, the employee will also be required to drive their personal vehicle to and from the project site from their temporary housing/hotel residence, for personal "daily life activities," etc.

- Employees may drive a Shaw-owned, -leased, or -rented vehicle home during off hours only when authorized in writing by a business line manager, who must hold a position at least one level above the Site/Project Manager to whom the authorized employee reports. In other words, the approval must be signed by the employee's supervisor or a higher level manager.

- In making vehicle use decisions the authorizing manager shall consider the risk of vehicle accidents, Shaw's liability risks, client and project specific needs, distances to be traveled, employee driving history, and any other relevant factors. Attachments 3 and 4 shall be used to facilitate this process.

6.2 Pre-Employment Evaluation

Human Resources shall distribute a copy of this procedure to all new hire candidates for the completion of Attachment 5, "Driving Record Certification." Information provided should be evaluated via the point system in Section 6.3. Human Resources and the hiring manager will be advised regarding any hiring or driving privilege restrictions that may apply. Hiring of persons with regular driving duties (e.g., field technicians and leadmen, sales persons, or others with assigned company motor vehicles) may only proceed after the information contained in Attachment 5 is evaluated.

Once Attachment 5 is completed, it is to be faxed to the Baton Rouge, Louisiana Corporate Health and Safety Records Department at (225) 213-2171. The driving status of the prospective employee will be reported to the appropriate Human Resources Department. Health and safety will notify the appropriate Human Resources Manager when the attachments are not returned.

Discrepancies between the certified driving record report and Attachment 5 shall be reviewed with the prospective employee. Deliberate falsification of driving record information will disqualify prospective employees from being hired.

6.3 Driving Record Point System

The following point system will be used to evaluate the driving record of all existing employees and new hire candidates that can reasonably be expected to operate a motor vehicle during their employment. This data is to be collected through MVR search and by the employee completing Attachment 5 of this policy. Attachment 1 is to be completed by the new hire candidate.

Driving Record Point System	
Description of Violation	**Assigned Point Value**
Non-Moving: vehicular equipment deficiency, no seatbelt use, failure to secure load, etc.	1
Moving: speeding (less than 20 miles per hour [mph] over limit), disobey traffic control signal, failure to signal, tailgating, improper lane usage, etc.	2
At-fault accident	3
Major citations: speeding (20 mph or more over limit), reckless driving, suspended license for driving violation, speed contest, improper lane usage, open alcohol container (Non-Work Related), etc.	6
Driving under the influence, hit and run (leaving the scene of an accident), or work related open alcohol container.	8
Open Alcohol Container (Work Related)	8

6.3.1 Pre-Employment Driving Record Point System Evaluation

If a new hire candidate has accumulated three points or less in the last 12 months or five points or less in the last 24 months, they will be given the privilege to drive motor vehicles on company business without restrictions.

If a new hire has accumulated four to six points in the last 12 months or six to eight points in the last 24 months, they will be placed on probation for a period of 12 months. They will be afforded the privilege to drive motor vehicles on company business during this probationary period. Any driving infractions (i.e., speeding tickets, at-fault accidents, citations, etc.) accumulated during this probationary period will result in termination of the privilege to drive a motor vehicle on company business.

If the new hire candidate has accumulated seven to11 points in the last 12 months or nine to15 points in the last 24 months, they will not be eligible for company driving privileges. Employment can only be offered with the strict understanding of denial of the privilege to drive motor vehicles on company business. After the first 12 months of employment, the employee can petition the appropriate business line President and the Senior Director of Safety and Health for reconsideration of driving privileges.

If a new hire candidate is expected to drive a vehicle, to fulfill the responsibilities of his/her role, and there has been an accumulation of 12 points or more in the last 12 months or 16 points or more in the last 24 months, the candidate shall not be hired. See table below:

Candidate's Driving Privilege Status Description	Past 12 Months	Past 24 Months
Can drive without restriction.	0 to 3 points	0 to 5 points
Can drive with understanding of probationary status.	4 to 6 points	6 to 8 points
Not eligible for company driving privileges for first 12 months of employment.	7 to 11 points	9 to 15 points
Candidate not eligible for hire.	12 points or more	16 points or more

6.3.2 Existing Employee Driving Record Point System

An acceptable traffic record is one requirement for continued driving privileges. Accordingly, each affected employee's MVR traffic record is subject to periodic and annual review to ensure compliance with state and federal regulations, as well as company policy.

6.3.2.1 Work Related Traffic Violations

It is the responsibility of all affected employees to provide verbal notice to their supervisor of any work related traffic violations that have occurred as soon as practicable but not longer than 24 hours after the occurrence. This verbal notice shall be followed by the employee completing an updated Company Rules for Motor Vehicle Operation (Attachment 1), and Notification of Work-Related Citation form (Attachment 6). Both Attachments 1 and 6 shall then be immediately forwarded to the Baton Rouge, Louisiana Health and Safety Records office.

6.3.2.2 Non-Work Related Traffic Violations

Employees have the responsibility to keep track of their non-work related vehicular citations and utilize the established evaluation criteria, as described below, to determine if their overall traffic citations exceed acceptable company limits. It is not necessary for employees to report non-work related citations to their supervisor as they occur. However, if an employee's overall MVR record (work related or not) exceeds the company's established points system criteria, the employee must verbally inform their supervisor as soon as practical but no longer than the following business day after the occurrence. This verbal notice shall be followed by the employee completing an updated

Attachment 1, and it shall then be immediately forwarded to the Baton Rouge, Louisiana Health and Safety Records office.

6.3.2.3 Overall Driving Record Evaluation

If it is determined that an employee has accumulated three points or less in the last 12 months or five points or less in the last 24 months, they will be allowed to continue with the privilege to drive motor vehicles on company business without restrictions.

If an employee has accumulated four to six points in the last 12 months or six to eight points in the last 24 months, the employee will be placed on probation for a period of 12 months. The employee can continue to drive motor vehicles on company business during this probationary period.

If the employee has accumulated seven to11 points in the last 12 months or nine to15 points in the last 24 months, they will not be eligible for company driving privileges. Continued employment may only be extended with the strict understanding of denial of the privilege to drive company owned, eased, or rented motor vehicles on company business. After the first 12 months following driving privilege revocation, the employee can petition their respective Business Line President and the Senior Director of Safety and Health for reconsideration of driving privileges. See table below:

Employee's Driving Privilege Status Description	Past 12 Months	Past 24 Months
Can drive without restriction.	0 to 3 points	0 to 5 points
Can drive with understanding of probationary status.	4 to 6 points	6 to 8 points
Company driving privileges are revoked.	7 to 11 points	9 to 15 points

6.3.2.4 Non Driving Related License Suspension

Any employee with a currently suspended license is prohibited from driving any Shaw owned and/or rented or leased vehicle. This includes the use of a personal vehicle to conduct Shaw company business. Although no points will be assessed for a non driving related license suspension, the employee will be placed on a revoked driving privileges status. Once the suspension has been lifted and proof has been provided by the employee, the employee has the right at that time to request reinstatement of his/her driving privileges. Refer to Section 6.6, "Reinstatement of Driving Privileges." Before driving privileges are reinstated a new MVR must be evaluated to ensure no other violations have occurred.

6.4 Employee Evaluation Criteria

All employees who may operate a motor vehicle on company business will become familiar with the requirements of this procedure, complete the currently-designated company driver training class, and complete Attachment 5 prior to such operation. The employee driving evaluation criteria is based upon all infractions including those incurred while on company business and during off-work hours. It is imperative that employees notify their supervisors immediately as possible, and no later than 24 hours following a work-related citation/accident. Once notified, the supervisor will ensure the completion of Attachment 5, forward it to the Baton Rouge, Louisiana Health and Safety Records Office, and initiate one of the following corrective actions as required. Additionally, as it relates to non-work related and work related traffic violations, it is the employee's responsibility to ensure that their overall driving record does not allow for the exceeding of the driving records points system. Should the employee's driving record points exceed the system limits, they must notify their supervisor immediately, complete an updated Company Rules for Motor Vehicle Operation and employee Driving Record Certification (Attachments 1 and 5), and forward it to the Baton Rouge, Louisiana Health and Safety Records Department.

6.4.1 Work-Related Minor Citation

When an employee is given a work related minor citation (i.e., speeding ticket, moving violation, failure to signal turn, loss of load, etc.), the employee's supervisor will meet with the employee to discuss the corrective action that must be taken so that further violations do not occur. At a minimum, the supervisor shall require the employee to attend a recognized course in defensive driving on his/her own time and the cost of this training will be borne by the employee. This course shall be pre-approved by the Division Health and Safety Manager. The supervisor will provide written direction to the employee regarding the assigned corrective action(s). The supervisor shall forward a copy of an updated Company Rules for Motor Vehicle Operation and employee Driving Record Certification form (Attachments 1 and 5) and a form of verification showing the employee's successful completion of an approved defensive driving course to the appropriate regional Human Resources Department for inclusion in the employee's personnel file. These documents shall also be forwarded to the Baton Rouge, Louisiana Health and Safety Records Department.

6.4.2 Work Related Major Citation

When an employee is given a work related major citation (i.e., reckless driving, tailgating, suspended license, speed contest, etc.), the supervisor will hold a meeting with the employee, at which time the supervisor will complete the company Disciplinary Action Form (Shaw E&I Procedure No. HR207, "Employee Discipline") thereby informing the employee that any additional infractions will lead to more severe disciplinary action. In addition, the employee will be required to attend a recognized defensive driving course on his/her own time, as described in Section 6.4.1, and will be suspended from work for one day without pay. A copy of the Disciplinary Action Form shall be forwarded to the appropriate Human Resources Department for their information and inclusion in the employee's personnel file.

6.4.3 Failure to Notify

Should an employee fail to notify his/her supervisor of any work or non-work related citation or accident within the required reporting time, his/her company driving privilege may be revoked. The supervisor will also take disciplinary action that is appropriate for the unreported event. If the unreported event is work related and is either an at-fault accident, driving under the influence case or a hit and run violation, the termination process will be initiated. All disciplinary actions shall be documented to the employee by the supervisor. This copy, and any written response by the employee, shall be forwarded to the appropriate Human Resources Department for their information and inclusion in the employee's personnel file.

6.4.4 At-Fault Accident

Whenever an employee is operating a company owned/leased/rented vehicle or their personal vehicle on company business and is involved in an at-fault vehicle accident, an Accident Review Board shall be convened and will recommend the corrective action to be taken. At a minimum, the action shall include the completion of a recognized driver safety course on their time and at their expense, as described in Section 6.4.1.

Depending upon the circumstances and severity of the accident, termination of the employee can be considered. As above, this must be approved by the appropriate Human Resources Department. All communication to the employee regarding the accident and resulting action shall be in writing with a copy to the appropriate Human Resources Department for their information and inclusion in the employee's personnel file.

6.4.5 Driving Under the Influence, Hit and Run (Leaving the Scene), and Open Container

If an employee is charged with Driving Under the Influence, Hit and Run, or an Open Alcohol Container violation, he/she will have their driving privileges temporarily suspended pending final resolution of the charge. If the charge is resolved in the employee's favor, with a final adjudication holding no penalty, driving privileges may be re-instated. However, if any penalty is attached, such as probation, license restrictions, etc., the employee may be considered unqualified to drive for the

company. Whenever an employee is convicted or pleads no contest to a company-related driving under the influence, hit and run, or open container charge, he/she will be immediately terminated.

In a case that is not work related, and an employee is convicted or pleads no contest to a hit and run or driving under the influence charge, the employee shall notify his supervisor. Accordingly, the employee's company driving privileges will then be revoked for 12 months. After the first 12 months following driving privilege revocation, the employee can petition their respective Business Line President and the Senior Director of Safety and Health for reconsideration of driving privileges.

6.5 Training

All employees who will, or may reasonably be expected to, drive a company owned/leased/rented vehicle or their personal vehicle on company business shall review this procedure and complete the currently-designated company driver training class prior to such operation. This class is designed to be taught either via the company's Web-based training program or by local Health and Safety personnel and must include the following elements:

- Federal/state/local driving rules
- Company driving rules
- Emergency/accident procedures
- Defensive driving techniques.

Specific information on the vehicle to be operated will be provided locally. Personnel conducting this class shall provide the Knoxville Health and Safety Training Department with a copy of the course attendance sheet for inclusion in individual training records. All affected employees shall complete a driver safety training class at least once every two years.

6.6 Reinstatement of Driving Privilege

Any employee who has had his/her privilege to drive a motor vehicle on company business revoked or denied, and who desires to reinstate this privilege, must apply to the Business Line President and the Senior Director of Health and Safety for reinstatement. The Director of Health and Safety, or his designee, shall specify rehabilitation program (if applicable), an external safe driving course, and any other requirements in which he/she deems appropriate. Once the employee completes the program, documentation of successful completion must be formally presented to the appropriate President and the Senior Director of Health and Safety. If the documentation is accepted, the driving privilege may be reinstated. Copies of all documents shall then be forwarded, by the responsible Health and Safety Manager, to Human Resources and to the Baton Rouge, Louisiana Health & Safety Records Department.

Reinstatement of the driving privilege may occur one time, at the discretion of the Director of Health & Safety and the responsible Business Line Vice President. If employee driving performance leads to a subsequent revocation of this privilege, such revocation shall be permanent.

6.7 Non-Shaw Employee Vehicle Use Requirements

Only approved non-Shaw employees (client, subcontractor, or temporary/temp agency employees) who have completed and signed the "Non-Shaw Employee Driver Questionnaire" (Attachment 7) will be allowed to drive a Shaw owned, leased, or rented vehicle. Upon completing the questionnaire and prior to the driver operating a Shaw vehicle, the subject questionnaire must be signed, dated, and placed on file at the job site. The primary vehicle operator or the Shaw Project Management representative shall review the questionnaire and determine whether the non-Shaw employee satisfies the driver qualification requirements of this procedure. The driver qualification point system can be found in Section 6.3 of this procedure.

In addition to the above requirement, it is also a requirement of the responsible Shaw Project Manager to forward a fully executed, company-specific version of the correspondence that is found in Attachment 8, "Memorandum Template for Employers of Non-Shaw Drivers," to the employer of the non-Shaw driver. This correspondence should not be modified except for the fields that specify the name and address of the subcontractor or client to whom the letter is being written. This written correspondence will serve to notify that any employee that is assigned by their company to a Shaw project, and is required to operate/drive a Shaw-owned, -leased, or -rented vehicle will be subject to either meeting or exceeding the operator requirements for Shaw employees.

As the employer of individuals who are assigned to a Shaw project, the authorized non-Shaw employer representative shall sign and return Attachment 8 to the respective Shaw Project Manager. By signing Attachment 8, the non-Shaw employer is acknowledging that they are either adopting the requirements set forth in this procedure or have developed a similar policy that meets or exceeds these requirements. Failure of a non-Shaw employer to comply with the requirements set forth in this procedure shall result in the prohibition of their employees driving any Shaw-owned, -leased, or -rented vehicles.

6.8 DRIVER SAFETY NOTIFICATION STICKER

A safety notification bumper sticker shall be applied to all Shaw owned/leased vehicles in an effort to ensure continued compliance with driving safety regulations. The notification service will be managed by a third party fleet safety management company and will serve as the recipient of all calls that are placed concerning unsafe driving behavior. The Findlay, Ohio Equipment Services Group will serve as the first point of contact as it pertains to notifications that are received from the third party company who administers the bumper sticker safety call in service. Upon receiving a report from the third party administrator, the equipment division shall determine what business line the vehicle/driver is located within and then contact the respective business line Health and Safety Manager. The Health and Safety Manager will then contact the affected employee and the employee's supervisor for a counseling/discussion meeting, concerning the complaint. Upon conclusion of the meeting, the information will be reviewed by the supervisor and the Divisional Health and Safety Manager for determination of corrective or disciplinary action.

The company shall endeavor to ensure that all company owned/leased fleet vehicles shall have a safety notification bumper sticker applied to the rear of the vehicle. It is the responsibility of the driver, who is deemed the primary/responsible operator of the vehicle, to ensure that the sticker remains on the vehicle and remains legible and in no way defaced. If the vehicle is project or program assigned and there is no designated primary operator, then the Project Manager will be considered the primary/responsible operator. The primary / responsible operator shall contact the Equipment Division in Findlay, Ohio, at 1-800-225-6464 ext. 6051 or direct dial at 419-425-6051, immediately upon recognizing that the sticker is defaced or removed such that a new one can be re-applied. Failure, on the part of the primary operator, to ensure that a legible sticker remains on the vehicle shall result in disciplinary action, up to and including vehicle usage being revoked, in addition to possible termination of employment.

6.9 CELLULAR TELEPHONES, IPOD/WALKMANS, AND PAGERS

Cellular telephones, Blackberry's, and other 2-way communication devices have been proven as distractions while driving. Based on the findings of the National Highway Transportation Safety Administration and other sources, the Company recommends not using these devices while operating a motor vehicle of any type. If, against better judgment, a driver engages in the use of these devices, the following is required:

- External speaker and microphone or a Bluetooth style earpiece must be used to allow hands-free operation.
- Telephone number memory and programming capabilities are to be included and used.
- Drivers are to refrain from responding to pagers while the vehicle is in motion.

- Incoming calls should be limited to two minutes or less.
- For any cellular telephone that does not meet the above equipment specifications, use of the telephone/pager is authorized only when the vehicle is safely parked.
- Employees are prohibited from using an iPod/Walkman or similar device while operating a motor vehicle.
- Text messaging of any kind, while driving, is strictly forbidden.

7. ATTACHMENTS

- Attachment 1, Company Rules for Motor Vehicle Operation
- Attachment 2, Motor Vehicle Operation: General Requirements, Responsibility Matrix
- Attachment 3, Authorization for Assignment Form
- Attachment 4, Vehicle Use Agreement
- Attachment 5, Driving Record Certification
- Attachment 6, Notification of Work-Related Citation
- Attachment 7, Non-Shaw Employee Driver Questionnaire
- Attachment 8, Memorandum Template for Employers of Non-Shaw Drivers

8. FORMS

- None

9. REVISION HISTORY

Revision Level / Revision Date	Revision Description	Responsible Manager
6 10/28/09	• Several of the assigned point values for specific violations have been revised, see Section 6.3. • Driving record requests require a charge code for processing (see Attachment 5). • The fax number for the Baton Rouge, Louisiana Health and Safety Records Department is 225-213-1271. • Driving rules 13 and 15 have been modified. • Disciplinary actions resulting from at-fault vehicle accidents no longer have to be reviewed for consistency by the appropriate Safety Council. • Project Managers are no longer required to execute written authorizations for use of company vehicles when shift work or non-traditional workdays have been scheduled. • Section 6.3.2.4 has been added to address non driving related license suspensions. • Section 6.9 has been added to address cellular telephones, iPods, Walkmans, and pagers.	Allen, Troy

Attachment 1
Company Rules for Motor Vehicle Operation

1. Prior to motor vehicle operation, all motor vehicle operators are required to provide the company with current documentation of licensing for the motor vehicle(s) to be operated. Supervisors shall review and approve said documentation.

2. The motor vehicle operator is responsible for the vehicle, and for conducting a pre-trip, walk around inspection prior to use (including load evaluation, if applicable). No vehicle with any mechanical defect, which endangers the safety of the driver, passengers, or the public, shall be used. The motor vehicle operator is also responsible for the Driver Safety Notification sticker (Section 6.8).

3. All company owned/leased trucks should have small convex mirrors attached to the side mirrors.

4. The operator shall drive defensively at all times and is responsible for complying with all state and local traffic laws, as well as customer regulations concerning motor vehicle operation.

5. The operator and all passengers shall use seat belts at all times when the vehicle is in motion.

6. No employee shall operate a motor vehicle when abnormally tired, temporarily disabled, or under the influence of alcohol or drugs.

7. No employee shall allow a company owned, leased, or rented motor vehicle to be operated by an unauthorized employee or non-employee (see also unauthorized personal use of company vehicles) (Section 6.7).

8. The operator shall not allow for any open alcoholic beverage containers within a company vehicle or within a personal vehicle while it is being utilized for company business.

9. No employee shall drive beyond any barricades or into any area with designations such as HAZARDOUS, DO NOT ENTER, etc.

10. Use caution when driving through congested areas, or near where personnel and equipment are working.

11. Whenever possible, a spotter shall be used for backing all vehicles. This may be a fellow company employee, or a non-company employee who is willing to help.

12. Unless required, such as on a client's property, keys shall not be left in an unattended vehicle.

13. Employees shall not leave the driver's seat of a vehicle while the motor is running. Exemption: Vehicles equipped with a power take-off device with parking brake set and chocks in place and vehicles operated in Arctic conditions (i.e., less than 0 degrees Fahrenheit).

14. No motorcycles are to be operated on company business.

15. Radar/laser detectors are prohibited in all company owned, leased, or rented vehicles or in personal vehicles while being used for company business.

16. Analytical samples will be transported in accordance with Title 49 Code of Federal Regulations. Regulated hazardous substances shall not be transported in personal vehicles.

17. In case of an accident, the following steps shall be taken:

    A. Stop

    B. Call for medical assistance in case of injuries

    C. Notify police

    D. Complete Vehicle Accident Report and submit to your supervisor as soon as possible.

18. Whenever a vehicle is stopped upon the traveled portion of a highway or the shoulder of a highway, for any cause other than necessary traffic stops, the driver shall, as soon as possible, place or activate the warning devices with which the vehicle is equipped.

19. Employee must notify the supervisor as soon as possible, but not longer than 24 hours after occurrence, for work related citations, accidents, and license expiration, suspension, or revocation.

20. No employee is authorized to operate a company vehicle (including rentals) after having been on duty for a period of 16 hours. No employee may drive for more than 12 hours in any single on-duty period. Once either of these criteria has been met, a period of eight consecutive hours off duty is required before driving duties may be resumed. These are maximum, not minimum, requirements and employees may be unfit to drive after shorter on-duty periods. Commercial U.S. Department of Transportation drivers are subject to the more restrictive hours of service regulations described in Shaw E&I Procedure No. HS810.

21. Project-assigned employees are not permitted to operate company owned, leased, or rented vehicles after 10:00 p.m. without written authorization from their supervisor (see Section 6.1.1).

22. Employees shall not operate company vehicles for any type of personal use, no exceptions. Personal use includes any usage that is not directly related to company business. See Section 6.1.1 for definitions concerning “daily life activities” for Project Assigned Employees.

23. Employees shall not use a company vehicle to visit an establishment that has a primary function of providing nighttime entertainment including the dispensing of alcoholic beverages.

24. Temporary or non-Shaw employees shall be allowed to utilize Shaw company vehicles only after the driver has completed Attachment 7 and has satisfied the point system requirements set forth in Section 6.3 of this policy. In addition, the employer of that driver shall have satisfied the requirement set forth in Section 6.7 of this policy and signed a copy of the memo set forth in Attachment 8. This includes clients or subcontractors.

25. Employees shall not transport family members, friends, or any other unauthorized guest passenger unless it is arising out of course and scope of company business.

26. Employees may not drive company owned, leased, or rented vehicles home when off of duty except when authorized in writing by a designated business line manager and in accordance with Section 6.1.1.

27. Employees needing to use a mobile telephone or engage in other potentially distracting activity while operating a Motor Vehicle are advised to pull off the road when safe to do so for the duration of the activity.

I have read and understand company Procedure No. HS800 and the company rules for Motor Vehicle Operation and agree to abide by all requirements

Employee’s Name (Printed)	Employee Signature	Date

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Attachment 2
Motor Vehicle Operation: General Requirements
Responsibility Matrix

Action	Procedure Section	Responsible Party					
		Health & Safety Assistant	Business Line Health and Safety Manager	Supervisor	Accident Review Board	Human Resources	Senior Director of H&S
Issue, Revise, and Maintain This Procedure	3.1						X
Ensure Employees Complete Attachment 1	5.1			X		X	
Distribute Shaw E&I Procedure No. HS800 to New Hire Candidates for Completion of Attachment 1	5.2					X	
Request Evaluation of New Hire Driving Record	5.2	X		X		X	
Obtain Driving Record and Determine Driving Status	5.2	X					
Initiate Corrective Actions	5.4			X		X	
Ensure Completion and Distribution of Attachment 5	5.4	X					
Accident Review	5.4.4				X		
Ensure Drivers Meet Training Requirements	5.5		X	X			
Specify Program for Reinstatement of Driving Privilege	5.6						X
Reinstatement of Driving Privilege	5.6						X
Non-Shaw Employee Vehicle Use Requirements	5.7			X			
Contact Employee to discuss report from Safety Notification Sticker Service	5.8		X	X			

Attachment 3
Authorization for Assignment Form

I, the hereby undersigned Supervisor / Manager, give my consent and approval for the Employee listed below to be assigned a company owned and/or rented vehicle ("Company Vehicle") as specified herein and in accordance with the Company Motor Vehicle Use Policy and the Company Rules for Motor Vehicle Operation. I have given a copy of the rules and the procedure to the Employee listed below and the Employee has signed and agreed to be bound by the Vehicle Usage Agreement.

Employee Name _____

VIN Number of Vehicle _____

Company Vehicle ID Number _____

Period of Allowance _____

Phone: _____

Company by which employed: _____

I, the undersigned Supervisor, personally attest that the following things have been done and are in proper order *(Please check off when complete and attach appropriate documents)*:

- ☐ Employee Driving Record Complete within the last six months
- ☐ Employee Driving Record rating allows operation of motor vehicle in accordance with policy (*List Rating* _____ *Date Completed*_____*)*
- ☐ Employee has presented a valid driver's license (*attach a copy)*
- ☐ Employee has signed the Vehicle Use Agreement and a copy has been obtained by the Company (*attach a copy)*
- ☐ Employee has been given a copy of Motor Vehicle Use Policy and Company Rules for Motor Vehicle Operation
- ☐ Employee has provided sufficient proof of insurance as required by the Procedure (*attach a copy)*

SUPERVISOR SIGNATURE: _____

Printed Name: _____

Date: _____

Phone Number: _____

FAX A COPY OF THIS FORM TO THE EQUIPMENT DIVISION IN FINDLAY, OHIO @ 419-425-6295. ALSO NOTE THAT THE AUTHORIZED EMPLOYEE AND THE AUTHORIZING MANAGER IS RESPONSIBLE FOR MAINTAINING COPIES OF THIS FORM FOR FUTURE REFERENCE AND AUDITING.

DO NOT FAX THIS FORM TO THE BATON ROUGE HEALTH AND SAFETY RECORDS DEPARTMENT.

Attachment 4
Vehicle Use Agreement

THIS VEHICLE USE AGREEMENT made and entered into this _____day of _____, _____, between the undersigned Employee listed below ("Employee") and the undersigned Company below ("Company").

WITNESSETH:

WHEREAS, Employee has been granted permission to be assigned a Company owned/leased vehicle ("Company Vehicle") as is set forth and approved on the AUTHORIZATION FOR ASSIGNMENT FORM.

In consideration of being assigned use of a Company Vehicle, Employee agrees to the following:

1. Employee will not use the Company Vehicle for personal use.
2. Employee will follow all rules and requirements set forth in the Company's Motor Vehicle Use Policy, a copy of which Employee has received.
3. Employee certifies that Employee has automobile insurance on a personal vehicle of Employee, Employee has provided to Company a copy of such insurance, and a copy is attached to this agreement;
4. Employee agrees that for any claims for damage, injury, or death related to Employee's operation of the Company Vehicle while operating the vehicle on non-company business (personal use), that Employee's own personal automobile liability insurance will be primary and will pay the claim **FIRST AND BEFORE** any insurance of Company. In the event that Employee fails to secure and maintain personal automobile insurance coverage and there is a claim for damage or injury related to Employee's operation of the vehicle for personal use, the Employee will then be responsible and accepts liability for any claims paid by Company up to the minimum limits of insurance required in the state of the Employee's permanent residence.
5. Employee understands that violation of this Agreement or any policy or provision or rule contained in the Motor Vehicle Use Policy or any other Policy of the Company will subject the Employee to discipline including the potential loss of driving privileges for the Company or suspension or termination.

I am a person who is able to read in English and I have read this document and agree to all of its terms and conditions. I understand that the privilege to be assigned a Company Vehicle to take home can be withdrawn by the Company at any time for any reason (and without cause) with notice to me. I agree to comply with return of the vehicle when requested by the Company.

Employee_____

Date:_____

Address:_____

Phone:_____

COMPANY Supervisor / Manager:

Name (Print & Sign): _____ Date: _____

FAX A COPY OF THIS FORM TO THE EQUIPMENT DIVISION IN FINDLAY, OHIO @ 419-425-6295. ALSO NOTE THAT THE AUTHORIZED EMPLOYEE AND THE AUTHORIZING MANAGER IS RESPONSIBLE FOR MAINTAINING COPIES OF THIS FORM FOR FUTURE REFERENCE AND AUDITING.

DO NOT FAX THIS FORM TO THE BATON ROUGE HEALTH AND SAFETY RECORDS DEPARTMENT.

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Attachment 5
Driving Record Certification

Fair Credit Reporting Act Disclosure Statement

In accordance with the provisions of Section 604 (b)(2)(A) of the Fair Credit Reporting Act, Pubic Law 91-508, as amended by the Consumer Credit Reporting Act of 1996 (title II, Subtitle D, Chapter I, of Pubic Law 104-208), you are being informed that reports verifying your driving record may be obtained on you for employment purposes. These reports are required by Sections 382.413, 391.23 and 391.25 of Federal Motor Carrier Safety Regulations. You have the right to receive a copy of the reports and have the prescribed allotment of time by law to have any errors corrected and the reports obtained after corrections have been posted.

	Assigned Point Value
Overweight, loss of load, vehicular equipment infraction, etc.	1
Moving violation: speeding, failure to stop, failure to signal turn, etc.	2
At-fault accident	3
Major citation: speeding in excess of 20 mph, reckless driving, tailgating, suspended license, speed contest, improper lane usage, open container, etc.	6
Driving under the influence or Hit and Run (Leaving the Scene)	8

In the space provided below, please list all violations and accidents currently listed on your driving record by the state issuing your driver's license (include all states for which you have held a driver's license during the last two years). Determine the number of points assigned from the table above, and write in column labeled Points. Finally, write the sum total of all points where indicated.

Violations/Accidents	Driver License #/State	Date (mo/yr)	Points

Total Points _____

I hereby certify that the information provided is a complete and accurate statement of my driving record for the previous 24 months. I authorize the company to obtain a copy of my driving record from the state of issuance of my license(s). I understand that falsification of data will disqualify me from being hired or may result in revocation of my company driving privileges.

Driver's License No. _____ Driver's Lic. State of Issuance _____

Expiration Date _____ Date of Birth _____

_____ _____

Print Name Social Security Number

_____ _____

Signature Date

PLEASE FAX THIS FORM TO THE BATON ROUGE H & S RECORDS DEPARTMENT AT (225) 213-1271.

Attachment 6
Notification of Work-Related Citation

This form is to be completed by employees incurring a work-related vehicular citation. Once complete, it is to be signed by the employee's supervisor and forwarded to the appropriate Human Resources Department for inclusion in the employee's personnel file.

Employee Name _____ Employee No. _____ Date _____

Nature of Citation _____

_____

Location of Citation (City, State) _____

Date/Time Citation Received _____

Is Citation Being Contested? ☐ No ☐ Yes Details _____

_____

_____

Employee Signature _____ Date _____

Corrective Action Being Taken _____

_____

_____

Supervisor Signature _____ Date _____

PLEASE FAX THIS FORM TO THE BATON ROUGE H & S RECORDS DEPARTMENT AT (225) 213-1271.

Attachment 7
Non-Shaw Employee Driver Questionnaire

_____ _____

Date *Time*

_____

Vehicle is assigned to what Shaw employee? *Signature of Shaw Employee*

_____

Non-Shaw Driver's Name

Do you have a valid driver's license? ☐ Yes ☐ No

State in which license was issued, DL Number and Exp Date _____

Have you had any citations or accidents in the past 24 months? ☐ Yes ☐ No

If yes, please list type of citations and the associated dates below:

_____

_____

_____

_____

(Refer to HS800, Section 5.3, to determine driver eligibility based on the points system provided.)

By signing below, I, the temporary driver, am acknowledging that the above information is true and accurately represents my driving record. I understand and agree that any misrepresentation or omission of material fact on this questionnaire will constitute sufficient grounds for your removal from the project site and will restrict the future use of Shaw vehicles.

I have read and fully understand the above:

_____ _____

Signature of Non-Shaw Driver? *Date*

Attachment 8
Memorandum Template for Employers of Non-Shaw Drivers

Address

Address

Phone

Fax:

Memorandum

Date:

To:

CC:

From: Project Manager

RE: Requirements for Motor Vehicle Operation

Attached is Shaw Environmental & Infrastructure, Inc. (Shaw E&I) Procedure No. HS800, "Motor Vehicle Operation: General Requirements." As you can see, this policy applies to all operators of Shaw owned, leased, or rented vehicles, as well as personal vehicles used on Shaw business.

Accordingly, you are hereby notified that any employee that is assigned by your company to a Shaw E&I project and is required to operate/drive Shaw owned, leased, or rented vehicles, will be subject to either meeting or exceeding the operator requirements for Shaw employees. Please be aware that as the employer of individuals who are assigned to a Shaw project, you must ensure that your company either adopts the requirements set forth in Shaw E&I Procedure No. HS800 or develop a similar policy that meets or exceeds those requirements.

Only approved non-Shaw employees, who have completed and signed the "Non-Shaw Employee Driver Questionnaire" (Shaw E&I Procedure No. HS800, Attachment 7) will be allowed to drive a Shaw vehicle. Furthermore, prior to the driver operating a Shaw vehicle, the subject questionnaire must be completed and placed on file at the job site. The primary vehicle operator or responsible Shaw management representative shall review the questionnaire and determine whether the non-Shaw employee satisfies the driver qualification requirements of Shaw E&I Procedure No. HS800.

Failure to comply with the requirements of this correspondence or the requirements set forth in Shaw E&I Procedure No. HS800 shall result in disciplinary action up to and including driving privilege revocation or removal of an affected non-Shaw employee from a project site. If the duties of your employees are expected to include driving a Shaw owned, leased, or rented vehicle, please complete Attachment 7, for all of your affected personnel, and provide these to Shaw's site management. Alternatively, please be aware and make your employees aware that they are not authorized to drive a Shaw owned, leased, or rented vehicle without such compliance.

By signing this document, I, an authorized employee and agent of the subject company/employer, am acknowledging acceptance of the above information and agree to my employer's compliance with the referenced requirements stated herein.

_____ _____

Signature / Title *Date*

PROCEDURE

Subject: Commercial Motor Vehicle Regulations and DOT Compliance

1.0 PURPOSE AND SUMMARY

The objective of this policy is to outline the policies and procedures that govern Commercial Motor Vehicle Regulations and Department of Transportation (DOT) Compliance for the operation of commercial motor vehicles used for Company business. All operators of Company owned, leased, rented and personal vehicles are required to comply with this policy in conjunction with policy HS800.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBIITY MATRIX

3.1 Procedure Responsibility

3.1.1 The Vice President of Health & Safety is responsible for the issuance, revision and maintenance of this procedure.

3.2 Action/Approval Responsibilities

3.2.1 See Responsibility Matrix, Attachment 1

4.0 DEFINITIONS

4.1 General

4.1.1 General definitions can be found in DOT Regulations 49 CFR 390.5. Other definitions can be found at the beginning of the regulatory reference for each section of this procedure.

4.1.2 In accordance with FMCSR 390.5(a): "Commercial motor vehicle means any self-propelled or towed vehicle used on public highways in interstate commerce to transport passengers or property when...the vehicle has a gross weight rating or gross combination weight rating of 10,001 or more pounds"

4.1.3 CMV = Commercial Motor Vehicle

4.1.4 CDL = Commercial Drivers License

4.1.5 DOT = Department of Transportation

4.1.6 FMCSR = Federal Motor Carrier Safety Regulations

4.1.7 CFR = Commercial Federal Regulations

4.2 **Commercial Motor Vehicle Requiring CDL Driver**

4.2.1 In accordance with Federal Motor Carrier Safety Regulations (FMCSR) 383.91, there are three vehicle classes which require CDL drivers. The three Commercial Motor Vehicle (CMV) classes are defined as follows:

Class A - "Any combination of vehicles with a GCWR of 26,001 or more pounds provided the GVWR of the vehicle(s) being towed is in excess of 10,000 pounds. (Holders of a Class A license may, with any appropriate endorsements, operate all vehicles within Classes B and C.)"

Class B - "Any single vehicle with a GVWR of 26,001 or more pounds, or any such vehicle towing a vehicle not in excess of 10,000 pounds GVWR (Holders of a Class B license may, with any appropriate endorsements, operate all vehicles within Class C.)"

Class C - "Any single vehicle, or combination of vehicles, that does not meet the definition of Class A or Class B as contained herein, but that either is designed to transport 16 or more passengers including the driver, or is placarded for hazardous materials."

4.2.2 All CDL drivers must:

- Meet or exceed the minimum requirements per the DOT regulations
- Provide in a timely manner all required documentation to the DOT Compliance Administrator Findlay, OH. The Drivers Qualification (DQ) File will be approved, maintained and updated by the DOT Compliance Administrator
- Submit completed **Driver's Daily Logs** which are required to agree with Daily Time Cards. Driver's Daily Logs are to be submitted weekly to the DOT Compliance Administrator Findlay, OH
- Hold a valid Commercial Driver's License (CDL)

4.3 **Commercial Motor Vehicle NOT Requiring CDL Driver**

4.3.1 The CMV described in 4.1.2 is not covered in FMCSR 383.91 and thus would not require a driver to hold a CDL. However, since the vehicle is considered a CMV by the CFR, any employee operating such a vehicle must:

- Meet or exceed the minimum requirements per the DOT regulations
- Provide in a timely manner all required documentation to the DOT Compliance Administrator Findlay, OH. The Drivers Qualification (DQ) File will be approved, maintained and updated by the DOT Compliance Administrator
- Submit completed **Driver's Daily Logs** which are required to agree with Daily Time Cards. Driver's Daily Logs are to be submitted weekly to the DOT Compliance Administrator Findlay, OH
- Hold a valid Driver's License

5.0 POLICY

This policy enforces the Department of Transportation (DOT) regulations; FMCSR = Federal Motor Carrier Safety Regulations and CFR = Commercial Federal Regulations regarding the operation and maintenance of commercial motor vehicles. Requirements are based upon

interstate activity, activity in non-agreement states and **intrastate** drug and alcohol testing. Shaw employees are authorized to use applicable state regulations for **intrastate** activity, but must fully comply with Federal regulations whenever an **intrastate** unit engages in **interstate** activity. All Commercial Motor Vehicle drivers **must** contact both;

5.1 DOT Compliance Administrator in Findlay, OH for DOT compliance and training

5.2 Corporate Health & Safety in Baton Rouge, LA for required enrollment in the random drug testing program

6.0 PROCEDURE

6.1 General Requirements

6.1.1 All locations operating commercial motor vehicles shall maintain a current copy of the Federal Motor Carrier Safety Regulations (FMCSR) and the Hazardous Materials Regulations (HMR), both of which are found in Title 49 of the Commercial Federal Regulations.

6.1.2 Training requirements for all drivers include attending these training classes:

- Safe Driver Training (SDT)
- Hazardous Waste Hauling (HWH)
- Vacuum Truck Safety Training (VTST) (Note: Vacuum truck operators only)
- Defensive Driving refresher training is required every two (2) years

6.1.3 All locations operating commercial motor vehicles shall include safe commercial motor vehicle operation in their safety incentive and awareness programs

6.1.4 All locations operating commercial motor vehicles shall monitor overall compliance in accordance with:

- HS021; Accident Prevention Program: Management Safety Audits and Inspections
- HS018; Safety Councils

6.1.5 A person is qualified to operate a commercial motor vehicle if they

- are at least 21 years old;
- can read and speak the English language sufficiently to converse with the general public, to understand highway traffic signs and signals in the English language, to respond to official inquiries, and make entries on reports and records;
- can by reason of experience and training safely operate the type of motor vehicle he or she drives
- can by reason of experience and training determine whether the cargo to be transported has been properly stored, distributed and secured in or on the motor vehicle;
- are familiar with methods and procedures for securing cargo in or on the motor vehicle; and
- have a complete and current Driver Qualification File (DQ) with the DOT Compliance Administrator Findlay, OH. (see Section 6.4)

6.2 Motor Carrier Insurance and Financial Responsibility

6.2.1 Corporate Risk Management shall provide and maintain insurance and financial responsibility information as required by 49 CFR 387.

6.2.2 Corporate Risk Management shall execute DOT MCS90, with a copy forwarded to the DOT Compliance Administrator Findlay, OH.

6.2.3 See 49 CFR 387 for additional regulations.

6.3 **Accident Notification and Reporting**

6.3.1 All accidents and near misses shall be reported in accordance with:
- HS020; Accident Prevention Program: Reporting, Investigation and Review
- HS091; Serious Injury and Fatality Reporting Requirements
- Monthly Loss Reports

6.3.2 Commercial Federal Regulations require that motor carriers maintain, for a period of one year after an accident occurs, an "Accident Register" containing specific information. This applies to <u>all commercial vehicle accidents</u>. Corporate Health & Safety will maintain the Register. The Register must include: date and time of accident, city/state, driver's name, number of injuries and/or fatalities, and whether hazardous materials other than fuel were released. Motor carriers are also required to maintain copies of all accident reports required by State and/or other governmental entities or insurers. **Motor carriers must continue to retain copies of all accident reports previously submitted to FHWA for a period of three (3) years after the date of the accident.** (49 CFR 390, Subpart A)

6.3.3 Corporate Health & Safety must be notified by telephone or fax of <u>all commercial vehicle accidents</u> within 24 hours, or not later than the next business day. Per HS020 the **Vehicle Accident Report** shall be used.

6.3.4 The Accident Register shall include the most reliable information on "reportable accidents" available to the motor carrier. A "reportable accident" means an occurrence involving a commercial motor vehicle operating on a public road which results in:
- A fatality; defined as any injury which results in the death of a person at the time of the motor vehicle accident or within 30 days of the accident
- Bodily injury to a person who, as a result of the injury, immediately receives medical treatment away from the scene of the accident; or
- One or more vehicles incurring disabling damage as a result of the accident, requiring the vehicle(s) to be transported away from the scene by a tow truck or other vehicle

6.3.5 The term "accident" does **<u>not</u>** include:
- An occurrence involving only boarding and alighting from a stationary motor vehicle;
- An occurrence involving only the loading or unloading of cargo; or
- An occurrence in the course of the operation of a passenger car or a multipurpose passenger vehicle (as defined in 571.3 of 49 CFR) by a motor carrier and is not transporting passengers for hire or hazardous materials of a type and quantity that require the motor vehicle to be marked or placarded in accordance with 177.823 of 49 CFR.

6.3.6 "Disabling damage" means damage which precludes departure of a motor vehicle from the scene of the accident in its usual manner in daylight after simple repairs.

6.3.6.1 Inclusions

- Damage to motor vehicles that could have been driven, but would have been further damaged if so driven

6.3.6.2 Exclusions:

- Damage which can be remedied temporarily at the scene of the accident without special tools or parts;
- Tire disablement without other damage even if no spare tire is available;
- Damage to turn signals, horn or windshield wipers which make them inoperative.

6.3.7 All Vehicle Accident Reports shall include the most reliable information available to the motor carrier on the following subjects:

- Date of accident;
- Time of accident;
- Location (city, state) of the accident;
- Name of driver;
- Number of persons injured;
- Number of persons killed; and
- Whether hazardous materials were released (other than fuel).

6.3.8 Follow-up action with drivers involved with vehicle accidents shall be per HS800 Motor Vehicle Operation: General Requirements and the Shaw progressive discipline system.

6.3.9 See 49 CFR 390 for additional regulations.

6.4 Qualifications of Drivers

6.4.1 All hiring of drivers shall be done in accordance with the requirements of HS800 Motor Vehicle Operation: General Requirements and 49 CFR 391.

6.4.2 All prospective drivers shall be interviewed to verify the accuracy of information on the application.

6.4.3 All prospective drivers shall be required to show proof of current automobile insurance prior to hiring.

6.4.4 All locations shall track and verify that the following driver documents are current: Driver's License, Driver's Certification of Violations, Annual Review of Driving Record and Medical. **The Employee's Records Expiration Dates form** may be used for this purpose.

6.4.5 Prior to being allowed to operate a commercial motor vehicle, all drivers will be required to provide a **Driver Qualification File** with the following requirements to the DOT Compliance Administrator, Findlay, OH and their Home Terminal.

6.4.5.1 **Driver Qualification File - Commercial Drivers License (CDL)**

- **Combination Vehicle (Class A)** - Any combination of vehicles with a Gross Combination Weight Rating (GCWR) of 26,001 or more pounds provided the GVWR of the vehicle(s) being towed is in excess of 10,000 pounds.

- **Heavy Straight Vehicle (Class B)** - Any single vehicle with a GVWR of 26,001 or more pounds, or any such vehicle towing a vehicle not in excess of 10,000 pounds GVWR.

- **Small Vehicle (Class C)** - Any single vehicle, or combination of vehicles, that meets neither the definition of Class A nor that of Class B as contained in this section, but that either is designed to transport 16 or more passengers including the driver, or is used in the transportation of materials found to be hazardous for the purposes of the Hazardous Materials Transportation Act and which require the motor vehicle to be placarded under the Hazardous Materials Regulations (49 CFR Part 172, Subpart F).

- (See 49 CFR 383.91 Figure 1 for additional regulations on vehicles and CDL Classes.)

6.4.5.2 **Driver Qualification File - Driver's License** - A driver operating a combination vehicle with a gross combined weight rating exceeding 10,001 pounds, but never operating a vehicle in one of the CDL classes (A,B,C), may perform these duties with a valid driver's license. No CDL is required.

6.4.5.3 **Driver Qualification File – Additional Requirements**

- Receipt for Federal Motor Carrier Safety Regulations (FMCSR)
- Application for Employment
- DOT Driver Supplemental Application for Employment
- Driver's Road Test Examination
- Written Examination - This exam will be reviewed by the examiner and incorrect responses will be reviewed and corrected with the driver. Examiner and driver shall initial test when complete.
- Certification of Road Test and Written Examination - A copy of this form must be provided to the driver.
- Annual Driver's Certification of Violations
- Inquiry to Previous Employers - This form pertains to experience operating commercial motor vehicles.
- Alcohol & Controlled Substance Test Information Inquiry to Previous Employers - This is a Federal requirement which went into effective January 1, 1995. Whereas the Inquiry to Previous Employers regarding experience does not require a response, this form requires a response from the previous employer with 14 days of the driver being qualified. If a response is not received within the specified time, the driver is automatically disqualified.
- Periodic inquiry to State Agencies for Driver's Record
- Annual Review of Driving Record.
- Driver Data Sheet

- Medical Examiner's Certificate - The certificate must be signed by the driver and Shaw's Medical Review Officer. A copy must also be provided to the driver.
- DOT Long Form
- Medical Clearance and Drug and Alcohol Test Report
- **NOTE:** All drug and alcohol test results for commercial drivers must be retained with DOT Compliance Administrator, Findlay, OH and Health and Safety, Baton Rouge, LA. Medical Clearance must be endorsed for DOT and signed on back by supervisor and driver. DOT requires examination every two years. Shaw requires examination every year due to hazardous waste operations duties. Also note that issuance of medical clearance signifies a negative drug test result for baseline and update exams. See Shaw HS100 Medical Policies and HS101 Drug and Alcohol Testing for further information.
- Vehicle Types - This list details which vehicles a driver is qualified and/or authorized to operate based on his CDL class and endorsements. Applicable to all states.
- Certification of Drug and Alcohol Awareness Training

6.5 **Driving of Motor Vehicles**

6.5.1 Use, possession, or sale of drugs, alcohol, or other illicit substances is generally prohibited. Specific procedures are found in HR024 Illegal Drugs, Alcohol, and Other Substances and HS101 Drug and Alcohol Testing.

6.5.2 Authorized passengers are limited to employees of Shaw and those subcontractor, client or regulatory personnel who are integral in performing a project task.

6.5.3 Management shall monitor compliance with speed laws by reviewing daily miles of operation versus actual driving time. Runs in excess of 500 miles shall have documentation attached that speed laws and hours of service rules were not violated (e.g. areas where speed laws exceed 55 mph).

6.5.4 See 49 CFR 392 for additional regulations.

6.6 **Inspection, Repair, and Maintenance**

6.6.1 All commercial motor vehicles shall be included in a scheduled preventive maintenance program. Service intervals shall be in terms of miles or hours of operation. Service intervals and service requirements shall be per the manufacturer's recommendations with manufacturer recommendations documented in the Vehicle Maintenance File in Findlay.

6.6.2 Whenever manufacturer service recommendations either fail to cover company's utilization of the equipment or are unavailable, preventative maintenance shall be done in accordance with Shaw Procedure EQ008, Repairs and Maintenance.

6.6.3 All drivers operating a commercial motor vehicle shall conduct and document a pre-trip inspection in accordance with 49 CFR 396.13 and a post-trip inspection in accordance with 49 CFR 396.11 using the **Driver's Daily Vehicle Inspection Report**. No vehicle shall be operated unless the following parts and accessories

are in good working order: service brakes (including trailer brake connections), parking brake, steering mechanism, lighting devices and reflectors, tires, horn, windshield wiper(s), rear-vision mirror(s) and coupling devices, wheels and rims and emergency equipment. When there is a defect or deficiency which would likely affect the safety operation of the vehicle, a copy is required to be submitted to the Maintenance Service Manager and the original is to remain with the vehicle until correction is performed.

6.6.4 When repairs are needed, a **Work Order Request Form** will be completed. Upon approval of the needed repair, the work will be performed in accordance with manufacturer service recommendations. Once the work is complete, the mechanic will record on the **Work Order Form** the work that was performed and will file the form in the Vehicle Maintenance File Findlay, OH. The agent performing the repairs will sign the original **Driver's Daily Vehicle Inspection Report** in the vehicle. The on-coming driver shall verify that repairs have been made, sign the **Driver's Daily Vehicle Inspection Report** and forward the original to the DOT Compliance Administrator Findlay, OH with a copy forwarded to Maintenance Department Findlay, OH. In conjunction with, the **Driver's Daily Vehicle Inspection Report** for long-term projects, a **Weekly Vehicle Inspection Form** may be completed.

6.6.5 All **Driver's Daily Vehicle Inspection Reports** shall be forwarded to the DOT Compliance Administrator Findlay, OH not later than the twentieth day of the following month, and retained there for three months.

6.6.6 All Commercial Motor Vehicles shall be subject to an annual safety inspection in accordance with 49 CFR 396.17. A copy of this inspection shall be forwarded to the DOT Compliance Administrator and Maintenance Department Findlay, OH. Note that the vehicle must carry a copy of the inspection and be marked with a sticker/decal displaying the information required in 49 CFR 396.17(c)(2).

6.6.7 A limited safety inspection is required no less often than 90 days.

6.6.8 Inspectors shall meet the qualification requirements in 49 CFR 396.19. The DOT Compliance Administrator is responsible to approve qualified inspectors per DOT requirements upon completion of the **Inspector Qualifications Form**. Certification of qualifications must be on file with DOT Compliance Administrator Findlay, OH.

6.6.9 Brake inspectors shall meet the qualification requirement in 49 CFR 396.25, which generally includes completion of an approved training program or one year of documented experience. The DOT Compliance Administrator is responsible to approve qualified inspectors per DOT requirements upon completion of the **Brake Inspector Qualifications Form**. Any driver making brake adjustments must also have certification of qualifications on file with DOT Compliance Administrator Findlay, OH.

6.6.10 Where an outside vendor is used for inspection and repair, DOT Compliance Administrator Findlay, OH shall verify that the vendor understands and will comply with inspector qualification requirements.

6.6.11 The **Vehicle Service and Maintenance Record Form** shall be used to check completeness of Vehicle Maintenance File Findlay, OH.

6.6.12 49 CFR 396.9 must be complied with in determining the service status of all commercial motor vehicles. Vehicles shall be marked out-of-service that would result in its mechanical breakdown or affect the safety of operation of the vehicle. Any vehicle identified as out-of-service will not be operated until such repairs have been performed.

6.6.13 All cargo tanks shall have a copy of the manufacturer's data report and required recertification in the maintenance file. Qualifications for recertification vendors shall be on file with the DOT Compliance Administrator. Recertification requirements can be found in 49 CFR 180.

6.6.14 All exempt vehicles or trailers are required to carry a copy of the exemption within in the trailer.

6.7 Hours of Service of Drivers

6.7.1 Drivers shall not operate a commercial motor vehicle under the following conditions:

- More than 11 hours following 10 consecutive hours off-duty;
- For any period after having been on duty for 14 hours; or
- For any period after having been on duty for 70 hours during the period of eight consecutive days with the eighth day being the current date.
- A driver may restart a 7 and or 8 consecutive day period after taking 34 or more consecutive hours off duty.

6.7.2 All drivers shall record their duty status on the Driver's Daily Log (see DOT Manual), including recap. Logs shall be completely filled out and submitted to home terminal management daily, or no less often than every 13 days for extended trips. Note that a driver’s daily log must match a driver’s timesheet but cannot replace a time card.

6.7.3 Local management shall carefully review all Drivers’ Daily Logs. They shall require the driver to correct any errors, and take follow-up action (training or progressive discipline) where regulations or company procedures have been violated.

6.7.4 Dispatchers shall track driver’s hours of service via the driver's recap for local service and via recap and daily phone calls during extended trips.

6.7.5 The DOT Log Book Compliance Checklist shall be used by management to review Driver's Daily Logs.

6.7.6 All original Drivers’ Daily Logs are to be forwarded to the DOT Compliance Administrator in Findlay by the twentieth day of the following month, and retained there for six months. Copies must also be retained at the local office for six months.

6.7.7 See 49 CFR 395 for additional regulations.

6.8 Transportation of Hazardous Materials Driving and Parking Rules

6.8.1 A motor vehicle containing hazardous materials must not be operated near an open fire unless its driver has first taken precautions to ascertain that the vehicle can safely pass the fire without stopping.

6.8.2 A motor vehicle containing hazardous materials must not be parked within 300 feet of an open fire.

6.8.3 No person may smoke or carry a lighted cigarette, cigar, or pipe on or within 25 feet of:

- A motor vehicle which contains explosives, oxidizing materials, or flammable materials; or
- An empty tank motor vehicle which has been used to transport flammable liquids or gases and which, when so used, was required to be marked or placarded in accordance with the rules in subsection 177.823 or 49 CFR.

6.8.4 When a motor vehicle which contains hazardous materials is being fueled:

- Its engine must not be operating, and
- A person must be in control of the fueling process at the point where the fuel tank is filled.

6.8.5 A motor vehicle transporting hazardous materials of a kind or quantity that require the vehicle to be marked or placarded in accordance with subsection 177.823 of 49 CFR must also display the information required in subsection 390.21 of 49 CFR, including USDOT 197183 (the Shaw DOT number).

6.8.6 Special consideration shall be given to avoidance of heavily populated areas when hauling hazardous material/waste loads.

6.9 Carriage by Public Highway

6.9.1 All loads of hazardous materials or hazardous wastes shall be accompanied by shipping papers or hazardous waste manifest, respectively. These documents shall be prepared in accordance with 49 CFR 177.817 and 49 CFR 172 Subpart C. All documents shall be retained for at least three years. Shipping documents using any generic descriptions (e.g. "n.o.s.") must also contain the technical name of the hazardous substance in parentheses following the basic description.

6.9.2 Shipping documents shall be within the drivers reach and readily visible. When the driver is out of the cab, they shall be in the driver's door pocket or on the driver's seat.

6.9.3 All hazardous materials/wastes loads shall be marked, labeled, and placarded in accordance with 49 CFR 192 Subparts D, E, and F, respectively.

6.9.4 All hazardous materials/wastes loads shall be reported and segregated in accordance with 49 CFR 177.848.

6.9.5 Spill incidents meeting any of the criteria listed below shall be reported to the DOT Compliance Administrator on DOT Form F 5800.1 (Attachment 2):

- Any quantity of hazardous waste,
- A reportable quantity (RQ) of hazardous material,

*** * * Criteria listed below require immediate phone notification * * ***

- A fatal injury or hospitalization occurs;
- Property damage exceeds $50,000;
- Radioactive materials are spilled;
- The general public is evacuated for more than one hour; or
- Etiologic agent(s) are discharged.

6.9.6 49 CFR 177 for additional regulations.

7.0 EXCEPTION PROVISIONS

Variances to this procedure shall be requested in accordance with procedure HS013 Health & Safety Procedure Variances.

8.0 CROSS REFERENCES

HS018 Safety Councils
HS020 Accident Prevention Program: Reporting, Investigation and Review
HS021 Accident Prevention Program: Management Safety Audits and Inspections
HS091 Serious Injury and Fatality Reporting Requirements
HS100 Medical Policies
HS101 Drug and Alcohol Testing
HS800 Motor Vehicle Operation: General Requirements
EQ008 Repair and Maintenance
DOT DOT Forms in DOT Manual

9.0 ATTACHMENTS

Attachment 1 Responsibility Matrix
Attachment 2 Hazardous Materials Incident Report (Form DOT F 5800.1)

ATTACHMENT 1
COMMERCIAL MOTOR VEHICLE OPERATION AND MAINTENANCE

Responsibility Matrix

Action	Procedure Section	*Responsible Party*			
		DOT Administrator	**Risk Mgmt. Dept.**	**Corporate HS**	**Driver**
Verify driver meets general requirements, including training	6.1	X		X	
Maintain statutory financial responsibility	6.2		X		
Accident Reporting: Internal	6.3	X			X
Accident Reporting: External	6.3			X	
Document driver qualification: Establish DQ file Maintain DQ file	 6.4 6.4	 X X			
Monitor driver performance	6.5	X			
Maintain, inspect and service vehicles, and document (retain working copy)	6.6	X			
Hold maintenance documents	6.6	X			
Verify drivers comply with and document hours of service requirements	6.7	X			
Hold Drivers Daily Logs for 374 days	6.7	X			

ATTACHMENT 2
HAZARDOUS MATERIALS INCIDENT FORM

DEPARTMENT OF TRANSPORTATION Form Approved DMB No. 2137 0039
HAZARDOUS MATERIALS INCIDENT REPORT

INSTRUCTIONS: Submit this report in duplicate to the Information Systems Manager, Office of Hazardous Materials Transportation, DHM-63, Research and Special Programs Administration, U.S. Department of Transportation, Washington, D.C. 20590. If space provided for any item is inadequate, complete that item under Section IX, keying to the entry number being completed. Copies of this form, in limited quantities, may be obtained from the Information Systems Manager, Office of Hazardous Materials Transportation. Additional copies in this prescribed format may be reproduced and used, if on the same size and king of paper.

I. MODE, DATE, AND LOCATION OF INCIDENT

1. MODE OF TRANSPORTATION Γ Air Γ Highway Γ Rail Γ Water Γ Other

2. DATE AND TIME OF INCIDENT (Use Military time [e.g., 8:30 am=0830, Noon=1200, 6 pm=1800, Midnight=2400])
Date: Time:

3. LOCATION OF INCIDENT (Include airport name in ROUTE/STREET if incident occurs at an airport.)
CITY: STATE:
COUNTY: ROUTE/STREET:

II. DESCRIPTION OF CARRIER, COMPANY, OR INDIVIDUAL REPORTING

4. FULL NAME	5. ADDRESS (Principal place of business)

6. LIST YOUR OMC MOTOR CARRIER CENSUS NUMBER, REPORTING RAILROAD ALPHABETIC CODE, MERCHANT VESSEL NAME AND ID NUMBER OR OTHER REPORTING CODE OR NUMBER.

III. SHIPMENT INFORMATION (From Shipping Paper or Packaging)

7. SHIPPER NAME AND ADDRESS (Principal place of business)	8. CONSIGNEE NAME AND ADDRESS (Principal place of business)
9. ORIGIN ADDRESS (If different from Shipper address)	10. DESTINATION ADDRESS (If different from Consignee address)

11. SHIPPING PAPER/WAYBILL IDENTIFICATION NO.

IV. HAZARDOUS MATERIAL(S) SPILLED (NOTE: REFERENCE 49 CFR SECTION 172.101.)

12. PROPER SHIPPING NAME	13. CHEMICAL/TRADE NAME	14. HAZARD CLASS	15. IDENTIFICATION NO. (i.e., UN 2020)

16. IS MATERIAL A HAZARDOUS SUBSTANCE? Γ YES Γ NO	17. WAS THE RO MET? Γ YES Γ NO

18. ESTIMATED QUANTITY HAZARDOUS MATERIAL RELEASED (Include easurement)	19. FATALITIES	20. HOSPITALIZED	21. NON-HOSPITALIZED INJURIES
22. NUMBER OF PEOPLE EVACUATED			

23. ESTIMATED DOLLAR AMOUNT OF LOSS AND/OR PROPERTY DAMAGE, INCLUDING COST OF DECONTAMINATION OR CLEANUP (Round off in dollars):

A. PRODUCT LOSS	B. CARRIER DAMAGE	C. PUBLIC/PRIVATE PROPERTY DAMAGE	D. DECONTAMINATION/ CLEANUP	E. OTHER

24. CONSEQUENCES ASSOCIATED WITH INCIDENT: Γ VAPOR (GAS) DISPERSION ΓMATERIAL ENTERED

Γ SPILLAGE	ΓFIRE	WATERWAY SEWER		ΓEXPLOSION	Γ ENVIRONMENTAL DAMAGE
				Γ NONE	Γ OTHER

VI. TRANSPORT ENVIRONMENT

25. INDICATE TYPE(S) OF VEHICLE(S) INVOLVED: Γ CARGO TANK Γ VAN TRUCK/TRAILER Γ FLAT BED TRUCK TRAILER Γ TANK CAR ΓRAIL CAR ΓTOFC/COFC ΓAIRCRAFT ΓBARGE Γ SHIP Γ OTHER_____

26. TRANSPORTATION PHASE DURING WHICH INCIDENT OCCURRED OR WAS DISCOVERED: Γ EN ROUTE BETWEEN ORIGIN/DESTINATION Γ LOADING Γ UNLOADING Γ TEMPORARY STORAGE TERMINAL

27. LAND USE AT INCIDENT SITE: Γ INDUSTRIAL Γ COMMERCIAL Γ RESIDENTIAL Γ AGRICULTURAL Γ UNDEVELOPED

28. COMMUNITY TYPE AT SITE: Γ URBAN Γ SUBURBAN ΓRURAL

29. WAS THE SPILL THE RESULT OF A VEHICLE ACCIDENT/DERAILMENT? Γ YES Γ NO
IF YES AND APPLICABLE, ANSWER PARTS A THRU C.

A ESTIMATED SPEED:	B. HIGHWAY TYPE: Γ DIVIDED/LIMITED ACCESS Γ UNDIVIDED	C. TOTAL NUMBER OF LANES: [ ] ONE [ ] TWO [ ] THREE [ ] FOUR OR MORE	**SPACE FOR DOT USE ONLY**

VII. PACKAGING INFORMATION: If the package is overpacked (consists of several packages [e.g., glass jars within a fiberboard box]), begin with A for information on the innermost package.

ITEM	A	B	C
30. TYPE OF PACKAGING. INCLUDE INNER RECEPTACLES l drum, tank car)			
31. CAPACITY OR WEIGHT PER UNIT PACKAGE (e.g., 55 gallons, 65 lbs.)			
32. NUMBER OF PACKAGES OF SAME TYPE WHICH FAILED CAL MANNER			
33. NUMBER OF PACKAGES OF SAME TYPE IN SHIPMENT			
34. PACKAGE SPECIFICATION IDENTIFICATION (e.g., DOT 17E, DOT 105A 100, UN1A1 or none)			
35. ANY OTHER PACKAGING MARKINGS (e.g., STC, 18/16-55-88, Y1.4/150/87)			
36. NAME AND ADDRESS, SYMBOL OR REGISTRATION OF PACKAGING MANUFACTURER			
37. SERIAL NUMBER OF CYLINDERS, PORTABLE TANKS, ANKS, TANK CARS			
38. TYPE OF LABELING OR PLACARDING APPLIED			
39. IF RECONDITIONED OR FIED — A. REGISTRATION OR SYMBOL			
39. IF RECONDITIONED OR FIED — B. DATE OF LAST TEST OR ON			
40. EXEMPTION/APPROVAL/COMPETENT AUTHORITY			

IF APPLICABLE (e.g., DOT E1012)			

41. ACTION CONTRIBUTING TO PACKAGING FAILURE:

	A	B	C		A	B	C
a.	Γ	Γ	Γ	TRANSPORT VEHICLE COLLISION	Γ	Γ	Γ	CORROSION
b.	Γ	Γ	Γ	TRANSPORT VEHICLE OVERTURN	Γ	Γ	Γ	METAL FATIGUE
c.	Γ	Γ	Γ	OVERLOADING/OVERFILLING	Γ	Γ	Γ	FRICTION/RUBBING
d.	Γ	Γ	Γ	LOOSE FITTINGS, VALVES	Γ	Γ	Γ	FIRE/HEAT
e.	Γ	Γ	Γ	DEFECTIVE FITTINGS, VALVES	Γ	Γ	Γ	FREEZING
f.	Γ	Γ	Γ	DROPPED	Γ	Γ	Γ	VENTING
g.	Γ	Γ	Γ	STRUCK/RAMMED	Γ	Γ	Γ	VANDALISM
h.	Γ	Γ	Γ	IMPROPER LOADING	Γ	Γ	Γ	INCOMPATIBLE MATERIALS
i.	Γ	Γ	Γ	IMPROPER BLOCKING	Γ	Γ	Γ	OTHER

42. OBJECT CAUSING FAILURE:

	A	B	C
a.	Γ	Γ	Γ	OTHER FREIGHT
b.	Γ	Γ	Γ	FORKLIFT
c.	Γ	Γ	Γ	NAIL/PROTRUSION
d.	Γ	Γ	Γ	OTHER TRANSPORT VEHICLE
e.	Γ	Γ	Γ	WATER/OTHER LIQUID
f.	Γ	Γ	Γ	GROUND/FLOOR/ROADWAY
g.	Γ	Γ	Γ	ROADSIDE OBSTACLE
h.	Γ	Γ	Γ	NONE
i.	Γ	Γ	Γ	OTHER

43. HOW PACKAGE(S) FAILED:

	A	B	C
a.	Γ	Γ	Γ	PUNCTURED
b.	Γ	Γ	Γ	CRACKED
c.	Γ	Γ	Γ	BURST/INTERNAL PRESSURE
d.	Γ	Γ	Γ	RIPPED
e.	Γ	Γ	Γ	CRUSHED
f.	Γ	Γ	Γ	RUBBED/ABRADED
g.	Γ	Γ	Γ	RUPTURED
h.			Γ	Γ	Γ	OTHER_

44. PACKAGE AREA THAT FAILED:

	A	B	C
a.	Γ	Γ	Γ	END, FORWARD
b.	Γ	Γ	Γ	END, READ
c.	Γ	Γ	Γ	SIDE, RIGHT
d.	Γ	Γ	Γ	SIDE, LEFT
e.	Γ	Γ	Γ	TOP
f.	Γ	Γ	Γ	BOTTOM
g.	Γ	Γ	Γ	CENTER
h.			Γ	Γ	Γ	OTHER_

45. WHAT FAILED ON PACKAGE(S):

	A	B	C
a.	Γ	Γ	Γ	BASIC PACKAGE MATERIAL
b.	Γ	Γ	Γ	FITTING/VALVE
c.	Γ	Γ	Γ	CLOSURE
d.	Γ	Γ	Γ	CHIME
e.	Γ	Γ	Γ	WELD/SEAM
f.	Γ	Γ	Γ	HOSE/PIPING
g.	Γ	Γ	Γ	INNER LINER
h.	Γ	Γ	Γ	OTHER

IX. DESCRIPTION OF EVENTS: Describe the sequence of events that led to incident, action taken at time discovered, and action taken to prevent cidents. Include any recommendations to improve packaging, handling, or transportation of hazardous materials. Photographs and diagrams should itted when necessary for clarification. ATTACH A COPY OF THE HAZARDOUS WASTE MANIFEST FOR INCIDENTS INVOLVING HAZARDOUS Continue on additional sheets if necessary.

46. NAME OF PERSON RESPONSIBLE FOR PREPARING REPORT (Please Print)	47. SIGNATURE	
48. TITLE OF PERSON RESPONSIBLE FOR PREPARING REPORT	49. TELEPHONE NUMBER (Area Code) ( ) -	50. DATE REPORT SIGNED

VIII. DESCRIPTION OF PACKAGING FAILURE: Check all applicable boxes for the package(s) identified above.

PROCEDURE

Subject: COMPLIANCE REQUIREMENTS FOR DOT'S EMERGENCY RESPONSE INFORMATION TELEPHONE NUMBER

1.0 PURPOSE AND SUMMARY

This procedure describes the method the Company will utilize to comply with the U.S. Department of Transportation's (DOT) requirement to provide an emergency response information telephone number on hazardous material shipping papers (49 CFR 172.604). Key items discussed in this procedure include:

- Method of compliance
- Business line participation requirement
- Definition of shipment information that must be sent to the communication service
- Training requirements.

NOTE: Shipments of Troxler nuclear density gauges are subject to a separate procedure that satisfies this DOT requirement differently. Shippers of Troxler nuclear density gauges are trained in the proper implementation of that procedure.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Company - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

5.0 TEXT

DOT requires that shippers of hazardous materials provide an emergency response information telephone number to be used in event of an emergency involving the hazardous material shipment. The telephone number must be monitored at all times the hazardous material is in transport by a person knowledgeable of the hazardous material(s) being shipped and having comprehensive emergency response and incident mitigation information for that material(s), or having immediate access to a person who possesses such knowledge and information.

The emergency response information telephone number must be entered on the shipping papers (hazardous waste manifest, bill of lading, Shippers Declaration of Dangerous Goods) for all shipments of hazardous materials that require shipping papers.

5.1 Method of Compliance

The Company satisfies this DOT requirement by contracting CHEMTREC to provide answering and emergency information services.

5.2 Business Line Participation

All business lines that ship hazardous materials (including hazardous waste, environmental samples meeting DOT hazard class definitions, and air shipments of dangerous goods) shall utilize the CHEMTREC service to comply with emergency response information telephone number requirements.

5.3 Utilization of the Emergency Response Information Telephone Number for Hazardous Materials Shipments

The CHEMTREC emergency response telephone service may only be used when the Company is the shipper.

5.3.1 Preparations for Use of the Emergency Response Information Telephone Number. The following minimal information must be provided to CHEMTREC in advance of shipping hazardous materials:

- A copy of the completed shipping papers (Bill of Lading, Shipper's Declaration for Dangerous Goods, or Hazardous Waste Manifest) for the shipment and either of the following (or similar document) if available:

- A Material Safety Data Sheet (MSDS) for each hazardous material

- A completed waste profile for hazardous waste.

The information may be provided by fax (703-741-6037) or other means acceptable to CHEMTREC. All submissions to CHEMTREC must prominently indicate the customer code "ITCR" so that documents can be correctly linked to the Company's account. The employee responsible for preparing the shipping papers must verify receipt of a legible copy of the information by CHEMTREC prior to releasing the shipment to the transporter.

5.3.2 Procedures for Use of the Emergency Response Information Telephone Number

The emergency response information telephone number to be entered on the shipping paper is 1-800-424-9300. The appropriate Emergency Response Guidebook (ERG) guide number should be indicated in close proximity to CHEMTREC's telephone number. It should appear as, "24-hour Emergency Phone: 800-424-9300, ERG #xxx" where the "xxx" represents the appropriate three-digit guide number found in the ERG.

CHEMTREC will provide callers with the following emergency response information:

- The basic description and technical name of the hazardous material(s);

- Immediate hazards to health;

- Risks of fire or explosion;

- Immediate precautions to be taken in the event of an incident;

- Immediate methods of handling fires;

- Initial methods for handling spills or leaks in the absence of fire;

- Preliminary first aid measures.

In the event the CHEMTREC Dispatcher contacts the Company employee responsible for the shipment in association with a transportation incident, this will be considered an unusual occurrence, and the Company employee will document the incident using the CHEMTREC Emergency Call Documentation Form (Attachment 2).

Completed forms shall be sent to the Director of Health and Safety for review, determination of corrective action and as a basis for a lesson learned.

5.4 Training

Prior to being directed or permitted to ship hazardous materials or use the 24-hour emergency response information telephone number, employees will be trained in accordance with 49 CFR 172 Subpart H and will be familiar with the requirements of this procedure.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances

7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
49 CFR 172 Subpart G

8.0 ATTACHMENTS

1. Responsibility Matrix
2. CHEMTREC Emergency Call Documentation Form

ATTACHMENT 1
EMERGENCY RESPONSE INFORMATION TELEPHONE NUMBER

Responsibility Matrix

Action	Procedure Section	*Responsible Party*		
		CHEMTREC Dispatcher	**Company Employee Responsible for Shipment**	**Director of Health and Safety**
Issuance, revision, and maintenance of Procedure	3.1			X
Provide required shipment information to the CHEMTREC Dispatcher by Fax (703-741-6037) or other means, indicating "ITCR" prominently, and call to confirm delivery and legibility **PRIOR TO RELEASING THE SHIPMENT**	5.3.1		X	
Document contacts from CHEMTREC regarding transportation incidents using Attachment 2. Forward completed Attachment 2 to Vice President Health and Safety.	5.3.2		X	
Provide Emergency Callers With the Required Information	5.3.2	X		

ATTACHMENT 2

CHEMTREC EMERGENCY CALL DOCUMENTATION FORM

1. Date _____ Time _____ am/pm

2. Caller Information:

   Name: _____

   Affiliation: _____

   Phone Number: _____

3. Incident Information:

   Location: _____

   Description: _____

   _____

   Agencies On Site: _____

   _____

   Shipment Tracking Number, Bill of Lading Number, Hazardous Waste Manifest Number, or Other Shipment Identifier: _____

   _____

4. Other Information: _____

   _____

   _____

   _____

   _____

5. Name of Company Employee:

   _____ _____

   (Printed) (Signature)

PROCEDURE

Subject: FORKLIFT OPERATION

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to establish the requirements for the safe operation, maintenance, and inspection of forklift-type powered industrial trucks. It is intended to address the requirements of Occupational Safety and Health Administration (OSHA) Standard 29 CFR 1910.178, which regulates the operation and maintenance of forklifts. A copy of this procedure shall be conspicuously posted at a place frequented by forklift operators.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Company - All wholly-owned subsidiaries of Shaw Environmental and Infrastructure, Inc. (Shaw E & I).

Qualified Trainer - An employee who has the knowledge, training, and experience necessary to train forklift operators and evaluate their competence.

5.0 TEXT

This procedure establishes the minimum safety standards for the inspection, operation, and maintenance of company owned and/or operated forklifts. It is not intended to apply to other types of powered industrial trucks such as those used primarily for earthmoving or over-the-road hauling.

5.1 Operation

Only employees who are actively participating in training or have been trained in accordance with Section 5.2 of this procedure will be permitted to operate company owned, rented, or leased forklifts. The following forklift operational rules will be observed by all company employees operating forklifts:

- Forklifts shall be operated within rated capacity at all times. All capacity, operation, and maintenance instruction plates, tags, or decals shall be maintained in legible condition and strictly followed.

- Stunt driving and horseplay are prohibited.

- Employees shall not be permitted to ride on the forks of forklifts.

- Employees shall not place any part of their bodies outside the running lines of a forklift or between mast uprights and other parts of the equipment.

- Operators will inspect the forklift prior to its operation and report any unsafe conditions to their supervisor. The forklift will not be put back into service until it has been repaired by a qualified mechanic. Refer to Section 5.5 of this procedure.

- Employees will not be allowed to stand, pass, or work under the elevated portion of any forklift, loaded or empty, unless it is effectively blocked to prevent it from falling.

- No forklift will be operated with a leaking fuel system.

- Only approved forklifts will be used in hazardous locations.

- Forklifts will not exceed authorized or safe speeds. Always maintain a safe distance from other vehicles, keeping the forklift under control at all times. All established traffic regulations shall be observed.

- The operator will look in the direction of travel and shall not move the forklift until certain that all persons are in the clear.

- Forklifts shall not be driven up to anyone standing in front of a bench or other fixed object of such size that the person could be caught between the forklift and the object.

- Grades shall be ascended or descended slowly. When ascending or descending grades in excess of 10 percent, loaded forklifts shall be driven with the load upgrade.

- Forks shall always be carried as low as possible, consistent with safe operations.

- When leaving a forklift unattended, the power shall be shut off, brakes set, the mast brought to the vertical position, the load engaging means left in down position, and key removed from the ignition and left in the custody of a qualified operator or supervisor. When left on an incline, the wheels shall be chocked.

- Forklifts shall not be operated on floors, loading docks, or platforms that will not safely support the loaded forklift. Caution shall be exercised while driving over wet or slippery surfaces.

- Forklifts shall not be driven in and out of trucks or trailers at unloading docks until such trucks are securely blocked and brakes set.

- A width of one foot shall be the minimum distance maintained from the forklift and the leading edge of any elevated platform, dock, freight car, or truck.

- A loaded forklift shall not be moved until the load is safe and secure.

- Extreme care shall be taken when tilting loads. Tilting forward with the load engaging means elevated shall be prohibited except when picking up a load. Elevated loads shall not be tilted forward except when the load is being deposited onto a storage rack or equivalent. When stacking or turning, backward tilt shall be limited to that necessary to stabilize the load.

- Forklift operators shall avoid making quick starts and sudden stops.

- Loads shall not be raised or lowered while the forklift is in motion.

- Since fuels for forklifts vary, the manufacturer's recommendations for fueling or battery charging will be followed. The recharging of batteries shall comply with 29 CFR 1910.178(g).

- Seat belts are required to be worn at all times a forklift is being operated.

- Forklifts will not be used to elevate personnel unless they have been specifically designed to do so and the platform meets the requirements established in 29 CFR 1910.67.

- Operators must always face the forklift when dismounting and always have two hands and one foot or vice versa in contact with the forklift.

- At cross aisles and other locations where vision is obstructed, the forklift operator shall slow down and sound the horn. If the load being carried obstructs forward view, the driver shall be required to travel with the load trailing.

5.2 Training

Every employee that operates a forklift shall be informed of the operating instructions contained in Section 5.1 and in the forklift's operating manual. Other practices dictated by the particular workplace in which the forklift will be used will also be covered. Training shall be provided at the time of initial assignment and at least once every three years thereafter. Training will also be refreshed whenever:

- The operator is involved in an accident or near-miss incident while operating a forklift;
- The operator has been observed operating a forklift in an unsafe manner;
- There are changes in the workplace that could affect safe operation; or
- The operator is assigned to a different type of forklift.

Training will be conducted by a qualified trainer or outside training resource familiar with forklift operations and will consist of a review of this procedure, the forklift's operating manual and a demonstration of operational skills. The evaluation of operational skills will be tailored to the employee's anticipated work environment. The employee will have to demonstrate that he/she knows and understands the forklift's functional features, is familiar with safety rules and regulatory requirements, and can demonstrate overall safe forklift operational skills. The trainer and employee will acknowledge completion of this training by signing the forklift training record provided as Attachment 2.

5.3 Inspection

The forklift operator is required to perform a daily pre-use inspection of the forklift they will be operating. If an unsafe condition is identified, a supervisor shall be immediately informed of the condition and the forklift not operated until adequate repairs have been made. Most forklift operation and maintenance manuals contain inspection checklists that can be used as a guide for the inspection. In the event that a particular forklift manual does not contain an inspection checklist, the form provided in Attachment 3 can be used. All manufacturer-recommended procedures shall be followed during inspections.

5.4 Standard Forklift Safety Features

The use of standard safety features is an important factor in safe forklift operation. Although forklifts need not be equipped alike, there are some mandated safety features that are required to be on all company owned or operated forklifts. These required safety features include:

- Backup alarm

- Portable fire extinguisher
- Horn
- Seat belt.

5.5 Maintenance

Only authorized personnel shall perform maintenance or repair activities on forklifts. Guidelines for the maintenance of forklifts are contained in the operations and maintenance manual developed for the specific make and model of forklift being maintained. All work shall be done in accordance with the manufacturer's guidelines. Because forklifts are typically used every day, it is particularly important for personnel to follow these manufacturer-established maintenance, lubrication, and inspection schedules. Special attention should be given to forklift control and lifting features such as brakes, steering, lift overload devices, tilt mechanism, and safety features.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS050 Company Employee and Subcontractor Training Requirements

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Employee Training Record - Forklift Training
3. Daily Forklift Pre-Use Inspection Checklist

ATTACHMENT 1
FORKLIFT OPERATION

Responsibility Matrix

Action	Procedure Section	*Responsible Party*		
		Forklift Operator	**Qualified Trainer**	**Director of Health and Safety**
Issue, Revise, and Maintain Procedure	3.1			X
Provide Training	5.2		X	
Receive Training	5.2	X		
Complete Attachment 2	5.2	X	X	
Daily Forklift Inspection	5.3	X		

ATTACHMENT 2

EMPLOYEE TRAINING RECORD
FORKLIFT TRAINING

NAME _____ LOCATION _____ SUPERVISOR _____

EMPLOYEE NUMBER _____ INITIAL OR REFRESHER TRAINING (CIRCLE ONE)

FORKLIFT MAKE/MODEL _____

- I have reviewed and agree to abide by the requirements established in the forklift operation procedure.
- I have reviewed, understand, and agree to abide by the forklift operational rules described in Procedure HS820 and the manufacturer's operating manual.
- I acknowledge that it is my responsibility to conduct a daily inspection of the forklift that I will be expected to operate.

EMPLOYEE SIGNATURE _____ DATE _____

- I have observed a demonstration of the forklift operational skills for the above employee and feel that they understand the forklift's operational features, are familiar with safety rules and operational requirements, and have demonstrated satisfactory operating skills.

INSTRUCTOR SIGNATURE _____ DATE _

A copy of this training record is to be forwarded to the Knoxville Health and Safety Training Department and the original maintained in the project/location file.

ATTACHMENT 3

DAILY FORKLIFT PRE-USE INSPECTION CHECKLIST

PROJECT/LOCATION NAME: _____

FORKLIFT MAKE/MODEL: _____

INSPECTION COMPLETED BY/DATE: _____

ITEM	Y		
	ACCEPTABLE	NOT ACCEPTABLE	NOT APPLICABLE
Fire Extinguisher			
Mast			
Roller			
Forks			
Hydraulics			
Leaks			
Loose Fittings			
Fluid Levels			
Tires			
Excessive Wear			
Splits			
Missing Material			
Separation From Rim			
Loose/Missing Lug Nuts			
Fork Carriage			
Tilt Mechanism			
Gauges/Indicators			
Steering			
Lights			
Horn			
Backup Indicator			
Brakes			
Other Fluids			
Leaks			
Levels			
Power Source			
Battery			
Fuel System (Tank, Lines)			
Seat Belt			

If an unsafe condition is identified, a supervisor is to be immediately informed of the condition and the forklift not operated until adequate repairs have been made.

COMMENTS:

_____

_____

_____

_____

_____

PROCEDURE

Subject: CRANE OPERATIONS

1.0 PURPOSE AND SUMMARY

Crane safety is a key issue at many Shaw Environmental & Infrastructure, Inc. (Shaw E & I) construction sites. Proper qualification of operators is arguably the key element in proper crane operation.

Since the majority of crane operations at Shaw E & I projects involve subcontracted or rental equipment, **Shaw E & I HAS ESTABLISHED A POLICY PREFERENCE TO OBTAIN A QUALIFIED OPERATOR WITH RENTED OR SUBCONTRACTED EQUIPMENT, WHENEVER POSSIBLE.** Requirements are also established for qualifying an Shaw E & I operator.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The National Director, Health & Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

(None)

5.0 TEXT

Crane operations are a periodic part of many Shaw E & I projects. Generally, this involves hiring a qualified subcontractor, or renting a crane to be operated by Shaw E & I personnel. It is the responsibility of the project manager to verify that crane operations are conducted in accordance with applicable standards, using qualified personnel.

5.1 Shaw E & I Requirements

- All cranes operated on Shaw E & I-controlled sites shall meet applicable design standards (i.e., ANSI, Power Crane and Shovel Association, etc.).

- Cranes shall have a copy of the most recent annual and periodic inspections on-board.

- All cranes shall be inspected by a qualified person, prior to operation (see Attachment 5, Crane and Derrick Inspection Checklist), to verify proper working condition. If this inspection is not conducted by an Shaw E & I associate, a Shaw E & I supervisor shall verify that it is done.

- A copy of the manufacturer's operating manual shall be carried on all cranes. The manual shall include a load rating chart that indicates safe loads in various configurations, wire and cable minimums and maximums, and any special considerations.

- It is the strong preference of Shaw E & I that crane operations be subcontracted to qualified firms, or that rented cranes come with a qualified operator from the provider.

- The "Recognizing Unsafe Crane and Rigging Practices" (Attachment 2), or equivalent, and the "Hand Signals for Mobile Cranes" (Attachment 3) are to be reviewed at the Tailgate Safety Meeting prior to crane operation.

- All cranes rented, leased, or purchased by Shaw E & I shall be equipped with a load indicator where feasible. This is mandatory where load/lift conditions are not completely known.

5.2 Qualifying an Shaw E & I Operator

Shaw E & I will only operate cranes where it has been demonstrated that the Shaw E & I associate is qualified to operate the specific crane to be used. It is the responsibility of the project manager, working with the project HS professional, to identify a supervisor who is competent to qualify a crane operator, based on the supervisor's training and/or experience.

Key elements of qualifying an Shaw E & I operator are listed below.

- Documented training on specific, or type of crane, to be used (on-the-job training may be difficult to document).

- A competent supervisor evaluates the proposed operator's familiarity with, and ability to safely operate, the crane using the Mobile Crane Operator Proficiency Form (Attachment 4).

- The completed Mobile Crane Operator Proficiency Form is to be placed in the associate's training file.

- Verify that the operator has no physical/medical conditions that would inhibit safe operations (i.e., incorrect vision deficiency, disorders which could cause sudden loss of consciousness, etc.).

Except where qualifications and experience can be verified, it is recommended that Shaw E & I operators not be qualified to operate the types of equipment listed below.

- Lattice boom
- Crawlers
- Telescoping boom >2 lengths

6.0 EXCEPTION PROVISIONS

Exceptions shall be per the requirements of Shaw E & I Procedure HS013**.**

7.0 CROSS REFERENCES

29 CFR 1926.550

8.0 ATTACHMENTS

1. Matrix
2. "Recognizing Unsafe Crane and Rigging"
3. "Hand Signals for Mobile Cranes"
4. Mobile Crane Operator Proficiency Form
5. Crane and Derrick Inspection Checklist

ATTACHMENT 1
CRANE OPERATIONS

Responsibility Matrix

Action	Procedure Section	*Responsible Party*		
		Project Manager	**Site Supervisor**	**HS Professional**
Verify that crane operations are conducted in accordance with applicable standards, using qualified personnel.	5.0	X		
Inspect all cranes prior to operation, or ensure an inspection is performed before operations commence.	5.1	X		
Ensure a copy of the manufacturer's operating manual is carried on all cranes.	5.1	X		
Review "Recognizing Unsafe Crane and Rigging Practices" (or equivalent) and "Hand Signals for Mobile Cranes" at Tailgate Safety Meeting.	5.1		X	
Identify a competent supervisor to qualify crane operators.	5.2	X		X
Evaluate proposed operators' familiarity with, and ability to safely operate, the crane using the Mobile Crane Operators Proficiency Form.	5.2		X	
Place completed Mobile Crane Operator Proficiency Form in associates' training files.	5.2			X
Verify that operator has no physical/medical conditions that would inhibit safe operations.	5.2	X		X

ATTACHMENT 2

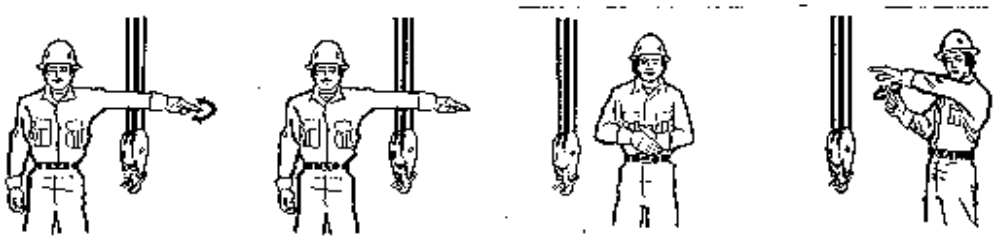
RECOGNIZING UNSAFE CRANE RIGGING PRACTICES

Be Alert For:

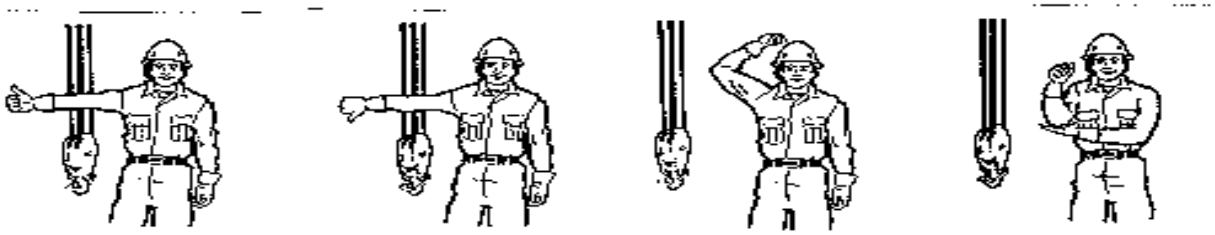
- Quick and sudden crane movements;
- Improper crane ground conditions;
- Improper crane support (mats, cribbing, etc.); - Mobile
- Horseplay with and around the crane;
- Unsecured crane swing radius; - Mobile
- Leaking hydraulic systems
- Maintenance being performed without proper mechanical/electrical Lock-Out's; -Overhead
- Repairs being performed on one of multiple cranes on the same runway without properly installed railstops, or the positioning of a signal person to warn of approaching cranes; - Overhead
- Unsecured crane load path;
- Loads being passed over the heads of personnel;
- Damaged wire rope on crane;
- Use of damaged rigging gear;
- Use of rigging gear without gloved hands;
- Improper use of Standard Hand Signs.

This list is not intended to be all-inclusive. The constant observance of crane and rigging operations is a must to obtain the safest environment possible. Always be on the lookout for acts which could lead to an accident.

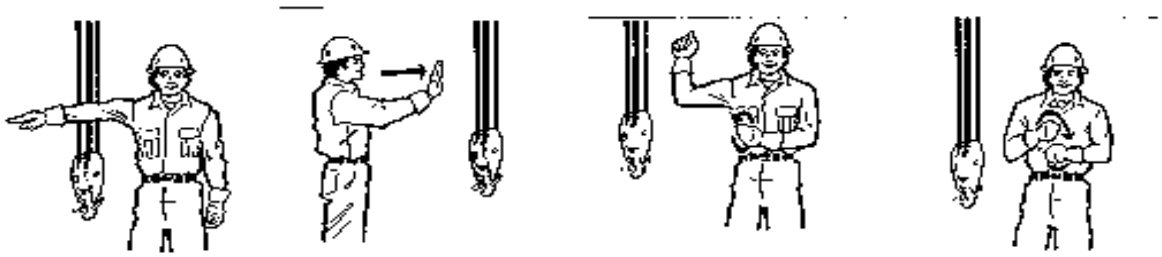
ATTACHMENT 3
HAND SIGNALS FOR MOBILE CRANES



EMERGENCY STOP. Arm extended, palm down, move hand rapidly right and left.	STOP. Arm extended, palm down, hold position rigidly.	DOG EVERYTHING. Clasp hands in front of body.	MOVE SLOWLY. Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal. (Hoist Slowly shown as example.)

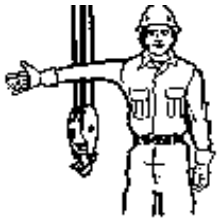


RAISE BOOM. Arm extended, fingers closed, thumb pointing upward.	LOWER BOOM. Arm extended, fingers closed, thumb pointing downward.	USE MAIN HOIST. Tap fist on head; then use regular signals.	USE WHIP LINE. (Auxiliary Hoist) Tap elbow with one hand; then use regular signals.



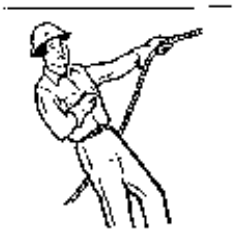
SWING. Arm extended, point with finger in direction of swing of boom.	TRAVEL. Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.	TRAVEL (One Track). Lock the track on side indicated by raised fist. Travel opposite track in direction indicated by circular motion of other fist rotated vertically in front of body. (For crawler cranes only.)	TRAVEL (Both Tracks). Use both fists, in front of body, making a circular motion, about each other, indicating direction of travel, forward or backward. (For crawler cranes only)

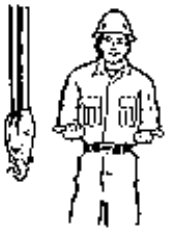
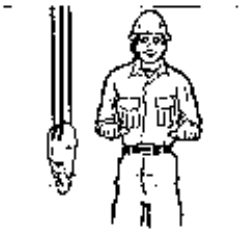





HOIST. With forearm vertical, forefinger pointing up, move hand in small horizontal circle.	LOWER. With arm extended downward, forefinger pointing down, move hand in small horizontal circles.	RAISE THE BOOM AND LOWER THE LOAD. With arm extended, thumb pointing up, flex fingers in and out as long as load movement is desired.	LOWER THE BOOM AND RAISE THE LOAD. With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired.

FOR HYDRAULIC MACHINES ONLY



RETRACT BOOM (Telescoping Boom). One Hand Signal. One fist in front of chest, thumb pointing outward and heel of fist tapping chest.	EXTEND BOOM (Telescoping Boom). One Hand Signal. One fist in front of chest with thumb tapping chest.	EXTEND BOOM (Telescoping Boom). Both fists in front of body with thumbs pointing outward.	RETRACT BOOM (Telescoping Boom). Both fists in front of body with thumbs pointing toward each other.

ATTACHMENT 4

MOBILE CRANE OPERATOR PROFICIENCY FORM

Name_____ SS#

Project Name_____ Project #

RESULTS:

LEVEL	SCORE	DESCRIPTION
☒ 1	00-60	Not recommended to operate crane with load attached
☒ 2	61-70	Recommendation: Operate only under direct supervision
☒ 3	71-80	Recommendation: Operate only to 50% of crane capacity
☒ 4	81-90	Recommendation: Operate only to 75% of crane capacity
☒ 5	91-100	Recommendation: Operate to machine full capacity

DEDUCT	POINTS ARE TO BE DEDUCTED BASED ON SEVERITY OF INFRACTION.	Manuf.	Manuf.	Manuf.	Manuf
		Model	Model	Model	Model
		Cap.	Cap.	Cap.	Cap.
		---------- 100 ----------			
	PRE-START INSPECTION				
1-3	A. Assure that no repairs are in progress. A.				
1-3	B. Observe condition of rope and hook(s). B.				
1-3	C. Point out to examiner fittings needing lubrication every 8 hours. C.				
1-3	D. Check all fuel and levels. D.				
	STARTING THE ENGINE				
1-3	E. Observe gauges for correct readings. E.				
1-3	F. Allow sufficient warm-up time. F.				
1-3	G. Test operating controls. G.				
1-3	H. Test swing brake. H.				
	TRAVELING				
1-5	I. Travel with boom in line with carrier. I.				
1-5	J. Travel to test area. J.				
1-5	K. Spot machine to accomplish lift. K.				
1-5	L. Set-up and level machine. L.				
	OPERATION				
1-5	M. Failing to keep the proper distance from hazards. M.				
1-5	N. Striking the ground or any other object. N.				
1-5	O. Swinging abruptly causing dynamic loading. O.				
1-5	P. Snapping the load causing shock loading. P.				
	OPERATION (HAND SIGNALS)				
1-5	Q. Moving without signals. Q.				
1-5	R. Improper response to signal. R.				
1-5	S. Responding to go signal abruptly. S.				
1-5	T. Responding to stop signal too slowly. T.				

	MACHINE SHUT-DOWN					
1-3	U. Travel machine to designated parking area.	U.				
1-3	V. Engage swing, boom and hoist brakes (where applicable).	V.				
1-3	W. Idle engine one full minute before shut-down.	W.				
1-3	X. Close all doors, windows and skylight.	X.				
	TOTAL POINTS DEDUCTED					

It is the ultimate responsibility of supervision to know and recognize the operator's current physical and mental capabilities.

☒ New Operator - Good coordination and understanding of equipment. Should operate only under direct supervision.

☒ Experienced Operator:

_Operator's Signature

Examiner's Signature

Project Manager's Signature

ATTACHMENT 5

CRANE AND DERRICK INSPECTION CHECKLIST

The following items shall be checked by the operator every time the crane is to be operated:

1.	☒	☒	All control mechanisms for maladjustment interfering with proper operation.
2.	☒	☒	All control mechanisms for excessive wear of components and contamination by lubricants or other foreign matter.
3.	☒	☒	All operator aids, motion and load limiting devices, and other safety devices for malfunction and inaccuracy of settings.
4.	☒	☒	All chords and lacing.
5.	☒	☒	All hydraulic and pneumatic systems - with particular emphasis given to those which flex in normal operation of the crane.
6.	☒	☒	Hooks and latches for deformation, chemical damage, cracks, and wear.
7.	☒	☒	Rope for proper spooling onto the drum(s) and sheave(s) and rope reeving for compliance with crane manufacturer's specifications.
8.	☒	☒	Electrical apparatus for malfunctioning, signs of excessive deterioration, dirt, and moisture accumulation.
9.	☒	☒	Hydraulic system for proper oil level.
10.	☒	☒	Tires for recommended inflation pressure (mobile cranes).
11.	☒	☒	Wedges and supports for looseness or dislocation (climbing tower cranes).
12.	☒	☒	Braces and guys supporting crane masts; anchor bolt base connections for looseness or loss of preload (tower cranes and derricks).
13.	☒	☒	Derrick mast fittings and connections for compliance with manufacturer's recommendations.
14.	☒	☒	Barge or pontoon ballast compartments for proper ballast; deckloads for proper securing; chain lockers, storage, fuel compartments, and battening of hatches; fire fighting and lifesaving equipment in place and functional; hull void compartments sounded for leakage (floating cranes and derricks).

Inspector's Signature Date

Inspector's Name (print)

PROCEDURE

Subject: **Rigging & Lifting**

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to establish the requirements for proper rigging and lifting activities performed on Shaw Environmental & Infrastructure, Inc. (Shaw E & I) construction sites. This procedure applies to all Shaw E & I personnel and subcontractors working on projects where rigging and lifting safety requirements are applicable.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The EH&S Operations Manager is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

(None)

5.0 TEXT

5.1 Pre-Lift Planning

In order to address different types of lifts, the following lift strategy has been established. Every crane lift performed on Shaw Environmental & Infrastructure, Inc. (Shaw E & I) construction sites, regardless of weight, requires the completion of a Lift Plan Worksheet (Attachment 2). A pre-lift meeting involving all participating personnel shall be conducted prior to making the lift. The Lift Plan Worksheet shall be reviewed with all personnel involved with the rigging and lifting and all questions shall be resolved prior to lifting.

5.2 Rigging & Lifting Personnel Responsibilities & Qualifications

5.2.1 Project/Facility Manager Responsibilities

The project/facility manager is responsible for the identification and assignment of personnel who will be involved in the rigging and lifting operations. Additionally, this person must be knowledgeable of the requirements of the lifting task and provide equipment (Shaw E & I or rented) which is of adequate capacity to perform the lift.

5.2.2 Lift Supervisor Qualifications

Any lift performed at a Shaw E & I project/facility requires supervision. For the purpose of this procedure, this person will be designated as the lift supervisor. The lift supervisor will be an operations person and may be the site facility manager assigned to the task. The lift supervisor must meet the following minimum requirements:

- Capable of understanding and completion of the required information contained on the Lift Plan Worksheet (Attachment 2).

- Capable of recognizing hazards involved during lifting operations.

- Posses the authority to suspend any lifting operation which is considered unsafe or incorrect.
- Understanding rigging selection, use, and inspection requirements.

- Capable of reading and understanding the load chart of the crane or hoisting device being used.

- Capable of determining that the crane and rigging equipment are of sufficient capacity to safely perform the lift as per EH&S 822—Crane Operations.

- Understand the standard hand signals for controlling crane operations (Attachment 3).

- Understand the proper application of tag lines and their importance in safe lifting operations.

5.2.2.1 **Lift Supervisor Responsibilities**

The lift supervisor shall have overall responsibility for general rigging and lifting and therefore must plan all phases of the operation. This includes complete cooperation with the crane operator who has the final say regarding the safety of the operation. The lift supervisor is also responsible for:

- Supervising all work involving the crane.

- Determining the correct load weight and radius and informing the operator.

- Ensuring that personnel rigging a load are experienced and competent. They must be capable of establishing weights; judging distances, heights and clearances; selecting tackle and lifting gear suitable for the loads; and rigging the load safely and securely.

- Supervising the rigging personnel.

- Ensuring that the load is properly rigged.

- Ensuring that the signalmen are competent and capable of directing the crane and load to ensure the safety and efficiency of the operation.

- Ensuring the safety of the rigging personnel and all other personnel affected by the rigging operation.

- Keeping the public and all non-essential personnel clear of the crane during operation.

- Controlling the movement of all personnel within the area affected by the lift.

- Ensuring that all required safety precautions are taken when the lift is in the vicinity of power lines or other overhead obstructions.

- Ensuring that all personnel involved in the operation understand their jobs, responsibilities and safety related aspects.

5.2.3 **Rigging Crew Responsibilities**

The rigging crew must be capable of 1) selecting tackle and lifting gear suitable for the load to be lifted, 2) directing the safe movement of the load, and 3) maintaining full load control. The rigging crew is also responsible for:

- Review the planned operation and requirements with the lift supervisor.

- Know and never exceed the safe working load of the equipment and tackle to be used.

- Confirm the total load weight or confirm the maximum load weight is less than the capacity of the rigging equipment.

- The weight of the hook, load block and material handling devices shall be included when calculating the total weight of a load.

- Examine all hardware, equipment, tackle and slings before using.

- Understand and know how to signal operator's using the "Hand Signals for Mobile Cranes" (Attachment 3)

- Report unsafe or unsuitable equipment or tackle to the lift supervisor

- **CAUTION: Defective components which cannot be repaired should be destroyed.**

- Recognize and make appropriate allowances for the factors that can reduce the capability of the equipment.

- Personal Protective Equipment (PPE) shall be used in accordance with Shaw Policy.

5.2.4 **Signal Person Responsibilities**

Riggers are frequently required to act as a signal person for equipment operators. Whenever the operator is obstructed in his view of the path of travel of any part of the equipment, it's load or components; a qualified signal person shall be stationed:

- In full view of the operator or accompanying signal person.
- With full view of the intended path of travel of the equipment, load or components, yet clear of the intended path of travel.

The Signal Person shall:

- Be responsible for the lift when required to direct the lift.
- Be clearly identifiable (fluorescent vest, etc.) and equipped with a whistle, air horn, etc.
- Have knowledge of the operations.
- Be in constant communication with operator, either visually with hand signal or audibly by radio throughout the operation.
- Use hand signals only when conditions are such that his signals are clearly visible to the operator.
- Keep all unauthorized personnel outside the radius of the operation.
- Direct the load so that it does not pass over anyone.

5.3 Rigging and Lifting Requirements

Because of the inherent dangers associated with rigging and lifting operations, it is imperative that all hoisting equipment be inspected before they are used. There must be no apparent damage, excessive wear, or deformation of any part of the equipment. All safety devices, controls, and other operating parts of the equipment shall be checked during each inspection and shall be in good working order. Any defects shall be corrected or repaired before the equipment is put into service. Any part found to be defective as a result of an inspection or nondestructive examination shall be replaced or repaired as directed by the lift supervisor or operator.

5.3.1 **General.** Only equipment which has been built to nationally recognized manufactures' standards shall be used on Shaw E & I facilities and project sites. Equipment with discrepancies which may affect the safety of the operation shall not be allowed to operate on Shaw E & I facilities and project sites. No repairs, modifications, or additions which affect the capacity or safe operation of the equipment shall be made without the manufacture's written approval.

5.3.2 **Rigging Selection & Inspection**

Proper selection of slings and other rigging tackle is a critical factor when planning a lift. Items which must be considered when selecting slings, rigging accessories, and rigging techniques should include but are not limited to the following:

- Never rig a load if you do not know how much it weighs.
- Always rig a load so the center of gravity is directly below the crane hook.
- Always ensure that all components used to rig a load are of adequate capacity to lift the load safely.
- To minimize loss of capacity due to excessive load angle factors the longest sling available of adequate capacity should be chosen.

5.3.3 **Sling Selection**

Even though making lifts with slings may seem routine, sling selection must not become a casual process, for the whole job depends, literally, on the sling. The following is an accepted procedure for arriving at the proper sling for a lift:

- Determine the Weight - The load to be lifted must be known. If the weight of an item is not known, the lift supervisor must calculate the weight and ensure that a sling with more than adequate rated capacity is used.
- Decide the Hitch - Must accommodate the load's shape and size as well as its weight using a vertical, basket, or choker hitch. Consideration must be given to possible physical damage to the load as well as providing a positive attachment. The hitch you choose may affect your choice of sling construction and material.
- Lifting Devices - Must have sufficient capacity and be in proper working condition and provide any maneuverability required once the load is hoisted. The sling must also fit to or on this device.
- Room to Lift - Be sure the lifting device has sufficient headroom to pick up the load and handle it when the length of the sling is added to the hook.
- Sling Length - Determine the longest sling possible for completing the lift in this situation--since the longest sling will provide the smallest angle of spread between legs, for minimum stress on the sling.
- Use Rated Capacity Chart - After double checking the sling length, type and diameter, and rigged angle, refer to 29 CFR 1910.184, the sling capacity tag, or other approved capacity chart to determine that the sling will accommodate the load you will be lifting.

5.3.4 Calculating Sling Loads

Safe crane operation requires detailed attention to the selection of equipment, setup, maintenance, and most importantly, operation. When slings are used, it is of utmost importance that each sling be selected for the loads involved, with detailed inspection prior to each use.

Never overload a sling. When using a three or four leg sling, ensure that the load is equalized on each leg. When lifting loads, take up the slack slowly to minimize shock loading. Protect the sling over sharp corners or edges with padding. Calculating sling loads can mean the difference between a safe lift or failure, which can involve the crane itself.

The sling angle formed by a leg and the horizontal has a definite effect on the rated capacity of the sling. As the angle decreases from the vertical (straight pull), the amount of sling lifting capacity decreases. The tension in each leg increases without an increase in the load weight lifted. Sling angles of less than 45 degrees should be avoided because of the increased stresses on the slings.

When selecting the sling(s) to be used, visualize the horizontal angle formed by the sling and the load. Divide the total weight by the number of sling legs, then multiply by the sling angle factor (see Attachment 4). This number must be compared to the capacity of the sling.

5.3.5 Rigging Practices

- Use loops, thimbles and corner pads to prevent damage to slings when used around corners or on cutting edges.
- Never allow wire rope to lie on the ground for any length of time or on rusty steel or near solvents, chemicals or corrosive substances.
- Slings shall not be pulled from between or under loads with load resting on the sling.
- Keep all rope away from flame cutting or welding operations.
- Never use rope as sling material.
- Never wrap a wire rope completely around a hook.
- Do not bend wire rope near any attached fitting.
- The sling must be selected to suite the most heavily loaded leg rather than the total weight when using multi-legged sling to lift loads in which one end is heavier than the other.

- When using 3 and 4 legged sling configurations, any two legs must be capable of supporting the entire load

- Where possible, wire rope choker hitches should include a shackle with the eye around the shackle pin to prevent breaking wires of the choke. The choker hitch should be "snugged down" prior to lifting, not after tension is applied.

- Unless authorized by the hook manufacturer when two or more sling/rope eyes are placed over a hook, install a shackle, pin resting in the hook, and place the rope eyes in the bowl of the shackle.

- Properly rig all loads to prevent dislodgment of any part.

- Use guide ropes or tag lines to prevent the rotation or uncontrolled motion of the load when necessary.

- Loads must be safely landed and properly blocked before being unhooked and unslung. Tag lines shall not be used in situations that jeopardize the safety of the lift.

- Lifting beams should be plainly marked with their weight and designed working load and should only be used in the manner for which they were designed.

- The hoist rope or chain shall never be wrapped around the load. The load shall be attached to the hook by slings or other rigging devices that are adequate for the load being lifted.

- Multiple part lines shall not be twisted around each other.

- The hook should be brought over the center of gravity of load before the lift is started.

- If there has been a slack rope condition, determine that the rope is properly seated on the drum and in the sheaves prior to lifting.

- Keep hands away from pinch points as the slack is being taken up.

- Leather gloves are recommended when handling wire rope.

- Avoid impact loading caused by sudden jerking when lifting or lowering. Lift the load gradually until the slack is eliminated.

- Never ride on a load that is suspended.

- Avoid allowing the load to be carried over the heads of any personnel.
- Never work under a suspended load until the load has been adequately supported from the floor and all conditions have been approved by the supervisor in charge of the operation.
- Never leave a load suspended unless emergency evacuation is required.
- Never make temporary repairs to sling.
- The capacity of a sling is determined by its angle, construction, type of hitch and size.
- Never lift loads with one leg of a multi-leg sling until the unused legs are made secure.
- Never point load a hook unless it is especially designed and rated for such use.
- Make certain that the load is broken free before lifting and that all legs are taking the load.
- When using two or more slings on a load make certain all slings are made from the same materials.
- Lower the loads on to adequate blocking to prevent damage to the slings.
- Materials and equipment being hoisted must be loaded and secured to prevent any movement which could create a hazard in transit.
- The weight of the hook, load block and any material handling devices shall be included when determining crane capacity.
- Chains shall not be used for lifting in place of slings. Chain hoists and come-a-longs may be used for lifting.
- All wire rope sling eyes shall be made with flemished splice and compressed steel swaged sleeves.
- Sling eyes shall not be shackled together on lifting hook to prevent spreading. Slings should be placed in a shackle of sufficient size and the shackle shall be placed with the pin on the hook.

5.3.6 **Sling Softener Requirements.** Sling softeners are devices used to increase the radius at corners and/or bends where a sling wraps around. The reason for increasing the radius at corners is to ensure the sling's capacity is maintained.

Sling softeners should be used in all cases necessary to minimize the reduction in the rated capacity of the sling. The amount of reduction to the sling's capacity is dependent upon the type of sling being used, the sling's contact angle, etc.

5.3.7 Synthetic Sling Requirements

- Synthetic slings shall be marked to show the rated capacity for each type of hitch and type of web material.
- Nylon web slings shall not be used where fumes, vapors, sprays or mists or liquids of acids or phenols are present. Web slings with aluminum fittings shall apply in this category.
- Synthetic web slings shall be removed from service and destroyed if any of the following conditions are present:
  - Acid or caustic burns
  - Melting or charring of any part of the sling surface
  - Snags, punctures tears or cuts
  - Broken stitches
  - Distortion of fittings
- Synthetic web slings of polyester or nylon shall not be used at or come in contact with temperatures in excess of 180 degrees F.
- Polypropylene web slings shall not be used at or come in contact with temperatures in excess of 200 degrees F.
- Insulated hooks shall be tested yearly to insure insulation integrity to at least manufacturer's specifications.

5.3.8 Plate Clamp Requirements

- The rated load of the plate clamp shall be marked on the main structure.
- Care should be taken to make certain the load is correctly distributed for the plate clamp being used.
- Do not allow load or plate clamp to come into contact with any obstruction.
- The plate clamp shall not be used for side pulls or sliding the load.
- When lifting stainless steel or special alloys, ensure plate clamp is designed for use on the specific metal.

5.3.9 **Wire Rope Sling Requirements.** Wire rope slings shall be removed from service immediately if any of the following conditions are present.

- Six (6) randomly distributed wires broken in one (1) rope lay, or three (3) broken sires in one (1) strand in one (1) rope lay.
- Wear or scraping of one-third the original diameter of outside wires.
- Kinking, crushing, bird caging or any other damage resulting in distortion of the wire rope structure.
- Evidence of heat damage.
- End attachments that are cracked, deformed worn.
- Corrosion of the rope or end attachments.
- Metal mesh slings shall be immediately removed from service if any of the following conditions are present:
  - A broken weld or broken brazed joint along the sling edge.
  - Reduction in wire diameter of 25 percent due to abrasion or 15 percent due to corrosion.
  - Lack of flexibility due to distortion or corrosion.
- Synthetic web slings shall be removed from service and destroyed if any of the following conditions are present:
  - Acid or caustic burns.
  - Melting or charring of any part of the sling service.
  - Snags, punctures, tears or cuts.
  - Broken stitches.
  - Distortion of fittings.
- Round slings shall be removed from service if any of the following is visible:
  - The tag showing the sling identification and/or capacities is unreadable or missing.
  - Melting, charring or weld splatter of any part of the sling.
  - Holes, tears, cuts, embedded particles, abrasive wear, or snags that expose the load carrying yarns.
  - Broken or worn stitching in the cover which exposes the load carrying yarn.
  - Fitting distortion—elongation, damaged, corroded or chemical degradation of fittings/component hardware.
  - Slings that are knotted.
  - Chemical deterioration—acid or alkali burns.
  - Other damage which causes any doubts as to the strength of the sling.

If a sling is equipped with a tell tale or a fiber optic strand then the sling shall be removed from service if:

- The tell tale has withdrawn into the canvas.
- The fiber optic strand does not show light on one end when a flashlight is used to light the other end.

5.4 Rigging Equipment Inspections

All slings shall be visually inspected each day prior to use (Attachment 5, 6 & 7). Any deterioration which could result in an appreciable loss of original strength shall be carefully noted, and determination made whether further use of the sling would constitute a safety hazard.

5.4.1 **Wire Rope Slings.** Conditions, such as the following, shall be sufficient reason for questioning sling safety and removing the sling from service:

- Six (6) randomly distributed broken wires in one rope lay, or three (3) broken wires in one strand in one rope lay.
- Evidence of any broken wires next to an end fitting.
- Wear or scraping of one-third the original diameter of outside individual wires.
- Kinking, crushing, birdcaging, or any other damage resulting in distortion of the rope structure.
- Evidence of heat damage.
- End attachments that are cracked, deformed, or worn.
- Hooks that have been opened more than 15 percent of the normal throat opening measured at the narrowest point, or twisted more than 10 degrees from the plane of the unbent hook.
- Severe corrosion of the rope or end attachments.

NOTE: Wire rope sling capacity must be determined by consulting 29 CFR 1910.184.

5.4.2 **Synthetic Web Slings.** A synthetic web sling shall be removed from service if any defects, such as the following are visible:

- Evidence of the "Red Thread" showing anywhere along the sling body or in the eyes of the sling.
- Missing or non-legible sling capacity tag.

- Acid or caustic burns.
- Melting or charring of any part of the surface.
- Snags, punctures, tears, or cuts.
- Significant number of broken stitches, especially where the eyes are formed on the sling.
- Distortion of metal end fittings.
- Other apparent defects which cause doubt as to the strength of the sling. These defects should be referred to the manufacturer for determination.

5.4.3 **Alloy Steel Chain Slings.**

NOTE: Only Grade 8 Alloy or other approved Alloy chain with a capacity tag permanently attached may be used for lifting operations.

All Alloy steel chain slings shall be visually inspected each day before use. The following are the recommended inspection guidelines for Alloy chain slings:

- Locate the Alloy chain sling capacity tag. If the tag is missing or illegible, the sling must be removed from service and re-rated by a certified chain sling rating agency.
- Conduct a link-by-link inspection for the following defects: bent links, stretched links, cracks in any section of link, scores, abrasions, or markings tending to weaken the rings or hooks. Remove from service if discovered.
- Check rings and hooks for distortion, cracks in weld areas, corrosion, scores, or markings tending to weaken the ring or hooks. Remove from service if discovered.
- Inspection shall be made on an individual link basis. If any link does not hinge freely with the adjoining link, the assembly shall be removed from service.
- Sling assemblies with deformed master links or coupling links shall be removed from service.
- Sling assemblies shall be removed from service if hooks are cracked, have been opened more than 15 percent of the normal throat opening measured at the narrowest point, or twisted more than 10 degrees from the plane of the unbent hook.

- Deformed hooks or other attachments shall not be straightened on the job. Assemblies with such defects shall be reconditioned by the manufacturer.

5.5 Rigging Accessories Inspections. Rigging hardware must have a capacity equal to or greater than that of the sling. If there is any difference between the rating of slings and hardware, lifting capacity is determined by whichever has the lower capacity.

5.5.1 **Inspections Before Each Shift**

- Shackles, rings, eyebolts, lifting beams, rigging assemblies, and hooks shall be inspected at the beginning of each shift in which they are to be used.

- Shackles, rings, and similar items shall be inspected for wear, corrosion, spreading, and deformation, and shall be replaced if deformation exceeds 15 percent of their new condition. Shackle pins shall be replaced if they show any sign of failure in shear.

- Lifting beams and spreaders shall be inspected for signs of failure in bending, and shall be replaced if permanently bent more than 2 inch in 10 feet, or twisted more than 5 degrees out of the original plane. Hook attachment welds shall be examined for cracks and signs of failure in tension.

- Hooks having any of the following deficiencies shall be removed from service:
  - Crack(s)
  - Wear exceeding 10 percent of the original dimension
  - A bend or twist exceeding 10 degrees from the plane of the unbent hook.
  - Increase in throat opening exceeding 15 percent from the new condition.
  - If a latch is provided, and it becomes inoperative because of wear or deformation, or fails to fully bridge the throat opening, the hook shall be removed from service until the device has been repaired or replaced.
  - If hooks are painted, a visual inspection should take the coating into consideration. Surface variations can disclose evidence of heavy or severe service. The surface condition may then call for stripping the paint in such instances.

6.0 EXCEPTION PROVISIONS

Exceptions shall be per the requirements of Shaw E & I Procedure HS013**.**

7.0 CROSS REFERENCES

EH&S 013 Health and Safety Procedure Variances
EH&S 822 Crane Operations

8.0 ATTACHMENTS

1. Matrix
2. “Lift Plan Work Sheet”
3. “Hand Signals for Mobile Cranes”
4. Sling Angle Factors
5. “Choker/Sling Inspection” form
6. “Drum Hoist Inspection” form
7. “Come-a-long Chainfall Inspection” form

ATTACHMENT 1
RIGGING & LIFTING

Responsibility Matrix

Action	Procedure Section	*Responsible Party*		
		Project/ Facility Manager	**Site Supervisor**	**Rigging Crew**
Providing equipment and personnel to perform rigging and lifting operations.	5.2.1	X		
Identify a competent supervisor to serve as Lift Supervisor.	5.2.1	X		
Capable of understanding and completing the “Lift Plan Worksheet”.	5.2.2		X	
Verify that crane operator has no physical/medical conditions that would inhibit safe operations. Verify that a copy of the manufacture’s operating manual is carried on the crane.	5.2.2		X	
Determining that the crane and rigging equipment are sufficient to safely perform the lift.	5.2.2		X	
Ensuring that all personnel involved in the operation understand their jobs, responsibilities and safety related aspects.	5.2.2.1		X	
Keeping the public and non-essential personnel clear of the lift.	5.2.2.1		X	
Review Rigging and Lifting procedure and “Hand Signals for Mobile Cranes” at Tailgate Safety Meeting.	5.2.3			X
Examine all hardware equipment, tackle and slings before using.	5.2.3			X
Report unsafe or unsuitable equipment or tackle to the Lift Supervisor.	5.2.3			X

ATTACHMENT 2

LIFT PLAN WORKSHEET

General Information

Date:_____ Project No:_____

Location: _____ Crane Owner:_____

Item to be Lifted:_____ Equipment No:_____

Item Weight:_____(lbs) _____(lbs)
Actual Calculated Weight (from below)

If actual weight is not known, the item weight must be determined by one of the following methods:

XManufacturer Data Sheet
XTruck Weigh Ticket (only for single piece loads)
XCalculated Weight

Standard weight per cubic foot of this material: _____

Dimension of item/material: L _____ x W _____ x H _____ = _____ cu. ft.

Cubic feet of item _____ x Standard Weight _____ =
Calculated Weight

Lifting Responsibility

Lift Supervisor:_____ Employee No:_____
(Required for lifts over 75% of capacity)

Lift Supervisor:_____ _____
Print Name Signature

Crane Operator:_____ _____
Print Name Signature

Rig:_____ _____
Print Name Signature

Rigging Personnel:_____ _____
Print Name Signature

Tag Line 1: _____ _____
Print Name Signature

Tag Line 2: _____ _____
Print Name Signature

Crane Capacity Determination

Item Weight: _____

Block Weight: + _____

Stowed Jib: + _____

Spreader Bar Weight: + _____

Sling Weight: + _____

Accessories: + _____

Other: + _____

Lift Total: = _____

Anticipated Maximum Boom Extension: _____ feet

Anticipated Minimum Boom Angle: _____ °

Anticipated Maximum Load Radius: _____ feet

Based on the above configuration, this crane can safely lift * _____ lbs.

*The crane capacity must exceed the lift total while also taking the following into account:

- X Crane/Boom Lift Point (i.e. main boom or jib)
- X Quadrant of Operation (over front or 360°)
- X Line Pull & Reeving Requirements (parts of line required)
- X Crane is level and on fully extended outriggers; or
- X Within "On Rubber" Capacity chart if not fully extended or a pick and carry lift is required.

Rigging Capacity Determination

_____ x _____ = _____

Item weight (from page 1) | Sling angle factor | Implied Sling Load

Sling capacity must be determined based on the following items:

- X When using multiple slings, the sling with the least lifting capacity must be capable of lifting the load.
- X Hitch (vertical, basket, chock)
- X Number of sling legs for calculation purpose; never use more than 3 legs.
- X Sling angle

NOTE: Sling angle factors can be found in Attachment 4.

Rigging Accessories

Shackles: Number _____ Size _____ Capacity

Other: Number _____ Size _____ Capacity

Implied Sling Load: _____ Sling Capacity:

NOTE: Implied sling load must not exceed sling capacity.

Pre-Lift Checklist

- ☐ rigger has inspected all rigging
- ☐ equipment operator has inspected equipment
- ☐ wind conditions acceptable
- ☐ other weather conditions acceptable
- ☐ keep all unnecessary personnel clear of the lift area
- ☐ no personnel allowed down slope during operations
- ☐ use all PPE properly (hard hats, boots, etc.)
- ☐ weight of lift remains unchanged
- ☐ pre-lift meeting with all personnel
- ☐ personnel are qualified
- ☐ equipment in accordance with plan
- ☐ no hazardous conditions in lift area
- ☐ equipment is properly set up
- ☐ signal person assigned if necessary
- ☐ Lift Supervisor (LS) to ensure job done safely
- ☐ LS to stop job if unsafe condition
- ☐ LS to stabilize job if accident occurs

Critical lifts require drawings of lift configuration. Use box below or attach drawing to worksheet.

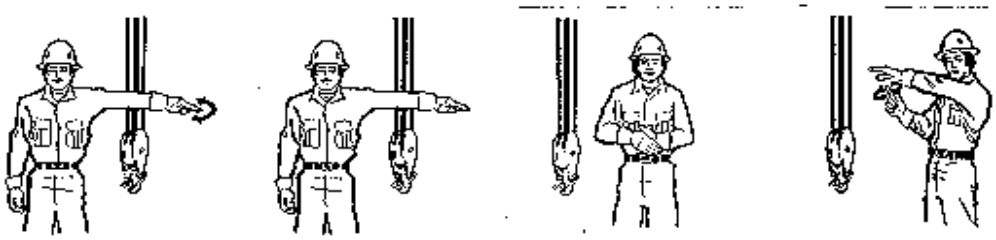
Lifting Approvals

Lifts which exceed 25 tons or greater outlined on this lift planning worksheet require the approval of a competent civil, structural/mechanical engineer.

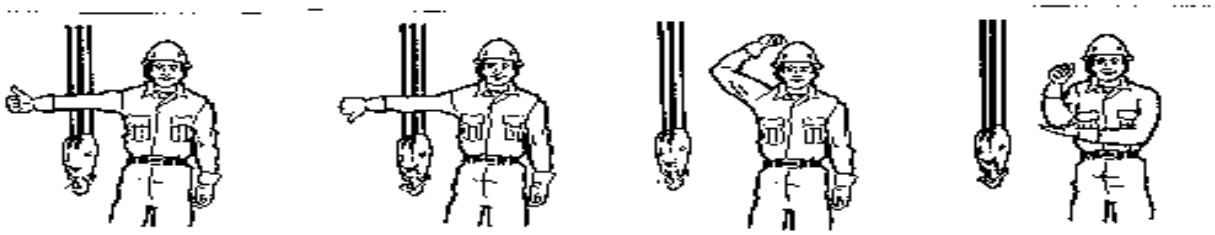
_____ _____

Print Name Signature

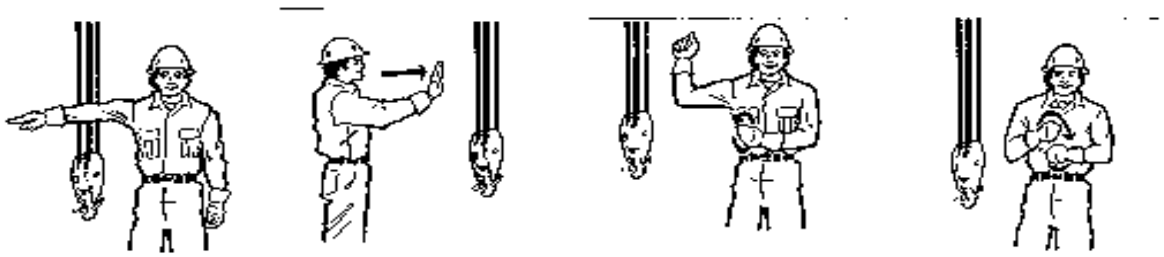
ATTACHMENT 3
HAND SIGNALS FOR MOBILE CRANES



EMERGENCY STOP. Arm extended, palm down, move hand rapidly right and left.	STOP. Arm extended, palm down, hold position rigidly.	DOG EVERYTHING. Clasp hands in front of body.	MOVE SLOWLY. Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal. (Hoist Slowly shown as example.)



RAISE BOOM. Arm extended, fingers closed, thumb pointing upward.	LOWER BOOM. Arm extended, fingers closed, thumb pointing downward.	USE MAIN HOIST. Tap fist on head; then use regular signals.	USE WHIP LINE. (Auxiliary Hoist) Tap elbow with one hand; then use regular signals.

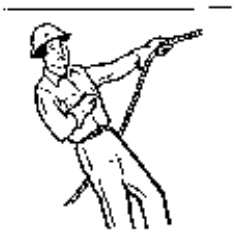


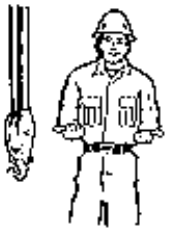
SWING. Arm extended, point with finger in direction of swing of boom.	TRAVEL. Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.	TRAVEL (One Track). Lock the track on side indicated by raised fist. Travel opposite track in direction indicated by circular motion of other fist rotated vertically in front of body. (For crawler cranes only.)	TRAVEL (Both Tracks). Use both fists, in front of body, making a circular motion, about each other, indicating direction of travel, forward or backward. (For crawler cranes only)




HOIST. With forearm vertical, forefinger pointing up, move hand in small horizontal circle.	LOWER. With arm extended downward, forefinger pointing down, move hand in small horizontal circles.	RAISE THE BOOM AND LOWER THE LOAD. With arm extended, thumb pointing up, flex fingers in and out as long as load movement is desired.	LOWER THE BOOM AND RAISE THE LOAD. With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired.

FOR HYDRAULIC MACHINES ONLY






RETRACT BOOM (Telescoping Boom). One Hand Signal. One fist in front of chest, thumb pointing outward and heel of fist tapping chest.	EXTEND BOOM (Telescoping Boom). One Hand Signal. One fist in front of chest with thumb tapping chest.	EXTEND BOOM (Telescoping Boom). Both fists in front of body with thumbs pointing outward.	RETRACT BOOM (Telescoping Boom). Both fists in front of body with thumbs pointing toward each other.

ATTACHMENT 4
SLING ANGLE FACTORS

Sling Angle Form	Sling Angle Factor
60	1.155
55	1.221
50	1.305
45	1.414
40	1.555
35	1.732
30	2.000

ATTACHMENT 5
CHOKER/SLING INSPECTION FORM

Date _____ Job Name: _____
Job No. _____ Superintendent: _____
Inspector: _____

				Y / N / N/A			
No.	Choker/Sling	Size/In.	Rating/#'s	Cuts	Tears	Frays	Appearance
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							

ATTACHMENT 6
COME-A-LONG CHAINFALL INSPECTION

Location_____ Date_____
Inspector_____

G=Good NR=Needs Repair (Remove from Service)

Designation Number	Manufacturer	Capacity	Appearance	Paint	Chain	Safety Latch	Hook	Handle	Body	Stop Link

COMMENTS

ATTACHMENT 7
DRUM HOIST INSPECTION FORM

MONTH: _____ HOIST #: _____

DATE: _____ JOB #: _____

HOIST TYPE	
CABLE/WIRE ROPE SIZE	
CAPACITY	
IF MOUNTED, WHERE	
APPEARANCE	
PAINT	
LEAD CHAIN	
HOOK DAMAGE	
SAFETY LATCH	
BRAKE	
MOUNTING STRUCTURE	

COMMENTS:

_____

_____

_____

_____

Appendix B

Laboratory ELAP Certification and QAPP

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

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Issued April 01, 2011
Revised February 13, 2012

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. CHRISTOPHER SPENCER
TESTAMERICA BUFFALO
10 HAZELWOOD DRIVE - SUITE 106
AMHERST, NY 14228

NY Lab Id No: 10026

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Acrylates	
Acrolein (Propenal)	EPA 624
	EPA 8260B
Acrylonitrile	EPA 624
	EPA 8260B
Ethyl methacrylate	EPA 8260B
Methyl acrylonitrile	EPA 8260B
Methyl methacrylate	EPA 8260B
Amines	
1,4-Phenylenediamine	EPA 8270C
	EPA 8270D
1-Naphthylamine	EPA 8270C
	EPA 8270D
2-Naphthylamine	EPA 8270C
	EPA 8270D
2-Nitroaniline	EPA 8270C
	EPA 8270D
3-Nitroaniline	EPA 8270C
	EPA 8270D
4-Chloroaniline	EPA 8270C
	EPA 8270D
4-Nitroaniline	EPA 8270C
	EPA 8270D
5-Nitro-o-toluidine	EPA 8270C
	EPA 8270D
Aniline	EPA 8270C

Amines	
Aniline	EPA 8270D
Carbazole	EPA 8270C
	EPA 8270D
Diphenylamine	EPA 8270C
	EPA 8270D
Methapyrilene	EPA 8270C
	EPA 8270D
Pronamide	EPA 8270C
	EPA 8270D
Propionitrile	EPA 8260B
Pyridine	EPA 625
	EPA 8270C
	EPA 8270D
Benzidines	
3,3'-Dichlorobenzidine	EPA 625
	EPA 8270C
	EPA 8270D
3,3'-Dimethylbenzidine	EPA 8270C
	EPA 8270D
Benzidine	EPA 625
	EPA 8270C
	EPA 8270D
Chlorinated Hydrocarbon Pesticides	
4,4'-DDD	EPA 608
	EPA 8081A

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Chlorinated Hydrocarbon Pesticides	
4,4'-DDD	EPA 8081B
4,4'-DDE	EPA 608
	EPA 8081A
	EPA 8081B
4,4'-DDT	EPA 608
	EPA 8081A
	EPA 8081B
Aldrin	EPA 608
	EPA 8081A
	EPA 8081B
alpha-BHC	EPA 608
	EPA 8081A
	EPA 8081B
alpha-Chlordane	EPA 8081A
	EPA 8081B
beta-BHC	EPA 608
	EPA 8081A
	EPA 8081B
Chlordane Total	EPA 608
	EPA 8081A
	EPA 8081B
Chlorobenzilate	EPA 8270C
	EPA 8270D
delta-BHC	EPA 608
	EPA 8081A

Chlorinated Hydrocarbon Pesticides	
delta-BHC	EPA 8081B
Diallate	EPA 8270C
	EPA 8270D
Dieldrin	EPA 608
	EPA 8081A
	EPA 8081B
Endosulfan I	EPA 608
	EPA 8081A
	EPA 8081B
Endosulfan II	EPA 608
	EPA 8081A
	EPA 8081B
Endosulfan sulfate	EPA 608
	EPA 8081A
	EPA 8081B
Endrin	EPA 608
	EPA 8081A
	EPA 8081B
Endrin aldehyde	EPA 608
	EPA 8081A
	EPA 8081B
Endrin Ketone	EPA 8081A
	EPA 8081B
gamma-Chlordane	EPA 8081A
	EPA 8081B

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Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.

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Chlorinated Hydrocarbon Pesticides	
Heptachlor	EPA 608
	EPA 8081A
	EPA 8081B
Heptachlor epoxide	EPA 608
	EPA 8081A
	EPA 8081B
Isodrin	EPA 8270C
	EPA 8270D
Kepone	EPA 8270C
	EPA 8270D
Lindane	EPA 608
	EPA 8081A
	EPA 8081B
Methoxychlor	EPA 608
	EPA 8081A
	EPA 8081B
Mirex	EPA 8081A
	EPA 8081B
	SM 18-20 6630C
PCNB	EPA 8270C
	EPA 8270D
Toxaphene	EPA 608
	EPA 8081A
	EPA 8081B

Chlorinated Hydrocarbons	
1,2,3-Trichlorobenzene	EPA 8260B
1,2,4,5-Tetrachlorobenzene	EPA 8270C
	EPA 8270D
1,2,4-Trichlorobenzene	EPA 625
	EPA 8270C
	EPA 8270D
2-Chloronaphthalene	EPA 625
	EPA 8270C
	EPA 8270D
Hexachlorobenzene	EPA 625
	EPA 8270C
	EPA 8270D
Hexachlorobutadiene	EPA 625
	EPA 8270C
	EPA 8270D
Hexachlorocyclopentadiene	EPA 625
	EPA 8270C
	EPA 8270D
Hexachloroethane	EPA 625
	EPA 8270C
	EPA 8270D
Hexachloropropene	EPA 8270C
	EPA 8270D
Pentachlorobenzene	EPA 8270C
	EPA 8270D

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Chlorophenoxy Acid Pesticides

2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
Dalapon	EPA 8151A
Dichloroprop	EPA 8151A
Dinoseb	EPA 8151A

Demand

Biochemical Oxygen Demand	SM 18-21 5210B (01)
Carbonaceous BOD	SM 18-21 5210B (01)
Chemical Oxygen Demand	EPA 410.4 Rev. 2.0
	HACH 8000

Dissolved Gases

Acetylene	RSK-175
Ethane	RSK-175
Ethene (Ethylene)	RSK-175
Methane	RSK-175
Propane	RSK-175

Fuel Oxygenates

Di-isopropyl ether	EPA 8260B
Ethanol	EPA 8015 B
Methyl tert-butyl ether	EPA 8021B
	EPA 8260B
tert-amyl methyl ether (TAME)	EPA 8260B
tert-butyl alcohol	EPA 8015 B

Fuel Oxygenates

tert-butyl alcohol	EPA 8260B
tert-butyl ethyl ether (ETBE)	EPA 8260B

Haloethers

4-Bromophenylphenyl ether	EPA 625
	EPA 8270C
	EPA 8270D
4-Chlorophenylphenyl ether	EPA 625
	EPA 8270C
	EPA 8270D
Bis (2-chloroisopropyl) ether	EPA 625
	EPA 8270C
	EPA 8270D
Bis(2-chloroethoxy)methane	EPA 625
	EPA 8270C
	EPA 8270D
Bis(2-chloroethyl)ether	EPA 625
	EPA 8270C
	EPA 8270D

Mineral

Alkalinity	EPA 310.2
	SM 18-21 2320B (97)
Calcium Hardness	EPA 200.7 Rev. 4.4
Chloride	EPA 300.0 Rev. 2.1
	EPA 9056A
	SM 18-21 4110B (00)

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Mineral	
Chloride	SM 18-21 4500-Cl- E (97)
Fluoride, Total	EPA 300.0 Rev. 2.1
	EPA 9056A
	SM 18-21 4110B (00)
	SM 18-21 4500-F C (97)
Hardness, Total	SM 18-21 2340B (97)
	SM 18-21 2340C (97)
Sulfate (as SO4)	ASTM D516-90 02 & 07
	EPA 300.0 Rev. 2.1
	EPA 9056A
	SM 18-21 4110B (00)
Nitroaromatics and Isophorone	
1,3,5-Trinitrobenzene	EPA 8270C
	EPA 8270D
1,3-Dinitrobenzene	EPA 8270C
	EPA 8270D
1,4-Naphthoquinone	EPA 8270C
	EPA 8270D
2,4-Dinitrotoluene	EPA 625
	EPA 8270C
	EPA 8270D
2,6-Dinitrotoluene	EPA 625
	EPA 8270C
	EPA 8270D
Isophorone	EPA 625

Nitroaromatics and Isophorone	
Isophorone	EPA 8270C
	EPA 8270D
Nitrobenzene	EPA 625
	EPA 8270C
	EPA 8270D
Nitrosoamines	
N-Nitrosodiethylamine	EPA 8270C
	EPA 8270D
N-Nitrosodimethylamine	EPA 625
	EPA 8270C
	EPA 8270D
N-Nitrosodi-n-butylamine	EPA 8270C
	EPA 8270D
N-Nitrosodi-n-propylamine	EPA 625
	EPA 8270C
	EPA 8270D
N-Nitrosodiphenylamine	EPA 625
	EPA 8270C
	EPA 8270D
N-nitrosopiperidine	EPA 8270C
	EPA 8270D
N-Nitrosopyrrolidine	EPA 8270C
	EPA 8270D
Nutrient	
Ammonia (as N)	EPA 350.1 Rev. 2.0

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Nutrient	
Kjeldahl Nitrogen, Total	EPA 351.2 Rev. 2.0
Nitrate (as N)	EPA 300.0 Rev. 2.1
	EPA 353.2 Rev. 2.0
	EPA 9056A
	SM 18-21 4110B (00)
	SM 18-21 4500-NO3 F (00)
Nitrite (as N)	EPA 353.2 Rev. 2.0
	SM 18-21 4500-NO3 F (00)
Orthophosphate (as P)	SM 18-21 4500-P E
Phosphorus, Total	SM 18-21 4500-P E
Organophosphate Pesticides	
Atrazine	EPA 8270C
	EPA 8270D
Dimethoate	EPA 8270C
	EPA 8270D
Disulfoton	EPA 8270C
	EPA 8270D
Famphur	EPA 8270C
	EPA 8270D
Parathion ethyl	EPA 8270C
	EPA 8270D
Parathion methyl	EPA 8270C
	EPA 8270D
Phorate	EPA 8270C
	EPA 8270D
Organophosphate Pesticides	
Simazine	EPA 8270C
	EPA 8270D
Phthalate Esters	
Benzyl butyl phthalate	EPA 625
	EPA 8270C
	EPA 8270D
Bis(2-ethylhexyl) phthalate	EPA 625
	EPA 8270C
	EPA 8270D
Diethyl phthalate	EPA 625
	EPA 8270C
	EPA 8270D
Dimethyl phthalate	EPA 625
	EPA 8270C
	EPA 8270D
Di-n-butyl phthalate	EPA 625
	EPA 8270C
	EPA 8270D
Di-n-octyl phthalate	EPA 625
	EPA 8270C
	EPA 8270D
Polychlorinated Biphenyls	
PCB-1016	EPA 608
	EPA 8082
	EPA 8082A

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Polychlorinated Biphenyls

PCB-1221	EPA 608
	EPA 8082
	EPA 8082A
PCB-1232	EPA 608
	EPA 8082
	EPA 8082A
PCB-1242	EPA 608
	EPA 8082
	EPA 8082A
PCB-1248	EPA 608
	EPA 8082
	EPA 8082A
PCB-1254	EPA 608
	EPA 8082
	EPA 8082A
PCB-1260	EPA 608
	EPA 8082
	EPA 8082A
PCB-1262	EPA 8082
	EPA 8082A
PCB-1268	EPA 8082
	EPA 8082A

Polynuclear Aromatics

3-Methylcholanthrene	EPA 8270C
	EPA 8270D

Polynuclear Aromatics

7,12-Dimethylbenzyl (a) anthracene	EPA 8270C
	EPA 8270D
Acenaphthene	EPA 625
	EPA 8270C
	EPA 8270D
Acenaphthylene	EPA 625
	EPA 8270C
	EPA 8270D
Anthracene	EPA 625
	EPA 8270C
	EPA 8270D
Benzo(a)anthracene	EPA 625
	EPA 8270C
	EPA 8270D
Benzo(a)pyrene	EPA 625
	EPA 8270C
	EPA 8270D
Benzo(b)fluoranthene	EPA 625
	EPA 8270C
	EPA 8270D
Benzo(ghi)perylene	EPA 625
	EPA 8270C
	EPA 8270D
Benzo(k)fluoranthene	EPA 625
	EPA 8270C

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Polynuclear Aromatics	
Benzo(k)fluoranthene	EPA 8270D
Chrysene	EPA 625
	EPA 8270C
	EPA 8270D
Dibenzo(a,h)anthracene	EPA 625
	EPA 8270C
	EPA 8270D
Fluoranthene	EPA 625
	EPA 8270C
	EPA 8270D
Fluorene	EPA 625
	EPA 8270C
	EPA 8270D
Indeno(1,2,3-cd)pyrene	EPA 625
	EPA 8270C
	EPA 8270D
Naphthalene	EPA 625
	EPA 8270C
	EPA 8270D
Phenanthrene	EPA 625
	EPA 8270C
	EPA 8270D
Pyrene	EPA 625
	EPA 8270C
	EPA 8270D

Priority Pollutant Phenols	
2,3,4,6 Tetrachlorophenol	EPA 8270C
	EPA 8270D
2,4,5-Trichlorophenol	EPA 625
	EPA 8270C
	EPA 8270D
2,4,6-Trichlorophenol	EPA 625
	EPA 8270C
	EPA 8270D
2,4-Dichlorophenol	EPA 625
	EPA 8270C
	EPA 8270D
2,4-Dimethylphenol	EPA 625
	EPA 8270C
	EPA 8270D
2,4-Dinitrophenol	EPA 625
	EPA 8270C
	EPA 8270D
2,6-Dichlorophenol	EPA 8270C
	EPA 8270D
2-Chlorophenol	EPA 625
	EPA 8270C
	EPA 8270D
2-Methyl-4,6-dinitrophenol	EPA 625
	EPA 8270C
	EPA 8270D

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Priority Pollutant Phenols	
2-Methylphenol	EPA 8270C
	EPA 8270D
2-Nitrophenol	EPA 625
	EPA 8270C
	EPA 8270D
3-Methylphenol	EPA 8270C
	EPA 8270D
4-Chloro-3-methylphenol	EPA 625
	EPA 8270C
	EPA 8270D
4-Methylphenol	EPA 8270C
	EPA 8270D
4-Nitrophenol	EPA 625
	EPA 8270C
	EPA 8270D
Cresols, Total	EPA 625
	EPA 8270C
	EPA 8270D
Pentachlorophenol	EPA 625
	EPA 8151A
	EPA 8270C
	EPA 8270D
Phenol	EPA 625
	EPA 8270C
	EPA 8270D

Residue	
Settleable Solids	SM 18-21 2540 F (97)
Solids, Total	SM 18-21 2540B (97)
Solids, Total Dissolved	SM 18-21 2540C (97)
Solids, Total Suspended	SM 18-21 2540D (97)

Semi-Volatile Organics	
1,1'-Biphenyl	EPA 8270C
	EPA 8270D
1,2-Dichlorobenzene, Semi-volatile	EPA 8270C
	EPA 8270D
1,3-Dichlorobenzene, Semi-volatile	EPA 8270C
	EPA 8270D
1,4-Dichlorobenzene, Semi-volatile	EPA 8270C
	EPA 8270D
2-Methylnaphthalene	EPA 8270C
	EPA 8270D
4-Amino biphenyl	EPA 8270C
	EPA 8270D
Acetophenone	EPA 8270C
	EPA 8270D
Benzaldehyde	EPA 8270C
	EPA 8270D
Benzoic Acid	EPA 8270C
	EPA 8270D
Benzyl alcohol	EPA 8270C
	EPA 8270D

Serial No.: 45859

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2012
Issued April 01, 2011
Revised February 13, 2012

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. CHRISTOPHER SPENCER
TESTAMERICA BUFFALO
10 HAZELWOOD DRIVE - SUITE 106
AMHERST, NY 14228

NY Lab Id No: 10026

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Semi-Volatile Organics

Caprolactam	EPA 8270C
	EPA 8270D
Dibenzofuran	EPA 8270C
	EPA 8270D
Ethyl methanesulfonate	EPA 8270C
	EPA 8270D
Isosafrole	EPA 8270C
	EPA 8270D
Methyl methanesulfonate	EPA 8270C
	EPA 8270D
O,O,O-Triethyl phosphorothioate	EPA 8270C
	EPA 8270D
p-Dimethylaminoazobenzene	EPA 8270C
	EPA 8270D
Phenacetin	EPA 8270C
	EPA 8270D
Safrole	EPA 8270C
	EPA 8270D

Volatile Aromatics

1,2,4-Trichlorobenzene, Volatile	EPA 8260B
1,2,4-Trimethylbenzene	EPA 8021B
	EPA 8260B
1,2-Dichlorobenzene	EPA 601
	EPA 602
	EPA 624

Volatile Aromatics

1,2-Dichlorobenzene	EPA 8260B
1,3,5-Trimethylbenzene	EPA 8021B
	EPA 8260B
1,3-Dichlorobenzene	EPA 601
	EPA 602
	EPA 624
	EPA 8260B
1,4-Dichlorobenzene	EPA 601
	EPA 602
	EPA 624
	EPA 8260B
Benzene	EPA 602
	EPA 624
	EPA 8021B
	EPA 8260B
Chlorobenzene	EPA 601
	EPA 602
	EPA 624
	EPA 8260B
Ethyl benzene	EPA 602
	EPA 624
	EPA 8021B
	EPA 8260B
Isopropylbenzene	EPA 8021B
	EPA 8260B

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Volatile Aromatics		**Volatile Halocarbons**	
Naphthalene, Volatile	EPA 8260B	1,1,1-Trichloroethane	EPA 624
n-Butylbenzene	EPA 8021B		EPA 8260B
	EPA 8260B	1,1,2,2-Tetrachloroethane	EPA 624
n-Propylbenzene	EPA 8021B		EPA 8260B
	EPA 8260B	1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260B
p-Isopropyltoluene (P-Cymene)	EPA 8021B	1,1,2-Trichloroethane	EPA 601
	EPA 8260B		EPA 624
sec-Butylbenzene	EPA 8021B		EPA 8260B
	EPA 8260B	1,1-Dichloroethane	EPA 601
Styrene	EPA 624		EPA 624
	EPA 8260B		EPA 8260B
tert-Butylbenzene	EPA 8260B	1,1-Dichloroethene	EPA 601
Toluene	EPA 602		EPA 624
	EPA 624		EPA 8260B
	EPA 8021B	1,1-Dichloropropene	EPA 8260B
	EPA 8260B	1,2,3-Trichloropropane	EPA 8260B
Total Xylenes	EPA 602	1,2-Dibromo-3-chloropropane	EPA 8011
	EPA 624		EPA 8260B
	EPA 8021B	1,2-Dibromoethane	EPA 8011
	EPA 8260B		EPA 8260B
Volatile Chlorinated Organics		1,2-Dichloroethane	EPA 601
			EPA 624
Epichlorohydrin	EPA 8260B		EPA 8260B
Volatile Halocarbons		1,2-Dichloropropane	EPA 601
1,1,1,2-Tetrachloroethane	EPA 8260B		EPA 624
1,1,1-Trichloroethane	EPA 601		

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Volatile Halocarbons	
1,2-Dichloropropane	EPA 8260B
1,3-Dichloropropane	EPA 8260B
2,2-Dichloropropane	EPA 8260B
2-Chloro-1,3-butadiene (Chloroprene)	EPA 8260B
2-Chloroethylvinyl ether	EPA 601
	EPA 624
	EPA 8260B
3-Chloropropene (Allyl chloride)	EPA 8260B
Bromochloromethane	EPA 8260B
Bromodichloromethane	EPA 601
	EPA 624
	EPA 8260B
Bromoform	EPA 624
	EPA 8260B
Bromomethane	EPA 601
	EPA 624
	EPA 8260B
Carbon tetrachloride	EPA 601
	EPA 624
	EPA 8260B
Chloroethane	EPA 601
	EPA 624
	EPA 8260B
Chloroform	EPA 601
	EPA 624

Volatile Halocarbons	
Chloroform	EPA 8260B
Chloromethane	EPA 601
	EPA 624
	EPA 8260B
cis-1,2-Dichloroethene	EPA 8260B
cis-1,3-Dichloropropene	EPA 601
	EPA 624
	EPA 8260B
cis-1,4-Dichloro-2-butene	EPA 8260B
Dibromochloromethane	EPA 601
	EPA 624
	EPA 8260B
Dibromomethane	EPA 8260B
Dichlorodifluoromethane	EPA 601
	EPA 624
	EPA 8260B
Hexachlorobutadiene, Volatile	EPA 8260B
Methyl iodide	EPA 8260B
Methylene chloride	EPA 601
	EPA 624
	EPA 8260B
Tetrachloroethene	EPA 601
	EPA 624
	EPA 8260B
trans-1,2-Dichloroethene	EPA 601

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Volatile Halocarbons	
trans-1,2-Dichloroethene	EPA 624
	EPA 8260B
trans-1,3-Dichloropropene	EPA 601
	EPA 624
	EPA 8260B
trans-1,4-Dichloro-2-butene	EPA 8260B
Trichloroethene	EPA 601
	EPA 624
	EPA 8260B
Trichlorofluoromethane	EPA 601
	EPA 624
	EPA 8260B
Vinyl chloride	EPA 601
	EPA 624
	EPA 8260B
Volatiles Organics	
1,4-Dioxane	EPA 8260B
2-Butanone (Methylethyl ketone)	EPA 8260B
2-Hexanone	EPA 8260B
4-Methyl-2-Pentanone	EPA 8260B
Acetone	EPA 8260B
Acetonitrile	EPA 8260B
Carbon Disulfide	EPA 8260B
Cyclohexane	EPA 8260B
Isobutyl alcohol	EPA 8015 B

Volatiles Organics	
Isobutyl alcohol	EPA 8015C
	EPA 8260B
Methyl acetate	EPA 8260B
Methyl cyclohexane	EPA 8260B
o-Toluidine	EPA 8270C
Vinyl acetate	EPA 8260B
Wastewater Metals I	
Barium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Cadmium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Calcium, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
	EPA 6010C
Chromium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B

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Wastewater Metals I	
Chromium, Total	EPA 6010C
	EPA 6020
	EPA 6020A
Copper, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Iron, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
	EPA 6010C
Lead, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Magnesium, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
	EPA 6010C
Manganese, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C

Wastewater Metals I	
Manganese, Total	EPA 6020
	EPA 6020A
Nickel, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Potassium, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
	EPA 6010C
Silver, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Sodium, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
	EPA 6010C
Strontium, Total	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6020
	EPA 6020A

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Wastewater Metals II

Aluminum, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
	EPA 6010C
Antimony, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Arsenic, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Beryllium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Chromium VI	EPA 7196A
	SM 18-19 3500-Cr D
	SM 20-21 3500-Cr B (01)
Mercury, Total	EPA 245.1 Rev. 3.0

Wastewater Metals II

Mercury, Total	EPA 7470A
Selenium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Vanadium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Zinc, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A

Wastewater Metals III

Cobalt, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020

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Wastewater Metals III

Cobalt, Total	EPA 6020A
Molybdenum, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Thallium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Tin, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
	EPA 6010C
Titanium, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
	EPA 6010C

Wastewater Miscellaneous

Boron, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
	EPA 6010C
Bromide	EPA 300.0 Rev. 2.1
	EPA 9056A

Wastewater Miscellaneous

Bromide	SM 18-21 4110B (00)
Color	SM 18-21 2120B (01)
Cyanide, Total	EPA 335.4 Rev. 1.0
	EPA 9012A
	LACHAT 10-204-00-1-X
	SM 18-21 4500-CN E (99)
	SM 18-21 4500-CN G (99)
Hydrogen Ion (pH)	EPA 9040B
	SM 18-21 4500-H B (00)
Oil & Grease Total Recoverable (HEM)	EPA 1664A
	EPA 9070 (Solvent:Hexane)
Organic Carbon, Total	EPA 9060
	SM 18-21 5310D (00)
Phenols	EPA 420.4 Rev. 1.0
	EPA 9065
	EPA 9066
Specific Conductance	EPA 120.1 Rev. 1982
	EPA 9050
	SM 18-21 2510B (97)
Sulfide (as S)	SM 18-21 4500-S D (00)
	SM 19-21 4500-S F (00)
Surfactant (MBAS)	SM 18-21 5540C (00)
Temperature	SM 18-21 2550B (00)
Total Petroleum Hydrocarbons	EPA 1664A
Total Residual Chlorine	SM 18-21 4500-Cl G (00)

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Wastewater Miscellaneous

Turbidity	EPA 180.1 Rev. 2.0

Sample Preparation Methods

EPA 200.2
EPA 3005A
EPA 3010A
EPA 3020A
EPA 3510C
EPA 3520C
EPA 5030B
EPA 9010B
SM 18-20 4500-P b.5

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Quality Assurance Manual

TestAmerica Buffalo
10 Hazelwood Drive
Amherst, New York 14228
716.504.9800
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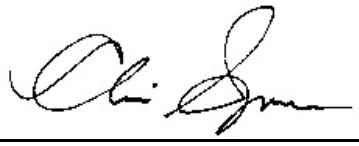
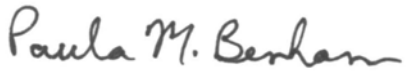
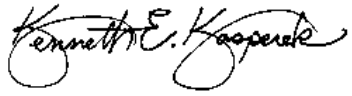


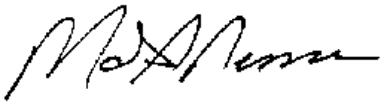
Laboratory Director – Chris Spencer — 2/1/2011 Date



Quality Assurance Manager - Paula Benham — 2/1/2011 Date



Technical Director & EH&S - Kenneth Kasperek — 2/1/2011 Date



Customer Service Manager - Mark Nemec — 2/1/2011 Date

Operations Manager – Jennifer Pierce — 2/1/2011 Date

SECTION 2

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LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

REFERENCED CORPORATE SOPs AND POLICIES

SOP/Policy Reference	Title
CA-Q-S-001	Solvent and Acid Lot Testing and Approval
CA-Q-S-002	Acceptable Manual Integration Practices
CA-Q-S-004	Method Compliance & Data Authenticity Audits
CA-Q-S-006	Detection Limits
CA-Q-S-008	Management Systems Review
CW-Q-S-001	Corporate Document Control and Archiving
CW-Q-S-002	Writing a Standard Operating Procedure (SOPs)
CA-L-S-001	Internal Investigation of Potential Data Discrepancies and Determination for Data Recall
CA-L-S-002	Subcontracting Procedures
CA-L-P-001	Ethics Policy
CA-L-P-002	Contract Compliance Policy
CW-F-P-002	Authorization Matrix
CW-F-P-004	Procurement and Contracts Policy
CA-C-S-001	Work Sharing Process

CA-T-P-001	Qualified Products List
CW-F-S-007	Controlled Purchases Policy
CW-F-S-018	Vendor Selection
CA-Q-M-002	Corporate Quality Management Plan
CW-E-M-001	Corporate Environmental Health & Safety Manual

REFERENCED LABORATORY SOPs

SOP Reference	Title
BF-GP-001	Calibration of Autopipettes and Repipetters
BF-GP-002	Support Equipment: Maintenance, Record Keeping and Corrective Actions
BF-GP-005	Sample Homogenization and Subsampling
BF-GP-012	Technical Data Review
BF-GP-013	Manual Integration
BF-GP-015	Record Storage and Retention
BF-GP-018	Strict Internal Chain or Custody
BF-GP-019	Standard Traceability and Preparation
BF-GP-020	Thermometer Calibration
BF-PM-001	Project Information Requirements
BF-PM-003	Bottle Order Set-up
BF-PM-005	Correctness of Analysis
BF-QA-001	Determination of Method Detection Limits
BF-QA-002	Quality Control Limits
BF-QA-003	Procedure for Writing, Reviewing and Revising Controlled Documents
BF-QA-004	Laboratory Personnel Training
BF-QA-005	Preventative and Corrective Action
BF-QA-006	Data Quality Review
BF-SR-001	Cooler Shipping - Bottle Kits and Samples
BF-SR-002	Receipt of Analytical Samples

SECTION 3

INTRODUCTION
(NELAC 5.1 - 5.3)

3.1 INTRODUCTION AND COMPLIANCE REFERENCES

TestAmerica Buffalo's Quality Assurance Manual (QAM) is a document prepared to define the overall policies, organization objectives and functional responsibilities for achieving TestAmerica's data quality goals. The laboratory maintains a local perspective in its scope of services and client relations and maintains a national perspective in terms of quality.

The QAM has been prepared to assure compliance with the 2003 National Environmental Laboratory Accreditation Conference (NELAC) standards and ISO/IEC Guide 17025 (1999 or 2005 if you're an A2LA lab). In addition, the policies and procedures outlined in this manual are compliant with TestAmerica's Corporate Management Plan (CQMP) and the various accreditation and certification programs listed in Appendix 3. The CQMP provides a summary of TestAmerica's quality and data integrity system. It contains requirements and general guidelines under which all TestAmerica facilities shall conduct their operations.

The QAM has been prepared to be consistent with the requirements of the following documents:

- EPA 600/4-88/039, *Methods for the Determination of Organic Compounds in Drinking Water,* EPA, Revised July 1991.
- EPA 600/R-95/131, *Methods for the Determination of Organic Compounds in Drinking Water,* Supplement III, EPA, August 1995.
- EPA 600/4-79-019, *Handbook for Analytical Quality Control in Water and Wastewater Laboratories,* EPA, March 1979.
- Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846), Third Edition September 1986, Final Update I, July 1992, Final Update II A, August 1993, Final Update II, September 1994; Final Update IIB, January 1995; Final Update III, December 1996; Final Update IV, January 2008.
- Federal Register, 40 CFR Parts 136, 141, 172, 173, 178, 179 and 261. New York State Analytical Services Protocol, July 2005
- Statement of Work for Inorganics & Organics Analysis, SOM and ISM, current versions, USEPA Contract Laboratory Program Multi-media, Multi-concentration.
- APHA, *Standard Methods for the Examination of Water and Wastewater,* 18th Edition, 19th, 20th and 21st Edition.
- *U.S. Department of Energy* Order 414.1B, *Quality Assurance*, Approved April 29, 2004.
- *U.S. Department of Energy* Order 414.1C, *Quality Assurance*, June 17, 2005.
- *U.S. Department of Energy*, *Quality Systems for Analytical Services*, Revision 2.4, October 28, 2008.
- Toxic Substances Control Act (TSCA).

3.2 TERMS AND DEFINITIONS

A Quality Assurance Program is a company-wide system designed to ensure that data produced by the laboratory conforms to the standards set by state and/or federal regulations. The program functions at the management level through company goals and management policies, and at the analytical level through Standard Operating Procedures (SOPs) and quality control. The TestAmerica program is designed to minimize systematic error, encourage constructive, documented problem solving, and provide a framework for continuous improvement within the organization.

Refer to Appendix 2 for the Glossary/Acronyms.

3.3 SCOPE / FIELDS OF TESTING

The laboratory analyzes a broad range of environmental and industrial samples every month. Sample matrices vary among air, drinking water, effluent water, groundwater, hazardous waste, sludge and soils. The Quality Assurance Program contains specific procedures and methods to test samples of differing matrices for chemical, physical and biological parameters. The Program also contains guidelines on maintaining documentation of analytical process, reviewing results, servicing clients and tracking samples through the laboratory. The technical and service requirements of all requests to provide analyses are thoroughly evaluated before commitments are made to accept the work. Measurements are made using published reference methods or methods developed and validated by the laboratory.

The methods covered by this manual include the most frequently requested methodologies needed to provide analytical services in the United States and its territories. The specific list of test methods used by the laboratory can be found in Section 19.0. The approach of this manual is to define the minimum level of quality assurance and quality control necessary to meet requirements. All methods performed by the laboratory shall meet these criteria as appropriate. In some instances, quality assurance project plans (QAPPs), project specific data quality objectives (DQOs) or local regulations may require criteria other than those contained in this manual. In these cases, the laboratory will abide by the requested criteria following review and acceptance of the requirements by the Laboratory Director/Manager and the Quality Assurance (QA) Manager. In some cases, QAPPs and DQOs may specify less stringent requirements. The Laboratory Director/Manager and the QA Manager must determine if it is in the lab's best interest to follow the less stringent requirements.

3.4 MANAGEMENT OF THE MANUAL

3.4.1 Review Process

The manual is reviewed every two years by senior laboratory management to assure that it reflects current practices and meets the requirements of the laboratory's clients and regulators as well as the CQMP. Occasionally, the manual may need changes in order to meet new or changing regulations and operations. The QA Manager will review the changes in the normal course of business and incorporate changes into revised sections of the document. All updates will be reviewed by the senior laboratory management staff. The laboratory updates and approves such changes according to our Document Control & updating procedures (refer to BF-QA-003)

SECTION 4

ORGANIZATION AND MANAGEMENT
(NELAC 5.4.1)

4.1 OVERVIEW

TestAmerica Buffalo is a local operating unit of TestAmerica Laboratories, Inc.. The organizational structure, responsibilities and authorities of the corporate staff of TestAmerica Laboratories, Inc. are presented in the CQMP. The laboratory has day-to-day independent operational authority overseen by corporate officers (e.g., President, Chief Operating Officer, Corporate Quality Assurance, etc.). The laboratory operational and support staff work under the direction of the Laboratory Director. The organizational structure for both Corporate & TestAmerica Buffalo is presented in Figure 4-1.

4.2 ROLES AND RESPONSIBILITIES

In order for the Quality Assurance Program to function properly, all members of the staff must clearly understand and meet their individual responsibilities as they relate to the quality program. The following descriptions briefly define each role in its relationship to the Quality Assurance Program.

4.2.1 Quality Assurance Program

The responsibility for quality lies with every employee of the laboratory. All employees have access to the QAM, are trained to this manual and are responsible for upholding the standards therein. Each person carries out his/her daily tasks in a manner consistent with the goals and in accordance with the procedures in this manual and the laboratory's SOPs. Role descriptions for corporate personnel are defined in the CQMP. This manual is specific to the operations of TestAmerica's Buffalo laboratory.

4.2.2 Laboratory Director

TestAmerica Buffalo's Laboratory Director is responsible for the overall quality, safety, financial, technical, human resource and service performance of the whole laboratory and reports to their respective GM. The Laboratory Director provides the resources necessary to implement and maintain an effective and comprehensive Quality Assurance and Data Integrity Program.

The Laboratory Director has the authority to affect those policies and procedures to ensure that only data of the highest level of excellence are produced. As such, the Laboratory Director is responsible for maintaining a working environment which encourages open, constructive problem solving and continuous improvement.

Specific responsibilities include, but are not limited to:

- Provides one or more department managers for the appropriate fields of testing. If the Department Manager is absent for a period of time exceeding 15 consecutive calendar days, the Laboratory Director must designate another full time staff member meeting the qualifications of the Department Manager to temporarily perform this function. If the absence exceeds 65 consecutive calendar days, the primary NELAC accrediting authority must be notified in writing.
- Ensures that all analysts and supervisors have the appropriate education and training to properly carry out the duties assigned to them and ensures that this training has been documented.
- Ensures that personnel are free from any commercial, financial and other undue pressures which might adversely affect the quality of their work.
- Ensures TestAmerica's human resource policies are adhered to and maintained.
- Ensures that sufficient numbers of qualified personnel are employed to supervise and perform the work of the laboratory.
- Ensures that appropriate corrective actions are taken to address analyses identified as requiring such actions by internal and external performance or procedural audits. Procedures that do not meet the standards set forth in the QAM or laboratory SOPs may be temporarily suspended by the Laboratory Director.
- Reviews and approves all SOPs prior to their implementation and ensures all approved SOPs are implemented and adhered to.
- Pursues and maintains appropriate laboratory certification and contract approvals. Supports ISO 17025 requirements.
- Ensures client specific reporting and quality control requirements are met.

Leads the management team, consisting of the QA Manager, the Technical Director, Customer Service Manager, and the Operations Manager as direct reports.

4.2.2 Quality Assurance (QA) Manager

The QA manager has responsibility and authority to ensure the continuous implementation of the quality system based on ISO 17025.

The QA Manager reports directly to the Laboratory Director and has access to Corporate QA for advice and resources. This position is able to evaluate data objectively and perform assessments without outside (i.e., managerial) influence. Corporate QA may be used as a resource in dealing with regulatory requirements, certifications and other quality assurance related items. The QA Manager directs the activities of the QA department to accomplish specific responsibilities, which include, but are not limited to:

- Having functions independent from laboratory operations for which he/she has quality assurance oversight.
- Maintaining and updating the QAM.
- Monitoring and evaluating laboratory certifications; scheduling proficiency testing samples.

- Monitoring and communicating regulatory changes that may affect the laboratory to management.
- Training and advising the laboratory staff on quality assurance/quality control procedures that are pertinent to their daily activities.
- Having a general knowledge of the analytical test methods for which data audit/review is performed (and/or having the means of getting this information when needed).
- Arranging for or conducting internal audits on quality systems, data authenticity and the technical operation.
- The laboratory QA Manager will maintain records of all ethics-related training, including the type and proof of attendance.
- Maintain, improve, and evaluate the corrective action and preventive action systems.
- Notifying laboratory management of deficiencies in the quality system and ensuring corrective action is taken
- Monitoring standards of performance in quality control and quality assurance.
- Coordinating of document control of SOPs, MDLs, control limits, and miscellaneous forms and information.
- Review a subset of all final data reports for internal consistency.
- Review of external audit reports and data validation requests.
- Follow-up with audits to ensure client QAPP requirements are met.
- Establishment of reporting schedule and preparation of various quality reports for the Laboratory Director, clients and/or Corporate QA.
- Development of suggestions and recommendations to improve quality systems.
- Research of current state and federal requirements and guidelines.
- Leads the QA team to enable communication and to distribute duties and responsibilities.
- Ensuring Communication & monitoring standards of performance to ensure that systems are in place to produce the level of quality as defined in this document.
- Notifying laboratory management of deficiencies in the quality system and ensuring corrective action is taken. Procedures that do not meet the standards set forth in the QAM or laboratory SOPs are temporarily suspended following the procedures outlined in Section 12.
- Evaluation of the thoroughness and effectiveness of training.
- Compliance with ISO 17025.

4.2.3 Technical Director

The Technical Director reports directly to the Laboratory Director and is responsible for assessing the construction and management of the facility design, maintaining environmental conditions, technical and financial evaluation of capital equipment and capital budgeting and asset valuation.

In addition, the Technical Director solves day to day technical issues, provides technical training and guidance to staff, project managers and clients, investigates technical issues identified by operations personnel or QA, and directs evaluation of new methods. Specific responsibilities include but are not limited to:

- Reviewing and approving, with input from the QA Manager, proposals from marketing, in accordance with an established procedure for the review of requests and contracts. This procedure addresses the adequate definition of methods to be used for analysis and any limitations, the laboratory's capability and resources, the client's expectations. Differences are resolved before the contract is signed and work begins. A system documenting any significant changes is maintained, as well as pertinent discussions with the client regarding their requirements or the results of the analyses during the performance of the contract. All work subcontracted by the laboratory must be approved by the client. Any deviations from the contract must be disclosed to the client. Once the work has begun, any amendments to the contract must be discussed with the client and so documented.
- Monitoring the validity of the analyses performed and data generated in the laboratory. This activity begins with reviewing and supporting all new business contracts, insuring data quality, analyzing internal and external non-conformances to identify root cause issues and implementing the resulting corrective and preventive actions, facilitating the data review process (training, development, and accountability at the bench), and providing technical and troubleshooting expertise on routine and unusual or complex problems.
- Enhancing efficiency and improving quality through technical advances and improved LIMS utilization. Capital forecasting and instrument life cycle planning for second generation methods and instruments as well as asset inventory management.
- Compliance with ISO 17025 Standard.

4.2.4 Operations Manager

The Operations Manager reports to the Laboratory Director and oversees the daily operations of the analytical laboratory, maintaining a working environment that encourages open, constructive problem solving and continuous improvement.

The Operations Manager is responsible for supervision of laboratory staff, setting goals and objectives for the laboratory, ensuring compliance with project/client requirements and ensuring on-time performance, supervises maintenance of equipment and scheduling of repairs. Responsibilities also include implementation of the quality system in the laboratory and ensuring timely compliance with audit and QA corrective actions.

In addition, the Operations Manager works with the Technical Director in evaluating technical equipment, assessing capital budget needs and determining the most efficient instrument utilization. More specifically he:

- Evaluates the level of internal/external non-conformances for all departments.
- Continuously evaluates production capacity and improves capacity utilization.
- Continuously evaluates turnaround time and addresses any problems that may hinder meeting the required and committed turnaround time from the various departments.
- Develops and improves the training of all analysts in cooperation with the Technical Director and QA Manager and in compliance with regulatory requirements.
- Works with the Preventive Maintenance Coordinator to ensure that scheduled instrument maintenance is completed.
- Is responsible for efficient utilization of supplies.
- Constantly monitors and modifies the processing of samples through the departments.
- Fully supports the quality system and, if called upon in the absence of the QA Manager, serves as his substitute in the interim.

4.2.5 Department Managers

Department Managers report to the Operations Manager. The Department Managers serve as the technical experts on assigned projects, provide technical liaison, assist in resolving any technical issues within the area of their expertise; and implement established policies and procedures to assist the Operations Manager in achieving section goals. Each one is responsible to:

- Ensure that analysts in their department adhere to applicable SOPs and the QA Manual. They perform frequent SOP and QA Manual review to determine if analysts are in compliance and if new, modified, and optimized measures are feasible and should be added to these documents.
- With regard to analysts, participates in the selection, training, and development of performance objectives and standards of performance, appraisal (measurement of objectives), scheduling, counseling, discipline, and motivation of analysts and documents these activities in accordance with systems developed by the QA and Human Resources Departments. They evaluate staffing sufficiency and overtime needs. Training consists of familiarization with SOP, QC, Safety, and computer systems.
- Encourage the development of analysts to become cross-trained in various methods and/or operate multiple instruments efficiently while performing maintenance and documentation, self-supervise, and function as a department team.
- Provide guidance to analysts in resolving problems encountered daily during sample prep/analysis in conjunction with the Technical Director, Operations Manager, and/or QA Manager. Each is responsible for 100% of the data review and documentation, non-conformance and CPAR issues, the timely and accurate completion of performance evaluation samples and MDLs, for his department.

- Ensure all logbooks are maintained, current, and properly labeled or archived.
- Report all non-conformance conditions to the QA Manager, Technical Director, Operations Manager, and/or Laboratory Director.
- Ensure that preventive maintenance is performed on instrumentation as detailed in the QA Manual or SOPs. He is responsible for developing and implementing a system for preventive maintenance, troubleshooting, and repairing or arranging for repair of instruments.
- Maintain adequate and valid inventory of reagents, standards, spare parts, and other relevant resources required to perform daily analysis.
- Achieve optimum turnaround time on analyses and compliance with holding times.
- Conduct efficiency and cost control evaluations on an ongoing basis to determine optimization of labor, supplies, overtime, first-run yield, capacity (designed vs. demonstrated), second- and third-generation production techniques/instruments, and long-term needs for budgetary planning.
- Develop, implement, and enhance calibration programs.
- Provide written responses to external and internal audit issues.

4.2.6 Environmental Health & Safety / Hazardous Waste Coordinator

The Health and Safety Coordinator is responsible for the safety and well-being of all employees while at the laboratory. This includes, but is not limited to, administering the Corporate Safety Manual that complies with federal regulations, MSDS training and review, conducting laboratory safety orientation and tours for all new employees, providing instructions on safety equipment, cleaning up laboratory spills, and instructing personnel of laboratory procedures for emergency situations. The Health and Safety Coordinator is on-call 24-hours a day, 7-days a week for all laboratory situations.

The Health and Safety Coordinator responsibilities additionally include waste management of laboratory generated hazardous waste in accordance with appropriate regulations. This includes maintenance of required documentation, such as waste manifests, segregation of waste in accordance with requirements, and training of personnel in proper segregation of waste and preparation of Safety related SOPs. The EHSC maintains overall EH&S program oversight, but may delegate specific day-to-day activities as necessary.

- Staying current with the hazardous waste regulations.
- Continuing training on hazardous waste issues.
- Reviewing and updating annually the Hazardous Waste Contingency Plan in the Environmental Health & Safety Manual.
- Auditing the staff with regard to compliance with the Hazardous Waste Contingency Plan.
- Contacting the hazardous waste subcontractors for review of procedures and opportunities for minimization of waste.
- Conduct ongoing, necessary safety training and conduct new employee safety orientation.

- Assist in developing and maintaining the Chemical Hygiene/Safety Manual.
- Administer dispersal of all Material Safety Data Sheet (MSDS) information.
- Perform regular chemical hygiene and housekeeping instruction.
- Give instruction on proper labeling and practice.
- Serve as chairman of the laboratory safety committee.
- Provide and train personnel on protective equipment.
- Oversee the inspection and maintenance of general safety equipment – fire extinguishers, safety showers, eyewash fountains, etc. and ensure prompt repairs as needed.
- Supervise and schedule fire drills and emergency evacuation drills.
- Determine what initial and subsequent exposure monitoring, if necessary to determine potential employee exposure to chemicals used in the laboratory.
- When determined necessary, conduct exposure monitoring assessments.
- Determine when a complaint of possible over-exposure is "reasonable" and should be referred for medical consultation.
- Assist in the internal and external coordination of the medical consultation/monitoring program conducted by TestAmerica's medical consultants.

4.2.7 Laboratory Analysts

Laboratory analysts are responsible for conducting analysis and performing all tasks assigned to them by the group leader or supervisor. The responsibilities of the analysts are listed below:

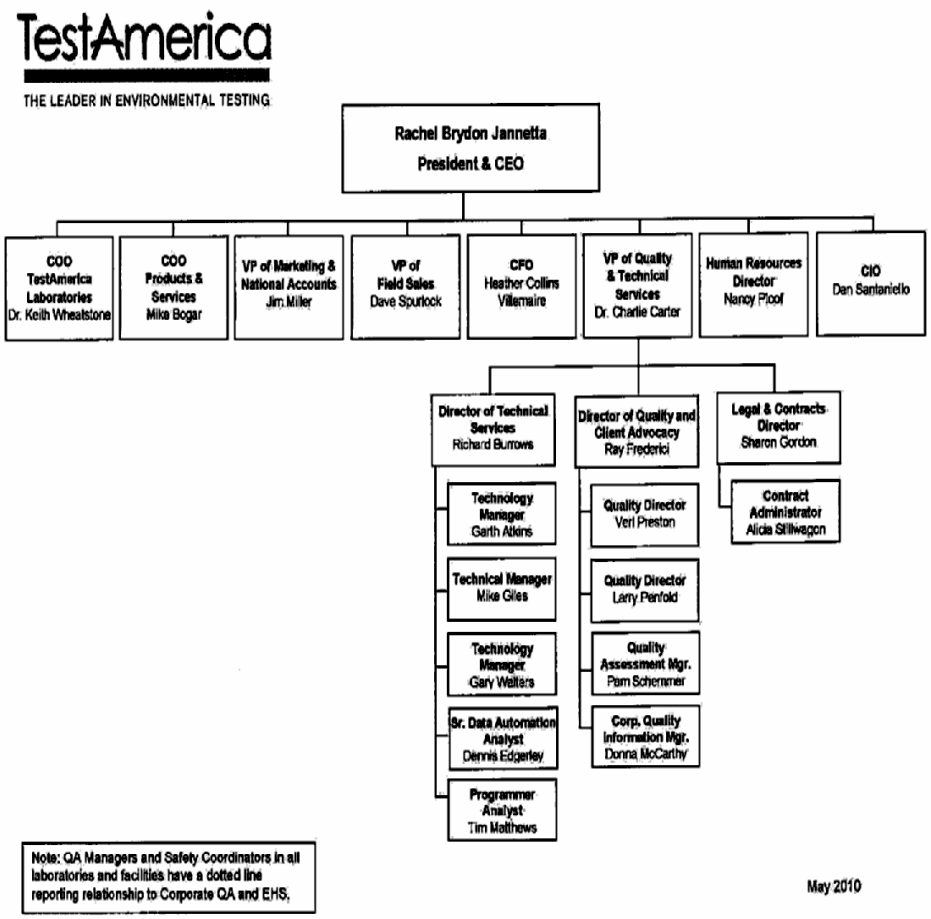
- Perform analyses by adhering to analytical and quality control protocols prescribed by current SOPs, this QA Manual, and project-specific plans honestly, accurately, timely, safely, and in the most cost-effective manner.
- Document standard and sample preparation, instrument calibration and maintenance, data calculations, sample matrix effects, and any observed non-conformance on worklists, benchsheets, lab notebooks and/or the Non-Conformance Database.
- Report all non-conformance situations, instrument problems, matrix problems and QC failures, which might affect the reliability of the data, to their supervisor, the Technical Director, and/or the QA Manager or member of QA staff.
- Perform 100% review of the data generated prior to entering and submitting for secondary level review.
- Suggest method improvements to their supervisor, the Technical Director, and the QA Manager. These improvements, if approved, will be incorporated. Ideas for the optimum performance of their assigned area, for example, through the proper cleaning and maintenance of the assigned instruments and equipment, are encouraged.
- Work cohesively as a team in their department to achieve the goals of accurate results, optimum turnaround time, cost effectiveness, cleanliness, complete documentation, and personal knowledge of environmental analysis.

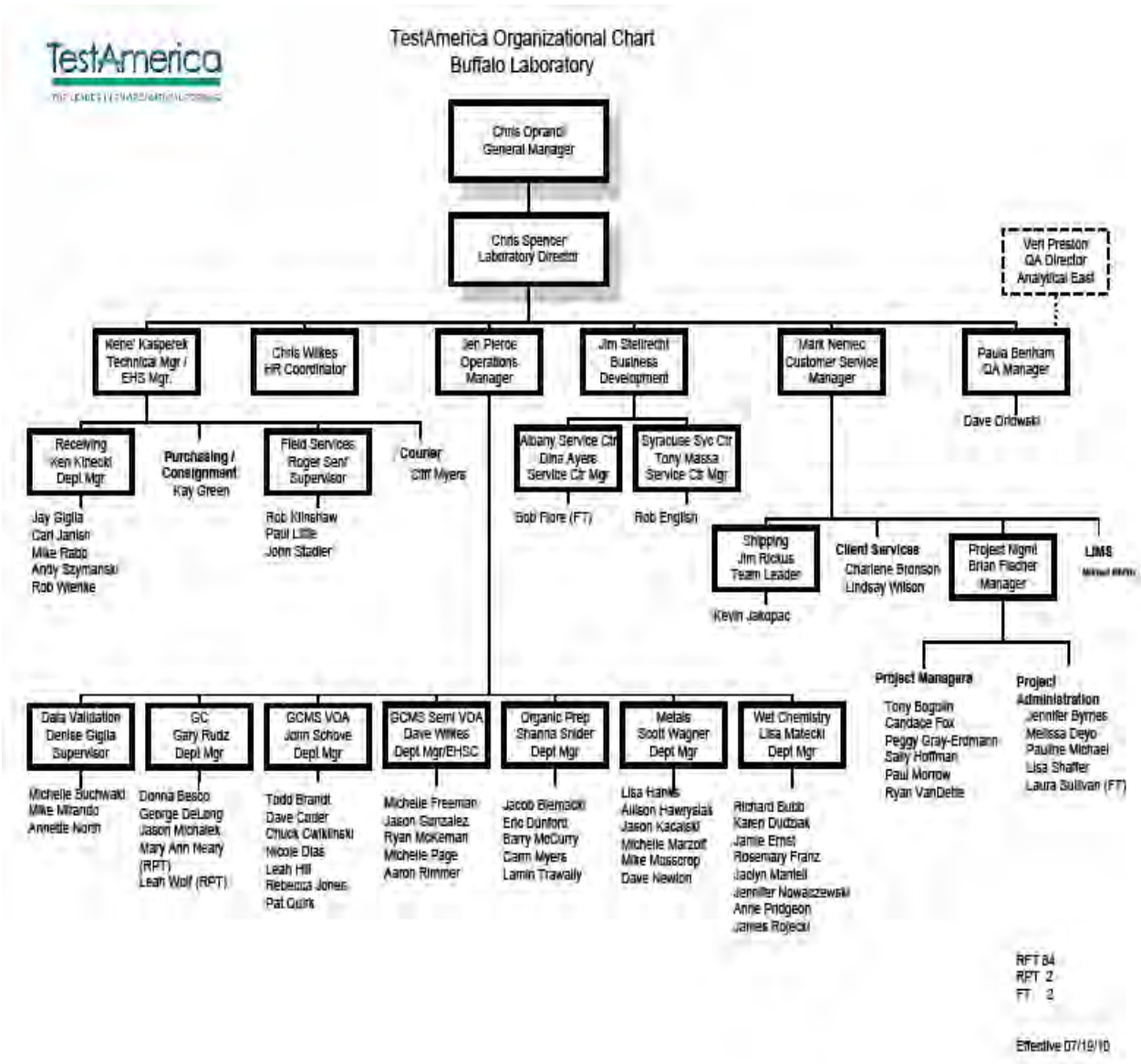
4.3 DEPUTIES

The following table defines who assumes the responsibilities of key personnel in their absence:

Key Personnel	Deputy	Comment
Laboratory Director	Operations Manager (1) Technical Director (2)	
QA Manager	QA Specialist (1) Operations Manager (2)	
Technical Director	Laboratory Director (1) Operations Manager (2)	
Operations Manager	Department Manager (1) Department Manager (2)	Selected based on availability
Customer Service Manager	Project Mng't Manager (1) Laboratory Director (2)	
Project Management Manager	Customer Srv. Manager (1) Project Manager (2)	(2) Selected based on availability
Project Manager	Project Manager (1) Project Management Asst. (2)	(1) 2° team PM (2) Team PMA
Organic Department Manager	Analyst (1) Analyst (2)	Selected based on department, experience and availability
Inorganic Department Manager	Analyst (1) Analyst (2)	Selected based on department, experience and availability
Data Validation / Data Packaging Manager	Data Validation Specialist Data Packaging Specialist	Selected based on department and availability
EHS Coordinator	Safety Officer (1) Sample Mng't Manager (2)	
Sample Management Manager	Sample Custodian (1) EHS Coordinator (2)	
Bottle Preparation / Shipping Manager	Bottle Prep Technician (1) Sample Mng't Manager (2)	

Figure 4-1.
Corporate and Laboratory Organization Charts




TestAmerica
TestAmerica Organizational Chart
Buffalo Laboratory
Chris Oprandi
General Manager
Chris Spencer
Laboratory Director
Keri Preston
QA Director
Analytical East
Kenet Kasperek
Technical Mgr /
EHS Mgr.
Chris Wilkes
HR Coordinator
Jen Pierce
Operations
Manager
Jim Stellrecht
Business
Development
Mark Nemec
Customer Service
Manager
Paula Benham
QA Manager
Dave Orlowski
Receiving
Ken Kinecki
Dept Mgr
Jay Gigila
Carl Janish
Mike Rabb
Andy Szymanski
Rob Wienke
Purchasing /
Consignment
Kay Green
Field Services
Roger Senf
Supervisor
Rob Klinshaw
Paul Little
John Stadler
Courier
Cliff Myers
Albany Service Ctr
Dina Ayers
Service Ctr Mgr
Bob Fiore (FT)
Syracuse Svc Ctr
Tony Massa
Service Ctr Mgr
Rob English
Shipping
Jim Rickus
Team Leader
Kevin Jakopac
Client Services
Charlene Bronson
Lindsay Wilson
Project Mgmt
Brian Fischer
Manager
LIMS
Project Managers
Tony Bogovin
Candace Fox
Peggy Gray-Erdmann
Sally Hoffman
Paul Morrow
Ryan VanDette
Project
Administration
Jennifer Byrnes
Melissa Deyo
Pauline Michael
Lisa Shaffer
Laura Sullivan (FT)
Data Validation
Denise Gigila
Supervisor
Michelle Buchwald
Mike Mirando
Annette North
GC
Gary Rudz
Dept Mgr
Donna Bosco
George DeLong
Jason Michalek
Mary Ann Neary
(RPT)
Leah Wolf (RPT)
GCMS VOA
John Schove
Dept Mgr
Todd Brandt
Dave Carder
Chuck Catkinski
Nicole Dias
Leah Hill
Rebecca Jones
Pat Quirk
GCMS Semi VOA
Dave Wilkes
Dept Mgr/EHSC
Michelle Freeman
Jason Gonzalez
Ryan McKeman
Michelle Page
Aaron Rimmer
Organic Prep
Shanna Snider
Dept Mgr
Jacob Biernacki
Eric Dunford
Barry McCurry
Darin Myers
Lamin Trawally
Metals
Scott Wagner
Dept Mgr
Lisa Hanes
Allison Hawrylak
Jason Kacalski
Michelle Marzolf
Mike Musscrop
Dave Newton
Wet Chemistry
Lisa Matecki
Dept Mgr
Richard Bubb
Karen Dudziak
Jamie Ernst
Rosemary Franz
Jaclyn Mantell
Jennifer Nowaczewski
Anne Pridgeon
James Rojecki
RFT 84
RPT 2
FT 2
Effective 07/19/10

SECTION 5

QUALITY SYSTEM
(NELAC 5.4.2)

5.1 QUALITY POLICY STATEMENT

It is TestAmerica's Policy to:

- Provide data of known quality to its clients by adhering to approved methodologies, regulatory requirements and the QA/QC protocols.
- Effectively manage all aspects of the laboratory and business operations by the highest ethical standards.
- Continually improve systems and provide support to quality improvement efforts in laboratory, administrative and managerial activities. TestAmerica recognizes that the implementation of a quality assurance program requires management's commitment and support as well as the involvement of the entire staff.
- Provide clients with the highest level of professionalism and the best service practices in the industry.

Every staff member at the laboratory plays an integral part in quality assurance and is held responsible and accountable for the quality of their work. It is, therefore, required that all laboratory personnel are trained and agree to comply with applicable procedures and requirements established by this document.

5.2 ETHICS AND DATA INTEGRITY

TestAmerica is committed to ensuring the integrity of its data and meeting the quality needs of its clients. The 7 elements of TestAmerica's Ethics and Data Integrity Program include:

- An Ethics Policy (Corporate Policy No. CA-L-P-001) and Employee Ethics Statements.
- Ethics and Compliance Officers (ECOs).
- A training program.
- Self-governance through disciplinary action for violations.
- A confidential mechanism for anonymously reporting alleged misconduct and a means for conducting internal investigations of all alleged misconduct. (Corporate SOP No. CA-L-S-001)
- Procedures and guidance for recalling data if necessary (Corporate SOP No. CA-L-S-001).
- Effective external and internal monitoring system that includes procedures for internal audits (Section 16).

- Produce results, which are accurate and include QA/QC information that meets client pre-defined Data Quality Objectives (DQOs).
- Present services in a confidential, honest and forthright manner.
- Provide employees with guidelines and an understanding of the Ethical and Quality Standards of our industry.
- Operate our facilities in a manner that protects the environment and the health and safety of employees and the public.
- Obey all pertinent federal, state and local laws and regulations and encourage other members of our industry to do the same.
- Educate clients as to the extent and kinds of services available.
- Assert competency only for work for which adequate personnel and equipment are available and for which adequate preparation has been made.
- Promote the status of environmental laboratories, their employees, and the value of services rendered by them.

5.3 QUALITY SYSTEM DOCUMENTATION

The laboratory's Quality System is communicated through a variety of documents:

- Quality Assurance Manual – Each laboratory has a lab specific quality assurance manual.
- Corporate SOPs and Policies - Corporate SOPs and Policies are developed for use by all relevant laboratories. They are incorporated into the laboratories normal SOP distribution, training and tracking system. Corporate SOPs may be general or technical.
- Work Instructions - A subset of procedural steps, tasks or forms associated with an operation of a management system (e.g., checklists, preformatted bench sheets, forms).
- Laboratory SOPs – General and Technical
- Corporate Quality Policy Memorandums
- Laboratory QA/QC Policy Memorandums

5.3.1 Order of Precedence

In the event of a conflict or discrepancy between policies, the order of precedence is as follows:

- Corporate Quality Policy Memorandum
- Corporate Quality Management Plan (CQMP)
- Corporate SOPs and Policies
- Laboratory QA/QC Policy Memorandum
- Laboratory Quality Assurance Manual (QAM)
- Laboratory SOPs and Policies

- Other (Work Instructions (WI), memos, flow charts, etc.)

Note: The laboratory's has the responsibility and authority to operate in compliance with regulatory requirements of the jurisdiction in which the work is performed. Where the CQMP conflicts with those regulatory requirements, the regulatory requirements of the jurisdiction shall hold primacy. The laboratory's QAM shall take precedence over the CQMP in those cases.

5.4 QA/QC OBJECTIVES FOR THE MEASUREMENT OF DATA

Quality Assurance (QA) and Quality Control (QC) are activities undertaken to achieve the goal of producing data that accurately characterize the sites or materials that have been sampled. Quality Assurance is generally understood to be more comprehensive than Quality Control. Quality Assurance can be defined as the integrated system of activities that ensures that a product or service meets defined standards.

Quality Control is generally understood to be limited to the analyses of samples and to be synonymous with the term *"analytical quality control"*. QC refers to the routine application of statistically based procedures to evaluate and control the accuracy of results from analytical measurements. The QC program includes procedures for estimating and controlling precision and bias and for determining reporting limits.

Request for Proposals (RFPs) and Quality Assurance Project Plans (QAPP) provide a mechanism for the client and the laboratory to discuss the data quality objectives in order to ensure that analytical services closely correspond to client needs. The client is responsible for developing the QAPP. In order to ensure the ability of the laboratory to meet the Data Quality Objectives (DQOs) specified in the QAPP, clients are advised to allow time for the laboratory to review the QAPP before being finalized. Additionally, the laboratory will provide support to the client for developing the sections of the QAPP that concern laboratory activities.

Historically, laboratories have described their QC objectives in terms of precision, accuracy, representativeness, comparability, completeness, selectivity and sensitivity (PARCCSS).

5.4.1 Precision

The laboratory objective for precision is to meet the performance for precision demonstrated for the methods on similar samples and to meet data quality objectives of the EPA and/or other regulatory programs. Precision is defined as the degree of reproducibility of measurements under a given set of analytical conditions (exclusive of field sampling variability). Precision is documented on the basis of replicate analysis, usually duplicate or matrix spike (MS) duplicate samples.

5.4.2 Accuracy

The laboratory objective for accuracy is to meet the performance for accuracy demonstrated for the methods on similar samples and to meet data quality objectives of the EPA and/or other regulatory programs. Accuracy is defined as the degree of bias in a measurement system. Accuracy may be documented through the use of laboratory control samples (LCS) and/or MS.

A statement of accuracy is expressed as an interval of acceptance recovery about the mean recovery.

5.4.3 Representativeness

The laboratory objective for representativeness is to provide data which is representative of the sampled medium. Representativeness is defined as the degree to which data represent a characteristic of a population or set of samples and is a measurement of both analytical and field sampling precision. The representativeness of the analytical data is a function of the procedures used in procuring and processing the samples. The representativeness can be documented by the relative percent difference between separately procured, but otherwise identical samples or sample aliquots.

The representativeness of the data from the sampling sites depends on both the sampling procedures and the analytical procedures. The laboratory may provide guidance to the client regarding proper sampling and handling methods in order to assure the integrity of the samples.

5.4.4 Comparability

The comparability objective is to provide analytical data for which the accuracy, precision, representativeness and reporting limit statistics are similar to these quality indicators generated by other laboratories for similar samples, and data generated by the laboratory over time.

The comparability objective is documented by inter-laboratory studies carried out by regulatory agencies or carried out for specific projects or contracts, by comparison of periodically generated statements of accuracy, precision and reporting limits with those of other laboratories.

5.4.5 Completeness

The completeness objective for data is 90% (or as specified by a particular project), expressed as the ratio of the valid data to the total data over the course of the project. Data will be considered valid if they are adequate for their intended use. Data usability will be defined in a QAPP, project scope or regulatory requirement. Data validation is the process for reviewing data to determine its usability and completeness. If the completeness objective is not met, actions will be taken internally and with the data user to improve performance. This may take the form of an audit to evaluate the methodology and procedures as possible sources for the difficulty or may result in a recommendation to use a different method.

5.4.6 Selectivity

Selectivity is defined as: The capability of a test method or instrument to respond to a target substance or constituent in the presence of non-target substances. Target analytes are separated from non-target constituents and subsequently identified/detected through one or more of the following, depending on the analytical method: extractions (separation), digestions (separation), interelement corrections (separation), use of matrix modifiers (separation), specific retention times (separation and identification), confirmations with different columns or detectors (separation and identification), specific wavelengths (identification), specific mass spectra (identification), specific electrodes (separation and identification), etc..

5.4.7 Sensitivity

Sensitivity refers to the amount of analyte necessary to produce a detector response that can be reliably detected (Method Detection Limit) or quantified (Reporting Limit).

5.5 CRITERIA FOR QUALITY INDICATORS

The laboratory maintains *Quality Control Limit Data in their LIMS system.* A summary report is generated from LIMS to check the precision and accuracy acceptability limits for performed analyses on request. The summary report is generated and is managed by the laboratory's QA department. Some acceptability limits are derived from US EPA methods when they are required. Where US EPA method limits are not required, the laboratory has developed limits from evaluation of data from similar matrices. Criteria for development of control limits is contained in Section 24.

5.6 STATISTICAL QUALITY CONTROL

Statistically-derived precision and accuracy limits are required by selected methods (such as SW-846) and programs [such as the Ohio Voluntary Action Plan (VAP)]. The laboratory routinely utilizes statistically-derived limits to evaluate method performance and determine when corrective action is appropriate. The procedure for determining the statistical limits may be found in SOP BF-QA-002, Quality Control Limits. The analysts are instructed to use the current limits in the laboratory (dated and approved the QA Manager) and entered into the Laboratory Information Management System (LIMS). The Quality Assurance department maintains an archive of all limits used within the laboratory through date sensitive tables within the LIMs System. If a method defines the QC limits, the method limits are used.

If a method requires the generation of historical limits, the lab develops such limits from recent data in the QC database of the LIMS following the guidelines described in Section 24. All calculations and limits are documented and dated when approved and effective. On occasion, a client requests contract-specified limits for a specific project.

Surrogate recoveries are determined for a specific time period as defined above. The resulting ranges are entered in LIMS.

Current QC limits are entered and maintained in the LIMS analyte database. As sample results and the related QC are entered into LIMS, the sample QC values are compared with the limits in LIMS to determine if they are within the acceptable range. The analyst then evaluates if the sample needs to be rerun or re-extracted/rerun or if a comment should be added to the report explaining the reason for the QC outlier.

5.6.1 QC Charts

The QA Manager periodically evaluates these to determine if adjustments need to be made or for corrective actions to methods (SOP No. BF-QA-002). All findings are documented and kept on file.

5.7 QUALITY SYSTEM METRICS

In addition to the QC parameters discussed above, the entire Quality System is evaluated on a monthly basis through the use of specific metrics (refer to Section 16). These metrics are used to drive continuous improvement in the laboratory's Quality System.

SECTION 6

DOCUMENT CONTROL
(NELAC 5.4.3)

6.1 OVERVIEW

The QA Department is responsible for the control of documents used in the laboratory to ensure that approved, up-to-date documents are in circulation and out-of-date (obsolete) documents are archived or destroyed. The following documents, at a minimum, must be controlled:

- Laboratory Quality Assurance Manual
- Laboratory Standard Operating Procedures (SOP)
- Laboratory Policies
- Work Instructions and Forms
- Corporate Policies and Procedures distributed outside the intranet

Corporate Quality posts Corporate Manuals, SOPs, Policies, Work Instructions, White Papers and Training Materials on the company intranet site. These Corporate documents are only considered controlled when they are read on the intranet site. Printed copies are considered uncontrolled unless the laboratory physically distributes them as controlled documents. A detailed description of the procedure for issuing, authorizing, controlling, distributing, and archiving corporate documents is found in Corporate SOP No. CW-Q-S-001, Corporate Document Control and Archiving. The laboratory's internal document control procedure is defined in SOP No. BF-QA-003.

The laboratory QA Department also maintains access to various references and document sources integral to the operation of the laboratory. This includes reference methods and regulations. Instrument manuals (hard or electronic copies) are also maintained by the laboratory.

The laboratory maintains control of records for raw analytical data and supporting records such as audit reports and responses, logbooks, standard logs, training files, MDL studies, Proficiency Testing (PT) studies, certifications and related correspondence, and corrective action notices. Raw analytical data consists of bound logbooks, instrument printouts, any other notes, magnetic media, electronic data and final reports.

6.2 DOCUMENT APPROVAL AND ISSUE

The pertinent elements of a document control system for each document include a unique document title and number, the number of pages of the item, the effective date, revision number and the laboratory's name. The Quality personnel are responsible for the maintenance of the system.

Controlled documents are authorized by the QA Department and other management. In order to develop a new document, a Department Manager submits an electronic draft to the QA

Department for suggestions and approval before use. Upon approval, QA personnel add the identifying version information to the document and retain the official document on file. The official document is provided to all applicable operational units. Controlled documents are identified as such and records of their distribution are kept by the QA Department. Document control may be achieved by either electronic or hardcopy distribution.

The QA Department maintains a list of the official versions of controlled documents.

Quality System Policies and Procedures will be reviewed at a minimum of every two years for the majority of procedures and every 1 year for Drinking Water programs. Changes to documents occur when a procedural change warrants.

6.3 PROCEDURES FOR DOCUMENT CONTROL POLICY

For changes to the QA Manual, refer to SOP No. BF-QA-003, “Writing, Reviewing and Revising Controlled Documents”. Uncontrolled copies must not be used within the laboratory. Previous revisions and back-up data are stored by the QA department. A controlled electronic copy of the current version is maintained on the laboratory IntraNet site and is available to all personnel.

For changes to SOPs, refer to SOP No. BF-QA-003, “Writing, Reviewing and Revising Controlled Documents”.

Forms, worksheets, work instructions and information are organized by department in the QA office. Electronic versions are kept in a controlled access electronic folder in the QA department. As revisions are required, a new version number and revision date is assigned and the document placed on the laboratory IntraNet (BufNet) for use.

6.4 OBSOLETE DOCUMENTS

All invalid or obsolete documents are removed, or otherwise prevented from unintended use. The laboratory has specific procedures as described above to accomplish this. In general, obsolete documents are collected from employees according to distribution lists and are marked obsolete on the cover or destroyed. At least one copy of the obsolete document is archived according to SOP No. BF-GP-015.

SECTION 7

SERVICE TO THE CLIENT

7.1 OVERVIEW

The laboratory has established procedures for the review of work requests and contracts, oral or written. The procedures include evaluation of the laboratory's capability and resources to meet the contract's requirements within the requested time period. All requirements, including the methods to be used, must be adequately defined, documented and understood. For many environmental sampling and analysis programs, testing design is site or program specific and does not necessarily "fit" into a standard laboratory service or product. It is the laboratory's intent to provide both standard and customized environmental laboratory services to our clients.

A thorough review of technical and QC requirements contained in contracts is performed to ensure project success. The appropriateness of requested methods, and the lab's capability to perform them must be established. Projects, proposals and contracts are reviewed for adequately defined requirements and the laboratory's capability to meet those requirements. Alternate test methods that are capable of meeting the clients' requirements may be proposed by the lab. A review of the lab's capability to analyze non-routine analytes is also part of this review process.

All projects, proposals and contracts are reviewed for the client's requirements in terms of compound lists, test methodology requested, sensitivity (detection and reporting levels), accuracy, and precision requirements (% Recovery and RPD). The reviewer ensures that the laboratory's test methods are suitable to achieve these regulatory and client requirements and that the laboratory holds the appropriate certifications and approvals to perform the work. The laboratory and any potential subcontract laboratories must be certified, as required, for all proposed tests.

The laboratory must determine if it has the necessary physical, personnel and information resources to meet the contract, and if the personnel have the expertise needed to perform the testing requested. Each proposal is checked for its impact on the capacity of the laboratory's equipment and personnel. As part of the review, the proposed turnaround time will be checked for feasibility.

Electronic or hard copy deliverable requirements are evaluated against the laboratory's capacity for production of the documentation.

If the laboratory cannot provide all services but intends to subcontract such services, whether to another TestAmerica facility or to an outside firm, this will be documented and discussed with the client prior to contract approval. (Refer to Section 8 for Subcontracting Procedures.)

The laboratory informs the client of the results of the review if it indicates any potential conflict, deficiency, lack of accreditation, or inability of the lab to complete the work satisfactorily. Any discrepancy between the client's requirements and the laboratory's capability to meet those requirements is resolved in writing before acceptance of the contract. It is necessary that the

contract be acceptable to both the laboratory and the client. Amendments initiated by the client and/or TestAmerica, are documented in writing.
All contracts, QAPPs, Sampling and Analysis Plans (SAPs), contract amendments, and documented communications become part of the project record.

The same contract review process used for the initial review is repeated when there are amendments to the original contract by the client and the participating personnel are informed of the changes.

7.2 REVIEW SEQUENCE AND KEY PERSONNEL

Appropriate personnel will review the work request at each stage of evaluation.

For routine projects and other simple tasks, a review by the Project Manager (PM) is considered adequate. The PM confirms that the laboratory has any required certifications, that it can meet the clients' data quality and reporting requirements and that the lab has the capacity to meet the clients turn around needs. It is recommended that, where there is a sales person assigned to the account, an attempt should be made to contact that sales person to inform them of the incoming samples.

For new, complex or large projects, the proposed contract is given to the National Account Director, who will decide which lab will receive the work based on the scope of work and other requirements, including certification, testing methodology, and available capacity to perform the work. The contract review process is outlined in TestAmerica's Corporate SOP No. CA-L-P-002**,** Contract Compliance Policy.

This review encompasses all facets of the operation. The scope of work is distributed to the appropriate personnel, as needed based on scope of contract, to evaluate all of the requirements shown above (not necessarily in the order below):

- Legal & Contracts Director
- General Manager
- Customer Service Manager
- Operations Manager
- Laboratory and/or Corporate Technical Directors
- Corporate Information Technology Managers/Directors
- Regional and/or National Account representatives
- Laboratory and/or Corporate Quality
- Laboratory and/or Corporate Environmental Health and Safety Managers/Directors
- The Laboratory Director reviews the formal laboratory quote and makes final acceptance for their facility.

The National Account Director, Legal Contracts Director, or local account representative then submits the final proposal to the client.

In the event that one of the above personnel is not available to review the contract, his or her back-up will fulfill the review requirements.

The Legal & Contracts Director maintains copies of all signed contracts. The Customer Service Manager at the TestAmerica Buffalo facility also maintains copies of these documents.

7.3 DOCUMENTATION

Appropriate records are maintained for every contract or work request. All stages of the contract review process are documented and include records of any significant changes.

The contract will be distributed to and maintained by the appropriate sales/marketing personnel and the Regional Account Manager. A copy of the contract and formal quote will be filed with the laboratory PM and the Customer Service Manager.

Records are maintained of pertinent discussions with a client relating to the client's requirements or the results of the work during the period of execution of the contract. The PM keeps a phone log of conversations with the client.

7.3.1 Project-Specific Quality Planning

Communication of contract specific technical and QC criteria is an essential activity in ensuring the success of site specific testing programs. To achieve this goal, the laboratory assigns a PM to each client. The PM is the first point of contact for the client. It is the PM's responsibility to ensure that project specific technical and QC requirements are effectively evaluated and communicated to the laboratory personnel before and during the project. QA department involvement may be needed to assist in the evaluation of custom QC requirements. Specific information related to project planning may be found in SOP BF-PM-001, Project Information Requirements.

PM's are the primary client contact and they ensure resources are available to meet project requirements. Although PM's do not have direct reports or staff in production, they coordinate opportunities and work with laboratory management staff to ensure available resources are sufficient to perform work for the client's project. Project management is positioned between the client and laboratory resources.

Prior to work on a new project, the dissemination of project information and/or project opening meetings may occur to discuss schedules and unique aspects of the project. Items to be discussed may include the project technical profile, turnaround times, holding times, methods, analyte lists, reporting limits, deliverables, sample hazards, or other special requirements. The PM introduces new projects to the laboratory staff through project kick-off meetings or to the management staff during production meetings. These meetings provide direction to the laboratory staff in order to maximize production and client satisfaction, while maintaining quality. In addition, project notes may be associated with each sample batch as a reminder upon sample receipt and analytical processing.

During the project, any change that may occur within an active project is agreed upon between the client/regulatory agency and the PM/laboratory. These changes (e.g., use of a non-standard method or modification of a method) and approvals must be documented prior to implementation. Documentation pertains to any document, e.g., letter, e-mail, variance, contract addendum, which has been signed by both parties.

Such changes are also communicated to the laboratory during production meetings. Such changes are updated to the project notes and are introduced to the managers at these meetings. The laboratory staff is then introduced to the modified requirements via the PM or the individual laboratory Department Manager.

The laboratory strongly encourages client visits to the laboratory and for formal/informal information sharing session with employees in order to effectively communicate ongoing client needs as well as project specific details for customized testing programs.

7.4 SPECIAL SERVICES

The laboratory cooperates with clients and their representatives to monitor the laboratory's performance in relation to work performed for the client. It is the laboratory's goal to meet all client requirements in addition to statutory and regulatory requirements. The laboratory has procedures to ensure confidentiality to clients (Section 15 and 25).

Note: ISO 17025/NELAC 2003 states that a laboratory "shall afford clients or their representative's cooperation to clarify the client's request". This topic is discussed in Section 7.

The laboratory's standard procedures for reporting data are described in Section 25. Special services are also available and provided upon request. These services include:

- Reasonable access for our clients or their representatives to the relevant areas of the laboratory for the witnessing of tests performed for the client.
- Assist client-specified third party data validators as specified in the client's contract.
- Supplemental information pertaining to the analysis of their samples. Note: An additional charge may apply for additional data/information that was not requested prior to the time of sample analysis or previously agreed upon.

7.5 CLIENT COMMUNICATION

Project managers are the primary communication link to the clients. They shall inform their clients of any delays in project completion as well as any non-conformances in either sample receipt or sample analysis. Project management will maintain ongoing client communication throughout the entire client project.

Technical Directors are available to discuss any technical questions or concerns that the client may have.

7.6 REPORTING

The laboratory works with our clients to produce any special communication reports required by the contract.

7.7 CLIENT SURVEYS

The laboratory assesses both positive and negative client feedback. The results are used to improve overall laboratory quality and client service.

TestAmerica's Sales and Marketing teams periodically develops lab and client specific surveys to assess client satisfaction.

SECTION 8

SUBCONTRACTING OF TESTS
(NELAC 5.4.5)

8.1 OVERVIEW

For the purpose of this quality manual, the phrase subcontract laboratory refers to a laboratory external to the TestAmerica laboratories. The phrase “work sharing” refers to internal transfers of samples between the TestAmerica laboratories. The term outsourcing refers to the act of subcontracting tests.

When contracting with our clients, the laboratory makes commitments regarding the services to be performed and the data quality for the results to be generated. When the need arises to outsource testing for our clients because project scope, changes in laboratory capabilities, capacity or unforeseen circumstances, we must be assured that the subcontractors or work sharing laboratories understand the requirements and will meet the same commitments we have made to the client. Refer to TestAmerica’s Corporate SOP’s on Subcontracting Procedures (CA-L-S-002) and the Work Sharing Process SOP (CA-C-S-001).

When outsourcing analytical services, the laboratory will assure, to the extent necessary, that the subcontract or work sharing laboratory maintains a program consistent with the requirements of this document, the requirements specified in NELAC/ISO 17025 and/or the client’s Quality Assurance Project Plan (QAPP). All QC guidelines specific to the client’s analytical program are transmitted to the subcontractor and agreed upon before sending the samples to the subcontract facility. Additionally, work requiring accreditation will be placed with an appropriately accredited laboratory. The laboratory performing the subcontracted work will be identified in the final report, as will non-NELAC accredited work where required.

Project Managers (PMs), Customer Service Managers (CSM), or Regional Account Executives (RAE) for the Export Lab are responsible for obtaining client approval prior to outsourcing any samples. The laboratory will advise the client of a subcontract or work sharing arrangement in writing and when possible approval from the client shall be retained in the project folder.

Note: In addition to the client, some regulating agencies, such as the Department of Energy and the USDA, require notification prior to placing such work**.**

Approval may be documented through reference in a quote / contract or e-mail correspondence.

8.2 QUALIFYING AND MONITORING SUBCONTRACTORS

Whenever a PM, Regional Account Executive (RAE) or Customer Service Manager (CSM] becomes aware of a client requirement or laboratory need where samples must be outsourced to another laboratory, the other laboratory(s) shall be selected based on the following:

- The first priority is to attempt to place the work in a qualified TestAmerica laboratory;
- Firms specified by the client for the task (Documentation that a subcontractor was

designated by the client must be maintained with the project file. This documentation can be

- as simple as placing a copy of an e-mail from the client in the project folder);
- Firms listed as pre-qualified and currently under a subcontract with TestAmerica. A listing of all approved subcontracting laboratories and supporting documentation is available on the TestAmerica intranet site. Verify necessary accreditation, where applicable (e.g. on the subcontractors NELAC, A2LA accreditation or State certification.
- Firms identified in accordance with the company's Small Business Subcontracting program as small, women-owned, veteran-owned and/or minority-owned businesses;
- NELAC or A2LA accredited laboratories.
- In addition, the firm must hold the appropriate certification to perform the work required.

All TestAmerica laboratories are pre-qualified for work-sharing provided they hold the appropriate accreditations, can adhere to the project/program requirements, and the client approved sending samples to that laboratory. The client must provide acknowledgement that the samples can be sent to that facility (an e-mail is sufficient documentation or if acknowledgement is verbal, the date, time, and name of person providing acknowledgement must be documented). The originating laboratory is responsible for communicating all technical, quality, and deliverable requirements as well as other contract needs. (Corporate SOP No. CA-C-S-001, Work Sharing Process.

When the potential sub-contract laboratory has not been previously approved, then to begin the process, Account Executives or PMs may nominate a laboratory as a subcontractor based on need. The decision to nominate a laboratory must be approved by the Laboratory Director. The Laboratory Director requests that the QA Manager begin the process of approving the subcontract laboratory as outlined in Corporate SOP No. CA-L-S-002, Subcontracting Procedures. The client must provide acknowledgement that the samples can be sent to that facility (an e-mail is sufficient documentation or if acknowledgement is verbal, the date, time, and name of person providing acknowledgement must be documented).

8.2.1 Once the appropriate accreditation and legal information is received by the laboratory, it is evaluated for acceptability (where applicable) and forwarded to Corporate Contracts for formal contracting with the laboratory. They will add the lab to the approved list on the intranet site along with the associate documentation and notify the finance group for JD Edwards.

8.2.2 The client will assume responsibility for the quality of the data generated from the use of a subcontractor they have requested the lab to use. The qualified subcontractors on the intranet site are known to meet minimal standards. TestAmerica does not certify laboratories. The subcontractor is on our approved list and can only be recommended to the extent that we would use them.

8.2.3 The status and performance of qualified subcontractors will be monitored periodically by the Corporate Contracts and/or Quality Departments. Any problems identified will be brought

to the attention of TestAmerica's Corporate Finance or Corporate Quality personnel.

- Complaints shall be investigated. Documentation of the complaint, investigation and
- corrective action will be maintained in the subcontractor's file on the intranet site. Complaints are posted using the Vendor Performance Report (Form No. CW-F-WI-009)**.**
- Information shall be updated on the intranet when new information is received from the subcontracted laboratories.
- Subcontractors in good standing will be retained on the intranet listing. The QA Manager will notify all TestAmerica laboratories and Corporate Quality and Corporate Contracts if any laboratory requires removal from the intranet site. This notification will be posted on the intranet site and e-mailed to all Lab Directors/Managers, QA Managers and Sales Personnel.

8.3 OVERSIGHT AND REPORTING

The PM must request that the selected subcontractor be presented with a subcontract, if one is not already executed between the laboratory and the subcontractor. The subcontract must include terms which flow down the requirements of our clients, either in the subcontract itself or through the mechanism of work orders relating to individual projects. A standard subcontract and the Lab Subcontractor Vendor Package (posted on the intranet) can be used to accomplish this, and the Legal & Contracts Director can tailor the document or assist with negotiations, if needed. The PM (or RAE or CSM, etc.) responsible for the project must advise and obtain client consent to the subcontract as appropriate, and provide the scope of work to ensure that the proper requirements are made a part of the subcontract and are made known to the subcontractor.

Prior to sending samples to the subcontracted laboratory, the PM confirms their certification status to determine if it's current and scope-inclusive. The information is documented on a Subcontract Laboratory Certification Verification Form (Figure 8-1) and the form is retained in the project folder. For TestAmerica laboratories, certifications can be viewed on the company TotalAccess Database.

The Sample Control department is responsible for ensuring compliance with QA requirements and applicable shipping regulations when shipping samples to a subcontracted laboratory.

All subcontracted samples must be accompanied by a Chain of Custody (COC). A copy of the original COC sent by the client must be included with all samples subbed within TestAmerica.

Through communication with the subcontracted laboratory, the PM monitors the status of the subcontracted analyses, facilities successful execution of the work, and ensures the timeliness and completeness of the analytical report.

Non-NELAC accredited work must be identified in the subcontractor's report as appropriate. If NELAC accreditation is not required, the report does not need to include this information.

Reports submitted from subcontractor laboratories are not altered and are included in their original form in the final project report. This clearly identifies the data as being produced by a

subcontractor facility. If subcontract laboratory data are incorporated into the laboratories EDD (i.e. imported), the report must explicitly indicate which lab produced the data for which methods and samples.

Note: The results submitted by TestAmerica work sharing laboratory may be transferred electronically and the results reported by the TestAmerica work sharing lab are identified on the final report. The report must explicitly indicate which lab produced the data for which methods and samples. The final report must include a copy of the completed COC for all work sharing reports.

8.4 CONTINGENCY PLANNING

The Laboratory Director may waive the full qualification of a subcontractor process temporarily to meet emergency needs. In the event this provision is utilized, The QA Manager will be required to verify certifications. The comprehensive approval process must then be initiated within 30 calendar days of subcontracting.

Figure 8-1 Subcontracting Laboratory Approval Form (Initial / Renewal)

SUBCONTRACTING LABORATORY APPROVAL

Reference: Section 8 – Quality Assurance Manual

Date: _____
Laboratory: _____
Address: _____
_____
Contact and e-mail address: _____
Phone: Direct _____ Fax _____

Requested Item[3]	Date Received	Reviewed/ Accepted	Date
1. Copy of State Certification[1]			
2. Insurance Certificate			
3. USDA Soil Permit			
4. Description of Ethics Program[3]			
5. QA Manual[3]			
6. Most Recent (and relevant) 2 Sets of WP/WS Reports with Corrective Action Response[1,3]			
7. State Audit with Corrective Action Response (or NELAC or A2LA Audit)[3]			
8. Sample Report[3]			
9. SOQ or Summary list of Technical Staff and Qualifications [3]			
10. SOPs for Methods to Be Loadshifted[2,3]			
11. For DoD Work: Statement that Lab quality system complies with QSM.			
12. For DoD Work: Approved by specific DoD Component laboratory approval process.			

1 - Required when emergency procedures are implemented.
2 - Some labs may not submit copies due to internal policies. In these cases, a copy of the first page and signature page of the SOP is acceptable. This requirement may also be fulfilled by supplying a table of SOPs with effective dates.
3 – If the laboratory has NELAC accreditation, Item #s 4 through 10 are not required.

On Site Audit Planned: YES NO If yes, Date Completed: _____ By Whom: _____

Comments: _____

Lab Acceptable for Subcontracting Work: YES NO Limitations: _____

QA Manager (Signature): _____ Date: _____
Paula Benham

□ Forwarded to Contract Coordinator, by: _____ Date: _____

SECTION 9

PURCHASING SERVICES AND SUPPLIES
(NELAC 5.4.6)

9.1 OVERVIEW

Evaluation and selection of suppliers and vendors is performed, in part, on the basis of the quality of their products, their ability to meet the demand for their products on a continuous and short term basis, the overall quality of their services, their past history, and competitive pricing. This is achieved through evaluation of objective evidence of quality furnished by the supplier, which can include certificates of analysis, recommendations, and proof of historical compliance with similar programs for other clients. To ensure that quality critical consumables and equipment conform to specified requirements, which may affect quality, all purchases from specific vendors are approved by a member of the supervisory or management staff.

Capital expenditures are made in accordance with TestAmerica's Corporate Controlled Purchases Procedure, SOP No. CW-F-S-007

Contracts will be signed in accordance with TestAmerica's Corporate Authorization Matrix Policy, Policy No. CW-F-P-002. Request for Proposals (RFP's) will be issued where more information is required from the potential vendors than just price. Process details are available in TestAmerica's Corporate Procurement and Contracts Policy (Policy No. CW-F-P-004). RFP's allow TestAmerica to determine if a vendor is capable of meeting requirements such as supplying all of the TestAmerica facilities, meeting required quality standards and adhering to necessary ethical and environmental standards. The RFP process also allows potential vendors to outline any additional capabilities they may offer.

9.2 GLASSWARE

Glassware used for volumetric measurements must be Class A or verified for accuracy according to laboratory procedure. Pyrex (or equivalent) glass should be used where possible. For safety purposes, thick-wall glassware should be used where available.

9.3 REAGENTS, STANDARDS & SUPPLIES

Purchasing guidelines for equipment and reagents must meet the requirements of the specific method and testing procedures for which they are being purchased. Solvents and acids are pre-tested in accordance with TestAmerica's Corporate SOP on Solvent & Acid Lot Testing & Approval, SOP No. CA-Q-S-001 and TestAmerica Buffalo SOP on Solvent Purity, SOP BF-OP-013.

9.3.1 Purchasing

Chemical reagents, solvents, glassware and general supplies are ordered as needed to maintain sufficient quantities on hand. Materials used in the analytical process must be of a

known quality. The wide variety of materials and reagents available makes it advisable to specify recommendations for the name, brand, and grade of materials to be used in any determination. This information is contained in the method SOP. Purchase requisitions are placed into the J.D. Edwards system by designated departmental personnel. The listing of items available in the J.D. Edwards system has been approved for use by the corporate purchasing staff. Each purchase requisition receives final approval by the laboratory Operations Manager or purchasing coordinator before the order is submitted.

The analyst may also check the item out of the on-site consignment system that contains items approved for laboratory use.

9.3.2 Receiving

It is the responsibility of the purchasing coordinator to receive the shipment. It is the responsibility of the department that ordered the materials to date the material when received. Once the ordered reagents or materials are received, the department that submitted the order compares the information on the label or packaging to the original order to ensure that the purchase meets quality level specified. Material Safety Data Sheets (MSDSs) are available online through the Company's intranet website. Anyone may review these for relevant information on the safe handling and emergency precautions of on-site chemicals.

9.3.3 Specifications

All methods in use in the laboratory specify the grade of reagent that must be used in the procedure. If the quality of the reagent is not specified, it may be assumed that it is not significant in that procedure and, therefore, any grade reagent may be used. It is the responsibility of the analyst to check the procedure carefully for the suitability of grade of reagent.

Chemicals must not be used past the manufacturer's expiration date and must not be used past the expiration time noted in a method SOP. If expiration dates are not provided, the laboratory may contact the manufacturer to determine an expiration date.

The laboratory assumes a five year expiration date on inorganic dry chemicals unless noted otherwise by the manufacturer or by the reference source method. Chemicals should not be used past the manufacturer's or SOP expiration date unless 'verified' (refer to item 3 listed below).

- An expiration date can not be extended if the dry chemical is discolored or appears otherwise physically degraded, the dry chemical must be discarded.

- Expiration dates can be extended if the dry chemical is found to be satisfactory based on acceptable performance of quality control samples (Continuing Calibration Verification (CCV), Blanks, Laboratory Control Sample (LCS), etc.).

- If the dry chemical is used for the preparation of standards, the expiration dates can be extended 6 months if the dry chemical is compared to an unexpired independent source in

performing the method and the performance of the dry chemical is found to be satisfactory. The comparison must show that the dry chemical meets CCV limits. The comparison studies are maintained along with the calibration raw data for which the reagent was used.

Wherever possible, standards must be traceable to national or international standards of measurement or to national or international reference materials. Records to that effect are available to the user.

Compressed gases in use are checked for pressure and secure positioning daily. The minimum total pressure must be 200 psig or the tank must be replaced. The quality of the gases must meet method or manufacturer specification or be of a grade that does not cause any analytical interference.

Water used in the preparation of standards or reagents must have a specific conductivity of less than 1- mmho/cm (or specific resistivity of greater than 1.0 megaohm-cm) at 25^{o}C. The specific conductivity is checked and recorded daily. If the water's specific conductivity is greater than the specified limit, the Facility Manager and appropriate Department Managers/Supervisors must be notified immediately in order to notify all departments, decide on cessation (based on intended use) of activities, and make arrangements for correction.

The laboratory may purchase reagent grade (or other similar quality) water for use in the laboratory. This water must be certified "clean" by the supplier for all target analytes or otherwise verified by the laboratory prior to use. This verification is documented.

Standard lots are verified before first time use if the laboratory switches manufacturers or has historically had a problem with the type of standard.

Purchased VOA vials must be certified clean and the certificates must be maintained. If uncertified VOA vials are purchased, all lots must be verified clean prior to use. This verification must be maintained.

Records of manufacturer's certification and traceability statements are maintained in the LIMS system, files or binders in each laboratory section. These records include date of receipt, lot number (when applicable), and expiration date (when applicable). Incorporation of the item into the record indicates that the analyst has compared the new certificate with the previous one for the same purpose and that no difference is noted, unless approved and so documented by the Technical Director or QA Manager.

9.3.4 Storage

Reagent and chemical storage is important from the aspects of both integrity and safety. Light-sensitive reagents may be stored in brown-glass containers. Storage conditions are per the Corporate Environmental Health & Safety Manual (Corp. DOC No. CW-E-M-001) and method SOPs or manufacturer instructions.

9.4 PURCHASE OF EQUIPMENT/INSTRUMENTS/SOFTWARE

When a new piece of equipment is needed, either for additional capacity or for replacing inoperable equipment, the analyst or supervisor makes a supply request to the Technical Director and/or the Laboratory Director. If they agree with the request the procedures outlined in TestAmerica's Corporate Policy No. CA-T-P-001, Qualified Products List, are followed. A decision is made as to which piece of equipment can best satisfy the requirements. The appropriate written requests are completed and purchasing places the order.

Upon receipt of a new or used piece of equipment, an identification name is assigned and added to the equipment list. IT must also be notified so that they can synchronize the instrument for back-ups. Its capability is assessed to determine if it is adequate or not for the specific application. For instruments, a calibration curve is generated, followed by MDLs, Demonstration of Capabilities (DOCs), and other relevant criteria (refer to Section 19). For software, its operation must be deemed reliable and evidence of instrument verification must be retained by the IT Department or QA Department. Software certificates supplied by the vendors are filed with the LIMS Administrator. The manufacturer's operation manual is retained at the bench.

9.5 SERVICES

Service to analytical instruments (except analytical balances) is performed on an as needed basis. Routine preventative maintenance is discussed in Section 20. The need for service is determined by analysts and/or Department Managers. The service providers that perform the services are approved by the Department Managers, Operations Manager and/or Technical Director.

9.6 SUPPLIERS

TestAmerica selects vendors through a competitive proposal / bid process, strategic business alliances or negotiated vendor partnerships (contracts). This process is defined in the Corporate Finance documents on Vendor Selection (SOP No. CW-F-S-018) and Procurements & Contracts Policy (Policy No. CW-F-P-004). The level of control used in the selection process is dependent on the anticipated spending amount and the potential impact on TestAmerica business. Vendors that provide test and measuring equipment, solvents, standards, certified containers, instrument related service contracts or subcontract laboratory services shall be subject to more rigorous controls than vendors that provide off-the-shelf items of defined quality that meet the end use requirements. The JD Edwards purchasing system includes all suppliers /vendors that have been approved for use.

Evaluation of suppliers is accomplished by ensuring the supplier ships the product or material ordered and that the material is of the appropriate quality. This is documented by signing off on packing slips or other supply receipt documents. The purchasing documents contain the data that adequately describe the services and supplies ordered.

Any issues of vendor performance are to be reported immediately by the laboratory staff to the Corporate Purchasing Group by completing a Vendor Performance Report.

The Corporate Purchasing Group will work through the appropriate channels to gather the information required to clearly identify the problem and will contact the vendor to report the

problem and to make any necessary arrangements for exchange, return authorization, credit, etc.

As deemed appropriate, the Vendor Performance Reports will be summarized and reviewed to determine corrective action necessary, or service improvements required by vendors

The laboratory has access to a listing of all approved suppliers of critical consumables, supplies and services. This information is provided through the JD Edwards purchasing system.

9.6.1 New Vendor Procedure

TestAmerica employees who wish to request the addition of a new vendor must complete a J.D. Edwards Vendor Add Request Form (available on the intranet site).

New vendors are evaluated based upon criteria appropriate to the products or services provided as well as their ability to provide those products and services at a competitive cost. Vendors are also evaluated to determine if there are ethical reasons or potential conflicts of interest with TestAmerica employees that would make it prohibitive to do business with them as well as their financial stability. The QA Department and/or the Technical Director are consulted with vendor and product selection that have an impact on quality.

SECTION 10

COMPLAINTS *(NELAC 5.4.8)*

10.1 OVERVIEW

The laboratory considers an effective client complaint handling processes to be of significant business and strategic value. Listening to and documenting client concerns captures 'client knowledge' that enables our operations to continually improve processes and client satisfaction. An effective client complaint handling process also provides assurance to the data user that the laboratory will stand behind its data, service obligations and products.

A client complaint is any expression of dissatisfaction with any aspect of our business services, e.g, communications, responsiveness, data, reports, invoicing and other functions expressed by any party, whether received verbally or in written form. Client inquiries, complaints or noted discrepancies are documented, communicated to management, and addressed promptly and thoroughly.

The laboratory has procedures for addressing with both external and internal complaints with the goal of providing satisfactory resolution to complaints in a timely and professional manner..

The nature of the complaint is identified, documented and investigated, and an appropriate action is determined and taken. In cases where a client complaint indicates that an established policy or procedure was not followed, the QA Department must evaluate whether a special audit must be conducted to assist in resolving the issue. A written confirmation or letter to the client, outlining the issue and response taken is recommended as part of the overall action taken.

The process of complaint resolution and documentation utilizes the procedures outlined in Section 12 (Corrective Actions) and is documented following the laboratory SOPs related to Data Quality Review (BF-QA-006) and Corrective Action (BF-QA-005).

10.2 EXTERNAL COMPLAINTS

An employee that receives a complaint initiates the complaint resolution process by first documenting the complaint according to SOPs BF-QA-006 and BF-QA-005.

Complaints fall into two categories: correctable and non-correctable. An example of a correctable complaint would be one where a report re-issue would resolve the complaint. An example of a non-correctable complaint would be one where a client complains that their data was repeatedly late. Non-correctable complaints should be reviewed for preventive action measures to reduce the likely hood of future occurrence and mitigation of client impact.

The general steps in the complaint handling process are:

- Receiving and Documenting Complaints
- Complaint Investigation and Service Recovery
- Process Improvement

The laboratory shall inform the initiator of the complaint of the results of the investigation and the corrective action taken, if any.

10.3 INTERNAL COMPLAINTS

Internal complaints include, but are not limited to: errors and non-conformances, training issues, internal audit findings, and deviations from methods. Corrective actions may be initiated by any staff member who observes a nonconformance and shall follow the procedures outlined in Section 13. In addition, Corporate Management, Sales and Marketing and Information Technology (IT) may initiate a complaint by contacting the laboratory or through the corrective action system described in Section 12.

10.4 MANAGEMENT REVIEW

The number and nature of client complaints is reported by the QA Manager to the laboratory and QA Director in the QA Monthly report. Monitoring and addressing the overall level and nature of client complaints and the effectiveness of the solutions is part of the Annual Management Review (Section 16)

SECTION 11

CONTROL OF NON-CONFORMING WORK
(NELAC 5.4.9)

11.1 OVERVIEW

When data discrepancies are discovered or deviations and departures from laboratory standard procedures, policies and/or client requests have occurred, corrective action is taken immediately. First, the laboratory evaluates the significance of the nonconforming work. Then, a corrective action plan is initiated based on the outcome of the evaluation. If it is determined that the nonconforming work is an isolated incident, the plan could be as simple as adding a qualifier to the final results and/or making a notation in the case narrative. If it is determined that the nonconforming work is a systematic or improper practices issue, the corrective action plan could include a more in depth investigation and a possible suspension of an analytical method. In all cases, the actions taken are documented using the laboratory's corrective action system (refer to Section 12).

Due to the frequently unique nature of environmental samples, sometimes departures from documented policies and procedures are needed. When an analyst encounters such a situation, the problem is presented to the department manager for resolution. The department manager may elect to discuss it with the Technical Director, QA Manager or have a representative contact the client to decide on a logical course of action. Once an approach is agreed upon, the analyst documents it using the laboratory's job exception and corrective action system described in Section 12. This information can then be supplied to the client in the form of a footnote or a case narrative with the report.

Project Management may encounter situations where a client may request that a special procedure be applied to a sample that is not standard lab practice. Based on a technical evaluation, the lab may accept or opt to reject the request based on technical or ethical merit. An example might be the need to report a compound that the lab does not normally report. The lab would not have validated the method for this compound following the procedures in Section 19. The client may request that the compound be reported based only on the calibration. Such a request would need to be approved by the Laboratory Director, Technical Director, Operations Manager or QA Manager, documented and included in the project folder. Deviations must also be noted on the final report with a statement that the compound is not reported in compliance with the analytical method requirements and the reason.

11.2 RESPONSIBILITIES AND AUTHORITIES

TestAmerica's Corporate SOP entitled Internal Investigation of Potential Data Discrepancies and Determination for Data Recall (SOP No. CA-L-S-001), outlines the general procedures for the reporting and investigation of data discrepancies and alleged incidents of misconduct or violations of TestAmerica's data integrity policies as well as the policies and procedures related to the determination of the potential need to recall data.

Under certain circumstances the Laboratory Director, the Technical Director, the Operations Manager or the QA Manager may exceptionally authorize departures from documented

procedures or policies. The departures may be a result of procedural changes due to the nature of the sample; a one-time procedure for a client; QC failures with insufficient sample to reanalyze, etc. In most cases, the client will be informed of the departure prior to the reporting of the data. Any departures must be well documented using the laboratory's job exception and corrective action procedures described in Section 12. This information may also need to be documented in logbooks and/or data review checklists as appropriate**.** Any impacted data must be referenced in a case narrative and/or flagged with an appropriate data qualifier.

Any misrepresentation or possible misrepresentation of analytical data discovered by any laboratory staff member must be reported to facility senior laboratory management within 24-hours. The Senior Management staff is comprised of the Laboratory Director, Technical Director, Operations Manager, QA Manager, Customer Service Manager, Human Resources Manager and Business Development Manager. Suspected misrepresentation issues may also be reported to any member of the corporate staff as identified in Ethics Policy, CA-L-P-001. The data integrity hotline (1-800-736-9407) may also be used. The reporting of issues involving alleged violations of the company's Data Integrity or Manual Integration procedures must be conveyed to an Ethics and Compliance Officer (ECO), Director of Quality & Client Advocacy and the laboratory's Quality Director within 24 hours of discovery.

Whether an inaccurate result was reported due to calculation or quantitation errors, data entry errors, improper practices, or failure to follow SOPs, the data must be evaluated to determine the possible effect.

The Laboratory Director, QA Manager, ECOs, Corporate Quality, the COO, General Managers and the Quality Directors have the authority and responsibility to halt work, withhold final reports, or suspend an analysis for due cause as well as authorize the resumption of work.

11.3 EVALUATION OF SIGNIFICANCE AND ACTIONS TAKEN

For each nonconforming issue reported, an evaluation of its significance and the level of management involvement needed is made. This includes reviewing its impact on the final data, whether or not it is an isolated or systematic issue, and how it relates to any special client requirements.

TestAmerica's Corporate Data Investigation & Recall Procedure (SOP No. CA-L-S-001 distinguishes between situations when it would be appropriate for laboratory management to make the decision on the need for client notification (written or verbal) and data recall (report revision) and when the decision must be made with the assistance of the ECO's and Corporate Management. Laboratory level decisions are documented and approved using the laboratory's standard nonconformance/corrective action reporting in lieu of the data recall determination form contained in TestAmerica's Corporate SOP No. CA-L-S-001.

11.4 PREVENTION OF NONCONFORMING WORK

If it is determined that the nonconforming work could recur, further corrective actions must be made following the laboratory's corrective action system.

On a monthly basis, the QA Department evaluates non-conformances to determine if any nonconforming work has been repeated multiple times. If so, the laboratory's corrective action process may be followed.

11.5 METHOD SUSPENSION/RESTRICTION (STOP WORK PROCEDURES)

In some cases it may be necessary to suspend/restrict the use of a method or target compound which constitutes significant risk and/or liability to the laboratory. Suspension/restriction procedures can be initiated by any of the persons noted in Section 11.2, Paragraph 5.

Prior to suspension/restriction, confidentiality will be respected, and the problem with the required corrective and preventive action will be stated in writing and presented to the Laboratory Director.

The Laboratory Director shall arrange for the appropriate personnel to meet with the QA Manager as needed. This meeting shall be held to confirm that there is a problem, that suspension/restriction of the method is required and will be concluded with a discussion of the steps necessary to bring the method/target or test fully back on line. In some cases that may not be necessary if all appropriate personnel have already agreed there is a problem and there is agreement on the steps needed to bring the method, target or test fully back on line.

The QA Manager will also initiate a corrective action report as described in Section 12 if one has not already been started. A copy of any meeting notes and agreed upon steps should be faxed or e-mailed by the laboratory to the appropriate General Manager and member of Corporate QA. This fax/e-mail acts as notification of the incident.

After suspension/restriction, the lab will hold all reports to clients pending review. No faxing, mailing or distributing through electronic means may occur. The report must not be posted for viewing on the internet. It is the responsibility of the Laboratory Director to hold all reporting and to notify all relevant laboratory personnel regarding the suspension/restriction (i.e., Project Management, Log-in, etc…). Clients will NOT generally be notified at this time. Analysis may proceed in some instances depending on the non-conformance issue.

Within 72 hours, the QA Manager will determine if compliance is now met and reports can be released, OR determine the plan of action to bring work into compliance, and release work. A team, with all principals involved (Laboratory Director, Technical Director, Operations Manager, QA Manager, Department Manager) can devise a start-up plan to cover all steps from client notification through compliance and release of reports. Project Management and the Customer Service Manager and Sales and Marketing must be notified if clients must be notified or if the suspension/restriction affects the laboratory's ability to accept work. The QA Manager must approve start-up or elimination of any restrictions after all corrective action is complete. This approval is given by final signature on the completed corrective action report.

SECTION 12

CORRECTIVE ACTION
(NELAC 5.4.10)

12.1 OVERVIEW

A major component of TestAmerica's Quality Assurance (QA) Program is the problem investigation and feedback mechanism designed to keep the laboratory staff informed on quality related issues and to provide insight to problem resolution. When nonconforming work or departures from policies and procedures in the quality system or technical operations are identified, the corrective action procedure provides a systematic approach to assess the issues, restore the laboratory's system integrity, and prevent reoccurrence. Corrective actions are documented using Non-Conformance Report (NCR) also know as Job Exception Reports (JER) and Corrective Action Reports (CAR) (refer to Figure 12-1).

12.2 GENERAL

Problems within the quality system or within analytical operations may be discovered in a variety of ways, such as QC sample failures, internal or external audits, proficiency testing (PT) performance, client complaints, staff observation, etc..

The purpose of a corrective action system is to:

- Identify non-conformance events and assign responsibility for investigating.
- Resolve non-conformance events and assign responsibility for any required corrective action.
- Identify Systematic Problems before they become serious.
- Identify and track client complaints and provide resolution

12.2.1 Non-Conformance Report (NCR) - (previously known as Job Exception Report and Data Quality Review (DQR) - is used to document the following types of corrective actions:

- Deviations from an established procedure or SOP
- QC outside of limits (non matrix related)
- Isolated reporting / calculation errors
- Client complaints
- Project Management concerns regarding specific analytical results
- Discrepancies in materials / goods received vs. manufacturer packing slips.

12.2.2 Corrective Action Report (CAR) - is used to document the following types of corrective actions:

- Questionable trends that are found in the monthly review of JERs.

- Issues found while reviewing JERs that warrant further investigation.
- Questionable trends that are found in the monthly review of DQRs or client complaints
- Internal and External Audit Findings
- Failed or Unacceptable PT results.
- Corrective actions that cross multiple departments in the laboratory.
- Systematic Reporting / Calculation Errors

12.3 CLOSED LOOP CORRECTIVE ACTION PROCESS

Any employee in the company can initiate a corrective action. There are four main components to a closed-loop corrective action process once an issue has been identified: Cause Analysis, Selection and Implementation of Corrective Actions (both short and long term), Monitoring of the Corrective Actions, and Follow-up.

12.3.1 Cause Analysis

- Upon discovery of a non-conformance event, the event must be defined and documented. A NCR or CAR must be initiated, someone is assigned to investigate the issue and the event is investigated for cause. Table 12-1 provides some general guidelines on determining responsibility for assessment.
- The cause analysis step is the key to the process as a long term corrective action cannot be determined until the cause is determined.
- If the cause is not readily obvious, the Department Manager, Operations Manager, Technical Director, or QA Manager (or QA designee) is consulted.

12.3.2 Selection and Implementation of Corrective Actions

- Where corrective action is needed, the laboratory shall identify potential corrective actions. The action(s) most likely to eliminate the problem and prevent recurrence are selected and implemented. Responsibility for implementation is assigned.
- Corrective actions shall be to a degree appropriate to the magnitude of the problem identified through the cause analysis.
- Whatever corrective action is determined to be appropriate, the laboratory shall document and implement the changes. The NCR or CAR is used for this documentation.

12.3.3 Root Cause Analysis

Root Cause Analysis is a class of problem solving (investigative) methods aimed at identifying the basic or causal factor(s) that underlie variation in performance or the occurrence of a significant failure. The root cause may be buried under seemingly innocuous events, many steps preceding the perceived failure. At first glance, the immediate response is typically directed at a symptom and not the cause. Typically, root cause analysis would be best with three or more incidents to triangulate a weakness.

Systematically analyze and document the Root Causes of the more significant problems that are reported. Identify, track, and implement the corrective actions required to reduce the likelihood of recurrence of significant incidents. Trend the Root Cause data from these incidents to identify Root Causes that, when corrected, can lead to dramatic improvements in performance by eliminating entire classes of problems.

Identify the one event associated with problem and ask why this event occurred. Brainstorm the root causes of failures by asking why events occurred or conditions existed; and then why the cause occurred 5 consecutive times until you get to the root cause. For each of these sub events or causes, ask why it occurred. Repeat the process for the other events associated with the incident.

Root cause analysis does not mean the investigation is over. Look at technique, or other systems outside the normal indicators. Often creative thinking will find root causes that ordinarily would be missed, and continue to plague the laboratory or operation.

12.3.4 Monitoring of the Corrective Actions

- The Department Manager, Operations Manager and QA Manager are responsible to ensure that the corrective action taken was effective.
- Ineffective actions are documented and re-evaluated until acceptable resolution is achieved. Department Managers and the Operations Manager are accountable to the Laboratory Director to ensure final acceptable resolution is achieved and documented appropriately.
- Each NCR and DQR are entered into a database and each CAR is entered into a spreadsheet for tracking purposes and a monthly summary of all corrective actions is printed out for review to aid in ensuring that the corrective actions have taken effect.
- The QA Manager reviews monthly NCR and CARs for trends. Highlights are included in the QA monthly report (refer to Section 16). If a significant trend develops that adversely affects quality, an audit of the area is performed and corrective action implemented.
- Any out-of-control situations that are not addressed acceptably at the laboratory level may be reported to the Corporate Quality Director by the QA Manager, indicating the nature of the out-of-control situation and problems encountered in solving the situation.

12.3.5 Follow-up Audits

- Follow-up audits may be initiated by the QA Manager and shall be performed as soon as possible when the identification of a nonconformance casts doubt on the laboratory's compliance with its own policies and procedures, or on its compliance with state or federal requirements.
- These audits often follow the implementation of the corrective actions to verify effectiveness. An additional audit would only be necessary when a critical issue or risk to business is discovered.
- Also refer to Section 15.1.4, Special Audits)

12.4 TECHNICAL CORRECTIVE ACTIONS

In addition to providing acceptance criteria and specific protocols for technical corrective actions in the method SOPs the laboratory has general procedures to be followed to determine when departures from the documented policies and procedures and quality control have occurred (refer to Section 11). The documentation of these procedures is through the use of a NCR or CAR.

Table 12-1 includes examples of general technical corrective actions. For specific criteria and corrective actions refer to the analytical methods or specific method SOPs. The laboratory may also maintain work instructions on these items that are available upon request.

Table 12-1 provides some general guidelines for identifying the individual(s) responsible for assessing each QC type and initiating corrective action. The table also provides general guidance on how a data set should be treated if associated QC measurements are unacceptable. Specific procedures are included in Method SOPs, work instructions**,** QAM Sections 19 and 20. All corrective actions are reviewed monthly at a minimum by the QA Manager and highlights are included in the QA monthly report.

To the extent possible, samples shall be reported only if all quality control measures are acceptable. If the deficiency does not impair the usability of the results, data will be reported with an appropriate data qualifier and/or the deficiency will be noted in the case narrative. Where sample results may be impaired, the Project Manager is notified by an NCR and appropriate corrective action (e.g., reanalysis) is taken and documented**.**

12.5 BASIC CORRECTIONS

When mistakes occur in records, each mistake shall be crossed-out, not obliterated (e.g. no white-out), and the correct value entered alongside. All such corrections shall be initialed (or signed) and dated by the person making the correction. In the case of records stored electronically, the original “uncorrected” file must be maintained intact and a second “corrected” file is created.

This same process applies to adding additional information to a record. All additions made later than the initial must also be initialed (or signed) and dated.

When corrections are due to reasons other than obvious transcription errors, the reason for the corrections (or additions) shall also be documented.

Figure 12-1.
Example – Corrective Action Notice

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

October 27, 2010

CORRECTIVE ACTION NOTICE

CAN #_____

Date Issued:	***Issued By:***
Date Required:	***Responsible:***
Source of Issue:	

Explanation of Issue: Write a Problem Statement - State Problem - Outline events - Identify people involved - Identify missed opportunities	

Investigation Summary: Establish interim containment actions - short term preventive measures Define causal factors & analyze for root cause - Describe investigation (may attach notes, charts, graphs) - Procedures - Training - Quality Control - Communication - Management System - Work Direction	

Root Cause: Define causal factors & analyze for root cause - Describe investigation (may attach notes, charts, graphs) - Procedures - Training - Quality Control	

- Communication - Management System - Work Direction Define Root Cause - Summarize findings from problem solving	

Impact on Client Data: List work orders, batches affected and how - reanalysis - client notification - revised reports - data recall	

Corrective Action or Resolution: Select Permanent Corrective Actions - Alternatives, costs, value added - Effective solution - resolve to completion - within your control - measurable		
Timetable for Action: Implement permanent corrective action - modify procedures - train personnel - monitor (plan, do, check, act) - adjust if necessary		
Means to Document Corrective Action: Logbooks, SOPs, Checklists, Spreadsheets, Training		
Completed By:		**Date:**
Approved By:		**Date:**

Follow-Up Schedule: Define interval of follow-up State responsible party Set reminders - Outlook reminder - other reminder tools		
Follow-Up Comments: Sustained corrective action Retain follow-up frequency Not sustained - new investigation - new corrective action		
Follow-Up By:		**Date:**
Approved By:		**Date:**

Table 12-1.

Example – General Corrective Action Procedures

QC Activity ***(Individual Responsible for Initiation/Assessment)***	**Acceptance Criteria**	**Recommended Corrective Action**
Initial Instrument Blank *(Analyst)*	- Instrument response < MDL.	- Prepare another blank. - If same response, determine cause of contamination: reagents, environment, instrument equipment failure, etc..
Initial Calibration Standards *(Analyst, Department Manager)*	- Correlation coefficient > 0.99 or standard concentration value. - % Recovery within acceptance range. - See details in Method SOP.	- Reanalyze standards. - If still unacceptable, remake standards and recalibrate instrument.
Independent Calibration Verification (Second Source) *(Analyst, Department Manager)*	- % Recovery within control limits.	- Remake and reanalyze standard. - If still unacceptable, then remake calibration standards or use new primary standards and recalibrate instrument.
Continuing Calibration Standards *(Analyst, Data Reviewer)*	% Recovery within control limits.	- Reanalyze standard. - If still unacceptable, then recalibrate and rerun affected samples.
Matrix Spike / Matrix Spike Duplicate (MS/MSD) *(Analyst, Data Reviewer)*	- % Recovery within limits documented in LIMs.	- If the acceptance criteria for duplicates or matrix spikes are not met because of matrix interferences, the acceptance of the analytical batch is determined by the validity of the LCS. - If the LCS is within acceptable limits the batch is acceptable. - The results of the duplicates, matrix spikes and the LCS are reported with the data set.
Laboratory Control Sample (LCS) *(Analyst, Data Reviewer)*	- % Recovery within limits specified in LIMs.	- Batch must be re-prepared and re-analyzed. **Note:** If there is insufficient sample or the holding time cannot be met, contact client and report with flags.

QC Activity ***(Individual Responsible for Initiation/Assessment)***	**Acceptance Criteria**	**Recommended Corrective Action**
Surrogates *(Analyst, Data Reviewer)*	- % Recovery within limits of method or within three standard deviations of the historical mean.	- Individual sample must be repeated. Place comment in LIMS.
Method Blank (MB) *(Analyst, Data Reviewer)*	< Reporting Limit [1]	- Reanalyze blank. - If still positive, determine source of contamination. If necessary, reprocess (i.e. digest or extract) entire sample batch. Report blank results.
Proficiency Testing (PT) Samples *(QA Manager, Department Manager)*	- Criteria supplied by PT Supplier.	- Any failures or warnings must be investigated for cause. Failures may result in the need to repeat a PT sample to show the problem is corrected.
Internal / External Audits *(QA Manager, Department Manager, Operations Manager, Technical Director, Laboratory Director)*	- Defined in Quality System documentation such as SOPs, QAM, etc..	- Non-conformances must be investigated through CAR system and necessary corrections must be made.
Reporting / Calculation Errors *(Depends on issue – possible individuals include: Analysts, Data Reviewers, Project Managers, Department Manager, QA Manager, Corporate QA, Corporate Management)*	- SOP CA-L-S-001, Internal Investigation of Potential Data Discrepancies and Determination for Data Recall.	- Corrective action is determined by type of error. Follow the procedures in SOP CA-L-S-001.
Client Complaints *(Project Managers, Lab Director, Sales and Marketing, QA Manager)*	-	- Corrective action is determined by the type of complaint. For example, a complaint regarding an incorrect address on a report will result in the report being corrected and then follow-up must be performed on the reasons the address was incorrect (e.g., database needs to be updated).

QC Activity ***(Individual Responsible for Initiation/Assessment)***	**Acceptance Criteria**	**Recommended Corrective Action**
QA Monthly Report (Refer to Section 17 for an example) *(QA Manager, Lab Director, Operations Manager Department Managers)*	- QAM, SOPs.	- Corrective action is determined by the type of issue. For example, CARs for the month are reviewed and possible trends are investigated.
Health and Safety Violation *(EH&S Coordinator, Lab Director, Operations Manager, Department Manager)*	- Environmental Health and Safety (EHS) Manual.	- Non-conformance is investigated and corrected through EH&S office.

Note:

1. Except as noted below for certain compounds, the method blank should be below the reporting limit. Concentrations up to five times the reporting limit will be allowed for the ubiquitous laboratory and reagent contaminants: methylene chloride, acetone, 2-butanone and phthalates provided they appear in similar levels in the reagent blank and samples. This allowance presumes that the reporting limit is significantly below any regulatory limit to which the data are to be compared and that blank subtraction will not occur. For benzene and ethylene dibromide (EDB) and the other analytes for which regulatory limits are extremely close to the detection limit, the method blank must be below the method detection limit.

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SECTION 13.0

PREVENTIVE ACTION
(NELAC 5.4.11)

13.1 OVERVIEW

The laboratory's preventive action programs improve, or eliminate potential causes of nonconforming product and/or nonconformance to the quality system. This preventive action process is a proactive continuous process improvement activity that can be initiated through feedback from clients, employees, business providers, and affiliates. The QA Department has the overall responsibility to ensure that the preventive action process is in place, and that relevant information on actions is submitted for management review.

Dedicating resources to an effective preventive action system emphasizes the laboratory's commitment to its Quality Program. It is beneficial to identify and address negative trends before they develop into complaints, problems and corrective actions. Additionally, customer service and satisfaction can be improved through continuous improvements to laboratory systems.

Opportunities for improvement may be discovered during management reviews, the QA Metrics Report, internal or external audits, proficiency testing performance, client complaints, staff observation, etc..

The monthly QA Metrics Report shows performance indicators in all areas of the quality system. These areas include revised reports, corrective actions, audit findings, internal auditing and data authenticity audits, client complaints, PT samples, holding time violations, SOPs, ethics training, etc. These metrics are used to help evaluate quality system performance on an ongoing basis and provide a tool for identifying areas for improvement.

The laboratory's Corrective Action process is integral to implementation of preventive actions. A critical piece of the corrective action process is the implementation of actions to prevent further occurrence of a non-compliance event. Historical review of corrective action provides a valuable mechanism for identifying preventive action opportunities.

13.1.1 The following elements are part of a preventive action system:

- Identification of an opportunity for preventive action.
- Process for the preventive action.
- Define the measurements of the effectiveness of the process once undertaken.
- Execution of the preventive action.
- Evaluation of the plan using the defined measurements.
- Verification of the effectiveness of the preventive action.
- Close-Out by documenting any permanent changes to the Quality System as a result of the Preventive Action. Documentation of Preventive Action is incorporated into the monthly QA reports, corrective action process and management review

13.1.2 Any Preventive Actions undertaken or attempted shall be taken into account during the Annual Management Review (Section 17). A highly detailed recap is not required; a simple recount of success and failure within the preventive action program will provide management a measure for evaluation.

13.2 MANAGEMENT OF CHANGE

The Management of Change process is designed to manage significant events and changes that occur within the laboratory. Through these procedures, the potential risks inherent with a new event or change are identified and evaluated. The risks are minimized or eliminated through pre-planning and the development of preventive measures. The types of changes covered under this system include: Facility Changes, Major Accreditation Changes, Addition or Deletion to Division's Capabilities or Instrumentation, Key Personnel Changes, Laboratory Information Management System (LIMS) changes.

SECTION 14.0

CONTROL OF RECORDS
(NELAC 5.4.12)

The laboratory maintains a record system appropriate to its needs and that complies with applicable standards or regulations as required. The system produces unequivocal, accurate records that document all laboratory activities. The laboratory retains all original observations, calculations and derived data, calibration records and a copy of the analytical report for a minimum of five years after it has been issued. TestAmerica Buffalo SOP BF-GP-015, Record Storage and Retention specify additional storage, archiving and retention procedures.

14.1 OVERVIEW

The laboratory has established procedures for identification, collection, indexing, access, filing, storage, maintenance and disposal of quality and technical records. A record index is listed in Table 14-1. Quality records are maintained by the QA department in a database which is backed up as past of the regular laboratory backup. Records are of two types; either electronic or hard copy paper formats depending on whether the record is computer or hand generated (some records may be in both formats). Hardcopy technical records are maintained by the Data Deliverables Manager while electronic technical records are maintained by the IT Administrator.

Table 14-1. Record Index[1]

	Record Types [1]:	Retention Time:
Technical Records	- Raw Data - Logbooks[2] - Standards - Certificates - Analytical Records - Lab Reports	5 Years from analytical report issue*
Official Documents	- Quality Assurance Manual (QAM) - Work Instructions - Policies - Policy Memorandums - SOPs - Manuals	5 Years from document retirement date*
QA Records	- Internal & External Audits/Responses - Certifications - Corrective/Preventive Actions - Management Reviews - Method & Software Validation / Verification Data - Data Investigation	5 Years from archival* **Data Investigation:** 5 years or the life of the affected raw data storage whichever is greater (beyond 5 years if ongoing project or pending investigation)

	Record Types [1]:	Retention Time:
Project Records	- Sample Receipt & COC Documentation - Contracts and Amendments - Correspondence - QAPP -SAP - Telephone Logbooks - Lab Reports	5 Years from analytical report issue*
Administrative Records	Finance and Accounting	10 years
	EH&S Manual, Permits, Disposal Records	7 years
	Employee Handbook	Indefinitely
	Personnel files, Employee Signature & Initials, Administrative Training Records (e.g., Ethics)	7 Years (HR Personnel Files must be maintained indefinitely
	Administrative Policies Technical Training Records	7 years

[1] Record Types encompass hardcopy and electronic records.
[2] Examples of Logbook types: Maintenance, Instrument Run, Preparation (standard and samples), Standard and Reagent Receipt, Archiving, Balance Calibration, Temperature (hardcopy or electronic records).
* Exceptions listed in Table 14-2.

14.1.1 All records are stored and retained in such a way that they are secure and readily retrievable at the laboratory facility or an offsite location that provides a suitable environment to prevent damage or deterioration and to prevent loss. Retention of records is maintained on-site at the laboratory for at least 3 months after their generation and moved offsite for the remainder of the required storage time. Records are maintained for a minimum of five years unless other wise specified by a client or regulatory requirement. All records shall be protected against fire, theft, loss, environmental deterioration and vermin. In the case of electronic records, electronic or magnetic sources, storage media are protected from deterioration caused by magnetic fields and/or electronic deterioration. Access to the data is limited to laboratory and company employees.

For raw data and project records, record retention shall be calculated from the date the project report is issued. For other records, such as Controlled Documents, QA, or Administrative Records, the retention time is calculated from the date the record is formally retired. Records related to the programs listed in Table 14-2 have lengthier retention requirements and are subject to the requirements in Section 14.1.3.

14.1.2 Programs with Longer Retention Requirements

Some regulatory programs have longer record retention requirements than the standard record retention time. These are detailed in Table 14-2 with their retention requirements. In these cases, the longer retention requirement is enacted. If special instructions exist such that client data cannot be destroyed prior to notification of the client, the container or box containing that data is marked as to who to contact for authorization prior to destroying the data. Specific Information related to archival of data for greater than 5 years may be found in TestAmerica Buffalo SOP BF-GP-015.

Table 14-2. Special Record Retention Requirements

Program	[1]Retention Requirement
Drinking Water – All States	10 years (project records)
Drinking Water Lead and Copper Rule	12 years (project records)
Commonwealth of MA – All environmental data 310 CMR 42.14	10 years
FIFRA – 40 CFR Part 160	Retain for life of research or marketing permit for pesticides regulated by EPA
Housing and Urban Development (HUD) Environmental Lead Testing	10 years
Alaska	10 years
Louisiana – All	10 years
Michigan Department of Environmental Quality – all environmental data	10 years
Navy Facilities Engineering Service Center (NFESC)	5 years
NY Potable Water NYCRR Part 55-2	10 years
TSCA - 40 CFR Part 792	10 years after publication of final test rule or negotiated test agreement

[1]Note: Extended retention requirements are noted with the archive documents or addressed in TestAmerica Buffalo facility-specific records retention procedure BF-GP-015.

14.1.3 All records are held secure and in confidence. Records maintained at the laboratory are located in the locked on-site storage room. Records archived off-site are stored in a secure location. Access to the off-site storage facility is controlled and logs are maintained for the documented removal/return of records

14.1.4 The laboratory has procedures to protect and back-up records stored electronically and to prevent unauthorized access to or amendment of these records. All analytical data is maintained as hard copy or in a secure readable electronic format. TestAmerica Buffalo SOP BF-GP-015 also contains specific information for archival of scanned data.

14.1.5 The record keeping system allows for historical reconstruction of all laboratory activities that produced the analytical data, as well as rapid recovery of historical data (records

stored off site should be accessible within 2 business days of a request for such records). The history of the sample from when the laboratory took possession of the samples must be readily understood through the documentation. This shall include inter-laboratory transfers of samples and/or extracts.

- The records include the identity of personnel involved in sampling, sample receipt, preparation, or testing. All analytical work contains the initials (at least) of the personnel involved. The laboratory's copy of the chain of custody is stored with the project file and the Job Number analytical service request form (ASRF) generated by the LIMS. The chain of custody would indicate the name of the sampler. If any sampling notes are provided with a work order, they are kept with this package.

- All information relating to the laboratory facilities equipment, analytical test methods, and related laboratory activities, such as sample receipt, sample preparation, or data verification are documented.

- The record keeping system facilitates the retrieval of all working files and archived records for inspection and verification purposes (e.g., set format for naming electronic files, set format for what is included with a given analytical data set. Instrument data is stored sequentially by instrument. Calibration data for a given sequence are maintained in the order of the analysis. Sample data are stored on a job number basis in the project file or as part of the daily batch or sequence. Run logs are maintained for each instrument or method; a copy of each day's run log or instrument sequence is stored with the data to aid in re-constructing an analytical sequence. Where an analysis is performed without an instrument, bound logbooks, bench sheets or excel spreadsheets are used to record and file data. Standard and reagent information is recorded in logbooks or on the raw data for each method as required.

- Changes to hardcopy records shall follow the procedures outlined in Section 13 and 20. Changes to electronic records in LIMS or instrument data are recorded in audit trails.

- The reason for a signature or initials on a document is clearly indicated in the records such as "sampled by," "prepared by," "reviewed by", or "analyzed by".

- All generated data except those that are generated by automated data collection systems, are recorded directly, promptly and legibly in permanent dark ink.

- Hard copy data may be scanned into PDF format for record storage as long as the scanning process can be verified in order to ensure that no data is lost and the data files and storage media must be tested to verify the laboratory's ability to retrieve the information prior to the destruction of the hard copy that was scanned. The procedure for this verification can be found in TestAmerica SOP BF-GP-015.

- Also refer to Section 19.14.1 'Computer and Electronic Data Related Requirements'**.**

14.2 TECHNICAL AND ANALYTICAL RECORDS

14.2.1 The laboratory retains records of original observations, derived data and sufficient information to establish an audit trail, calibration records, staff records and a copy of each analytical report issued, for a minimum of five years unless otherwise specified by a client or regulatory requirement. The records for each analysis shall contain sufficient information to enable the analysis to be repeated under conditions as close as possible to the original. The records shall include the identity of laboratory personnel responsible for the sampling, performance of each analysis and reviewing of results.

14.2.2 Observations, data and calculations are recorded real-time.

14.2.3 Changes to hardcopy records shall follow the procedures outlined in Section 13 and 20. Changes to electronic records in LIMS or instrument data are recorded in audit trails.
The essential information to be associated with analysis, such as strip charts, tabular printouts, computer data files, analytical notebooks, and run logs, include:

- laboratory sample ID code**;**
- Date of analysis; time of analysis is also required if the holding time is seventy-two (72) hours or less, or when time critical steps are included in the analysis (e.g., drying times, incubations, etc.); instrumental analyses have the date and time of analysis recorded as part of their general operations. Where a time critical step exists in an analysis, location for such a time is included as part of the documentation in a specific logbook or on a bench sheet.
- Instrumentation identification and instrument operating conditions/parameters. Operating conditions/parameters are typically recorded in the method specific SOPs, in the instrument method detail records or the instrument maintenance logs where available.
- analysis type**;**
- all manual calculations and manual integrations**;**
- analyst's or operator's initials/signature**;**
- sample preparation including cleanup, separation protocols, incubation periods, ID codes, volumes, weights, instrument printouts, meter readings, temperatures, calculations, reagents**;**
- test results**;**
- standard and reagent origin, receipt, preparation, and use**;**
- calibration criteria, frequency and acceptance criteria**;**
- data and statistical calculations, review, confirmation, interpretation, assessment and reporting conventions**;**
- quality control protocols and assessment**;**
- electronic data security, software documentation and verification, software and hardware audits, backups, and records of any changes to automated data entries; and

- Method performance criteria including expected quality control requirements. These are indicated both in the LIMS and on specific analytical report formats**.**

14.3 LABORATORY SUPPORT ACTIVITIES

In addition to documenting all the above-mentioned activities, the following are retained QA records and project records (previous discussions in this section relate where and how these data are stored):

- all original raw data, whether hard copy or electronic, for calibrations, samples and quality control measures, including analysts' work sheets and data output records (chromatograms, strip charts, and other instrument response readout records)**;**
- a written description or reference to the specific test method used which includes a description of the specific computational steps used to translate parametric observations into a reportable analytical value**;**
- copies of final reports**;**
- archived SOPs**;**
- correspondence relating to laboratory activities for a specific project**;**
- all corrective action reports, audits and audit responses**;**
- proficiency test results and raw data; and
- results of data review, verification, and crosschecking procedures

14.3.1 Sample Handling Records

Records of all procedures to which a sample is subjected while in the possession of the laboratory are maintained. These include but are not limited to records pertaining to:

- sample preservation including appropriateness of sample container and compliance with holding time requirement;
- sample identification, receipt, acceptance or rejection and login;
- sample storage and tracking including shipping receipts, sample transmittal / COC forms; and
- Procedures for the receipt and retention of samples, including all provisions necessary to protect the integrity of samples.

14.4 ADMINISTRATIVE RECORDS

The laboratory also maintains the administrative records in either electronic or hard copy form. Refer to Table 14-1.

14.5 RECORDS MANAGEMENT, STORAGE AND DISPOSAL

14.5.1 All records (including those pertaining to test equipment), certificates and reports are safely stored, held secure and in confidence to the client. Certification related records are available upon request.

14.5.2 All information necessary for the historical reconstruction of data is maintained by the laboratory. Records that are stored only on electronic media must be supported by the hardware and software necessary for their retrieval.

14.5.3 Records that are stored or generated by computers or personal computers have hard copy, write-protected backup copies, or an electronic audit trail controlling access**.**

14.5.4 The laboratory has a record management system (also known as document control) for control of laboratory notebooks, instrument logbooks, standards logbooks, and records for data reduction, validation, storage and reporting. Laboratory notebooks are issued on a per instrument or analysis basis, and are numbered sequentially as they are issued. No instrument or analysis has more than one active notebook at a time, so all data are recorded sequentially within a series of sequential notebooks. Bench sheets and raw data sequence files are filed sequentially by date. Standard and reagent information is maintained in LIMS and logbooks which are maintained on a departmental basis and are numbered sequentially as they are issued or as they are archived by QA.

14.5.5 Records are considered archived when noted as such in the records management system (also known as document control). Access to archived hard-copy information is documented with an access log and in/out records is used to note data that is removed and returned.

14.5.6 Transfer of Ownership

In the event that the laboratory transfers ownership or goes out of business, the laboratory shall ensure that the records are maintained or transferred according to client's instructions. Upon ownership transfer, record retention requirements shall be addressed in the ownership transfer agreement and the responsibility for maintaining archives is clearly established. In addition, in cases of bankruptcy, appropriate regulatory and state legal requirements concerning laboratory records must be followed. In the event of the closure of the laboratory, all records will revert to the control of the corporate headquarters. Should the entire company cease to exist, as much notice as possible will be given to clients and the accrediting bodies who have worked with the laboratory during the previous 5 years of such action.

14.5.7 Records Disposal

14.5.7.1 Records are removed from the archive and destroyed after 5 years unless otherwise specified by a client or regulatory requirement. On a project specific or program basis, clients may need to be notified prior to record destruction. Records are destroyed in a manner that ensures their confidentiality such as shredding, mutilation or incineration. (Refer to Tables 14-1 and 14-2).

14.5.7.2 Electronic copies of records must be destroyed by erasure or physically damaging off-line storage media so no records can be read.

14.5.7.3 If a third party records Management Company is hired to dispose of records, a "Certificate of Destruction" is required**.**

SECTION 15

AUDITS
(NELAC 5.4.13)

15.1 INTERNAL AUDITS

Internal audits are performed to verify that laboratory operations comply with the requirements of the lab's quality system and with the external quality programs under which the laboratory operates. Audits are planned and organized by the QA staff. Personnel conducting the audits should be independent of the area being evaluated. Auditors will have sufficient authority, access to work areas, and organizational freedom necessary to observe all activities affecting quality and to report the assessments to laboratory management and when requested to corporate management.

Audits are conducted and documented as described in the TestAmerica Corporate SOP on performing Internal Audits, SOP No. CA-Q-S-004. The types and frequency of routine internal audits are shown in Table 15-1. Special or ad hoc assessments may be conducted as needed under the direction of the QA staff.

Table 15-1. Types of Internal Audits and Frequency

Description	Performed by	Frequency
Quality Systems	QA Department or Designee	All areas of the laboratory annually
QA Technical Audits *	QA Department or Designee	All methods within a 2-year period (50% annually)
SOP Method Compliance Audits *	Dept. Manager or designee	All methods within a 2-year period (50% annually)
Special	QA Department or Designee	Surveillance or spot checks performed as needed to monitor specific issues
Performance Testing	Coordinated by Corporate QA	Two successful per year for each NELAC field of testing or as dictated by regulatory requirements

* = all methods receive a QA Technical Audit or an SOP Method Compliance Audit annually.

15.1.1 Annual Quality Systems Audit

An annual quality systems audit is required to ensure compliance to analytical methods and SOPs, the laboratory's Data Integrity and Ethics Policies, NELAC quality systems client and state requirements, and the effectiveness of the internal controls of the analytical process, including but not limited to data review, quality controls, preventive action and corrective action. The completeness of earlier corrective actions is assessed. The audit is divided into modules for each operating or support area of the lab, and each module is comprehensive for a given area. The area audits may be done on a rotating schedule throughout the year to ensure

adequate coverage of all areas. This schedule may change as situations in the laboratory warrant.

15.1.2 QA Technical Audits

QA technical audits are based on client projects, associated sample delivery groups, and the methods performed. Reported results are compared to raw data to verify the authenticity of results. The validity of calibrations and QC results are compared to data qualifiers, footnotes, and case narratives. Documentation is assessed by examining run logs and records of manual integrations. Manual calculations are checked. Where possible, Chrom AuditMiner is used to identify unusual manipulations of the data deserving closer scrutiny. QA technical audits will include all methods within a two-year period.

15.1.3 SOP Method Compliance

Compliance of all SOPs with the source methods and compliance of the operational groups with the SOPs will be assessed by the Technical Director at least every two years. The work of each newly hired analyst is assessed within 3 months of working independently, (e.g., completion of method IDOC). In addition, as analysts add methods to their capabilities, (new IDOC) reviews of the analyst work products will be performed within 3 months of completing the documented training.

15.1.4 Special Audits

Special audits are conducted on an as needed basis, generally as a follow up to specific issues such as client complaints, corrective actions, PT results, data audits, system audits, validation comments, regulatory audits or suspected ethical improprieties. Special audits are focused on a specific issue, and report format, distribution, and timeframes are designed to address the nature of the issue.

15.1.5 Performance Testing

The laboratory participates semi-annually in performance audits conducted through the analysis of PT samples provided by a third party. The laboratory generally participates in the following types of PT studies: Drinking Water, Nonpotable Water, Soil, Air.

It is TestAmerica's policy that PT samples be treated as typical samples in the production process. Furthermore, where PT samples present special or unique problems, in the regular production process they may need to be treated differently, as would any special or unique request submitted by any client. The QA Manager must be consulted and in agreement with any decisions made to treat a PT sample differently due to some special circumstance.

Written responses to unacceptable PT results are required. In some cases it may be necessary for blind QC samples to be submitted to the laboratory to show a return to control.

15.2 EXTERNAL AUDITS

External audits are performed when certifying agencies or clients conduct on-site inspections or submit performance testing samples for analysis. It is TestAmerica's policy to cooperate fully with regulatory authorities and clients. The laboratory makes every effort to provide the auditors with access to personnel, documentation, and assistance. Laboratory supervisors are responsible for providing corrective actions to the QA Manager who coordinates the response for any deficiencies discovered during an external audit. Audit responses are due in the time allotted by the client or agency performing the audit. When requested, a copy of the audit report and the labs corrective action plan will be forwarded to Corporate Quality.

The laboratory cooperates with clients and their representatives to monitor the laboratory's performance in relation to work performed for the client. The client may only view data and systems related directly to the client's work. All efforts are made to keep other client information confidential.

15.2.1 Confidential Business Information (CBI) Considerations

During on-site audits, auditors may come into possession of information claimed as business confidential. A business confidentiality claim is defined as "a claim or allegation that business information is entitled to confidential treatment for reasons of business confidentiality or a request for a determination that such information is entitled to such treatment." When information is claimed as business confidential, the laboratory must place on (or attach to) the information at the time it is submitted to the auditor, a cover sheet, stamped or typed legend or other suitable form of notice, employing language such as "trade secret", "proprietary" or "company confidential". Confidential portions of documents otherwise non-confidential must be clearly identified. CBI may be purged of references to client identity by the responsible laboratory official at the time of removal from the laboratory. However, sample identifiers may not be obscured from the information. Additional information regarding CBI can be found in within the 2003 NELAC standards.

15.3 AUDIT FINDINGS

Audit findings are documented using the corrective action process and database. The laboratory's corrective action responses for both types of audits may include action plans that could not be completed within a predefined timeframe. In these instances, a completion date must set and agreed to by operations management and the QA Manager.

Developing and implementing corrective actions to findings is the responsibility of the Department Manager where the finding originated. Findings that are not corrected by specified due dates are reported monthly to management in the QA monthly report. . When requested, a copy of the audit report and the labs corrective action plan will be forwarded to Corporate Quality.

If any audit finding casts doubt on the effectiveness of the operations or on the correctness or validity of the laboratory's test results, the laboratory shall take timely corrective action, and shall notify clients in writing if the investigations show that the laboratory results have been affected. Once corrective action is implemented, a follow-up audit is scheduled to ensure that the problem has been corrected.

Clients must be notified promptly in writing, of any event such as the identification of defective measuring or test equipment that casts doubt on the validity of results given in any test report or amendment to a test report. The investigation must begin within 24-hours of discovery of the problem and all efforts are made to notify the client within two weeks after the completion of the investigation.

SECTION 16

MANAGEMENT REVIEWS
(NELAC 5.4.14)

16.1 QUALITY ASSURANCE REPORT

A comprehensive QA Report shall be prepared each month by the laboratory's QA Department and forwarded to the Laboratory Director for review and comments. The final report shall be submitted to the Operation Manager as well as the appropriate Quality Director and General Manager. All aspects of the QA system are reviewed to evaluate the suitability of policies and procedures. During the course of the year, the Laboratory Director, General Manager or Corporate QA may request that additional information be added to the report.

On a monthly basis, Corporate QA compiles information from all the monthly laboratory reports. The Corporate Quality Director prepares a report that includes a compilation of all metrics and notable information and concerns regarding the QA programs within the laboratories. The report also includes a listing of new regulations that may potentially impact the laboratories. This report is presented to the Senior Management Team and General Managers.

16.2 ANNUAL MANAGEMENT REVIEW

The senior lab management team (Laboratory Director, Technical Director, Operations Manager, Customer Service Manager, QA Manager) conducts a review annually of its quality systems and LIMS to ensure its continuing suitability and effectiveness in meeting client and regulatory requirements and to introduce any necessary changes or improvements. It will also provide a platform for defining quality goals and objectives. Corporate Operations and Corporate QA personnel may be included in this meeting at the discretion of the Laboratory Director. The LIMS review consists of examining any audits, complaints or concerns that have been raised through the year that are related to the LIMS. The laboratory will summarize any critical findings that can not be solved by the lab and report them to Corporate IT.

This management systems review (Corporate SOP No. CA-Q-S-008 & Work Instruction No. CA-Q-WI-020) uses information generated during the preceding year to assess the "big picture" by ensuring that routine actions taken and reviewed on a monthly basis are not components of larger systematic concerns. The monthly review should keep the quality systems current and effective; therefore, the annual review is a formal senior management process to review specific existing documentation. Significant issues from the following documentation are compiled or summarized by the QA Manager prior to the review meeting:

- Matters arising from the previous annual review.
- Prior Monthly QA Reports issues.
- Laboratory QA Metrics.
- Review of report reissue requests.
- Review of client feedback and complaints.

- Issues arising from any prior management or staff meetings.
- Minutes from prior senior lab management meetings. Issues that may be raised from these meetings include:
    - Adequacy of staff, equipment and facility resources.
    - Adequacy of policies and procedures.
    - Future plans for resources and testing capability and capacity.

- The annual internal double blind PT program sample performance (if performed),
- Compliance to the Ethics Policy and Data Integrity Plan. Including any evidence/incidents of inappropriate actions or vulnerabilities related to data Integrity.

A report is generated by the QA Manager and management. The report is distributed to the appropriate General Manager and the Quality Director. The report includes, but is not limited to:

- The date of the review and the names and titles of participants.
- A reference to the existing data quality related documents and topics that were reviewed.
- Quality system or operational changes or improvements that will be made as a result of the review [e.g., an implementation schedule including assigned responsibilities for the changes.

Changes to the quality systems requiring update to the laboratory QA Manual shall be included in the next revision of the QA Manual.

16.3 POTENTIAL INTEGRITY RELATED MANAGERIAL REVIEWS

Potential integrity issues (data or business related) must be handled and reviewed in a confidential manner until such time as a follow-up evaluation, full investigation, or other appropriate actions have been completed and issues clarified. The TestAmerica Corporate Data Investigation/ Recall SOP shall be followed (SOP No. CA-L-S-001). All investigations that result in finding of inappropriate activity are documented and include any disciplinary actions involved, corrective actions taken, and all appropriate notifications of clients.

TestAmerica's COO, VP of Client & Technical Services, General Managers and Quality Directors receive a monthly report from the Director of Quality & Client Advocacy summarizing any current data integrity or data recall investigations. The General Manager's are also made aware of progress on these issues for their specific labs.

SECTION 17

PERSONNEL
(NELAC 5.5.2)

17.1 OVERVIEW

The laboratory's management believes that its highly qualified and professional staff is the single most important aspect in assuring a high level of data quality and service. The staff consists of professionals and support personnel as outlined in the organization chart in Figure 4-1.

All personnel must demonstrate competence in the areas where they have responsibility. Any staff that is undergoing training shall have appropriate supervision until they have demonstrated their ability to perform their job function on their own. Staff shall be qualified for their tasks based on appropriate education, training, experience and/or demonstrated skills as required.

The laboratory employs sufficient personnel with the necessary education, training, technical knowledge and experience for their assigned responsibilities.

All personnel are responsible for complying with all QA/QC requirements that pertain to the laboratory and their area of responsibility. Each staff member must have a combination of experience and education to adequately demonstrate a specific knowledge of their particular area of responsibility. Technical staff must also have a general knowledge of lab operations, test methods, QA/QC procedures and records management.

Laboratory management is responsible for formulating goals for lab staff with respect to education, training and skills and ensuring that the laboratory has a policy and procedures for identifying training needs and providing training of personnel. The training shall be relevant to the present and anticipated responsibilities of the lab staff.

The laboratory only uses personnel that are employed by or under contract to, the laboratory. Contracted personnel, when used, must meet competency standards of the laboratory and work in accordance to the laboratory's quality system.

17.2 EDUCATION AND EXPERIENCE REQUIREMENTS FOR TECHNICAL PERSONNEL

The laboratory makes every effort to hire analytical staff that possesses a college degree (AA, BA, BS) in an applied science with some chemistry in the curriculum. Exceptions can be made based upon the individual's experience and ability to learn. Selection of qualified candidates for laboratory employment begins with documentation of minimum education, training, and experience prerequisites needed to perform the prescribed task. Minimum education and training requirements for TestAmerica employees are outlined in job descriptions and are generally summarized for analytical staff in the table below.

The laboratory maintains job descriptions for all personnel who manage, perform or verify work affecting the quality of the environmental testing the laboratory performs. Job Descriptions are

located in the TestAmerica Buffalo Human Resource office (Also see Section 4 for position descriptions/responsibilities).

Experience and specialized training are occasionally accepted in lieu of a college degree (basic lab skills such as using a balance, pipette, quantitation techniques, etc. are also considered).

As a general rule for analytical staff:

Specialty	Education	Experience
Extractions, Digestions, some electrode methods (pH, DO, Redox, etc.), or Titrimetric and Gravimetric Analyses	H.S. Diploma	On the job training (OJT)
CVAA, Single component or short list Chromatography (e.g., Fuels, BTEX-GC, IC)	A college degree in an applied science or 2 years of college and at least 1 year of college chemistry	Or 2 years prior analytical experience is required
ICP, ICPMS, Long List or complex chromatography (e.g., Pesticides, PCB, Herbicides, HPLC, etc.), GCMS	A college degree in an applied science or 2 years of college chemistry	or 5 years of prior analytical experience
Spectra Interpretation	A college degree in an applied science or 2 years of college chemistry	And 2 years relevant experience Or 5 years of prior analytical experience
Technical Directors/Department Managers – **General**	Bachelors Degree in an applied science or engineering with 24 semester hours in chemistry An advanced (MS, PhD.) degree may substitute for one year of experience	And 2 years experience in environmental analysis of representative analytes for which they will oversee

When an analyst does not meet these requirements, they can perform a task under the direct supervision of a qualified analyst, peer reviewer or Department Manager, and are considered an analyst in training. The person supervising an analyst in training is accountable for the quality of the analytical data and must review and approve data and associated corrective actions.

17.3 TRAINING

The laboratory is committed to furthering the professional and technical development of employees at all levels.

Orientation to the laboratory's policies and procedures, in-house method training, and employee attendance at outside training courses and conferences all contribute toward employee proficiency. Below are examples of various areas of required employee training:

Required Training	Time Frame	Employee Type
Environmental Health & Safety	Prior to lab work	All
Ethics – New Hires	1 week of hire	All
Ethics - Comprehensive	90 days of hire	All
Data Integrity	30 days of hire	Technical and PMs
Quality Assurance	90 days of hire	All
Ethics – Refresher	Annually	All
Initial Demonstration of Capability (DOC)	Prior to unsupervised method performance	Technical

The laboratory maintains records of relevant authorization/competence, education, professional qualifications, training, skills and experience of technical personnel (including contracted personnel) as well as the date that approval/authorization was given. These records are kept on file at the laboratory. Also refer to "Demonstration of Capability" in Section 19.

The training of technical staff is kept up to date by:

- Each employee must have documentation in their training file that they have read, understood and agreed to follow the most recent version of the laboratory QA Manual and SOPs in their area of responsibility. This documentation is updated as SOPs are updated.
- Documentation from any training courses or workshops on specific equipment, analytical techniques or other relevant topics are maintained in their training file.
- Documentation of proficiency (refer to Section 20).
- An Ethics Agreement signed by each staff member (renewed each year) and evidence of annual ethics training.
- A Confidentiality Agreement signed by each staff member signed at the time of employment.
- The Human Resource office maintains documentation and attestation forms on employment status & records; benefit programs; timekeeping/payroll; and employee conduct (e.g., ethics). This information is maintained in the employee's secured personnel file.

Further details of the laboratory's training program are described in TestAmerica Buffalo SOP BF-QA-004, Laboratory Personnel Training.

17.4 DATA INTEGRITY AND ETHICS TRAINING PROGRAM

Establishing and maintaining a high ethical standard is an important element of a Quality System. Ethics and data integrity training is integral to the success of TestAmerica and is provided for each employee at TestAmerica. It is a formal part of the initial employee orientation within 1 week of hire followed by technical data integrity training within 30 days, comprehensive

training within 90 days, and an annual refresher for all employees. Senior management at each facility performs the ethics training for their staff.

In order to ensure that all personnel understand the importance TestAmerica places on maintaining high ethical standards at all times; TestAmerica has established a Corporate Ethics Policy No. CA-L-P-001 and an Ethics Statement. All initial and annual training is documented by signature on the signed Ethics demonstrating that the employee has participated in the training and understands their obligations related to ethical behavior and data integrity.

Violations of this Ethics Policy will not be tolerated. Employees who violate this policy will be subject to disciplinary actions up to and including termination. Criminal violations may also be referred to the Government for prosecution. In addition, such actions could jeopardize TestAmerica's ability to do work on Government contracts, and for that reason, TestAmerica has a Zero Tolerance approach to such violations.

Employees are trained as to the legal and environmental repercussions that result from data misrepresentation. Key topics covered in the presentation include:

- Organizational mission and its relationship to the critical need for honesty and full disclosure in all analytical reporting.
- Ethics Policy
- How and when to report ethical/data integrity issues. Confidential reporting.
- Record keeping.
- Discussion regarding data integrity procedures.
- Specific examples of breaches of ethical behavior (e.g. peak shaving, altering data or computer clocks, improper macros, etc., accepting/offering kickbacks, illegal accounting practices, unfair competition/collusion)
- Internal monitoring. Investigations and data recalls.
- Consequences for infractions including potential for immediate termination, debarment, or criminal prosecution.
- Importance of proper written narration / data qualification by the analyst and project manager with respect to those cases where the data may still be usable but are in one sense or another partially deficient.

Additionally, a data integrity hotline (1-800-736-9407) is maintained by TestAmerica and administered by the Corporate Quality Department.

SECTION 18

ACCOMMODATIONS AND ENVIRONMENTAL CONDITIONS
(NELAC 5.5.3)

18.1 OVERVIEW

TestAmerica Buffalo is a 32,000 ft^2 secure laboratory facility with controlled access and designed to accommodate an efficient workflow and to provide a safe and comfortable work environment for employees. All visitors sign in and are escorted by laboratory personnel. Access is controlled by various measures.

The laboratory is equipped with structural safety features. Each employee is familiar with the location, use, and capabilities of general and specialized safety features associated with their workplace. The laboratory provides and requires the use of protective equipment including safety glasses, protective clothing, gloves, etc. OSHA and other regulatory agency guidelines regarding required amounts of bench and fume hood space, lighting, ventilation (temperature and humidity controlled), access, and safety equipment are met or exceeded.

Traffic flow through sample preparation and analysis areas is minimized to reduce the likelihood of contamination. Adequate floor space and bench top area is provided to allow unencumbered sample preparation and analysis space. Sufficient space is also provided for storage of reagents and media, glassware, and portable equipment. Ample space is also provided for refrigerated sample storage before analysis and archival storage of samples after analysis. Laboratory HVAC and deionized water systems are designed to minimize potential trace contaminants.

The laboratory is separated into specific areas for field operations, bottle kit preparation, sample receiving, sample preparation, volatile organic sample analysis, non-volatile organic sample analysis, inorganic sample analysis and administrative functions.

18.2 ENVIRONMENT

Laboratory accommodation, test areas, energy sources, lighting are adequate to facilitate proper performance of tests. The facility is equipped with heating, ventilation, and air conditioning (HVAC) systems appropriate to the needs of environmental testing performed at this laboratory.

The environment in which these activities are undertaken does not invalidate the results or adversely affect the required accuracy of any measurements.

The laboratory provides for the effective monitoring, control and recording of environmental conditions that may affect the results of environmental tests as required by the relevant specifications, methods, and procedures. Such environmental conditions include humidity, voltage, temperature, and vibration levels in the laboratory. Key equipment has been provided with back-up power supply in the event of a power outage.

When any of the method or regulatory required environmental conditions change to a point where they may adversely affect test results, analytical testing will be discontinued until the environmental conditions are returned to the required levels.

Environmental conditions of the facility housing the computer network and LIMS are regulated to protect against raw data loss.

18.3 WORK AREAS

There is effective separation between neighboring areas when the activities therein are incompatible with each other. Examples include:

- Volatile organic chemical handling areas, including sample preparation and waste disposal, and volatile organic chemical analysis areas.

Access to and use of all areas affecting the quality of analytical testing is defined and controlled by secure access to the laboratory building as described below in the Building Security section.

Adequate measures are taken to ensure good housekeeping in the laboratory and to ensure that any contamination does not adversely affect data quality. These measures include regular cleaning to control dirt and dust within the laboratory.

Work areas are available to ensure an unencumbered work area. Work areas include:

- Access and entryways to the laboratory.
- Sample receipt areas.
- Sample storage areas.
- Chemical and waste storage areas.
- Data handling and storage areas.
- Sample processing areas.
- Sample analysis areas.

18.4 FLOOR PLAN

A floor plan can be found in Appendix 1.

18.5 BUILDING SECURITY

Building pass cards and alarm codes are distributed to all facility employees.

Visitors to the laboratory sign in and out in a visitor's logbook. A visitor is defined as any person who visits the laboratory who is not an employee of the laboratory. [The reason for this is that it is important to know who is in the building in case of a safety emergency. The visitors logbook is used to ensure that everyone got out of the building safely.] In addition to signing into the laboratory, the Environmental, Health and Safety Manual contains requirements for visitors and vendors. There are specific safety forms that must be reviewed and signed.

Visitors (with the exception of company employees) are escorted by laboratory personnel at all times, or the location of the visitor is noted in the visitor's logbook.

SECTION 19.0

TEST METHODS AND METHOD VALIDATION
(NELAC 5.5.4)

19.1 OVERVIEW

The laboratory uses methods that are appropriate to meet our clients' requirements and that are within the scope of the laboratory's capabilities. These include sampling, handling, transport, storage and preparation of samples, and, where appropriate, an estimation of the measurement of uncertainty as well as statistical techniques for analysis of environmental data.

Instructions are available in the laboratory for the operation of equipment as well as for the handling and preparation of samples. All instructions, Standard Operating Procedures (SOPs), reference methods and manuals relevant to the working of the laboratory are readily available to all staff. Deviations from published methods are documented (with justification) in the laboratory's approved SOPs. SOPs are submitted to clients for review at their request. Significant deviations from published methods require client approval and regulatory approval where applicable.

19.2 STANDARD OPERATING PROCEDURES (SOPs)

The laboratory maintains SOPs that accurately reflect all phases of the laboratory such as assessing data integrity, corrective actions, handling customer complaints as well as all analytical methods and sampling procedures. The method SOPs are derived from the most recently promulgated/approved, published methods and are specifically adapted to the laboratory facility. Modifications or clarifications to published methods are clearly noted in the SOPs. All SOPs are controlled in the laboratory:

- All SOPs contain a revision number, effective date, and appropriate approval signatures. Controlled copies are available to all staff.
- Procedures for writing an SOP are incorporated by reference to TestAmerica's Corporate SOP CW-Q-S-002, Writing a Standard Operating Procedure (SOP) and Laboratory SOP BF-QA-003, Procedure for Writing, Reviewing and Revising Controlled Quality Documents (QAM, SOP, etc)
- SOPs are reviewed at a minimum of every 2 years (annually for Drinking Water SOPs), and where necessary, revised to ensure continuing suitability and compliance with applicable requirements.

19.3 LABORATORY METHODS MANUAL

For each test method, the laboratory shall have available the published referenced method as well as the laboratory developed SOP.

Note: If more stringent standards or requirements are included in a mandated test method or regulation than those specified in this manual, the laboratory shall demonstrate that such requirements are met. If it is not clear which requirements are more stringent, the standard from

the method or regulation is to be followed. Any exceptions or deviations from the referenced methods or regulations are noted in the specific analytical SOP.
The laboratory maintains an SOP Index for both technical and non-technical SOPs. Technical SOPs are maintained to describe a specific test method. Non-technical SOPs are maintained to describe functions and processes not related to a specific test method.

19.4 SELECTION OF METHODS

Since numerous methods and analytical techniques are available, continued communication between the client and laboratory is imperative to assure the correct methods are utilized. Once client methodology requirements are established, this and other pertinent information is summarized by the Project Manager. These mechanisms ensure that the proper analytical methods are applied when the samples arrive for log-in. For non-routine analytical services (e.g., special matrices, non-routine compound lists, etc.), the method of choice is selected based on client needs and available technology. The methods selected should be capable of measuring the specific parameter of interest, in the concentration range of interest, and with the required precision and accuracy.

19.4.1 Sources of Methods

Routine analytical services are performed using standard EPA-approved methodology. In some cases, modification of standard approved methods may be necessary to provide accurate analyses of particularly complex matrices. When the use of specific methods for sample analysis is mandated through project or regulatory requirements, only those methods shall be used.

When clients do not specify the method to be used or methods are not required, the methods used will be clearly validated and documented in an SOP and available to clients and/or the end user of the data.

19.4.1.1 The analytical methods used by the laboratory are those currently accepted and approved by the U. S. EPA and the state or territory from which the samples were collected. Reference methods include:

- *Method 1664, Revision A: N-Hexane Extractable Material (HEM; Oil and Grease) and Silica Gel Treated N-Hexane Extractable Material (SGT-HEM); Non-polar Material) by Extraction and Gravimetry, EPA-821-R-98-002, February 1999*
- *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, US EPA, January 1996.*
- *Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act, and Appendix A-C; 40 CFR Part 136, USEPA Office of Water. Revised as of July 1, 1995, Appendix A to Part 136 - Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater (EPA 600 Series)*
- *Methods for Chemical Analysis of Water and Wastes, EPA 600 (4-79-020), 1983.*
- *Methods for the Determination of Inorganic Substances in Environmental Samples, EPA-600/R-93/100, August 1993.*

- *Methods for the Determination of Metals in Environmental Samples, EPA/600/4-91/010, June 1991. Supplement I: EPA-600/R-94/111, May 1994.*
- *Methods for the Determination of Organic Compounds in Drinking Water, EPA-600/4-88-039, December 1988, Revised, July 1991, Supplement I, EPA-600-4-90-020, July 1990, Supplement II, EPA-600/R-92-129, August 1992. Supplement III EPA/600/R-95/131 - August 1995 (EPA 500 Series) (EPA 500 Series methods)*
- *Technical Notes on Drinking Water Methods, EPA-600/R94-173, October 1994*
- *NIOSH Manual of Analytical Methods, 4th ed., August 1994.*
- *Statement of Work for Inorganics & Organics Analysis, SOM and ISM, current versions, USEPA Contract Laboratory Program Multi-media, Multi-concentration.*
- *Standard Methods for the Examination of Water and Wastewater, 18th/19th /20th / on-line edition; Eaton, A.D. Clesceri, L.S. Greenberg, A.E. Eds; American Water Works Association, Water Pollution Control Federation, American Public Health Association: Washington, D.C.*
- *Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846), Third Edition, September 1986, Final Update I, July 1992, Final Update IIA, August 1993, Final Update II, September 1994; Final Update IIB, January 1995; Final Update III, December 1996; Final Update IV, January 2008.*
- *Annual Book of ASTM Standards, American Society for Testing & Materials (ASTM), Philadelphia, PA.*
- *National Status and Trends Program, National Oceanographic and Atmospheric Administration, Volume I-IV, 1985-1994.*
- *Manual for the Certification of Laboratories Analyzing Drinking Water (EPA 815-R-05-004, January 2005)* ***(DW labs only)***
- *Code of Federal Regulations (CFR) 40, Parts 136, 141, 172, 173, 178, 179 and 261*
- *New York State DEC Analytical Services Protocol, 2005*
- *New York State DOH Methods Manual*

The laboratory reviews updated versions to all the aforementioned references for adaptation based upon capabilities, instrumentation, etc., and implements them as appropriate. As such, the laboratory strives to perform only the latest versions of each approved method as regulations allow or require.

Other reference procedures for non-routine analyses may include methods established by specific states (e.g., Underground Storage Tank methods), ASTM or equipment manufacturers. Sample type, source, and the governing regulatory agency requiring the analysis will determine the method utilized.

The laboratory shall inform the client when a method proposed by the client may be inappropriate or out of date. After the client has been informed, and they wish to proceed contrary to the laboratory's recommendation, it will be documented.

19.4.2 Demonstration of Capability

Before the laboratory may institute a new method and begin reporting results, the laboratory shall confirm that it can properly operate the method. In general, this demonstration does not

test the performance of the method in real world samples, but in an applicable and available clean matrix sample. If the method is for the testing of analytes that are not conducive to spiking, demonstration of capability may be performed on quality control samples.

19.4.2.1 A demonstration of capability (BF-QA-004) is performed whenever there is a significant change in instrument type (e.g., new instrumentation), method or personnel.

19.4.2.2 The initial demonstration of capability must be thoroughly documented and approved by the Operations Manager and QA Manager prior to independently analyzing client samples. All associated documentation must be retained in accordance with the laboratories archiving procedures.

19.4.2.3 The laboratory must have an approved SOP, demonstrate satisfactory performance, and conduct a method detection limit study (when applicable). There may be other requirements as stated within the published method or regulations (i.e., retention time window study).

Note: In some instances, a situation may arise where a client requests that an unusual analyte be reported using a method where this analyte is not normally reported. If the analyte is being reported for regulatory purposes, the method must meet all procedures outlined within this QA Manual (SOP, MDL, and Demonstration of Capability). If the client states that the information is not for regulatory purposes, the result may be reported as long as the following criteria are met:

- The instrument is calibrated for the analyte to be reported using the criteria for the method and ICV/CCV criteria are met (unless an ICV/CCV is not required by the method or criteria are per project DQOs).
- The laboratory's nominal or default reporting limit (RL) is equal to the quantitation limit (QL), must be at or above the lowest non-zero standard in the calibration curve and must be reliably determined. Project RLs are client specified reporting levels which may be higher than the QL. Results reported below the QL must be qualified as estimated values. Also see Section 19.6.1.3, Relationship of Limit of Detection (LOD) to Quantitation Limit (QL).
- The client request is documented and the lab informs the client of its procedure for working with unusual compounds. The final report must be footnoted: *Reporting Limit based on the low standard of the calibration curve.*

19.4.3 Initial Demonstration of Capability (IDOC) Procedures

Procedures for generation of IDOCs are detailed below and in laboratory SOP BF-QA-004, Laboratory Personnel Training.

19.4.3.1 The spiking standard used must be prepared independently from those used in instrument calibration.

19.4.3.2 The analyte(s) shall be diluted in a volume of clean matrix sufficient to prepare four aliquots at the concentration specified by a method or the laboratory SOP.

19.4.3.3 At least four aliquots shall be prepared (including any applicable clean-up procedures) and analyzed according to the test method (either concurrently or over a period of days).

19.4.3.4 Using all of the results, calculate the mean recovery in the appropriate reporting units and the standard deviations for each parameter of interest.

19.4.3.5 When it is not possible to determine the mean and standard deviations, such as for presence, absence and logarithmic values, the laboratory will assess performance against criteria described in the Method SOP.

19.4.3.6 Compare the information obtained above to the corresponding acceptance criteria for precision and accuracy in the test method (if applicable) or in laboratory generated acceptance criteria (LCS or interim criteria) if there is no mandatory criteria established. If any one of the parameters do not meet the acceptance criteria, the performance is unacceptable for that parameter.

19.4.3.7 When one or more of the tested parameters fail at least one of the acceptance criteria, the analyst must proceed according to either option listed below:

- Locate and correct the source of the problem and repeat the test for all parameters of interest beginning with 19.4.3.3 above.
- Beginning with 19.4.3.3 above, repeat the test for all parameters that failed to meet criteria. Repeated failure, however, will confirm a general problem with the measurement system. If this occurs, locate and correct the source of the problem and repeat the test for all compounds of interest beginning with 20.4.3.1 above.

Note: Results of successive LCS analyses can be used to fulfill the DOC requirement.

A certification statement (see Figure 19-1) shall be used to document the completion of each initial demonstration of capability. A copy of the certification is archived in the analyst's training folder.

19.5 LABORATORY DEVELOPED METHODS AND NON-STANDARD METHODS

Any new method developed by the laboratory must be fully defined in an SOP and validated by qualified personnel with adequate resources to perform the method. Method specifications and the relation to client requirements must be clearly conveyed to the client if the method is a non-standard method (not a published or routinely accepted method). The client must also be in agreement to the use of the non-standard method.

19.6 VALIDATION OF METHODS

Validation is the confirmation by examination and the provision of objective evidence that the particular requirements for a specific intended use are fulfilled.

All non-standard methods, laboratory designed/developed methods, standard methods used outside of their scope, and major modifications to published methods must be validated to confirm they are fit for their intended use. The validation will be as extensive as necessary to meet the needs of the given application. The results are documented with the validation procedure used and contain a statement as to the fitness for use.

19.6.1 Method Validation and Verification Activities for All New Methods

While method validation can take various courses, the following activities can be required as part of method validation. Method validation records are designated QC records and are archived accordingly.

19.6.1.1 Determination of Method Selectivity

Method selectivity is the demonstrated ability to discriminate the analyte(s) of interest from other compounds in the specific matrix or matrices from other analytes or interference. In some cases to achieve the required selectivity for an analyte, a confirmation analysis is required as part of the method.

19.6.1.2 Determination of Method Sensitivity

Sensitivity can be both estimated and demonstrated. Whether a study is required to estimate sensitivity depends on the level of method development required when applying a particular measurement system to a specific set of samples. Where estimations and/or demonstrations of sensitivity are required by regulation or client agreement, such as the procedure in 40 CFR Part 136 Appendix B, under the Clean Water Act, these shall be followed.

19.6.1.3 Relationship of Limit of Detection (LOD) to the Quantitation Limit (QL)

An important characteristic of expression of sensitivity is the difference in the LOD and the QL. The LOD is the minimum level at which the presence of an analyte can be reliably concluded. The QL is the minimum concentration of analyte that can be quantitatively determined with acceptable precision and bias. For most instrumental measurement systems, there is a region where semi-quantitative data is generated around the LOD (both above and below the estimated MDL or LOD) and below the QL. In this region, detection of an analyte may be confirmed but quantification of the analyte is unreliable within the accuracy and precision guidelines of the measurement system. When an analyte is detected below the QL, and the presence of the analyte is confirmed by meeting the qualitative identification criteria for the analyte, the analyte can be reliably reported, but the amount of the analyte can only be estimated. If data is to be reported in this region, it must be done so with a qualification that denotes the semi-quantitative nature of the result.

19.6.1.4 Determination of Interferences

A determination that the method is free from interferences in a blank matrix is performed.

19.6.1.5 Determination of Range

Where appropriate to the method, the quantitation range is determined by comparison of the response of an analyte in a curve to established or targeted criteria. Generally the upper quantitation limit is defined by highest acceptable calibration concentration. The lower quantitation limit or QL cannot be lower than the lowest non-zero calibration level, and can be constrained by required levels of bias and precision.

19.6.1.6 Determination of Accuracy and Precision

Accuracy and precision studies are generally performed using replicate analyses, with a resulting percent recovery and measure of reproducibility (standard deviation, relative standard deviation) calculated and measured against a set of target criteria.

19.6.1.7 Documentation of Method

The method is formally documented in an SOP. If the method is a minor modification of a standard laboratory method that is already documented in an SOP, an SOP Attachment describing the specific differences in the new method is acceptable in place of a separate SOP.

19.6.1.8 Continued Demonstration of Method Performance

Continued demonstration of Method Performance is addressed in the SOP. Continued demonstration of method performance is generally accomplished by batch specific QC samples such as LCS, method blanks or PT samples.

19.7 METHOD DETECTION LIMITS (MDL)/ LIMITS OF DETECTION (LOD)

Method detection limits (MDL) are initially determined in accordance with 40 CFR Part 136, Appendix B or alternatively by other technically acceptable practices that have been accepted by regulators. MDL is also sometimes referred to as Limit of Detection (LOD). The MDL theoretically represents the concentration level for each analyte within a method at which the Analyst is 99% confident that the true value is not zero. The MDL is determined for each analyte initially during the method validation process and updated as required in the analytical methods, whenever there is a significant change in the procedure or equipment, or based on project specific requirements (refer to 19.7.10). Generally the analyst prepares at least seven replicates of solution spiked at one to five times the estimated method detection limit (most often at the lowest standard in the calibration curve) into the applicable matrix with all the analytes of interest. Each of these aliquots is extracted (including any applicable clean-up procedures) and analyzed in the same manner as the samples. Where possible, the seven replicates should be analyzed over 2-4 days to provide a more realistic MDL. To allow for some flexibility, this low level standard may be analyzed every batch or every week or some other frequency rather than doing the study all at once. In addition, a larger number of data points may be used if the appropriate t-value multiplier is used.

Refer to the Corporate SOP No. CA-Q-S-006 or the laboratory's SOP No. BF-QA-001 for details on the laboratory's MDL process.

19.8 INSTRUMENT DETECTION LIMITS (IDL)

19.8.1 The IDL is sometimes used to assess the reasonableness of the MDLs or in some cases required by the analytical method or program requirements. IDLs are most used in metals analyses but may be useful in demonstration of instrument performance in other areas.

19.8.2 IDLs are calculated to determine an instrument's sensitivity independent of any preparation method. IDLs are calculated either using 7 replicate spike analyses, like MDL but without sample preparation, or by the analysis of 10 instrument blanks and calculating 3 x the absolute value of the standard deviation. (For CLP procedures, the IDL is determined using the standard deviation of 7 replicate spike analyses on each of 3 non-consecutive days.)

19.8.3 If IDL is > than the MDL, it may be used as the reported MDL.

19.9 VERIFICATION OF DETECTION AND REPORTING LIMITS

19.9.1 Once an MDL is established, it must be verified, on each instrument, by analyzing a quality control sample (prepared as a sample) at approximately 2-3 times the calculated MDL for single analyte analyses (e.g. most wet chemistry methods, CVAA, etc.) and 1-4 times the calculated MDL for multiple analyte methods (e.g. GC, GCMS, ICP, etc.). The analytes must be qualitatively identified or see section 20.7.9 for other options. This verification does not apply to methods that are not readily spiked (e.g. pH, turbidity, etc.) or where the lab does not report to the MDL. If the MDL does not verify, then the lab will not report to the MDL, or redevelop their MDL or use the level where qualitative identification is established. MDLs must be verified at least annually

19.9.2 When the laboratory establishes a quantitation limit, it must be initially verified by the analysis of a low level standard or QC sample at 1-2 the reporting limit and annually thereafter. The annual requirement is waved for methods that have an annually verified MDL. The laboratory will comply with any regulatory

19.10 RETENTION TIME WINDOWS

Most organic analyses and some inorganic analyses use chromatography techniques for qualitative and quantitative determinations. For every chromatography analysis each analyte will have a specific time of elution from the column to the detector. This is known as the analyte's retention time. The variance in the expected time of elution is defined as the retention time window. As the key to analyte identification in chromatography, retention time windows must be established on every column for every analyte used for that method. These records are kept with the files associated with an instrument for later quantitation of the analytes. Complete details are available in the laboratory's Sops.

19.11 EVALUATION OF SELECTIVITY

The laboratory evaluates selectivity by following the checks within the applicable analytical methods, which include mass spectral tuning, second column confirmation, ICP interelement interference checks, chromatography retention time windows, sample blanks, and specific electrode response factors.

19.12 ESTIMATION OF UNCERTAINTY OF MEASUREMENT

19.12.1 Uncertainty is "a parameter associated with the result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to the measurand" (as defined by the International Vocabulary of Basic and General Terms in Metrology, ISO Geneva, 1993, ISBN 92-67-10175-1). Knowledge of the uncertainty of a measurement provides additional confidence in a result's validity. Its value accounts for all the factors which could possibly affect the result, such as adequacy of analyte definition, sampling, matrix effects and interferences, climatic conditions, variances in weights, volumes, and standards, analytical procedure, and random variation. Some national accreditation organizations require the use of an "expanded uncertainty": the range within which the value of the measurand is believed to lie within at least a 95% confidence level with the coverage factor k=2.

19.12.2 Uncertainty is not error. Error is a single value, the difference between the true result and the measured result. On environmental samples, the true result is never known. The measurement is the sum of the unknown true value and the unknown error. Unknown error is a combination of systematic error, or bias, and random error. Bias varies predictably, constantly, and independently from the number of measurements. Random error is unpredictable, assumed to be Gaussian in distribution, and reducible by increasing the number of measurements.

19.12.3 The minimum uncertainty associated with results generated by the laboratory can be determined by using the Laboratory Control Sample (LCS) accuracy range for a given analyte. The LCS limits are used to assess the performance of the measurement system since they take into consideration all of the laboratory variables associated with a given test over time (except for variability associated with the sampling and the variability due to matrix effects). The percent recovery of the LCS is compared either to the method-required LCS accuracy limits or to the statistical, historical, in-house LCS accuracy limits.

19.12.4 To calculate the uncertainty for the specific result reported, multiply the result by the decimal of the lower end of the LCS range percent value for the lower end of the uncertainty range, and multiply the result by the decimal of the upper end of the LCS range percent value for the upper end of the uncertainty range. These calculated values represent a 99%-certain range for the reported result. As an example, suppose that the result reported is 1.0 mg/l, and the LCS percent recovery range is 50 to 150%. The uncertainty range would be 0.5 to 1.5 mg/l, which could also be written as 1.0 +/- 0.5 mg/l.

19.12.5 In the case where a well recognized test method specifies limits to the values of major sources of uncertainty of measurement (e.g. 524.2, 525, etc) and specifies the form of presentation of calculated results, no further discussion of uncertainty is required.

19.13 SAMPLE REANALYSIS GUIDELINES

Because there is a certain level of uncertainty with any analytical measurement, a sample reanalysis may result in either a higher or lower value from an initial sample analysis. There are also variables that may be present (e.g., sample homogeneity, analyte precipitation over time, etc.) that may affect the results of a reanalysis. Based on the above comments, the laboratory will reanalyze samples at a client's request with the following caveats. Client specific Contractual Terms & Conditions for reanalysis protocols may supersede the following items.

- Homogenous samples: If a reanalysis agrees with the original result to within the RPD limits for MS/MSD or Duplicate analyses, or within $\pm$ 1 reporting limit for samples $\leq$ 5x the reporting limit, the original analysis will be reported. At the client's request, both results may be reported on the same report but not on two separate reports.

- If the reanalysis does not agree (as defined above) with the original result, then the laboratory will investigate the discrepancy and reanalyze the sample a third time for confirmation if sufficient sample is available.

- Any potential charges related to reanalysis are discussed in the contract terms and conditions or discussed at the time of the request. The client will typically be charged for reanalysis unless it is determined that the lab was in error.

- Due to the potential for increased variability, reanalysis may not be applicable to Non-homogenous, Encore, and Sodium Bisulfate preserved samples. See the Department Supervisor or Laboratory Director/Manager if unsure.

19.14 CONTROL OF DATA

The laboratory has policies and procedures in place to ensure the authenticity, integrity, and accuracy of the analytical data generated by the laboratory.

19.14.1 Computer and Electronic Data Related Requirements

The three basic objectives of our computer security procedures and policies are shown below. The laboratory is currently running the 'TALS Data System' which is a LIMs system that has been highly customized to meet the needs of the laboratory. It is referred to as LIMS for the remainder of this section. The LIMS utilizes a SQL server which is an industry standard relational database platform. It is referred to as Database for the remainder of this section.

19.14.1.1 Maintain the Database Integrity

Assurance that data is reliable and accurate through data verification (review) procedures, password-protecting access, anti-virus protection, data change requirements, as well as an internal LIMS permissions procedure.

- LIMS Database Integrity is achieved through data input validation, internal user controls, and data change requirements.

- Spreadsheets and other software developed in-house must be verified with documentation through hand calculations prior to use.

19.14.1.2 Ensure Information Availability

Protection against loss of information or service is ensured through scheduled back-ups, stable file server network architecture, secure storage of media, line filter, Uninterruptible Power Supply (UPS), and maintaining older versions of software as revisions are implemented.

19.14.1.3 Maintain Confidentiality

Ensure data confidentiality through physical access controls, when electronically transmitting data.

19.14.2 Data Reduction

The complexity of the data reduction depends on the analytical method and the number of discrete operations involved (e.g., extractions, dilutions, instrument readings and concentrations). The analyst calculates the final results from the raw data or uses appropriate computer programs to assist in the calculation of final reportable values.

For manual data entry, e.g., Wet Chemistry, the data is reduced by the analyst and then verified by the Department Manager or alternate analyst prior to updating the data in LIMS. The data review sheets, or any other type of applicable documents, are signed by both the analyst and alternate reviewer to confirm the accuracy of the manual entry(s).

Manual integration of peaks will be documented and reviewed and the raw data will be flagged in accordance with the TestAmerica Corporate SOP CA-Q-S-002, *Acceptable Manual Integration Practices*.

Analytical results are reduced to appropriate concentration units specified by the analytical method, taking into account factors such as dilution, sample weight or volume, etc. Blank correction will be applied only when required by the method or per manufacturer's indication; otherwise, it should not be performed. Calculations are independently verified by appropriate laboratory staff. Calculations and data reduction steps for various methods are summarized in the respective analytical SOPs or program requirements.

19.14.2.1 All raw data must be retained in the project job folder, computer file, and/or run log. All criteria pertinent to the method must be recorded. The documentation is recorded at the time observations or calculations are made and must be signed or initialed/dated (month/day/year). It must be easily identifiable who performed which tasks if multiple people were involved.

19.14.2.2 In general, concentration results are reported in milligrams per liter (mg/l) or micrograms per liter (µg/l) for liquids and milligrams per kilogram (mg/kg) or micrograms per kilogram (µg/kg) for solids. For values greater than 10,000 mg/l,

results can be reported in percent, i.e., 10,000 mg/l = 1%. Units are defined in each lab SOP.

19.14.2.3 In reporting, the analyst or the instrument output records the raw data result using values of known certainty plus one uncertain digit. If final calculations are performed external to LIMS, the results should be entered in LIMS with at least three significant figures. In general, final inorganic results are reported to 2 significant figures for values less than 10 and 3 significant figures for values greater than 10 on the final report. Organic results are generally reported to 1 significant figure for values less than 10 and 2 significant figures for values greater than 10 on the final report. The number of significant figures may be adjusted based on client or project requirements.

19.14.2.4 For those methods that do not have an instrument printout, an instrumental output or a calculation spreadsheet upload compatible with the LIMS System, the final results and dilution factors are entered directly into LIMS by the analyst, and the software formats the final result for the analytical report. LIMS has a defined significant figure criterion for each analyte.

19.14.2.5 The laboratory strives to import data directly from instruments or calculation spreadsheets to ensure that the reported data are free from transcription and calculation errors. For those analyses with an instrumental output compatible with the LIMS, the raw results and dilution factors are transferred into LIMS electronically after reviewing the quantitation report, and removing unrequested or poor spectrally-matched compounds. The analyst prints a copy of what has been entered to check for errors. This printout and the instrument's printout of calibrations, concentrations, retention times, chromatograms, and mass spectra, if applicable, are retained with the data file. The data file is automatically transferred to the network server and, eventually, to a back-up tape file.

19.14.3 Logbook / Worksheet Use Guidelines

Logbooks and worksheets are filled out 'real time' and have enough information on them to trace the events of the applicable analysis/task. (e.g. calibrations, standards, analyst, sample ID, date, time on short holding time tests, temperatures when applicable, calculations are traceable, etc.)

- Corrections are made following the procedures outlined in Section 12.
- Logbooks are controlled by the QA department. A record is maintained of all logbooks in the lab.
- Unused portions of pages must be "Z"'d out, signed and dated.
- Worksheets are created with the approval of the Technical Director/QA Manager at the facility. The QA Manager controls all worksheets following the procedures in Section 6.

19.14.4 Review / Verification Procedures

Review procedures are out lined in several laboratory SOPs (e.g. BF-SR-002, "Receipt of Analytical Samples", BF-GP-012, "Technical Data Review", and BF-PM-001, "Project Information Requirements") to ensure that reported data are free from calculation and transcription errors, that QC parameters have been reviewed and evaluated before data is reported. The laboratory also has an SOP discussing Manual Integrations to ensure the authenticity of the data (BF-GP-013, Manual Integration). The general review concepts are discussed below, more specific information can be found in the SOPs.

19.14.4.1 The data review process at the laboratory starts at the Sample Control level. Sample Control personnel review chain-of-custody forms and input the sample information and required analyses into a computer LIMS. The Project Managers perform review of the chain-of-custody forms and inputted information and approve the input in LIMs to make the samples available to the laboratory departments for batching and processing.

19.14.4.2 The next level of data review occurs with the Analysts. As results are generated, analysts review their work to ensure that the results generated meet QC requirements and relevant EPA methodologies. The Analysts transfer the data into the LIMS and add any manual data qualifiers or dilution codes if applicable. To ensure data compliance, a different analyst performs a second level of review. Second level review is accomplished by checking reported results against raw data and evaluating the results for accuracy. During the second level review, blank runs, QA/QC check results, initial and continuing calibration results, laboratory control samples, sample data, qualifiers and spike information are evaluated. Where calibration is not required on a daily basis, secondary review of the initial calibration results may be conducted at the time of calibration. Approximately 10% of all sample data from manual methods and from automated methods, all GC/MS spectra and all manual integrations are reviewed. Issues that deem further review include the following:

- QC data are outside the specified control limits for accuracy and precision
- Reviewed sample data does not match with reported results
- Unusual detection limit changes are observed
- Samples having unusually high results
- Samples exceeding a known regulatory limit
- Raw data indicating some type of contamination or poor technique
- Inconsistent peak integration
- Transcription errors
- Results outside of calibration range
- Results deviate from historical trends (if history available)

19.14.4.3 Unacceptable analytical results may require reanalysis of the samples. Any unusual or uncharacteristic circumstances are brought to the attention of the Department Manager. The Department Manager may involve the Project Manager, the Technical Director and/or the QA Manager for further investigation depending on the issue. Corrective action is initiated whenever necessary.

19.14.4.4 The results are then entered or directly transferred into the computer database and a hard copy (or .pdf) is printed for the client.

19.14.4.5 As a final review prior to the release of the report, the Project Manager reviews the results for appropriateness and completeness. This review and approval ensures that client requirements have been met and that the final report has been properly completed. The process includes, but is not limited to, verifying that chemical relationships are evaluated, COC is followed, cover letters/ narratives are present, flags are appropriate, and project specific requirements are met.

19.14.4.6 Any project that requires a data package is subject to a tertiary data review for transcription errors and acceptable quality control requirements. The Project Manager then signs the final report and creates the invoice. When complete, the report is issued to the client.

19.14.5 Manual Integrations

Computerized data systems provide the analyst with the ability to re-integrate raw instrument data in order to optimize the interpretation of the data. Though manual integration of data is an invaluable tool for resolving variations in instrument performance and some sample matrix problems, when used improperly, this technique would make unacceptable data appear to meet quality control acceptance limits. Improper re-integrations lead to legally indefensible data, a poor reputation, or possible laboratory decertification. Because guidelines for re-integration of data are not provided in the methods and most methods were written prior to widespread implementation of computerized data systems, the laboratory trains all analytical staff on proper manual integration techniques using SOP CA-Q-S-002 as the guidelines**.**

19.14.5.1 The analyst must adjust baseline or the area of a peak in some situations, for example when two compounds are not adequately resolved or when a peak shoulder needs to be separated from the peak of interest. The analyst must use professional judgment and common sense to determine when manual integrating is required. Analysts are encouraged to ask for assistance from a senior analyst or manager when in doubt.

19.14.5.2 Analysts shall not increase or decrease peak areas for the sole purpose of achieving acceptable QC recoveries that would have otherwise been unacceptable. The intentional recording or reporting of incorrect information (or the intentional omission of correct information) is against company principals and policy and is grounds for immediate termination.

19.14.5.3 Client samples, performance evaluation samples, and quality control samples are all treated equally when determining whether or not a peak area or baseline should be manually adjusted.

19.14.5.4 All manual integrations receive a second level review. Manual integrations must be indicated on an expanded scale “after” chromatograms such that the integration performed can be easily evaluated during data review. Expanded scale “before” chromatograms are also required for all manual integrations on QC parameters (calibrations, calibration verifications, laboratory control samples, internal standards, surrogates, etc.) unless the laboratory has another documented corporate approved procedure in place that can demonstrate an active process for detection and deterrence of improper integration practices.

Figure 19-1.
Example - Demonstration of Capability Documentation

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

DOC Cert. Statement
Revision 9
April 13, 2010

TESTAMERICA LABORATORIES, INC.

TRAINING & DEMONSTRATION OF CAPABILITY CERTIFICATION STATEMENT

Employee: _____ Page _____of__

Method Number: _____ Date: _____

Parameters or Analytes: _____

Initial Demonstration of Capability: ☐

SOP Number:_____Revision # _____ Date Read_____

Trained By:_____

Date training began:_____ Date training completed:_____

Continued Demonstration of Capability: ☐

SOP Number: _____ Revision # _____ Date Read_____

I CERTIFY that I have read and understand the SOP identified above. I have also submitted data associated with the demonstration of capability.

_____ _____
Employee Signature Date

We, the undersigned, CERTIFY that:

1. The analyst identified above, using the cited test method(s), which is in use at this facility for the analyses of samples under the National Environmental Laboratory Accreditation Program, have met the Demonstration of Capability.

2. The test method(s) was performed by the analyst(s) identified on this certification.

3. A copy of the test method(s) and the laboratory-specific Sops are available for all personnel on-site.

4. The data associated with the demonstration capability are true, accurate, complete and self-explanatory.

5. All raw data (including a copy of this certification form) necessary to reconstruct and validate these analyses have been retained at this facility, and that the associated information is well organized and available for review by authorized assessors.

Jennifer Pierce _____ _____ _____
Operations Manager Signature Date

Paula Benham _____ _____ _____
Quality Assurance Manager Signature Date

SECTION 20

EQUIPMENT (AND CALIBRATIONS)
(NELAC 5.5.5)

20.1 OVERVIEW

The laboratory purchases the most technically advanced analytical instrumentation for sample analyses. Instrumentation is purchased on the basis of accuracy, dependability, efficiency and sensitivity. Each laboratory is furnished with all items of sampling, preparation, analytical testing and measurement equipment necessary to correctly perform the tests for which the laboratory has capabilities. Each piece of equipment is capable of achieving the required accuracy and complies with specifications relevant to the method being performed. Before being placed into use, the equipment (including sampling equipment) is calibrated and checked to establish that it meets its intended specification. The calibration routines for analytical instruments establish the range of quantitation. Calibration procedures are specified in laboratory SOPs. A list of laboratory equipment and instrumentation is presented in Table 20-1.

Equipment is only operated by authorized and trained personnel. Manufacturer's instructions for equipment use are readily accessible to all appropriate laboratory personnel.

20.2 PREVENTIVE MAINTENANCE

20.2.1 The laboratory follows a well-defined maintenance program to ensure proper equipment operation and to prevent the failure of laboratory equipment or instrumentation during use. This program of preventive maintenance helps to avoid delays due to instrument failure.

20.2.2 Routine preventive maintenance procedures and frequency, such as lubrication, cleaning, and replacements, should be performed according to the procedures outlined in the manufacturer's manual. Qualified personnel must also perform maintenance when there is evidence of degradation of peak resolution, a shift in the calibration curve, loss of sensitivity, or failure to continually meet one of the quality control criteria.

20.2.3 Table 20-2 lists examples of scheduled routine maintenance. It is the responsibility of each Department Manager to ensure that instrument maintenance logs are kept for all equipment in his/her department. Preventative maintenance procedures may also be outlined in analytical SOPs or instrument manuals. (Note: for some equipment, the log used to monitor performance is also the maintenance log. Multiple pieces of equipment may share the same log as long as it is clear as to which instrument is associated with an entry.)

20.2.4 Instrument maintenance logs are controlled and are used to document instrument problems, instrument repair and maintenance activities. Maintenance logs shall be kept for all major pieces of equipment. Instrument maintenance logs may also be used to specify instrument parameters.

20.2.4.1 Documentation must include all major maintenance activities such as contracted preventive maintenance and service and in-house activities such as the replacement of electrical components, lamps, tubing, valves, columns, detectors, cleaning and adjustments.

20.2.4.2 Each entry in the instrument log includes the Analyst's initials, the date, a detailed description of the problem (or maintenance needed/scheduled), a detailed explanation of the solution or maintenance performed, and a verification that the equipment is functioning properly (state what was used to determine a return to control. e.g. CCV run on *'date'* was acceptable, or instrument recalibrated on 'date' with acceptable verification, etc.) must also be documented in the instrumentation records.

20.2.4.3 When maintenance or repair is performed by an outside agency, service receipts detailing the service performed can be affixed into the logbooks adjacent to pages describing the maintenance performed. This stapled in page must be signed across the page entered and the logbook so that it is clear that a page is missing if only half a signature is found in the logbook.

20.2.5 If an instrument requires repair (subjected to overloading or mishandling, gives suspect results, or otherwise has shown to be defective or outside of specified limits) it shall be taken out of operation and tagged as out of service or otherwise isolated until such a time as the repairs have been made and the instrument can be demonstrated as operational by calibration and/or verification or other test to demonstrate acceptable performance. The laboratory shall examine the effect of this defect on previous analyses

20.2.6 In the event of equipment malfunction that cannot be resolved, service shall be obtained from the instrument vendor manufacturer, or qualified service technician, if such a service can be tendered. If on-site service is unavailable, arrangements shall be made to have the instrument shipped back to the manufacturer for repair. Back up instruments, which have been approved, for the analysis shall perform the analysis normally carried out by the malfunctioning instrument. If the back up is not available and the analysis cannot be carried out within the needed timeframe, the samples shall be subcontracted.

If an instrument is sent out for service or transferred to another facility, it must be recalibrated and verified (including new initial MDL study) prior to return to lab operations.

20.3 SUPPORT EQUIPMENT

This section applies to all devices that may not be the actual test instrument, but are necessary to support laboratory operations. These include but are not limited to: balances, ovens, refrigerators, freezers, incubators, water baths, field sampling devices, temperature measuring devices and volumetric dispensing devices if quantitative results are dependent on their accuracy, as in standard preparation and dispensing or dilution into a specified volume. All raw data records associated with the support equipment are retained to document instrument performance. Laboratory SOPs BF-GP-001,"Calibration of Autopipettes and Repipetters" and BF-GP-002, "Support Equipment: Maintenance, Record Keeping and Corrective Actions of Analytical Balances, Temperature Control Devises and Reagent Water" provide additional detail on the monitoring and record keeping for support equipment.

20.3.1 Weights and Balances

The accuracy of the balances used in the laboratory is checked every working day, before use. All balances are placed on stable counter tops.

Each balance is checked prior to initial serviceable use with at least two certified ASTM type 1 weights spanning its range of use (weights that have been calibrated to ASTM type 1 weights may also be used for daily verification). ASTM type 1 weights used only for calibration of other weights (and no other purpose) are inspected for corrosion, damage or nicks at least annually and if no damage is observed, they are calibrated at least every 5 years by an outside calibration laboratory. Any weights (including ASTM Type 1) used for daily balance checks or other purposes are recalibrated/recertified annually to NIST standards (this may be done internally if laboratory maintains "calibration only" ASTM type 1 weights).

All balances are serviced annually by a qualified service representative, who supplies the laboratory with a certificate that identifies traceability of the calibration to the NIST standards.

All of this information is recorded in logs, and the recalibration/recertification certificates are kept on file.

20.3.2 pH, Conductivity, and Turbidity Meters

The pH meters used in the laboratory are accurate to $\pm$ 0.1 pH units, and have a scale readability of at least 0.05 pH units. The meters automatically compensate for the temperature, and are calibrated with at least two working range buffer solutions before each use.

Conductivity meters are also calibrated before each use with a known standard to demonstrate the meters do not exceed an error of 1% or one umhos/cm.

Turbidity meters are also calibrated before each use. All of this information is documented in logs.

Consult pH and Conductivity, and Turbidity SOPs for further information.

20.3.3 Thermometers

All reusable thermometers are calibrated on an annual basis with a NIST-traceable thermometer. Disposable glycol thermometers are discarded upon expiration and replaced with newly purchased thermometers. IR thermometers are verified daily and calibrated annually. Digital probes and thermocouples are calibrated quarterly.

The NIST thermometer is recalibrated every five years (unless thermometer has been exposed to temperature extremes or apparent separation of internal liquid) by an approved outside

service and the provided certificate of traceability is kept on file. The NIST thermometer(s) have increments of 1 degree (0.5 degree or less increments are required for drinking water microbiological laboratories) and have ranges applicable to method and certification requirements. The NIST traceable thermometer is used for no other purpose than to calibrate other thermometers.

All of this information is documented in logbooks. Monitoring method-specific temperatures, including incubators, heating blocks, water baths, and ovens, is documented in method-specific logbooks. More information on this subject can be found in the laboratory SOP BF-GP-020, "Thermometer Calibration".

20.3.4 Refrigerators/Freezer Units, Waterbaths, Ovens and Incubators

The temperatures of all refrigerator units and freezers used for sample and standard storage are monitored each working day.

Ovens, waterbaths and incubators are monitored on days of use.

All of this equipment has a unique identification number, and is assigned a unique thermometer for monitoring.

Sample storage refrigerator temperatures are kept between > 0ºC and $\leq$ 6 ºC.

Specific temperature settings/ranges for other refrigerators, ovens waterbaths, and incubators can be found in method specific SOPs.

All of this information is documented in Daily Temperature Logbooks and method-specific logbooks.

20.3.5 Autopipettors, Dilutors, and Syringes

Mechanical volumetric dispensing devices including burettes (except Class A Glassware) are given unique identification numbers and the delivery volumes are verified gravimetrically at a minimum on a quarterly basis. Glass micro-syringes are considered the same as Class A glassware.

For those dispensers that are not used for analytical measurements, a label is applied to the device stating that it is not calibrated. Any device not regularly verified can not be used for any quantitative measurements.

Micro-syringes are purchased from Hamilton Company. Each syringe is traceable to NIST. The laboratory keeps on file an "Accuracy and Precision Statement of Conformance" from Hamilton attesting established accuracy.

20.3.6 Field Sampling Devices (Isco Auto Samplers)

Each Auto Sampler (ISCO) is assigned a unique identification number in order to keep track of the calibration. This number is also recorded on the sampling documentation.

The Auto Sampler is calibrated monthly (or if not utilized monthly, immediately prior to its usage) by setting the sample volume to 100ml and recording the volume received. The results are filed in a logbook/binder. The Auto Sampler is programmed to run three (3) cycles and each of the three cycles is measured into a graduated cylinder to verify 100ml are received.

If the RSD (Relative Standard Deviation) between the 3 cycles is greater than 10%, the procedure is repeated and if the result is still greater than 10%, then the Auto Sampler is taken out of service until it is repaired and calibration verification criteria can be met. The results of this check are kept in a logbook/binder.

Additional calibration and use information is detailed in laboratory SOP BF-FS-006, “Calibration of Field Meter”.

20.4 INSTRUMENT CALIBRATIONS

Calibration of analytical instrumentation is essential to the production of quality data. Strict calibration procedures are followed for each method. These procedures are designed to determine and document the method detection limits, the working range of the analytical instrumentation and any fluctuations that may occur from day to day.

Sufficient raw data records are retained to allow an outside party to reconstruct all facets of the initial calibration. Records contain, but are not limited to, the following: calibration date, method, instrument, analyst(s) initials or signatures, analysis date, analytes, concentration, response, type of calibration (Avg RF, curve, or other calculations that may be used to reduce instrument responses to concentration.)

Sample results must be quantitated from the initial calibration and may not be quantitated from any continuing instrument calibration verification unless otherwise required by regulation, method or program.

If the initial calibration results are outside of the acceptance criteria, corrective action is performed and any affected samples are reanalyzed if possible. If the reanalysis is not possible, any data associated with an unacceptable initial calibration will be reported with appropriate data qualifiers (refer to Section 12).

Note: Instruments are calibrated initially and as needed after that and at least annually.

20.4.1 Calibration Standards

Calibration standards are prepared using the procedures indicated in the Reagents and Standards section of the determinative method SOP.

20.4.1.1 Standards for instrument calibration are obtained from a variety of sources. All standards are traceable to national or international standards of measurement, or to national or international standard reference materials.

20.4.1.2 The lowest concentration calibration standard that is analyzed during an initial calibration must be at or below the stated reporting limit for the method based on the final volume of extract (or sample).

20.4.1.3 The other concentrations define the working range of the instrument/method or correspond to the expected range of concentrations found in actual samples that are also within the working range of the instrument/method. Results of samples not bracketed by initial instrument calibration standards (within calibration range to 3 significant figures) must be reported as having less certainty, e.g., defined qualifiers or flags (additional information may be included in the case narrative). The exceptions to these rules are methods where the referenced method does not specify two or more standards.

20.4.1.4 All initial calibrations are verified with a standard obtained from a second source and traceable to a national standard, when available (or vendor certified different lot if a second source is not available). For unique situations, such as air analysis where no other source or lot is available, a standard made by a different analyst would be considered a second source. This verification occurs immediately after the calibration curve has been analyzed, and before the analysis of any samples.

20.4.2 Calibration Verification

The calibration relationship established during the initial calibration must be verified at least daily as specified in the laboratory method SOPs in accordance with the referenced analytical methods and NELAC (2003) standard, Section 5.5.5.10. The process of calibration verification applies to both external standard and internal standard calibration techniques, as well as to linear and non-linear calibration models. Initial calibration verification is with a standard source secondary (second source standard) to the calibration standards, but continuing calibration verifications may use the same source standards as the calibration curve.

Note: The process of calibration verification referred to is fundamentally different from the approach called "calibration" in some methods. As described in those methods, the calibration factors or response factors calculated during calibration are used to update the calibration factors or response factors used for sample quantitation. This approach, while employed in other EPA programs, amounts to a daily single-point calibration.

All target analytes and surrogates, including those reported as non-detects, must be included in periodic calibration verifications for purposes of retention time confirmation and to demonstrate that calibration verification criteria are being met i.e., RPD, per NELAC (2003) Standard, Section 5.5.5.10.

All samples must be bracketed by periodic analyses of standards that meet the QC acceptance criteria (e.g., calibration and retention time). The frequency is found in the determinative methods or SOPs.

Note: If an internal standard calibration is being used (basically GCMS) then bracketing standards are not required, only daily verifications are needed. The results from these verification standards must meet the calibration verification criteria and the retention time criteria (if applicable).

Generally, the initial calibrations must be verified at the beginning of each 12-hour analytical shift during which samples are analyzed. (Some methods may specify more or less frequent verifications). The 12-hour analytical shift begins with the injection of the calibration verification standard (or the MS tuning standard in MS methods). The shift ends after the completion of the analysis of the last sample, QC, or standard that can be injected within 12 hours of the beginning of the shift.

A continuing instrument calibration verification (CCV) must be repeated at the beginning and, for methods that have quantitation by external calibration models, at the end of each analytical batch. Some methods have more frequent CCV requirements see specific SOPs. Most Inorganic methods require the CCV to be analyzed after ever 10 samples or injections, including matrix or batch QC samples.

Note: If an internal standard calibration is being used (basically GCMS) then bracketing standards are not required, only daily verifications are needed. The results from these verification standards must meet the calibration verification criteria and the retention time criteria (if applicable).

20.4.2.1 Verification of Linear and Non-Linear Calibrations

Calibration verification for calibrations involves the calculation of the percent drift or the percent difference of the instrument response between the initial calibration and each subsequent analysis of the verification standard. (These calculations are available in the laboratory method SOPs.) Verification standards are evaluated based on the % Difference from the average CF or RF of the initial calibration or based on % Drift or % Recovery if a linear or quadratic curve is used.

Regardless of whether a linear or non-linear calibration model is used, if initial verification criterion is not met, then no sample analyses may take place until the calibration has been verified or a new initial calibration is performed that meets the specifications listed in the method SOPs. If the calibration cannot be verified after the analysis of a single verification standard, then adjust the instrument operating conditions and/or perform instrument maintenance, and analyze another aliquot of the verification standard. If the calibration cannot be verified with the second standard, then a new initial calibration is performed.

- When the acceptance criteria for the calibration verification are exceeded high, i.e., high bias, and there are associated samples that are non-detects, then those non-detects may be reported. Otherwise, the samples affected by the unacceptable calibration verification shall be reanalyzed after a new calibration curve has been established, evaluated and accepted.

- When the acceptance criteria for the calibration verification are exceeded low, i.e., low bias, those sample results may be reported if they exceed a maximum regulatory limit/decision level. Otherwise, the samples affected by the unacceptable verification shall be reanalyzed after a new calibration curve has been established, evaluated and accepted. Alternatively, a reporting limit standard may be analyzed to demonstrate that the laboratory can still support non-detects at their reporting limit.

20.5 TENTATIVELY IDENTIFIED COMPOUNDS (TICS) – GC/MS ANALYSIS

For samples containing components not associated with the calibration standards, a library search may be made for the purpose of tentative identification. The necessity to perform this type of identification will be determined by the purpose of the analyses being conducted. Data system library search routines should not use normalization routines that would misrepresent the library or unknown spectra when compared to each other.

Note: If the TIC compound is not part of the client target analyte list but is calibrated by the laboratory and is both qualitatively and/or quantitatively identifiable, it should not be reported as a TIC. If the compound is reported on the same form as true TICs, it should be qualified and/or narrated that the reported compound is qualitatively and quantitatively (if verification in control) reported compared to a known standard that is in control (where applicable).

For example, the RCRA permit or waste delisting requirements may require the reporting of non-target analytes. Only after visual comparison of sample spectra with the nearest library searches may the analyst assign a tentative identification. See laboratory SOP's BF-MB-005 and BF-MV-007 for guidelines for making tentative identifications

Note:
For general reporting if TICs are requested, the ten (10), largest non-target analyte peaks whose area count exceeds 10% of the nearest internal standard will be termed "Tentatively Identified Compounds" (TICs). More or fewer TICs may be identified based on client requirements.

20.6 GC/MS TUNING

Prior to any GCMS analytical sequence, including calibration, the instrument parameters for the tune and subsequent sample analyses within that sequence must be set.

Prior to tuning/auto-tuning the mass spec, the parameters may be adjusted within the specifications set by the manufacturer or the analytical method. These generally don't need any adjustment but it may be required based on the current instrument performance. If the tune verification does not pass it may be necessary to clean the source or perform additional maintenance. Any maintenance is documented in the maintenance log.

Table 20-1. Laboratory Equipment and Instrumentation – TestAmerica Buffalo

Instrumentation	Serial Number	Date In Service	Autosampler	Condition	Hazelwood Floor Plan Location	Method(s) Performed
GC/MS Instrumentation						
Agilent 5975	CN10833020	2009	Yes	good	T	8260B
Agilent 5975	US80838844	2008	Yes	good	C	8260B
Agilent 5973	US44621446	2005	Yes	good	G	8260B
Agilent 5973	US52420646	2005	Yes	good	J	8260B
Agilent 5973	US41720721	2004	Yes	good	S	8260B
Agilent 5973	US35120354	2004	Yes	good	W	8270C, 625
Agilent 5973	US41720707	2004	Yes	good	X	8270C, 625
Agilent 5973	US10241053	2003	Yes	good	R	8260B
Agilent 5973	US30965634	2003	Yes	good	V	8270C, 625
Agilent 5973	US03965692	2003	Yes	good	U	8270C, 625
Agilent 5973	US05060076	2001	Yes	good	F	8260B
Agilent 5973	US05060084	2001	Yes	good	N	8260B
Agilent 5973	US03950346	2001	Yes	good	P	8260B
Agilent 5973	US82321636	2001	Yes	good	Q	8260B
GC Instrumentation						
Agilent 6890 dual uECD	CN10520009	2005	Yes	good	5	8081
Agilent 6890 dual uECD	CN10520010	2005	Yes	good	6	CLP Pest/PCB
Agilent 6890 dual uECD	CN10448015	2005	Yes	good	7	8082
Hewlett Packard 5890II dual ECD	3336A53126	1994	Yes	good	14	8082
Hewlett Packard 5890II dual ECD	3336A63465	1994	Yes	good	15	RSK
Hewlett Packard 5890II dual ECD	3336A53464	1994	Yes	good	16	Screening
Hewlett Packard 5890II dual ECD	3336A53463	1994	Yes	good	17	504, 8011
Hewlett Packard 5890II dual ECD	3336A54409	1994	Yes	good	18	608, 8081
Hewlett Packard 5890II dual ECD	3336A54408	1994	Yes	good	19	8082
Hewlett Packard 5890II FID/FID	3115A34892	1994	Yes	good	2	NIOSH Air
Hewlett Packard 5890II PID/FID	3336A60622	1994	Yes	good	22	8021B
Hewlett Packard 5890II Hall/PID	3235A54089	1994	Yes	good	0	8021B
Hewlett Packard 5890II PID/FID	3336A53465	1994	Yes	good	23	8021B
Hewlett Packard 5890II dual FID	3336A53727	1994	Yes	good	24	8015 DRO
Hewlett Packard 5890II dual ECD	3310A47661	1993	Yes	good	12	8082
Hewlett Packard 5890II dual ECD	3336A53325	1993	Yes	good	13	8151A
Hewlett Packard 5890II PID/FID	3133A37157	1993	Yes	good	8	GRO
Hewlett Packard 5890II dual ECD	3203A42206	1992	Yes	good	9	CLP Pest/PCB
Hewlett Packard 5890II dual FID	3019A28433	1991	Yes	good	4	8015 Modified
Hewlett Packard 5890II Hall/PID	3121A35782	1990	Yes	good	3	8021B
Metals Instrumentation						
Perkin Elmer Elan 9000 ICP-MS	P0230202	2002	Yes	good	PE	6020, 200.8
Leeman PS200 II	HG9045	2000	Yes	good	Hg Lab	7471A, 7470,

						245.1
Leeman PS200 II	HG0033	2000	Yes	good	Hg Lab	7471A, 7470, 245.1
Thermo Jarrell ICAP 6000 Duo	ICP-20094603	2010	Yes	good	TJA	6010B, 200.7
Thermo Jarrell ICAP 6000 Duo	ICP-20094602	2010	Yes	good	TJA	6010B, 200.7
Water Quality Instrumentation					**(Suite 108)**	
Konelab Aqua20	SEA032	2009	Yes	good	WQ Lab	350.1, 351.2, 9012
Flash Point Analyzer	Herzog	2007	Yes	good		1010
OI Carbon Analyzer Model 1030	A54TB0578P	2006	Yes	good	41	415.1, 9060
OI Carbon Analyzer Model 1030	E616130020E	2006	Yes	good	41	415.1, 9060
Thermo ECA 1200 TOX	2006.0373	2006	Yes	good		9020B
Horizon Speed Vap	03-0415	2005	Yes	good	WQ Lab	1664
Konelab 20XT	E3719731	2005	Yes	good	WQ Lab	350.1, 351.2, 9012
Thermo ECA 1200 TOX	2004.901	2004	Yes	good	7	9020B
Dionex Ion Chromatograph #DX-120	20126	2004	Yes	good	35	VFA
Konelab 20	S5019455	2004	Yes	good	WQ Lab	310.2, 325.1, 375.4
Glastron CN Midi-distillation	2502	2003	n/a	good	5	335.2, 9010A, 9012
Glastron Phenol Midi-distillation	2069	2003	n/a	good	30	420.2, 9066
Glastron Phenol Midi-distillation	2053	2003	n/a	good	31	420.2, 9066
Labtronics BOD Magic - Autoanalyzer	270H3XB531	2004	Yes	good	WQ Lab	405.1
Labtronics BOD Magic - Autoanalyzer	270J2XB669	2003	Yes	good	WQ Lab	405.1
ManTech PC Titrator	MS-OK2-607	2003	Yes	good	WQ Lab	120.1, 150.1, 310.1, 340.2
HACH Spectrophotometer #DR/2500	30200004886	2003	n/a	good	WQ Lab	365.2,410.4, 7196A
Dionex Ion Chromatograph #DX-120	2060196	2002	Yes	good	29	300.0, 9056
Spectronic Genesis 4001/4	3SGC199091	2000	n/a	good	3	335.2, 9010A
Lachat Quickchem 8000 Autoanalyzer	A83000-1527	2000	Yes	good	27	335.4, 9012, 9066
OI Carbon Analyzer Model 1010 #1	H92170411	1999	Yes	good	1	415.1, 9060
Lachat Quickchem 8000 Autoanalyzer	A83000-1439	1999	Yes	good	9	350.1, 353.2
Dionex Ion Chromatograph #DX-120	99010157	1999	Yes	good	28	300.0, 9056
Orion Ion Meter #230A	2229	1999	n/a	good	WQ Lab	150.1, 9040A
VWR Ion Meter #2100	1063	1997	n/a	good	WQ Lab	150.1, 9040A
YSI Oxygen Meter #57	93J09826	1995	n/a	good	WQ Lab	405.1
BOD chamber	Revco	1994	n/a	good	6	405.1
Sample Preparation Equipment						
TurboVap II	TV0529N12427	2006	n/a	good	39	n/a

TurboVap II	TV0529N12428	2006	n/a	good	38	n/a
J2 ACCUPREP GPC	03F-10723	2003	Yes	good	10	3640A
TurboVap II	TV9445N5816	1996	n/a	good	17	n/a
TurboVap II	TV9427N4133	1996	n/a	good	18	n/a
TurboVap II	TV944N5819	1996	n/a	good	19	n/a
TurboVap II	TV944N5820	1996	n/a	good	20	n/a
TurboVap II	TV0024N9623	2000	n/a	good	32	n/a
TurboVap II	TV0022N9604	2000	n/a	good	25	n/a
TurboVap II	TV0312N11592	2003	n/a	good	33	n/a
TurboVap II	TV0312N11591	2003	n/a	good	34	n/a
Organomation Rot-X-Tractor	16902	1999	n/a	good	11	3510C
Organomation Rot-X-Tractor	16907	1999	n/a	good	12	3510C
Organomation Rot-X-Tractor	16913	1999	n/a	good	13	3510C
Heat Systems Sonicator #XL-2020	G1647/C5659	1994	n/a	good	O-Prep Lab	3550B
Heat Systems Sonicator #XL-2020	G2665/C5674	1994	n/a	good	O-Prep Lab	3550B
Heat Systems Sonicator #XL-2020	G2620/C5660	1994	n/a	good	O-Prep Lab	3550B
Heat Systems Sonicator #XL-2020	G2245/C6328	1995	n/a	good	O-Prep Lab	3550B
Heat Systems Sonicator #XL-2020	G2621/C6733	1995	n/a	good	O-Prep Lab	3550B
Heat Systems Sonicator #XL-2020	G2713/C6732	1995	n/a	good	O-Prep Lab	3550B
Heat Systems Sonicator #XL-2020	G1643/C6837	1995	n/a	good	O-Prep Lab	3550B
Heat Systems Sonicator #XL-2020	G2742/C6842	1995	n/a	good	O-Prep Lab	3550B

Table 20-2.

Schedule of Routine Maintenance

Instrument	Procedure	Frequency
Leeman Mercury Analyzer	Check tubing for wear Fill rinse tank with 10% HCl Change dryer tube Fill reductant bottle with 10% Stannous Chloride	Daily Daily As Needed Daily
ICP & ICP/MS	Check pump tubing Check liquid argon supply Check fluid level in waste container Check re-circulator levels Clean or replace filters Check torch Check sample spray chamber for debris Clean and align nebulizer Change pump oil Change Cones Change printer cartridge Replace pump tubing	Daily Daily Daily Monthly As required Daily Monthly Monthly Monthly As required As required As required
UV-Vis Spectrophotometer	Clean ambient flow cell Precision check/alignment of flow cell Wavelength verification check	As required As required Annually
Auto Analyzers	Clean sampler Check all tubing Clean inside of colorimeter Clean pump well and pump rollers Clean wash fluid receptacle Oil rollers/chains/side rails Clean optics and cells	Daily Daily Daily Quarterly Weekly Weekly Quarterly
Agilent GC/MS	Pump oil-level check Pump oil changing Analyzer bake-out Analyzer cleaning Resolution adjustment COMPUTER SYSTEM AND PRINTER: Air filter cleaning Change data system air filter Printer head carriage lubrication Paper sprocket cleaning Drive belt lubrication	Monthly Annually As required As required As required As required As required As required As required As required

Instrument	Procedure	Frequency
Gas Chromatograph	Compare standard response to previous day or since last initial calibration	Daily
	Check carrier gas flow rate in column	Daily via use of known compound retention
	Check temp. of detector, inlet, column oven	Daily
	Septum replacement	As required
	Glass wool replacement	As required
	Check system for gas leaks with SNOOP	W/cylinder change as required
	Check for loose/frayed power wires and insulation	As Required
	Bake injector/column	As Required
	Change/remove sections of guard column	As Required
	Replace connectors/liners	As Required
	Change/replace column(s)	As Required
Electron Capture Detector (ECD)	Detector wipe test (Ni-63)	Semi-annually
	Detector cleaning	As required
Flame Ionization Detector (FID)	Detector cleaning	As required
Photoionization Detector (PID)	Change O-rings	As required
	Clean lamp window	As required
HPLC	Change guard columns	As required
	Change lamps	As required
	Change pump seals	Semi-annually or as required
	Replace tubing	As required
	Change fuses in power supply	As required
	Filter all samples and solvents	Daily
	Change autosampler rotor/stator	As required
Vacuum Pumps/ Air Compressor	Drained	Weekly
	Belts checked	Monthly
	Lubricated	Semi-annually
Centrifuge	Check brushes and bearings	Every 6 months or as needed

Table 20-3.

Periodic Calibration

Instrument	Type of Calibration/ Number of Standards	Frequency	Acceptance Limits	Corrective Action
Analytical Balance	Accuracy determined using "S" NIST traceable weights. Minimum of 2 standards bracketing the weight of interest. Inspected and calibrated by A2LA accredited person annually.	Daily, when used Annual	± 0.2%	Clean, check level, insure lack of drafts, and that unit is warmed up, recheck. If fails, call service.
Top Loading Balance	Accuracy determined using "S" NIST traceable. Minimum of 2 standards bracketing the weight of interest. Inspected and calibrated by A2LA accredited person annually.	Daily, when used Annual	± 0.5%	Clean. Replace.
NIST Certified Weights	Accuracy determined by accredited weights and measurement laboratory.	1 year	As per certificate.	Replace.
NIST-Traceable Thermometer-Mercury	Accuracy determined by accredited measurement laboratory.	3 years	As per certificate.	Replace.
NIST-Traceable Thermometer-Digital	Accuracy determined by accredited measurement laboratory.	1 year	As per certificate	Replace.
Thermometer	Against NIST-traceable thermometer	Yearly at appropriate temperature range for intended use	± 1.2°C	Replace
Minimum-Maximum Thermometers	Against NIST-traceable thermometer	Yearly	± 1.5°C	Replace

Instrument	Type of Calibration/ Number of Standards	Frequency	Acceptance Limits	Corrective Action
InfraRed Temperature Guns	Against NIST-traceable thermometer Accuracy determined by accredited measurement laboratory.	Daily at appropriate temperature range for intended use. Annual	± 1.5°C	Repair/replace
Dial-type Thermometers	Against NIST-traceable thermometer	Quarterly at appropriate temperature range for intended use.	± 1.5°C	Replace
Refrigerator	Temperature checked using NIST-traceable thermometer.	Daily. If out of range, check again in two hours.	0-6°C	Adjust. Repair. While waiting for repair, seal door, attach "Out of Service" sign, move items to functional unit. Notify supervisor.
Freezer	Temperature checked using NIST-traceable thermometer	Daily. If out of range, check again in two hours.	(-10)-(-20)°C	Adjust. Repair. While waiting for repair, seal door, attach "Out of Service" sign, move items to functional unit. Notify supervisor.
Oven	Temperature checked using NIST-traceable thermometer.	When in use.	104 ± 1°C (drying) 180 ± 2°C (TDS)	Adjust. Replace.
Water Bath	Temperature checked using NIST-traceable thermometer.	When in use.	± 2°C	Adjust. Replace.
Volumetric Dispensing Devices (Eppendorf ® pipette, automatic dilutor or dispensing devices)	One delivery by weight. Using DI water or solvent of use, dispense into tared vessel. Record weight with device ID number. Calibrate using 4 replicate gravimetric measurements	Each day of use Quarterly	± 2% Calculate accuracy by dividing weight by stated volume times 100 for percent.	Adjust. Replace.

Instrument	Type of Calibration/ Number of Standards	Frequency	Acceptance Limits	Corrective Action
Glass Microliter Syringes	None	Accuracy must be initially demonstrated if syringe was not received with a certificate attesting to established accuracy.	± 1%	Not applicable.
Deionized Water	Check in-line conductivity meter on system with conductivity meter in Inorganics Department.	Daily	<1.0 µmho at 25°C	Record on log. Report discrepancies to QA Manager, Operations Manager or Technical Director.

SECTION 21

MEASUREMENT TRACEABILITY
(NELAC 5.5.6)

21.1 OVERVIEW

Traceability of measurements shall be assured using a system of documentation, calibration, and analysis of reference standards. Laboratory equipment that are peripheral to analysis and whose calibration is not necessarily documented in a test method analysis or by analysis of a reference standard shall be subject to ongoing certifications of accuracy. At a minimum, these must include procedures for checking specifications of ancillary equipment: balances, thermometers, temperature, Deionized (DI) and Reverse Osmosis (RO) water systems, automatic pipettes and other volumetric measuring devices. (Refer to Section 20.3). With the exception of Class A Glassware (including glass microliter syringes that have a certificate of accuracy), quarterly accuracy checks are performed for all mechanical volumetric devices. Wherever possible, subsidiary or peripheral equipment is checked against standard equipment or standards that are traceable to national or international standards. Class A Glassware should be routinely inspected for chips, acid etching or deformity. If the Class A glassware is suspect, the accuracy of the glassware will be assessed prior to use.

21.2 NIST-TRACEABLE WEIGHTS AND THERMOMETERS

Reference standards of measurement shall be used for calibration only and for no other purpose, unless it can be shown that their performance as reference standards would not be invalidated.

For NIST-traceable weights and thermometers, the laboratory requires that all calibrations be conducted by a calibration laboratory accredited by A2LA, NVLAP (National Voluntary Laboratory Accreditation Program), (APLAC (Asia-Pacific Laboratory Accreditation Cooperation), or EA (European Cooperation for Accreditation). A certificate and scope of accreditation is kept on file at the laboratory.

The calibration report or certificate submitted to ***TestAmerica Buffalo*** contains, in a well designed format, a traceability statement, the conditions under which the calibrations were made in the context of any potential influence, a compliance statement with an identified metrological specification and the pertinent clauses, a clearly identified record of the quantities and functional test results before and after re-calibration, and no recommendation on the calibration interval. Opinions and interpretations of results are presented along with the basis upon which they were made and identified as such. The report may be submitted by facsimile or other electronic means as long as the requirements of the International Standard are achieved. If significant amendments are made to a calibration certificate, a supplemental certificate for the serial-number-specified piece of equipment is so identified. When a new certificate is offered, it uniquely identifies and references the one it replaces. All calibration reports are filed in the QA Office.

An external certified service engineer services laboratory balances on an annual basis. This service is documented on each balance with a signed and dated certification sticker. Balance

calibrations are checked each day of use. All mercury thermometers are calibrated annually against a traceable reference thermometer. Temperature readings of ovens, refrigerators, and incubators are checked on each day of use.

21.3 REFERENCE STANDARDS / MATERIALS

Reference standards/materials, where commercially available, are traceable to certified reference materials. Commercially prepared standard materials are purchased from vendors accredited by A2LA or NVLAP with an accompanying Certificate of Analysis that documents the standard purity. If a standard cannot be purchased from a vendor that supplies a Certificate of Analysis, the purity of the standard is documented by analysis. The receipt of all reference standards must be documented. Reference standards are labeled with a unique Standard Identification Number and expiration date. All documentation received with the reference standard is retained as a QC record and references the Standard Identification Number.

All reference, primary and working standards/materials, whether commercially purchased or laboratory prepared, must be checked regularly to ensure that the variability of the standard or material from the 'true' value does not exceed method requirements. The accuracy of calibration standards is checked by comparison with a standard from a second source. In cases where a second standard manufacturer is not available, a vendor certified different lot is acceptable for use as a second source. For unique situations, such as air analysis where no other source or lot is available, a standard made by a different analyst would be considered a second source. The appropriate Quality Control (QC) criteria for specific standards are defined in laboratory SOPs. In most cases, the analysis of an Initial Calibration Verification (ICV) or LCS (where there is no sample preparation) is used as the second source confirmation. These checks are generally performed as an integral part of the analysis method (e.g. calibration checks, laboratory control samples).

All standards and materials must be stored and handled according to method or manufacturer's requirements in order to prevent contamination or deterioration. Refer to the Corporate Environmental Health & Safety Manual or laboratory SOPs. Method specific information may also be found in the laboratory method SOPs in the "Standards and Reagents" sections. For safety requirements, please refer to method SOPs and the laboratory Environmental Health and Safety Manual.

21.4 DOCUMENTATION AND LABELING OF STANDARDS, REAGENTS, AND REFERENCE MATERIALS

Reagents must be at a minimum the purity required in the test method. The date of reagent receipt and the expiration date are documented. The lots for most of the common solvents and acids are tested for acceptability prior to company wide purchase. Refer to SOP No. CA-Q-S-001, Solvent and Acid Lot Testing and Approval.

All manufacturer or vendor supplied Certificate of Analysis or Purity must be retained, stored appropriately, and readily available for use and inspection. These records are maintained by each department in bound or electronic folders. Records must be kept of the date of receipt and date of expiration of standards, reagents and reference materials. In addition, records of preparation of laboratory standards, reagents, and reference materials must be retained, stored

appropriately, and be readily available for use and inspection. For detailed information on documentation and labeling, please refer laboratory SOP BF-GP-019, "Standard Traceability and Preparation" and also to the method specific SOPs.

Commercial materials purchased for preparation of calibration solutions, spike solutions, etc.., are usually accompanied with an assay certificate or the purity is noted on the label. If the assay purity is 96% or better, the weight provided by the vendor may be used without correction. If the assay purity is less than 96% a correction will be made to concentrations applied to solutions prepared from the stock commercial material.

21.4.1 All standards, reagents, and reference materials must be labeled in an unambiguous manner. Standards are logged into the laboratory department's chemical history log and are assigned a unique identification number. Preparation of working standards or reagents prepared from the stock is documented in the laboratory Department's Standard Preparation Log. The following information is typically recorded:

- Standard ID
- Description of Standard
- Department
- Preparer's name
- Final volume and number of vials prepared
- Solvent type and lot number
- Preparation Date
- Expiration Date
- Standard source type (stock or daughter)
- Standard type (spike, surrogate, other)
- Parent standard ID (if applicable)
- Parent Standard Analyte Concentration (if applicable)
- Parent Standard Amount used (if applicable)
- Component Analytes
- Final concentration of each analyte
- Comment section

Records are maintained for standard and reference material preparation. These records show the traceability to purchased stocks or neat compounds. These records also include method of preparation, date of preparation, expiration date and preparer's name or initials. Preparation procedures are provided in the Method SOPs.

21.4.2 All standards, reagents, and reference materials must be clearly labeled with a minimum of the following information:

- Expiration Date
- Standard ID
- Special Health/Safety warnings if applicable

21.4.3 In addition, the following information may be helpful:

- Date of receipt for commercially purchased items or date of preparation for laboratory prepared items
- Date opened (for multi-use containers, if applicable)
- Description of standard (if different from manufacturer's label or if standard was prepared in the laboratory)
- Concentration (if applicable)
- Initials of analyst preparing standard or opening container

All containers of prepared reagents must include a preparation date, expiration date and an ID number to trace back to preparation.

Procedures for preparation of reagents can be found in the Method SOPs.

Standard ID numbers must be traceable through associated logbooks, worksheets and raw data.

All reagents and standards must be stored in accordance to the following priority: 1) with the manufacturer's recommendations; 2) with requirements in the specific analytical methods as specified in the laboratory SOPs.

SECTION 22.0

SAMPLING
(NELAC 5.5.7)

22.1 OVERVIEW

The laboratory provides sampling services. Sampling procedures are described in the following SOPs:

BF-FS-001	Chain of Custody Documentation
BF-FS-002	Sample Packaging and Shipment Off-Site
BF-FS-003	Groundwater Sampling Field Data Collection
BF-FS-004	Equipment Decontamination
BF-FS-005	Groundwater/Surface Water Sampling
BF-FS-006	Calibration of Field Meter
BF-FS-007	Low Flow Sampling Procedures
BF-FS-008	Surface and Subsurface Soil/Sediment Sampling

22.2 SAMPLING CONTAINERS

The laboratory offers clean sampling containers for use by clients. These containers are obtained from reputable container manufacturers and meet EPA specifications as required. Any certificates of cleanliness that are provided by the supplier are maintained at the laboratory.

22.2.1 Preservatives

Upon request, preservatives are provided to the client in pre-cleaned sampling containers. In some cases containers may be purchased pre-preserved from the container supplier. Whether prepared by the laboratory or bought pre-preserved, the grades of the preservatives are at a minimum:

- Hydrochloric Acid – Reagent ACS (Certified VOA Free) or equivalent
- Methanol – Purge and Trap grade
- Nitric Acid – Instra-Analyzed or equivalent
- Sodium Bisulfate – ACS Grade or equivalent
- Sodium Hydroxide – Instra-Analyzed or equivalent
- Sulfuric Acid – Instra-Analyzed or equivalent
- Sodium Thiosulfate – ACS Grade or equivalent

22.3 DEFINITION OF HOLDING TIME

The date and time of sampling documented on the chain-of-custody (COC) form establishes the day and time zero. As a general rule, when the maximum allowable holding time is expressed in “days” (e.g. 14 days, 28 days), the holding time is based on calendar day measured. Holding times

expressed in “hours” (e.g. 6 hours, 24 hours, etc.) are measured from date and time zero. The first day of holding time for time critical parameters ends twenty-four hours after sampling. Holding times for analysis include any necessary reanalysis. However there are some programs that determine holding time compliance based on the date and specific time of analysis compared to the time of sampling regardless of how long the holding time is. These programs will be addressed on a case-by-case basis.

22.4 SAMPLING CONTAINERS, PRESERVATION REQUIREMENTS, HOLDING TIMES

The preservation and holding time criteria specified in the following tables are derived from the source documents for the methods. If method required holding times, this info is in the SOP or preservation requirements are not met, the reports will be qualified using a flag, footnote or case narrative. As soon as possible or “ASAP” is an EPA designation for tests for which rapid analysis is advised, but for which neither EPA nor the laboratory have a basis for a holding time.

22.5 SAMPLE ALIQUOTS / SUBSAMPLING

Taking a representative sub-sample from a container is necessary to ensure that the analytical results are representative of the sample collected in the field. The size of the sample container, the quantity of sample fitted within the container, and the homogeneity of the sample need consideration when sub-sampling for sample preparation. It is the laboratory’s responsibility to take a representative subsample or aliquot of the sample provided for analysis.

Analysts should handle each sample as if it is potentially dangerous. At a minimum, safety glasses, gloves, and lab coats must be worn when preparing aliquots for analysis.

The following information provides general guidance for homogenization and subsampling. For laboratory specific procedures refer to SOP BF-GP-005, “Sample Homogenization and Subsampling”.

SECTION 23

HANDLING OF SAMPLES
(NELAC 5.5.8)

Sample management procedures at the laboratory ensure that sample integrity and custody are maintained and documented from sampling/receipt through disposal.

23.1 CHAIN OF CUSTODY (COC)

The COC form is the written documented history of any sample and is initiated when bottles are sent to the field, or at the time of sampling. This form is completed by the sampling personnel and accompanies the samples to the laboratory where it is received and stored under the laboratory's custody. The purpose of the COC form is to provide a legal written record of the handling of samples from the time of collection until they are received at the laboratory. It also serves as the primary written request for analyses from the client to the laboratory. The COC form acts as a purchase order for analytical services when no other contractual agreement is in effect. An example of a COC form may be found in Figure 23-1.

23.1.1 Field Documentation

The information the sampler needs to provide at the time of sampling on the container label is:

- Sample identification
- Date and time
- Preservative

During the sampling process, the COC form is completed and must be legible (see Figure 23-1). This form includes information such as:

- Client name, address, phone number and fax number (if available)
- Project name and/or number
- The sample identification
- Date, time and location of sampling
- Sample collectors name
- The matrix description
- The container description
- The total number of each type of container
- Preservatives used
- Analysis requested
- Requested turnaround time (TAT)
- Any special instructions
- Purchase Order number or billing information (e.g. quote number) if available

- The date and time that each person received or relinquished the sample(s), including their signed name.

The samples are stored in a cooler with ice, as applicable, and remain solely in the possession of the client's field technician until the samples are delivered to the laboratory. The sample collector must assure that each container is in his/her physical possession or in his/her view at all times, or stored in such a place and manner to preclude tampering. The field technician relinquishes the samples in writing on the COC form to the sample control personnel at the laboratory or to a TestAmerica courier. Samples are only considered to be received by lab when personnel at the laboratory have physical contact with the samples.

Note: Independent couriers are not required to sign the COC form. The COC is usually kept in the sealed sample cooler. The shipping documents are retained with the project files.

23.1.2 Legal / Evidentiary Chain-of-Custody

If samples are identified for legal/evidentiary purposes on the COC or in the project notes, sample management will initiate Strict Chain of Custody procedures as defined in SOP BF-GP-018, "Strict Internal Chain-of-Custody".

23.2 SAMPLE RECEIPT

Samples are received at the laboratory by designated sample receiving personnel and a unique laboratory project identification number is assigned. Each sample container shall be assigned a unique sample identification number that is cross-referenced to the client identification number such that traceability of test samples is unambiguous and documented. Each sample container is affixed with a durable sample identification label. Sample acceptance, receipt, tracking and storage procedures are summarized in the following sections.

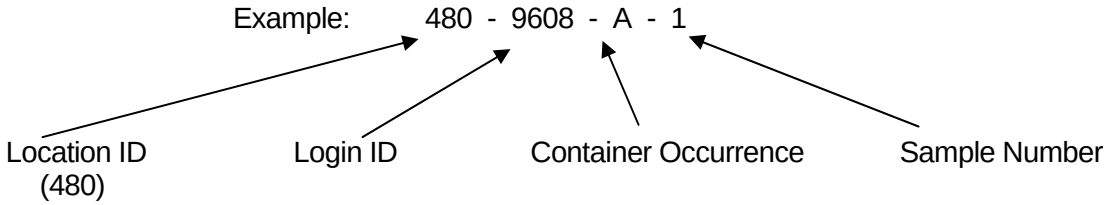
23.2.1 Laboratory Receipt

When samples arrive at the laboratory, sample receiving personnel inspect the coolers and samples. The integrity of each sample must be determined by comparing sample labels or tags with the COC and by visual checks of the container for possible damage. Any non-conformance, irregularity, or compromised sample receipt must be documented on a Login – Analytical Receipt Resolution Form and brought to the immediate attention of the client. The COC, shipping documents, documentation of any non-conformance, irregularity, or compromised sample receipt, record of client contact, and resulting instructions become part of the project record.

23.2.1.1 Unique Sample Identification

All samples that are processed through the laboratory receive a unique sample identification to ensure that there can be no confusion regarding the identity of such samples at anytime. This system includes identification for all samples, subsamples and subsequent extracts and/or digestates.

The laboratory assigns a unique identification (e.g., Sample ID) code to each sample container received at the laboratory. This Primary ID is made up of the following information (consisting of 4 components):



The above example states that TestAmerica Buffalo Laboratory (Location 480). Login ID is 9608 (unique to a particular client/job occurrence). The container code indicates it is the first container ("A") of Sample #1.

If the primary container goes through a prep step that creates a "new" container, then the new container is considered secondary and gets another ID. An example of this being a client sample in a 1-Liter amber bottle is sent through a Liquid/Liquid Extraction and an extraction vial is created from this step. The vial would be a SECONDARY container. The secondary ID has 5 components.

Example: XXX - 9608 - A - 1 - **A** ← **Secondary Container Occurrence**

Example: 220-9608-A-1-A, would indicate the PRIMARY container listed above that went through a step that created the 1st occurrence of a Secondary container.

With this system, a client sample can literally be tracked throughout the laboratory in every step from receipt to disposal.

23.3 SAMPLE ACCEPTANCE POLICY

The laboratory has a written sample acceptance policy (Figure 23-2) that clearly outlines the circumstances under which samples shall be accepted or rejected. These include:

- a COC filled out completely;
- samples must be properly labeled;
- proper sample containers with adequate volume for the analysis (Sampling Guide) and necessary QC;

- samples must be preserved according to the requirements of the requested analytical method (Sampling Guide);
- sample holding times must be adhered to (Sampling Guide);
- the project manager will be notified if any sample is received in damaged condition.

Data from samples which do not meet these criteria are flagged and the nature of the variation from policy is defined. A copy of the sample acceptance policy is provided to each client prior to shipment of samples.

23.3.1 After inspecting the samples, the sample receiving personnel sign and date the COC form, make any necessary notes of the samples' conditions and store them in appropriate refrigerators or storage locations.

23.3.2 Any deviations from these checks described in Section 23.1.1.1 that question the suitability of the sample for analysis, or incomplete documentation as to the tests required will be resolved by consultation with the client. If the sample acceptance policy criteria are not met, the laboratory shall either:

- Retain all correspondence and/or records of communications with the client regarding the disposition of rejected samples, or

- Fully document any decision to proceed with sample analysis that does not meet sample acceptance criteria.

Once sample acceptance is verified, the samples are logged into the LIMS according SOP No. BF-SR-002.

23.4 SAMPLE STORAGE

In order to avoid deterioration, contamination or damage to a sample during storage and handling, from the time of receipt until all analyses are complete, samples are stored in refrigerators suitable for the sample matrix. Aqueous samples designated for metals analysis are stored at ambient temperature. In addition, samples to be analyzed for volatile organic parameters are stored in separate refrigerators designated for volatile organic parameters only. Samples are never to be stored with reagents, standards or materials that may create contamination.

To ensure the integrity of the samples during storage, refrigerator blanks are maintained in the volatile sample refrigerators and analyzed at a minimum of every two weeks.

Analysts and technicians provide a request form to the cooler custodian who then retrieves the requested samples. In the absence of the cooler custodian, the analysts may personally retrieve the sample containers allocated to their analysis from the designated refrigerator. The samples are placed on carts, transported the analytical area and analyzed. Following analysis the remaining sample is returned to the refrigerator from which it originally came. All unused portions of samples are returned to the secure sample control area. All samples are kept in the refrigerators

for two to four weeks after analysis, which meets or exceeds most sample holding times. After two to four weeks the samples are moved to dry room temperature, sample archive area where they are retained a minimum of 2 weeks after the final report has been issued to the client at which time disposal occurs. Special arrangements may be made to store samples for longer periods of time. Extended archival periods allow additional metal analyses to be performed on the archived sample and assists clients in dealing with legal matters or regulatory issues.

Access to the laboratory is controlled such that sample storage need not be locked at all times unless a project specifically demands it. Samples are accessible to laboratory personnel only. Visitors to the laboratory are prohibited from entering the refrigerator and laboratory areas unless accompanied by an employee of TestAmerica.

23.5 HAZARDOUS SAMPLES AND FOREIGN SOILS

To minimize exposure to personnel and to avoid potential accidents, samples which are known or suspected to be hazardous are segregated and a notification is issued to all laboratory personnel. All hazardous samples are either returned to the client or disposed of appropriately through a hazardous waste disposal firm. All soil samples, including foreign soil samples are heat treated or incinerated in accordance with USDA permit requirements and are transported / disposed by USEPA approved facilities.

Unused portions of samples found or suspected to be hazardous according to state or federal guidelines may be returned to the client upon completion of the analytical work.

23.6 SAMPLE SHIPPING

In the event that the laboratory needs to ship samples, the samples are placed in a cooler with enough ice to ensure the samples remain just above freezing and at or below 6.0°C during transit. The samples are carefully surrounded by packing material to avoid breakage (yet maintain appropriate temperature). For sample shipments which include water/solid volatile organic analyses (see Note), A trip blank is enclosed when required by method specifications or state or regulatory programs. The chain-of-custody form is signed by the sample control technician and attached to the shipping paperwork. Samples are generally shipped overnight express or hand-delivered by a TestAmerica courier to maintain sample integrity. All personnel involved with shipping and receiving samples must be trained to maintain the proper chain-of-custody documentation and to keep the samples intact and on ice. The Environmental, Health and Safety Manual contains additional shipping requirements.

Note: If a client does not request trip blank analysis on the COC or other paperwork, the laboratory will analyze the trip blanks that were supplied.

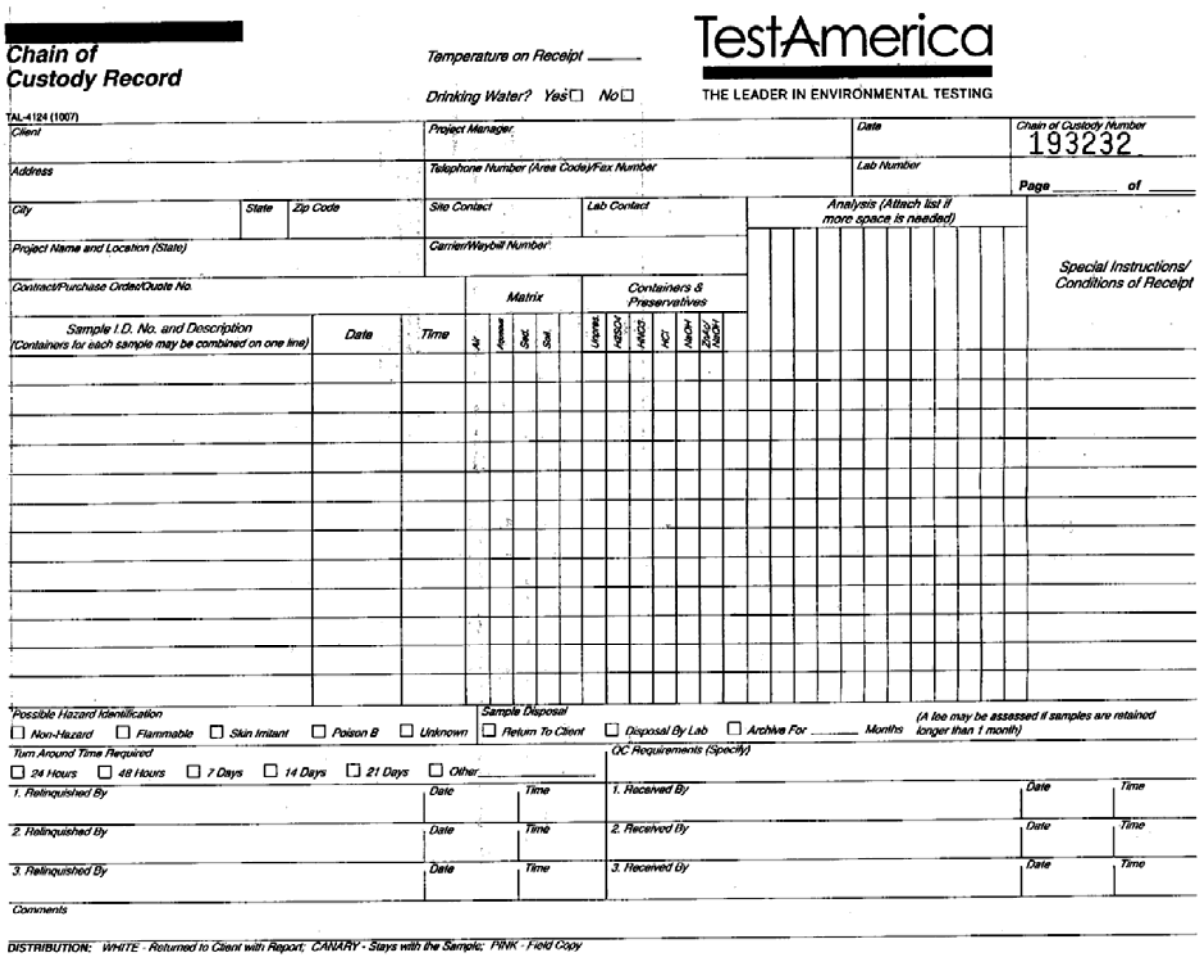
23.7 SAMPLE DISPOSAL

Samples should be retained for a minimum of 30 days after the project report is sent, however, provisions may be made for earlier disposal of samples once the holding time is exceeded. Some samples are required to be held for longer periods based on regulatory or client requirements (e.g., 60 days after project report is sent). The laboratory must follow the longer sample retention requirements where required by regulation or client agreement. Several possibilities for sample disposal exist: the sample may be consumed completely during analysis, the sample may be returned to the customer or location of sampling for disposal, or the sample may be disposed of in accordance with the laboratory's waste disposal procedures (SOP: BF-WM-001, "Waste Management".) All procedures in the laboratory Environmental, Health and Safety Manual are followed during disposal. Samples are normally maintained in the laboratory no longer than six weeks from receipt unless otherwise requested. Unused portions of samples found or suspected to be hazardous according to state or federal guidelines may be returned to the client upon completion of the analytical work.

If a sample is part of a known litigation, the affected legal authority, sample data user, and/or submitter of the sample may request to participate in the decision about the sample's disposal. All documentation and correspondence concerning the disposal decision process must be kept on file. Pertinent information includes the date of disposal and nature of disposal (such as sample depletion, hazardous waste facility disposal, return to client). All disposal of sample containers is accomplished through incineration. A Waste Disposal Record should be completed.

Figure 23-1.

Example: Chain of Custody (COC)



Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes☐ No☐

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TAL-4124 (1007)

Client | Project Manager | Date | Chain of Custody Number 193232

Address | Telephone Number (Area Code)/Fax Number | Lab Number | Page _____ of _____

City | State | Zip Code | Site Contact | Lab Contact | Analysis (Attach list if more space is needed) | Special Instructions/ Conditions of Receipt

Project Name and Location (State) | Carrier/Waybill Number

Contract/Purchase Order/Quote No. | Matrix | Containers & Preservatives

Sample I.D. No. and Description (Containers for each sample may be combined on one line) | Date | Time | Air | Aqueous | Sed. | Soil | Unpres. | H2SO4 | HNO3 | HCl | NaOH | ZnAc/ NaOH

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required
☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify)

1. Relinquished By | Date | Time | 1. Received By | Date | Time

2. Relinquished By | Date | Time | 2. Received By | Date | Time

3. Relinquished By | Date | Time | 3. Received By | Date | Time

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Figure 23-2.

Example: Sample Acceptance Policy

All incoming work will be evaluated against the criteria listed below. Where applicable, data from any samples that do not meet the criteria listed below will be noted on the laboratory report defining the nature and substance of the variation. In addition the client will be notified either by telephone, fax or e-mail ASAP after the receipt of the samples.

1) Samples must arrive with labels intact with a Chain of Custody filled out completely. The following information must be recorded.
   - *Client name, address, phone number and fax number (if available)*
   - *Project name and/or number*
   - *The sample identification*
   - *Date, time and location of sampling*
   - *The collectors name*
   - *The matrix description*
   - *The container description*
   - *The total number of each type of container*
   - *Preservatives used*
   - *Analysis requested*
   - *Requested turnaround time (TAT)*
   - *Any special instructions*
   - *Purchase Order number or billing information (e.g. quote number) if available*
   - *The date and time that each person received or relinquished the sample(s), including their signed name.*
   - ***The date and time of receipt must be recorded between the last person to relinquish the samples and the person who receives the samples in the lab, and they must be exactly the same.***
   - **Information must be legible**

2) Samples must be properly labeled.
   - Use durable labels (labels provided by TestAmerica are preferred)
   - Include a unique identification number
   - Include sampling date and time & sampler ID
   - Include preservative used.
   - Use indelible ink
   - **Information must be legible**

3) Proper sample containers with adequate volume for the analysis and necessary QC are required for each analysis requested.

4) Samples must be preserved according to the requirements of the requested analytical method. See lab Sampling Guide.
   Note: Samples that are hand delivered to the laboratory immediately after collection may not have had time to cool sufficiently. In this case the samples will be considered acceptable as long as there is evidence that the chilling process has begun (arrival on ice).

- Chemical preservation (pH) will be verified prior to analysis and the project manager will be notified immediately if there is a discrepancy. If analyses will still be performed, all affected results will be flagged to indicate improper preservation.

- For Volatile Organic analyses in drinking water (Methods 502.2 or 524.2). Residual chlorine must be neutralized prior to preservation. If there is prior knowledge that the samples are not chlorinated, state it on the COC and use the VOA vials pre-preserved with HCl. The following are other options for a sampler and laboratory where the presence of chlorine is not known:
  - 1. Test for residual chlorine in the field prior to sampling.
    - If no chlorine is present, the samples are to be preserved using HCl as usual.
    - If chlorine is present, add either ascorbic acid or sodium thiosulfate prior to adding HCl.
  - 2. Use VOA vials pre-preserved with sodium thiosulfate or ascorbic acid and add HCl after filling the VOA vial with the sample.
- **FOR WATER SAMPLES TESTED FOR CYANIDE – for NPDES samples by Standard Methods or EPA 335**
  - In the Field: Samples are to be tested for Sulfide using lead acetate paper prior to the addition of Sodium Hydroxide (NaOH). If sulfide is present, the sample must be treated with Cadmium Chloride and filtered prior to the addition of NaOH.
    - If the sulfide test and treatment is not performed in the field, the lab will test the samples for sulfide using lead acetate paper at the time of receipt and if sulfide is present in the sample, the client will be notified and given the option of retaking the sample and treating in the field per the method requirements or the laboratory can analyze the samples as delivered and qualify the results in the final report.
  - It is the responsibility of the client to notify the laboratory if thiosulfate, sulfite, or thiocyanate are known or suspected to be present in the sample. This notification may be on the chain of custody. The samples may need to be subcontracted to a laboratory that performs a UV digestion. If the lab does not perform the UV digestion on samples that contain these compounds, the results must be qualified in the final report.
  - The laboratory must test the sample for oxidizing agents (e.g. Chlorine) prior to analysis and treat according to the methods prior to distillation. (ascorbic acid or sodium arsenite are the preferred choice).

5) Sample Holding Times
   - TestAmerica will make every effort to analyze samples within the regulatory holding time. Samples must be received in the laboratory with enough time to perform the sample analysis. Except for short holding time samples (< 48hr HT) sample must be received with at least 48 hrs (2 working days) remaining on the holding time to ensure analysis.
   - Analyses that are designated as “field” analyses (Odor, pH, Dissolved Oxygen, Disinfectant Residual; a.k.a. Residual Chlorine, and Redox Potential) should be analyzed ASAP by the field sampler prior to delivering to the lab (within 15 minutes). However, if the analyses are to be performed in the laboratory, TestAmerica will make every effort to analyze the samples within 24 hours from receipt of the samples in the testing laboratory. Samples for “field” analyses received after 4:00 pm on Friday or on the weekend will be analyzed no later than the next business day after receipt (Monday unless a holiday). Samples will remain refrigerated and sealed until the time of analysis.

6) All samples submitted for Volatile Organic analyses must have a Trip Blank submitted at the same time. TestAmerica will supply this blank with the bottle order.

7) The project manager will be notified if any sample is received in damaged condition. TestAmerica will request that a sample be resubmitted for analysis.

8) Recommendations for packing samples for shipment.

- Pack samples in Ice rather than “Blue” ice packs.
- Soil samples should be placed in plastic zip-lock bags. The containers often have dirt around the top and do not seal very well and are prone to intrusion from the water from melted ice.
- Water samples would be best if wrapped with bubble-wrap or paper (newspaper, or paper towels work) and then placed in plastic zip-lock bags.
- Fill extra cooler space with bubble wrap.

Figure 23-3.
Example: Cooler Receipt Form
TestAmerica Buffalo

Doc. Login Front
Rev 8
10/15/2010

WORK ORDER RT

CLIENT_____ **PROJECT**_____

Pre-Log _____ **Strict Internal COC: YES / NO**

TAT_____BD/_____CD # OF SAMPLES _____TRIP BLANK Y/N # _____

SHIPPED BY	***ATTACH SHIPPING TAGS(back)***
RECEIVED DATE / TIME:	_____/_____/_____ _____: _____

COOLER TEMP **°C (<6 °C)** **OK** **NO** **SEE BACK**

Cooler Custody Seal intact? YES/NO NONE SEAL # _____

If NO to cooler temp or seal, PM notified? YES_____ (PM Name)

Sample received outside hold time_____

Condition/Issues YES/NO_____ARRF_____

Resolved at login_____

PRESERVATION CHECKED YES___NO____ NA___ Initials_____

RESIDUAL CHLORINE CHECK:□ YES, OK □ YES, Qualified □ NO, no volume □ NA

RADIATION CHECK <0.02 mR/hr: YES/ NO

ARE SAMPLE DATES AND TIMES CORRECT? Initials_____

WERE ALL THE APPROPRIATE TESTS ASSIGNED? Initials_____

Temp Cert Loss:

SECTION 24.0

ASSURING THE QUALITY OF TEST RESULTS
(NELAC 5.5.9)

24.1 OVERVIEW

In order to assure our clients of the validity of their data, the laboratory continuously evaluates the quality of the analytical process. The analytical process is controlled not only by instrument calibration as discussed in Section 20, but also by routine process quality control measurements (e.g. Blanks, Laboratory Control Samples (LCS), Matrix Spikes (MS), duplicates (DUP), surrogates, Internal Standards (IS)). These quality control checks are performed as required by the method or regulations to assess precision and accuracy. In addition to the routine process quality control samples, Proficiency Testing (PT) Samples (concentrations unknown to laboratory) are analyzed to help ensure laboratory performance.

24.2 CONTROLS

Sample preparation or pre-treatment is commonly required before analysis. Typical preparation steps include homogenization, grinding, solvent extraction, sonication, acid digestion, distillation, reflux, evaporation, drying and ashing. During these pre-treatment steps, samples are arranged into discreet manageable groups referred to as preparation (prep) batches. Prep batches provide a means to control variability in sample treatment. Control samples are added to each prep batch to monitor method performance and are processed through the entire analytical procedure with investigative/field samples.

24.3 NEGATIVE CONTROLS

Table 24-1.

Control Type	Details
Method Blank (MB)	are used to assess preparation and analysis for possible contamination during the preparation and processing steps.
	The specific frequency of use for method blanks during the analytical sequence is defined in the specific standard operating procedure for each analysis. Generally it is 1 for each batch of samples; not to exceed 20 environmental samples.
	The method blank is prepared from a clean matrix similar to that of the associated samples that is free from target analytes (e.g., Reagent water, Ottawa sand, glass beads, etc.) and is processed along with and under the same conditions as the associated samples. The method blank goes through all of the steps of the process (including as necessary: filtration, clean-ups, etc.).
Calibration Blanks	are prepared and analyzed along with calibration standards where applicable. They are prepared using the same reagents that are used to prepare the standards. In some analyses the calibration blank may be included in the calibration curve.
Instrument Blanks	are blank reagents or reagent water that may be processed during an analytical sequence in order to assess contamination in the analytical system. In general, instrument blanks are used to differentiate between contamination caused by the analytical system and that caused by the sample handling or sample prep process. Instrument blanks may also be inserted throughout the analytical sequence to minimize the effect of carryover from samples with high analyte content.

Table 24-1.

Control Type	Details
Trip Blank [1]	are required to be submitted by the client with each shipment of samples requiring aqueous and solid volatiles analyses. Additionally, trip blanks may be prepared and analyzed for volatile analysis of air samples, when required by the client. A trip blank may be purchased (certified clean) or is prepared by the laboratory by filling a clean container with pure deionized water that has been purged to remove any volatile compounds. Appropriate preservatives are also added to the container. The trip blank is sent with the bottle order and is intended to reflect the environment that the containers are subjected to throughout shipping and handling and help identify possible sources if contamination is found. The field sampler returns the trip blank in the cooler with the field samples.
Field Blanks [1]	are sometimes used for specific projects by the field samplers. A field blank prepared in the field by filling a clean container with pure reagent water and appropriate preservative, if any, for the specific sampling activity being undertaken. (EPA OSWER)
Equipment Blanks [1]	are also sometimes created in the field for specific projects. An equipment blank is a sample of analyte-free media which has been used to rinse common sampling equipment to check effectiveness of decontamination procedures. (NELAC)
Holding Blanks	also referred to as refrigerator or freezer blanks, are used to monitor the sample storage units for volatile organic compounds during the storage of VOA samples in the laboratory

[1] When known, these field QC samples should not be selected for matrix QC as it does not provide information on the behavior of the target compounds in the field samples. Usually, the client sample ID will provide information to identify the field blanks with labels such as "FB", "EB", or "TB."

Evaluation criteria and corrective action for these controls are defined in the specific standard operating procedure for each analysis.

24.4 POSITIVE CONTROLS

Control samples (e.g., QC indicators) are analyzed with each batch of samples to evaluate data based upon (1) Method Performance (Laboratory Control Sample (LCS) or Blank Spike (BS)), which entails both the preparation and measurement steps; and (2) Matrix Effects (Matrix Spike (MS) (Matrix spikes are not applicable to air) or Sample Duplicate (MD, DUP), which evaluates field sampling accuracy, precision, representativeness, interferences, and the effect of the matrix on the method performed. Each regulatory program and each method within those programs specify the control samples that are prepared and/or analyzed with a specific batch

Note that frequency of control samples vary with specific regulatory, methodology and project specific criteria. Complete details on method control samples are as listed in each analytical SOP.

24.4.1 Method Performance Control - Laboratory Control Sample (LCS)

24.4.1.1 The LCS measures the accuracy of the method in a blank matrix and assesses method performance independent of potential field sample matrix affects in a laboratory batch.

24.4.1.2 The LCS is prepared from a clean matrix similar to that of the associated samples that is free from target analytes (for example: Reagent water, Ottawa sand, glass beads, etc.) and is processed along with and under the same conditions as the

associated samples. The LCS is spiked with verified known amounts of analytes or is made of a material containing known and verified amounts of analytes, taken through all preparation and analysis steps along with the field samples. Where there is no preparation taken for an analysis (such as in aqueous volatiles), or when all samples and standards undergo the same preparation and analysis process (such as Phosphorus), a calibration verification standard may be reported as the LCS. In some instances where there is no practical clean solid matrix available, aqueous LCS's may be processed for solid matrices; final results may be calculated as mg/kg or ug/kg, assuming 100% solids and a weight equivalent to the aliquot used for the corresponding field samples, to facilitate comparison with the field samples.

24.4.1.3 Certified pre-made reference material purchased from a NIST/A2LA accredited vendor may also be used for the LCS when the material represents the sample matrix or the analyte is not easily spiked (e.g. solid matrix LCS for metals, TDS, etc.).

24.4.1.4 The specific frequency of use for LCS during the analytical sequence is defined in the specific standard operating procedure for each analysis. It is generally 1 for each batch of samples; not to exceed 20 environmental samples.

24.4.1.5 If the mandated or requested test method, or project requirements, do not specify the spiking components, the laboratory shall spike all reportable components to be reported in the Laboratory Control Sample (and Matrix Spike) where applicable (e.g. no spike of pH). However, in cases where the components interfere with accurate assessment (such as simultaneously spiking chlordane, toxaphene and PCBs in Method 608), the test method has an extremely long list of components or components are incompatible, at a minimum, a representative number of the listed components (see below) shall be used to control the test method. The selected components of each spiking mix shall represent all chemistries, elution patterns and masses, permit specified analytes and other client requested components. However, the laboratory shall ensure that all reported components are used in the spike mixture within a two-year time period.

24.4.1.5.1 For methods that have 1-10 target analytes, spike all components.

24.4.1.5.2 For methods that include 11-20 target analytes, spike at least 10 or 80%, whichever is greater.

24.4.1.5.3 For methods with more than 20 target analytes, spike at least 16 components.

24.4.1.5.4 Exception: Due to analyte incompatibility in pesticides, Toxaphene and Chlordane are only spiked at client request based on specific project needs.

24.4.1.5.5 Exception: Due to analyte incompatibility between the various PCB aroclors, aroclors 1016 and 1260 are used for spiking as they cover the range of all of the aroclors. Specific aroclors may be used by request on a project specific basis.

24.5 SAMPLE MATRIX CONTROLS

Table 24-5. Sample Matrix Control

Control Type	Details	
Matrix Spikes (MS)	Use	used to assess the effect sample matrix of the spiked sample has on the precision and accuracy of the results generated by the method used;
	Typical Frequency [1]	At a minimum, with each matrix-specific batch of samples processed, an MS is carried through the complete analytical procedure. Unless specified by the client, samples used for spiking are randomly selected and rotated between different client projects. If the mandated or requested test method does not specify the spiking components, the laboratory shall spike all reportable components to be reported in the Laboratory Control Sample and Matrix Spike. Refer to the method SOP for complete details
	Description	Essentially a sample fortified with a known amount of the test analyte(s).
Surrogate	Use	Measures method performance to sample matrix (organics only).
	Typical Frequency [1]	Are added to all samples, standards, and blanks, for all organic chromatography methods except when the matrix precludes its use or when a surrogate is not available. The recovery of the surrogates is compared to the acceptance limits for the specific method. Poor surrogate recovery may indicate a problem with sample composition and shall be reported, with data qualifiers, to the client whose sample produced poor recovery.
	Description	Are similar to matrix spikes except the analytes are compounds with properties that mimic the analyte of interest and are unlikely to be found in environment samples.
Duplicates[2]	Use	For a measure of analytical precision, with each matrix-specific batch of samples processed, a matrix duplicate (MD or DUP) sample, matrix spike duplicate (MSD), or LCS duplicate (LCSD) is carried through the complete analytical procedure.
	Typical Frequency [1]	Duplicate samples are usually analyzed with methods that do not require matrix spike analysis.
	Description	Performed by analyzing two aliquots of the same field sample independently or an additional LCS.
Internal Standards	Use	Are spiked into all environmental and quality control samples (including the initial calibration standards) to monitor the qualitative aspect of organic and some inorganic analytical measurements.
	Typical Frequency [1]	All organic and ICP methods as required by the analytical method.
	Description	Used to correct for matrix effects and to help troubleshoot variability in analytical response and are assessed after data acquisition. Possible sources of poor internal standard response are sample matrix, poor analytical technique or instrument performance.

[1] See the specific analytical SOP for type and frequency of sample matrix control samples.

[2] LCSD's are normally not performed except when regulatory agencies or client specifications require them. The recoveries for the spiked duplicate samples must meet the same laboratory established recovery limits as the accuracy QC samples. If an LCSD is analyzed both the LCS and LCSD must meet the same recovery criteria and be included in the final report. The precision measurement is reported as "Relative Percent Difference" (RPD). Poor precision between duplicates (except LCS/LCSD) may indicate non-homogeneous matrix or sampling.

24.6 ACCEPTANCE CRITERIA (CONTROL LIMITS)

24.6.1 As mandated by the test method and regulation, each individual analyte in the LCS, MS, or Surrogate Spike is evaluated against the control limits published in the test method. Where there are no established acceptance criteria, the laboratory calculates in-house control limits with the use of control charts or, in some cases, utilizes client project specific control limits. When this occurs, the regulatory or project limits will supersede the laboratory's in-house limits.

Note: For methods, analytes and matrices with very limited data (e.g., unusual matrices not analyzed often), interim limits are established using available data or by analogy to similar methods or matrices.

24.6.2 Once control limits have been established, they are verified, reviewed, and updated if necessary on an annual basis unless the method requires more frequent updating. Control limits are established per method (as opposed to per instrument) regardless of the number of instruments utilized.

24.6.3 Laboratory generated % Recovery acceptance (control) limits are generally established by taking $\pm$ 3 Standard Deviations (99% confidence level) from the average recovery of a minimum of 20-30 data points (more points are preferred).

24.6.3.1 Regardless of the calculated limit, the limit should be no tighter than the Calibration Verification (ICV/CCV). (Unless the analytical method specifies a tighter limit).

24.6.3.2 In-house limits cannot be any wider than those mandated in a regulated analytical method. Client or contract required control limits are evaluated against the laboratory's statistically derived control limits to determine if the data quality objectives (DQOs) can be achieved. If laboratory control limits are not consistent with DQOs, then alternatives must be considered, such as method improvements or use of an alternate analytical method.

24.6.3.3 The lowest acceptable recovery limit will be 10% (the analyte must be detectable). Exception: The lowest acceptable recovery limit for Benzidine will be 5% and the analyte must be detectable.

24.6.3.4 The maximum acceptable recovery limit will be 150%.

24.6.3.5 The maximum acceptable RPD limit will be 35% for waters and 40% for soils. The minimum RPD limit is 10%.

24.6.3.6 If either the high or low end of the control limit changes by $\leq$ 5% from previous, the data points are inspected and, using professional judgment, the limits may be left unchanged if there is no affect on laboratory ability to meet the existing limits.

24.6.4 The lab must be able to generate a current listing of their control limits and track when the updates are performed. In addition, the laboratory must be able to recreate historical control limits.

24.6.4.1 The control limits are maintained in the laboratory LIMs system. The limits for each analyte/method/matrix combination are assigned effective and expiration dates. The QA department is able to query the LIMs system and print an active list of control limits based on this database. The most current laboratory limits (based on the effective/expiration dates) are reflected on the laboratory worksheets and final reports unless superseded by project specific limits.

24.6.5 A LCS that is within the acceptance criteria establishes that the analytical system is in control and is used to validate the process. Samples that are analyzed with an LCS with recoveries outside of the acceptance limits may be determined as out of control and should be reanalyzed if possible. If reanalysis is not possible, then the results for all affected analytes for samples within the same batch must be qualified when reported. The internal corrective action process (see Section 13) is also initiated if an LCS exceeds the acceptance limits. Sample results may be qualified and reported without reanalysis if:

24.6.5.1 The analyte results are below the reporting limit and the LCS is above the upper control limit.

24.6.5.2 If the analytical results are above the relevant regulatory limit and the LCS is below the lower control limit.

24.6.6 If the MS/MSDs do not meet acceptance limits, the MS/MSD and the associated spiked sample is reported with a qualifier for those analytes that do not meet limits. If obvious preparation errors are suspected, or if requested by the client, unacceptable MS/MSDs are reprocessed and reanalyzed to prove matrix interference. A more detailed discussion of acceptance criteria and corrective action can be found in the lab's method SOPs and in Section 12.

24.6.7 If a surrogate standard falls outside the acceptance limits, if there is not obvious chromatographic matrix interference, reanalyze the sample to confirm a possible matrix effect. If the recoveries confirm or there was obvious chromatographic interference, results are reported from the original analysis and a qualifier is added. If the reanalysis meets surrogate recovery criteria, the second run is reported (or both are reported if requested by the client). Under certain circumstances, where all of the samples are from the same location and share similar chromatography, the reanalysis may be performed on a single sample rather than all of the samples and if the surrogate meets the recovery criteria in the reanalysis, all of the affected samples would require reanalysis.

24.7 ADDITIONAL PROCEDURES TO ASSURE QUALITY CONTROL

24.7.1 The laboratory has written and approved method SOPs to assure the accuracy of the test method including calibration (see Section 20), use of certified reference materials (see Section 21) and use of PT samples.

24.7.2 A discussion regarding MDLs, Limit of Detection (LOD) and Limit of Quantitation (LOQ) can be found in Section 19.

24.7.3 Use of formulae to reduce data is discussed in the method SOPs and in Section 20.

24.7.4 Selection of appropriate reagents and standards is included in Section 9 and 22.

24.7.5 A discussion on selectivity of the test is included in Section 5.

24.7.6 Constant and consistent test conditions are discussed in Section 19.

24.7.7 The laboratories sample acceptance policy is included in Section 23.

SECTION 25.0

REPORTING RESULTS
(NELAC 5.5.10)

25.1 OVERVIEW

The results of each test are reported accurately, clearly, unambiguously, and objectively in accordance with State and Federal regulations as well as client requirements. A variety of report formats are available to meet specific needs. Analytical results are issued in a format that is intended to satisfy customer and laboratory accreditation requirements as well as provide the end user with the information needed to properly evaluate the results. Where there is conflict between client requests and laboratory ethics or regulatory requirements, the laboratory's ethical and legal requirements are paramount, and the laboratory will work with the client during project set up to develop an acceptable solution. Refer to Section 7.

In cases where a client asks for simplified reports, there must be a written request from the client. There still must be enough information that would show any analyses that were out of conformance (QC out of limits) and there should be a reference to a full report that is made available to the client.

Review of reported data is included in Section 19.

25.2 TEST REPORTS

Analytical results are reported in a format that is satisfactory to the client and meets all requirements of applicable accrediting authorities and agencies. A variety of report formats are available to meet specific needs. The report is printed on laboratory letterhead, reviewed, and signed by the appropriate project manager. At a minimum, the standard laboratory report shall contain the following information:

25.2.1 A report title (e.g. Analytical Report) with a "sample results" column header.

25.2.2 Each report cover page is printed on company letterhead which includes the laboratory name, address and telephone number.

25.2.3 A unique identification of the report (e.g. job number) and on each page an identification in order to ensure the page is recognized as part of the report and a clear identification of the end.

Note: Page numbers of report are represented as # / ##. Where the first number is the page number and the second is the total number of pages.

25.2.4 A copy of the chain of custody (COC).

- Any COCs involved with Subcontracting are included.

- In most cases, the applicable COC is paginated and is an integral part of the report.

- Any additional addenda to the report must be treated in a similar fashion so it is a recognizable part of the report and cannot accidentally get separated from the report (e.g. Sampling information).

25.2.5 The name and address of client and a project name/number, if applicable.

25.2.6 Client project manager or other contact

25.2.7 Description and unambiguous identification of the tested sample(s) including the client identification code.

25.2.8 Date of receipt of sample, date and time of collection, and date(s) of test preparation and performance, and time of preparation or analysis if the required holding time for either activity is less than or equal to 72 hours.

25.2.9 Date reported or date of revision, if applicable.

25.2.10 Method of analysis including method code (EPA, Standard Methods, etc).

25.2.11 Practical quantitation limits or client reporting limit.

25.2.12 Method detection limits (if requested)

25.2.13 Definition of Data qualifiers and reporting acronyms (e.g. ND).

25.2.14 Sample results.

25.2.15 QC data consisting of method blank, surrogate, LCS, and MS/MSD recoveries and control limits (if requested).

25.2.16 Condition of samples at receipt including temperature. This may be accomplished in a narrative or by attaching sample login sheets (Refer to Sec. 25.2.4 – Item 3 regarding additional addenda). Sample temperatures are recorded in the report case narrative and on the COC. Deviations from normal conditions (e.g., preservation, breakage) are recorded in the report case narrative.

25.2.17 A statement to the effect that the results relate only to the items tested and the sample as received by the laboratory.

25.2.18 A statement that the report shall not be reproduced except in full, without prior express written approval by the laboratory coordinator.

25.2.19 A signature and title of the person(s) accepting responsibility for the content of the report and date of issue. Signatories are appointed by the Lab Director.

25.2.20 When NELAC accreditation is required, the lab shall certify that the test results meet all requirements of NELAC or provide reasons and/or justification if they do not.

25.2.21 The laboratory includes a cover letter.

25.2.22 Where applicable, a narrative to the report that explains the issue(s) and corrective action(s) taken in the event that a specific accreditation or certification requirement was not met.

25.2.23 When Soil samples are analyzed, a specific identification as to whether soils are reported on a “wet weight” or “dry weight” basis.

25.2.24 Appropriate laboratory certification number for the state of origin of the sample if applicable.

25.2.25 If only part of the report is provided to the client (client requests some results before all of it is complete), it must be clearly indicated on the report (e.g, partial report). A complete report must be sent once all of the work has been completed.

25.2.26 Any non-TestAmerica subcontracted analysis results are provided as an addendum to the report on the official letterhead of the subcontractor. All TestAmerica subcontracting is clearly identified on the report as to which laboratory performed a specific analysis.

25.3 REPORTING LEVEL OR REPORT TYPE

TestAmerica Buffalo offers four levels of quality control reporting. Each level, in addition to its own specific requirements, contains all the information provided in the preceding level. The packages provide the following information in addition to the information described above:

- Level I is a report with the features described in Section 25.2 above.
- Level II is a Level I report plus summary information, including results for the method blank, percent recovery for laboratory control samples and matrix spike samples, and the RPD values for all MSD and sample duplicate analyses.
- Level III contains all the information supplied in Level II, but presented on CLP-like summary forms, and relevant calibration information. A Level II report is not included, unless specifically requested. No raw data is provided.
- Level IV is the same as Level III with the addition of all raw supporting data.

In addition to the various levels of QC packaging, the laboratory also provides reports in diskette deliverable form. Initial reports may be provided to clients by facsimile. All faxed reports are followed by hardcopy. Procedures used to ensure client confidentiality are outlined in Section 26.7.

25.3.1 Electronic Data Deliverables (EDDs)

EDDs are routinely offered as part of TestAmerica's services. ***TestAmerica Buffalo*** offers a variety of EDD formats including Environmental Restoration Information Management System (ERPIMS), Excel, Dbase, GISKEY, and Text Files.

EDD specifications are submitted to the IT department by the PM for review and undergo the contract review process. Once the facility has committed to providing data in a specific electronic format, the coding of the format may need to be performed. This coding is documented and validated. The validation of the code is retained by the IT staff coding the EDD.

EDDs shall be subject to a review to ensure their accuracy and completeness. If EDD generation is automated, review may be reduced to periodic screening if the laboratory can demonstrate that it can routinely generate that EDD without errors. Any revisions to the EDD format must be reviewed until it is demonstrated that it can routinely be generated without errors. If the EDD can be reproduced accurately and if all subsequent EDDs can be produced error-free, each EDD does not necessarily require a review.

25.4 SUPPLEMENTAL INFORMATION FOR TEST

The lab identifies any unacceptable QC analyses or any other unusual circumstances or observations such as environmental conditions and any non-standard conditions that may have affected the quality of a result. This is typically in the form of a footnote or a qualifier and/or a narrative explaining the discrepancy in the front of the report

25.4.1 Numeric results with values outside of the calibration range, either high or low are qualified as 'estimated'.

25.4.2 Where quality system requirements are not met, a statement of compliance/non-compliance with requirements and/or specifications is required, including identification of test results derived from any sample that did not meet NELAC sample acceptance requirements such as improper container, holding time, or temperature.

25.4.3 Where applicable, a statement on the estimated uncertainty of measurements; information on uncertainty is needed when a client's instructions so require.

25.4.4 Opinions and Interpretations - The test report contains objective information, and generally does not contain subjective information such as opinions and interpretations. If such information is required by the client, the Laboratory Director will determine if a response can be prepared. If so, the Laboratory Director will designate the appropriate member of the management team to prepare a response. The response will be fully documented, and reviewed by the Laboratory Director, before release to the client. There may be additional fees charged to the client at this time, as this is a non-routine function of the laboratory.

Note: Review of data deliverable packages for submittal to regulatory authorities requires responses to non-conforming data concerning potential impact on data quality. This necessitates a limited scope of interpretation, and this work is performed by the QA Department. This is the only form of "interpretation" of data that is routinely performed by the laboratory.

When opinions or interpretations are included in the report, the laboratory provides an explanation as to the basis upon which the opinions and interpretations have been made. Opinions and interpretations are clearly noted as such and where applicable, a comment should be added suggesting that the client verify the opinion or interpretation with their regulator.

25.5 ENVIRONMENTAL TESTING OBTAINED FROM SUBCONTRACTORS

If the laboratory is not able to provide the client the requested analysis, the samples would be subcontracted following the procedures outlined in Section 8.

Data reported from analyses performed by a subcontractor laboratory are clearly identified as such on the analytical report provided to the client. Results from a subcontract laboratory outside of TestAmerica are reported to the client on the subcontract laboratory's original report stationary and the report includes any accompanying documentation.

25.6 CLIENT CONFIDENTIALITY

In situations involving the transmission of environmental test results by telephone, facsimile or other electronic means, client confidentiality must be maintained.

TestAmerica will not intentionally divulge to any person (other than the Client or any other person designated by the Client in writing) any information regarding the services provided by TestAmerica or any information disclosed to TestAmerica by the Client. Furthermore, information known to be potentially endangering to national security or an entity's proprietary rights will not be released.

Note: This shall not apply to the extent that the information is required to be disclosed by TestAmerica under the compulsion of legal process. TestAmerica will, to the extent feasible, provide reasonable notice to the client before disclosing the information.

Note: Authorized representatives of an accrediting authority are permitted to make copies of any analyses or records relevant to the accreditation process, and copies may be removed from the laboratory for purposes of assessment.

25.6.1 Report deliverable formats are discussed with each new client. If a client requests that reports be faxed or e-mailed, the reports are faxed with a cover sheet or e-mailed with the following note that includes a confidentiality statement similar to the following:

This material is intended only for the use of the individual(s) or entity to whom it is addressed, and may contain information that is privileged and confidential. It is our policy that facsimiles are intended for and should be used for business purposes only. If you are not the intended recipient, or the employee or agent responsible for delivering this material to the intended recipient, you are hereby notified that any dissemination, distribution or copying of this

25.7 FORMAT OF REPORTS

The format of reports is designed to accommodate each type of environmental test carried out and to minimize the possibility of misunderstanding or misuse.

25.8 AMENDMENTS TO TEST REPORTS

Corrections, additions, or deletions to reports are only made when justification arises through supplemental documentation. Justification is documented using the laboratory's corrective action system (refer to Section 12).

The revised report is retained on the Archive data server, as is the original report. The revised report is stored in the Archive data server under the sample number followed by "R". The revised report will have the word "revised" appended to the cover letter.

When the report is re-issued, a notation of "revised" is placed on the cover/signature page of the report. A brief explanation of reason for the re-issue is included in the report case narrative.

25.9 POLICIES ON CLIENT REQUESTS FOR AMENDMENTS

25.9.1 Policy on Data Omissions or Reporting Limit Increases

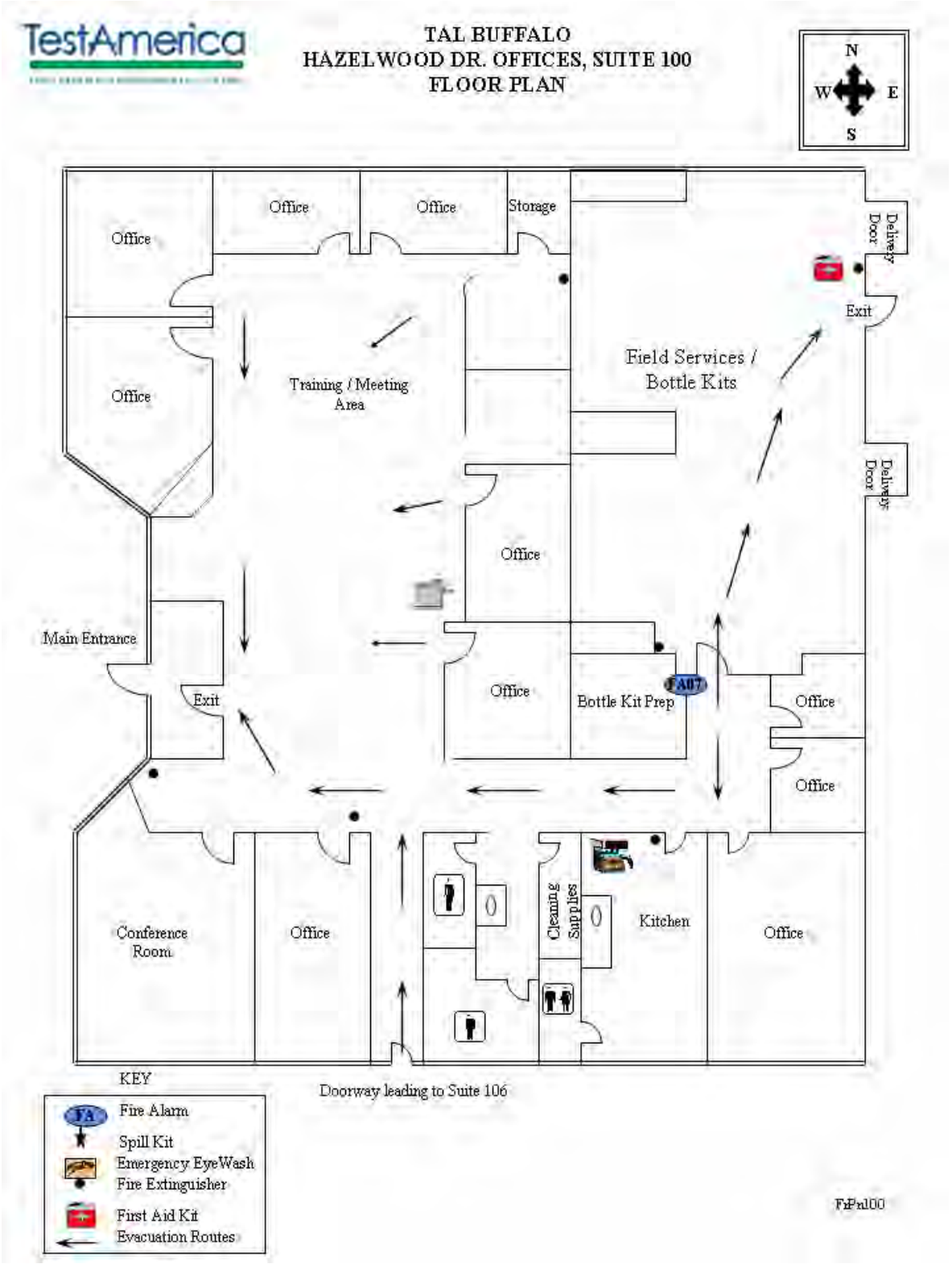
Fundamentally, our policy is simply to not omit previously reported results (including data qualifiers) or to not raise reporting limits and report sample results as ND. This policy has few exceptions. Exceptions are:

- Laboratory error.
- Sample identification is indeterminate (confusion between COC and sample labels).
- An incorrect analysis (not analyte) was requested (e.g., COC lists 8315 but client wanted 8310). A written request for the change is required.
- Incorrect limits reported based on regulatory requirements.
- The requested change has absolutely *no possible* impact on the interpretation of the analytical results and there is *no possibility* of the change being interpreted as misrepresentation by anyone inside or outside of our company.

25.9.2 Multiple Reports

TestAmerica does not issue multiple reports for the same workorder where there is different information on each report (this does not refer to copies of the same report) unless required to meet regulatory needs and approved by QA.

Appendix 1.


TestAmerica
TAL BUFFALO
HAZELWOOD DR. OFFICES, SUITE 100
FLOOR PLAN
N
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Storage
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Delivery Door
Exit
Training / Meeting Area
Field Services / Bottle Kits
Delivery Door
Office
Main Entrance
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FA07
Bottle Kit Prep
Office
Office
Conference Room
Office
Cleaning Supplies
Kitchen
Office
KEY
Doorway leading to Suite 106
FA Fire Alarm
Spill Kit
Emergency EyeWash
Fire Extinguisher
First Aid Kit
Evacuation Routes
FxPxl00

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TAL BUFFALO
HAZELWOOD DR. OFFICES, SUITE 106
CLIENT SERVICES/REPORT PREP
FLOOR PLAN

FrPl106L
3/2005

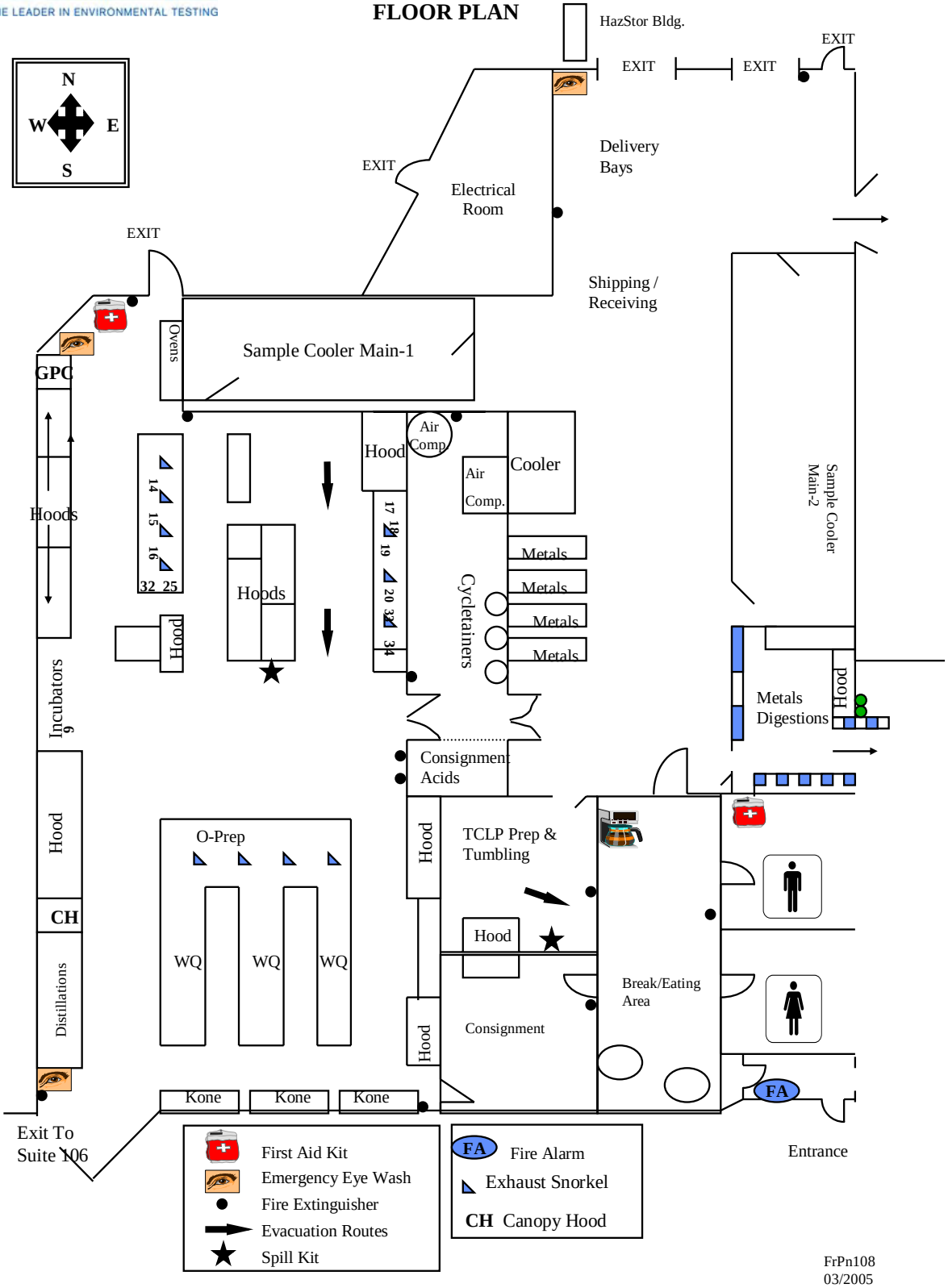
TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TAL BUFFALO
HAZELWOOD DR. NY OFFICES, SUITE 106
LABORATORY AREA
FLOOR PLAN

FrPn106r
03/2005

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TAL BUFFALO
HAZELWOOD DR. OFFICES, SUITE 108
FLOOR PLAN



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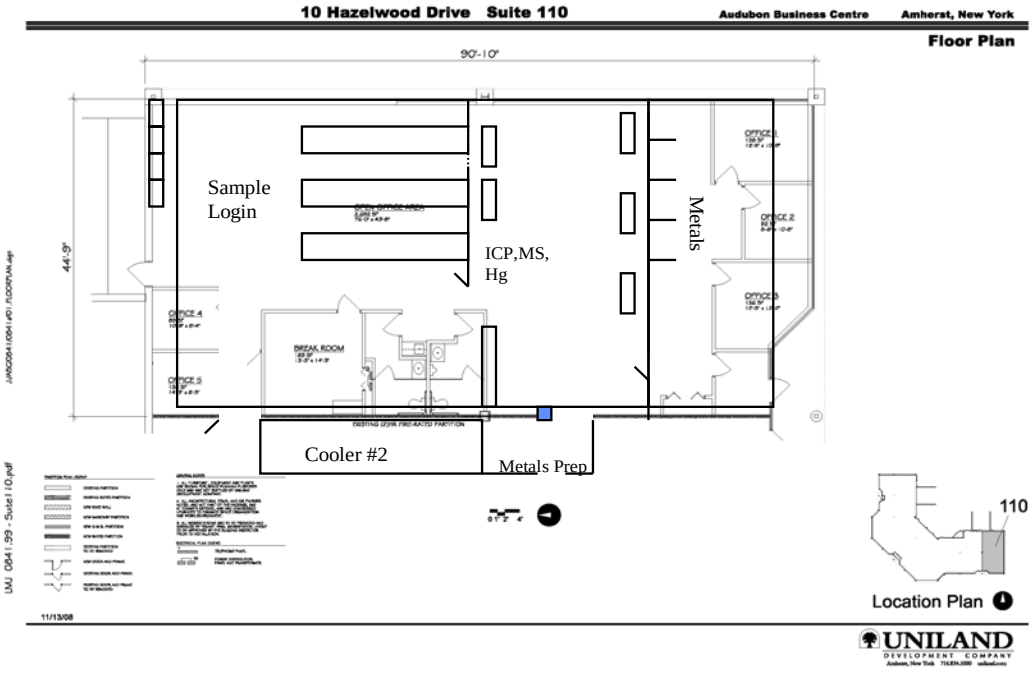
10 Hazelwood Drive Suite 110
Audubon Business Centre
Amherst, New York
Floor Plan
90'-10"
44'-9"
Sample Login
ICP,MS, Hg
Metals
OFFICE 1
OFFICE 2
OFFICE 3
OFFICE 4
OFFICE 5
BREAK ROOM
Cooler #2
Metals Prep
110
Location Plan
11/13/08
UNILAND
DEVELOPMENT COMPANY

Appendix 2. Glossary/Acronyms

Glossary:

Acceptance Criteria:
Specified limits placed on characteristics of an item, process, or service defined in requirement documents. (ASQC)

Accreditation:

The process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory. In the context of the National Environmental Laboratory Accreditation Program (NELAP), this process is a voluntary one. (NELAC)

Accrediting Authority:
The Territorial, State, or Federal Agency having responsibility and accountability for environmental laboratory accreditation and which grants accreditation (NELAC) [1.5.2.3]

Accuracy:
The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator. (QAMS)

Analyst:
The designated individual who performs the “hands-on” analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality. (NELAC)

Batch:
Environmental samples which are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A preparation batch is composed of one to 20 environmental samples of the same matrix, meeting the above mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An analytical batch is composed of prepared environmental samples (extracts, digestates or concentrates) and /or those samples not requiring preparation, which are analyzed together as a group using the same calibration curve or factor. An analytical batch can include samples originating from various environmental matrices and can exceed 20 samples. (NELAC Quality Systems Committee)

Blank:
A sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results. (ASQC)

Blind Sample:
A sample for analysis with a composition known to the submitter. The analyst/laboratory may know the identity of the sample but not its composition. It is used to test the analyst's or laboratory's proficiency in the execution of the measurement process.

Calibration:
To determine, by measurement or comparison with a standard, the correct value of each scale reading on a meter, instrument, or other device. The levels of the applied calibration standard should bracket the range of planned or expected sample measurements. (NELAC)

Calibration Curve:
The graphical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response. (NELAC)

Calibration Method:
A defined technical procedure for performing a calibration. (NELAC)

Calibration Standard:
A substance or reference material used to calibrate an instrument (QAMS)

Certified Reference Material (CRM):
A reference material one or more of whose property values are certified by a technically valid procedure, accompanied by or traceable to a certificate or other documentation which is issued by a certifying body. (ISO Guide 30–2.2)

Chain of Custody:
An unbroken trail of accountability that ensures the physical security of samples and includes the signatures of all who handle the samples. (NELAC) [5.12.4]

Clean Air Act:
The enabling legislation in 42 U>S>C> 7401 et seq., Public Law 91-604, 84 Stat. 1676 Pub. L. 95-95, 91 Stat., 685 and Pub. L. 95-190, 91 Stat., 1399, as amended, empowering EPA to promulgate air quality standards, monitor and enforce them. (NELAC)

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA/SUPERFUND):
The enabling legislation in 42 U.S.C. 9601-9675 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), 42 U.S.C. 9601 et seq., to eliminate the health and environmental threats posed by hazardous waste sites. (NELAC)

Compromised Samples:
Those samples which are improperly sampled, insufficiently documented (chain of custody and other sample records and/or labels), improperly preserved, collected in improper containers, or exceeding holding times when delivered to a laboratory. Under normal conditions, compromised samples are not analyzed. If emergency situation require analysis, the results must be appropriately qualified. (NELAC)

Confidential Business Information (CBI):
Information that an organization designates as having the potential of providing a competitor with inappropriate insight into its management, operation or products. NELAC and its

representatives agree to safeguarding identified CBI and to maintain all information identified as such in full confidentiality.

Confirmation:
Verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to:

Second column confirmation
Alternate wavelength
Derivitization
Mass spectral interpretation
Alternative detectors or
Additional Cleanup procedures
(NELAC)

Conformance:
An affirmative indication or judgment that a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements. (ANSI/ASQC E4-1994)

Corrective Action:
The action taken to eliminate the causes of an existing nonconformity, defect or other undesirable situation in order to prevent recurrence. (ISO 8402)

Data Audit:
A qualitative and quantitative evaluation of the documentation and procedures associated with environmental measurements to verify that the resulting data re of acceptable quality (i.e., that they meet specified acceptance criteria). (NELAC)

Data Reduction:
The process of transforming raw data by arithmetic or statistical calculations, standard curves, concentration factors, etc., and collation into a more useable form. (EPA-QAD)

Deficiency:
An unauthorized deviation from acceptable procedures or practices, or a defect in an item. (ASQC)

Detection Limit:
The lowest concentration or amount of the target analyte that can be identified, measured, and reported with confidence that the analyte concentration is not a false positive value. See Method Detection Limit. (NELAC)

Document Control:
The act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly, and controlled to ensure use of the correct version at the location where the prescribed activity if performed. (ASQC)

Duplicate Analyses:
The analyses or measurements of the variable of interest performed identically on two subsamples of the same sample. The results from duplicate analyses are used to evaluate analytical or measurement precision but not the precision of sampling, preservation or storage internal to the laboratory. (EPA-QAD)

Environmental Detection Limit (EDL):
The smallest level at which a radionuclide in an environmental medium can be unambiguously distinguished for a given confidence interval using a particular combination of sampling and measurement procedures, sample size, analytical detection limit, and processing procedure. The EDL shall be specified for the 0.95 or greater confidence interval. The EDL shall be established initially and verified annually for each test method and sample matrix. (NELAC Radioanalysis Subcommittee)

Equipment Blank:
Sample of analyte-free media which has been used to rinse common sampling equipment to check effectiveness of decontamination procedures. (NELAC)

External Standard Calibration:
Calibrations for methods that do not utilize internal standards to compensate for changes in instrument conditions.

Federal Water Pollution Control Act (Clean Water Act, CWA):
The enabling legislation under 33 U.S.C. 1251 et seq., Public Law 92-50086 Stat 816, that empowers EPA to set discharge limitations, write discharge permits, monitor, and bring enforcement action for non-compliance. (NELAC)

Field Blank:
Blank prepared in the field by filing a clean container with pure de-ionized water and appropriate preservative, if any, for the specific sampling activity being undertaken (EPA OSWER)

Field of Testing:
NELAC's approach to accrediting laboratories by program, method and analyte. Laboratories requesting accreditation for a program-method-analyte combination or for an up-dated/improved method are required to submit to only that portion of the accreditation process not previously addressed (see NELAC, section 1.9ff). (NELAC)

Holding Times (Maximum Allowable Holding Times):
The maximum times that samples may be held prior to analyses and still be considered valid or not compromised. (40 CFR Part 136)

Internal Standard:
A known amount of standard added to a test portion of a sample and carried through the entire measurement process as a reference for evaluating and controlling the precision and bias of the applied analytical test method. (NELAC)

Internal Standard Calibration:
Calibrations for methods that utilize internal standards to compensate for changes in instrument conditions.

Instrument Blank:
A clean sample (e.g., distilled water) processed through the instrumental steps of the measurement process; used to determine instrument contamination. (EPA-QAD)

Laboratory Control Sample (however named, such as laboratory fortified blank, spiked blank, or QC check sample):
A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes, taken through all preparation and analysis steps. Where there is no preparation taken for an analysis (such as in aqueous volatiles), or when all samples and standards undergo the same preparation and analysis process (such as Phosphorus), there is no LCS. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.

An LCS shall be prepared at a minimum of 1 per batch of 20 or less samples per matrix type per sample extraction or preparation method except for analytes for which spiking solutions are not available such as total suspended solids, total dissolved solids, total volatile solids, total solids, pH, color, odor, temperature, dissolved oxygen or turbidity. The results of these samples shall be used to determine batch acceptance.

Note: NELAC standards allow a matrix spike to be used in place of this control as long as the acceptance criteria are as stringent as for the LCS. (NELAC)

Laboratory Duplicate:
Aliquots of a sample taken from the same container under laboratory conditions and processed and analyzed independently. (NELAC)

Least Squares Regression (1st Order Curve):
The least squares regression is a mathematical calculation of a straight line over two axes. The y axis represents the instrument response (or Response ratio) of a standard or sample and the x axis represents the concentration. The regression calculation will generate a correlation coefficient (r) that is a measure of the "goodness of fit" of the regression line to the data. A value of 1.00 indicates a perfect fit. In order to be used for quantitative purposes, r must be greater than or equal to 0.99 for organics and 0.995 for Inorganics.

Limit of Detection (LOD):
An estimate of the minimum amount of a substance that an analytical process can reliably detect. An LOD is analyte- and matrix-specific and may be laboratory dependent. (Analytical Chemistry, 55, p.2217, December 1983, modified) See also Method Detection Limit.

Matrix:
The component or substrate that contains the analyte of interest. For purposes of batch and QC requirement determinations, the following matrix distinctions shall be used:

> Aqueous: Any aqueous sample excluded from the definition of Drinking Water matrix or Saline/Estuarine source. Includes surface water, groundwater, effluents, and TCLP or other extracts.
>
> Drinking Water: any aqueous sample that has been designated as a potable or potential potable water source.

Saline/Estuarine: any aqueous sample from an ocean or estuary, or other salt water source such as the Great Salt Lake.

Non-aqueous Liquid: any organic liquid with <15% Settleable solids.

Biological Tissue: any sample of a biological origin such as fish tissue, shellfish, or plant material. Such samples shall be grouped according to origin.

Solids: includes soils, sediments, sludges, and other matrices with >15% Settleable solids.

Chemical Waste: a product or by-product of an industrial process that results in a matrix not previously defined.

Air: whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbant tube, impinger solution, filter, or other device. (NELAC)

Matrix Spike (spiked sample or fortified sample):

Prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.

Matrix spikes shall be performed at a frequency of one in 20 samples per matrix type per sample extraction or preparation method except for analytes for which spiking solutions are not available such as, total suspended solids, total dissolved solids, total volatile solids, total solids, pH, color, odor, temperature, dissolved oxygen or turbidity. The selected sample(s) shall be rotated among client samples so that various matrix problems may be noted and/or addressed. Poor performance in a matrix spike may indicate a problem with the sample composition and shall be reported to the client whose sample was used for the spike. (QAMS)

Matrix Spike Duplicate (spiked sample or fortified sample duplicate):
A second replicate matrix spike is prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte.

Matrix spike duplicates or laboratory duplicates shall be analyzed at a minimum of 1 in 20 samples per matrix type per sample extraction or preparation method. The laboratory shall document their procedure to select the use of an appropriate type of duplicate. The selected sample(s) shall be rotated among client samples so that various matrix problems may be noted and/or addressed. Poor performance in the duplicates may indicate a problem with the sample composition and shall be reported to the client whose sample was used for the duplicate. (QAMS)

Method Blank:
A sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target

analytes or interferences are present at concentrations that impact the analytical results for sample analyses. (NELAC)

Method Detection Limit:
The minimum concentration of a substance (an analyte) that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. (40 CFR Part 136, Appendix B)

Negative Control:
Measures taken to ensure that a test, its components, or the environment do not cause undesired effects, or produce incorrect test results. (NELAC)

Performance Audit:
The routine comparison of independently obtained qualitative and quantitative measurement system data with routinely obtained data in order to evaluate the proficiency of an analyst or laboratory. (NELAC)

Performance Based Measurement System (PBMS):
A set of processes wherein the data quality needs, mandates or limitations of a program or project are specified and serve as criteria for selecting appropriate test methods to meet those needs in a cost-effective manner. (NELAC)

Positive Control:
Measures taken to ensure that a test and/or its components are working properly and producing correct or expected results from positive test subjects. (NELAC)

Precision:
The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms. (NELAC)

Preservation:
Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical and/or biological integrity of the sample. (NELAC)

Proficiency Testing:
A means of evaluating a laboratory's performance under controlled conditions relative to a given set of criteria through analysis of unknown samples provided by an external source. (NELAC) [2.1]

Proficiency Testing Program:
The aggregate of providing rigorously controlled and standardized environmental samples to a laboratory for analysis, reporting of results, statistical evaluation of the results and the collective demographics and results summary of all participating laboratories. (NELAC)

Proficiency Test Sample (PT):
A sample, the composition of which is unknown to the analyst and is provided to test whether the analyst/laboratory can produce analytical results within specified acceptance criteria. (QAMS)

Quality Assurance:
An integrated system of activities involving planning, quality control, quality assessment, reporting and quality improvement to ensure that a product or service meets defined standards of quality with a stated level of confidence. (QAMS)

Quality Assurance [Project] Plan (QAPP):
A formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved. (EAP-QAD)

Quality Control:
The overall system of technical activities which purpose is to measure and control the quality of a product or service so that it meets the needs of users. (QAMS)

Quality Control Sample:
An uncontaminated sample matrix spiked with known amounts of analytes from a source independent from the calibration standards. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. (EPA-QAD)

Quality Manual:
A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users. (NELAC)

Quality System:
A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA and QC (ANSI/ASQC-E-41994)

Quantitation Limits:
The maximum or minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be quantified with the confidence level required by the data user. (NELAC)

Range:
The difference between the minimum and the maximum of a set of values. (EPA-QAD)

Reagent Blank (method reagent blank):
A sample consisting of reagent(s), without the target analyte or sample matrix, introduced into the analytical procedure at the appropriate point and carried through all subsequent steps to determine the contribution of the reagents and of the involved analytical steps. (QAMS)

Reference Material:
A material or substance one or more properties of which are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials. (ISO Guide 30-2.1)

Reference Standard:
A standard, generally of the highest metrological quality available at a given location, from which measurements made at that location are derived. (VIM-6.0-8)

Replicate Analyses:
The measurements of the variable of interest performed identically on two or more sub-samples of the same sample within a short time interval. (NELAC)

Report Limit (RL):
The laboratory nominal Quantitation Limit (QL) or the level of sensitivity required by the client but not lower than the LOD.

Resource Conservation and Recovery Act (RCRA):
The enabling legislation under 42 USC 321 et seq. (1976), that gives EPA the authority to control hazardous waste from the “cradle-to-grave”, including its generation, transportation, treatment, storage, and disposal. (NELAC)

Safe Drinking Water Act (SDWA):
The enabling legislation, 42 USC 300f et seq. (1974), (Public Law 93-523), that requires the EPA to protect the quality of drinking water in the U.S. by setting maximum allowable contaminant levels, monitoring, and enforcing violations. (NELAC)

Sample Duplicate:
Two samples taken from and representative of the same population and carried through all steps of the sampling and analytical procedures in an identical manner. Duplicate samples are used to assess variance of the total method including sampling and analysis. (EPA-QAD)

Second Order Polynomial Curve (Quadratic): The 2^{nd} order curves are a mathematical calculation of a slightly curved line over two axis. The y axis represents the instrument response (or Response ratio) of a standard or sample and the x axis represents the concentration. The 2^{nd} order regression will generate a coefficient of determination (COD or r^2) that is a measure of the "goodness of fit" of the quadratic curvature the data. A value of 1.00 indicates a perfect fit. In order to be used for quantitative purposes, r^2 must be greater than or equal to 0.99.

Selectivity:
(Analytical chemistry) the capability of a test method or instrument to respond to a target substance of constituent in the presence of non-target substances. (EPA-QAD)

Sensitivity:
The capability of a method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. (NELAC)

Spike:
A known mass of target analyte added to a blank, sample or sub-sample; used to determine recovery efficiency or for other quality control purposes.

If the mandated or requested test method does not specify the spiking components, the laboratory shall spike all reportable components to be reported in the Laboratory Control Sample and Matrix Spike. However, in cases where the components interfere with accurate assessment (such as simultaneously spiking chlordane, toxaphene and PCBs in Method 608), the test method has an extremely long list of components or components are incompatible, a representative number (at a minimum 10%) of the listed components may be used to control the test method. The selected components of each spiking mix shall represent all chemistries, elution patterns and masses permit specified analytes and other client requested components. However, the laboratory shall ensure that all reported components are used in the spike mixture within a two-year time period.. (NELAC)

Standard:
The document describing the elements of laboratory accreditation that has been developed and established within the consensus principles of NELAC and meets the approval requirements of NELAC procedures and policies. (ASQC)

Standard Operating Procedures (SOPs):
A written document which details the method of an operation, analysis, or action whose techniques and procedures are thoroughly prescribed and which is accepted as the method for performing certain routine or repetitive tasks. (QAMS)

Standardized Reference Material (SRM):
A certified reference material produced by the U.S. National Institute of Standards and Technology or other equivalent organization and characterized for absolute content, independent of analytical method. (EPA-QAD)

Surrogate:
A substance with properties that mimic the analyte of interest. It is unlikely to be found in environment samples and is added to them for quality control purposes.

Surrogate compounds must be added to all samples, standards, and blanks, for all organic chromatography methods except when the matrix precludes its use or when a surrogate is not available. Poor surrogate recovery may indicate a problem with sample composition and shall be reported to the client whose sample produced poor recovery. (QAMS)

Systems Audit (also Technical Systems Audit):
A thorough, systematic, qualitative on-site assessment of the facilities, equipment, personnel, training, procedures, record keeping, data validation, data management, and reporting aspects of a total measurement system. (EPA-QAD)

Toxic Substances Control Act (TSCA):
The enabling legislation in 15 USC 2601 et seq., (1976) that provides for testing, regulating, and screening all chemicals produced or imported into the United States for possible toxic effects prior to commercial manufacture. (NELAC)

Traceability:
The property of a result of a measurement whereby it can be related to appropriate standards, generally international or national standards, through an unbroken chain of comparisons. (VIM-6.12)

Uncertainty:
A parameter associated with the result of a measurement that characterizes the dispersion of the value that could reasonably be attributed to the measured value.

Acronyms:

BS – Blank Spike
BSD – Blank Spike Duplicate
CAR – Corrective Action Report
CCV – Continuing Calibration Verification
CF – Calibration Factor
CFR – Code of Federal Regulations
COC – Chain of Custody
CRS – Change Request Form
DOC – Demonstration of Capability
DQO – Data Quality Objectives
DU – Duplicate
DUP - Duplicate
EHS – Environment, Health and Safety
EPA – Environmental Protection Agency
GC - Gas Chromatography
GC/MS - Gas Chromatography/Mass Spectrometry
HPLC - High Performance Liquid Chromatography
ICP - Inductively Coupled Plasma Atomic Emission Spectroscopy
ICV – Initial Calibration Verification
IDL – Instrument Detection Limit
IH – Industrial Hygiene
IS – Internal Standard
LCS – Laboratory Control Sample
LCSD – Laboratory Control Sample Duplicate
LIMS – Laboratory Information Management System
MDL – Method Detection Limit
MS – Matrix Spike
MSD – Matrix Spike Duplicate
MSDS - Material Safety Data Sheet
NELAC - National Environmental Laboratory Accreditation Conference
NELAP - National Environmental Laboratory Accreditation Program
PT – Performance Testing
QAM – Quality Assurance Manual
QA/QC – Quality Assurance / Quality Control
QAPP – Quality Assurance Project Plan
RF – Response Factor
RPD – Relative Percent Difference
RSD – Relative Standard Deviation
SD – Standard Deviation
SOP: Standard Operating Procedure
TAT – Turn-Around-Time
VOA – Volatiles
VOC – Volatile Organic Compound

Appendix 3.

Laboratory Certifications, Accreditations, Validations

TestAmerica Buffalo maintains certifications, accreditations, certifications, and validations with numerous state and national entities. Programs vary but may include on-site audits, reciprocal agreements with another entity, performance testing evaluations, review of the QA Manual, Standard Operating Procedures, Method Detection Limits, training records, etc. At the time of this QA Manual revision, the laboratory has accreditation/certification/licensing with the following organizations:

STATE	*Program*	*Cert # / Lab ID*
Arkansas	*CWA, RCRA, SOIL*	*88-0686*
California*	*NELAP CWA, RCRA*	*01169CA*
Connecticut	*SDWA, CWA, RCRA, SOIL*	*PH-0568*
Florida*	*NELAP CWA, RCRA*	*E87672*
Georgia*	*SDWA,NELAP CWA, RCRA*	*956*
Illinois*	*NELAP SDWA, CWA, RCRA*	*200003*
Iowa	*SW/CS*	*374*
Kansas*	*NELAP SDWA, CWA, RCRA*	*E-10187*
Kentucky	*SDWA*	*90029*
Kentucky UST	*UST*	*30*
Louisiana*	*NELAP CWA, RCRA*	*2031*
Maine	*SDWA, CWA*	*NY0044*
Maryland	*SDWA*	*294*
Massachusetts	*SDWA, CWA*	*M-NY044*
Michigan	*SDWA*	*9937*
Minnesota	*SDWA,CWA, RCRA*	*036-999-337*
New Hampshire*	*NELAP SDWA, CWA*	*233701*
New Jersey*	*NELAP,SDWA, CWA, RCRA,*	*NY455*
New York*	*NELAP, AIR, SDWA, CWA, RCRA*	*10026*
North Dakota	*CWA, RCRA*	*R-176*
Oklahoma	*CWA, RCRA*	*9421*
Oregon*	*CWA,RCRA*	*NY200003*
Pennsylvania*	*NELAP CWA,RCRA*	*68-00281*
Tennessee	*SDWA*	*02970*
Texas*	*NELAP CWA, RCRA*	*T104704412-08-TX*
USDA	*FOREIGN SOIL PERMIT*	*S-41579*
Virginia	*SDWA*	*278*
Washington*	*NELAP CWA,RCRA*	*C1677*
Wisconsin	*CWA, RCRA*	*998310390*
West Virginia	*CWA,RCRA*	*252*

The certificates and parameter lists (which may differ) for each organization may be found on the corporate web site, the laboratory's public server, and in the QA Department.

Appendix C

Standard Operating Procedures

1. PURPOSE

The purpose of this procedure is to provide the requirements for completion of written Chain of Custody (COC) documentation and to provide a suggested Chain of Custody Form for project use.

2. SCOPE

This procedure is applicable to all Shaw E & I efforts where samples are transferred among parties, including to off-site testing facilities. Adherence to this procedure is not required whenever the same individual/team is performing the sampling and testing within the same workday, and transfer to the testing process is being documented by other means, e.g. sampling and then field-screening in a mobile laboratory.

3. REFERENCES

- U.S. Environmental Protection Agency, 1986, *Test Methods for Evaluating Solid Waste; Physical/Chemical Methods, SW-846*, Third Edition.
- U.S. Army Corps of Engineers, *Requirements for the Preparation of Sampling and Analysis Plans*, EM200-1-3.
- Shaw E & I, 2002, *Sampler's Training Course Handout*.

4. DEFINITIONS

- **Custody**—The legal term used to define the control and evidence traceability of an environmental sample. A sample is considered to be in an individual's custody when it is in actual physical possession of the person, is in view of the person, is locked in a container controlled by the person, or has been placed into a designated secure area by the person.
- **Chain of Custody Form**—A form used to document and track the custody and transfers of a sample from collection to analysis or placement in a designated secure area within the testing facility.
- **COC Continuation Page**—Additional page(s) that may be included with a Chain of Custody form. The continuation page(s) contain the information on additional samples contained within the *same* cooler/shipping container associated with the cooler/shipping container Chain of Custody form.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Documentation

All Chain of Custody documentation must be completed in indelible ink. All corrections must be performed using standard single-line cross-out methods, and the initials of the individual making the change must be included beside the corrected entry.

6.2 Continuation Pages

Continuation pages may be utilized for shipping containers/coolers with sufficient samples/sample containers that all of the lines of the Chain of Custody form are used before the documentation of the cooler/shipping container is complete. The number of pages in total must be filled out. *All samples entered onto a Continuation Page must be included in the same cooler/shipping container as those on the Chain of Custody form itself.*

6.3 Header Information

- Each Chain of Custody form must be assigned a unique Reference Document Number–use the Project/proposal number followed by a unique numeric sequence or current date (if only one cooler sent per day). Continuation Pages should contain the same Document Reference Number as the Chain of Custody form that they are associated with. The project team should maintain a log of Chain of Custody Reference Document Numbers.
- The page identifier and total page count section must be completed. Total pages include the Chain of Custody form and any attached Continuation Pages.
- Project number, name, and location information must be completed for all forms.
- If available, the laboratory Purchase Order Number should be included on the appropriate line.
- The name and phone number of the *Project Contact* should be included; the Project Contact should be a responsible individual that the laboratory may access to address analytical issues. This person is usually the analytical lead for the project.
- The *Shipment Date* should be provided on the applicable lines.
- If shipping by carrier, the *Waybill/Airbill Number* must be included. Note: couriers will not sign custody documents. Therefore, inclusion of the waybill/airbill number on the Chain of Custody is the *only* means of documenting the transfer to the carrier.
- Laboratory Destination and Contact information should be provided.
- The Sampler(s) names should be provided on the appropriate line. This line should include all persons whose initials appear on any of the sample containers, to provide the laboratory a means of cross-referencing containers.
- The “Send Report To” information should be completed. If multiple reports/locations are needed, the information should be provided on a separate page included with the Chain of Custody documents.

6.4 Sample Information Section–Including on Continuation Page(s)

During actual sampling, each sample must be entered on the COC form at the time of collection in order to document possession. The sampler must not wait until sampling is completed before entering samples on the COC.

- Complete the *Sample ID Number* for each line. If there are multiple container types for a sample, use additional lines to indicate the needed information.
- Ensure that the *Sample Description* matches the description on the sample label–the laboratory will use this information for cross-referencing.
- Provide the *Collection Date* and *Time*. These must match those on the sample label and Field Logbook/Logsheets.
- Indicate whether the sample is a Grab or Composite sample.
- Indicate the *Matrix* of the sample. Use the Matrix Codes listed on the Chain of Custody form.
- Indicate the *Number of Containers* and the *Container Type*. If a sample has multiple container types, use multiple lines and cross-out the information spaces to the left of the container blocks. *Failure to do this may cause the laboratory to log-in each container type as a separate sample/lab-ID, resulting in a confused report and invoice.*
  - Alternatively, if each sample has the same number/type container types, use "various" in the *Container Type* block and provide detail in the *Special Instructions* section, e.g., "Each sample consists of one 16-oz jar, two pre-weighed VOC w/DI water, and one pre-weighed VOC w/Methanol."
- Check the appropriate *Preservative* box for each line/container type.
- Write in and check the *Analyses Requested* boxes for each line/container type. The appropriate method number (e.g., EPA Method 8260C) must be written as well as the method name.
- Indicate the *Turn-around Time Requested* for each sample.
- Use the *Special Instructions* section to provide important information to the laboratory, e.g., samples that may require dilution or samples that will need to be composited by the laboratory. This section may also be used to inform the laboratory of additional information contained in attachments to the Chain of Custody package.
- Circle the appropriate *QC/Data Package Level* requested.

6.5 Custody Transfer Section

- The first *Relinquished By* space must be completed by the individual who will either transfer the samples or seal the shipping container.
- If the samples will be transferred to a courier, write the courier/carrier company in the *Received By* box and enter the Date and Time that the shipping container was closed.
- All other transfers must be performed in person, and the Relinquisher must witness the signing by the Receiver.
- A copy of the Chain of Custody form and all associated Continuation Pages should be maintained in the project files.

7. ATTACHMENTS

None

8. FORMS

- EID-FS-003.01, Shaw E & I Chain of Custody Form
- EID-FS-003.02, Shaw E & I COC Continuation Page

9. RECORDS

- EID-FS-003.01, Chain of Custody Form
- EID-FS-003.02, Chain of Custody Continuation Page(s)

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 07/22/2003	Initial Issue	N/A
01 09/08/2006	New template, new numbering of procedure, Section 6.3 was edited, content was added in Section 6.4	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework	Scott Logan

1. PURPOSE

The purpose of this procedure is to provide the requirements for completion and attachment of Custody Seals on environmental samples and shipping containers.

2. SCOPE

This procedure is applicable to all Shaw E & I efforts where sample legal defensibility and custody integrity is desired. Adherence to this procedure is not required whenever the same individual/team is performing the sampling and testing within the same workday, and transfer to the testing process is being documented by other means, i.e. sampling and then field-screening in a mobile laboratory.

3. REFERENCES

- U.S. Environmental Protection Agency, 1986, *Test Methods for Evaluating Solid Waste; Physical/Chemical Methods, SW-846*, Third Edition.
- U.S. Army Corps of Engineers, *Requirements for the Preparation of Sampling and Analysis Plans, EM200-1-3*
- Shaw E & I, 2002, Sampler's Training Course Handout.

4. DEFINITIONS

- **Custody**—The legal term used to define the control and evidence traceability of an environmental sample. A sample is considered to be in one's custody if it is in actual physical possession of the person, is in view of the person, has been locked in a container controlled by the person, or has been placed into a designated secure area by the person.
- **Custody Seal**—Commercially available thin strips of adhesive paper with write-in lines for the date/time and identification of the using party. Custody seals are placed over the caps of sample containers and along the cover seals of shipping containers as a means to detect tampering before arrival at the testing facility. All Shaw E & I strategic alliance laboratories provide Custody Seals in their sample container supply kits.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting

information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Completing the Custody Seal Information

- All Custody Seals must be completed in indelible ink. All corrections must be made using standard single-line cross-out methods, and the initials of the individual making the change must be included beside the corrected entry.
- Each Custody Seal attached must be completed by writing the *Date*, at a minimum, and signing with *full signature* by the person responsible for the sealing of the sample.
- If a space is provided, the *Time* should also be added.

6.2 Attaching the Custody Seals

Whenever possible, custody seals should be attached over the sample container lids during actual sampling and not when the samples are packaged for shipment. This will provide confidence in legal custody and will demonstrate non-tampering during the sample collection process.

Do not attach custody seals to VOC sample containers, as contamination may occur. For these samples, the custody seal should be used to seal the folded plastic zip bag that holds the sample containers.

- For sample jars, the completed Custody Seal should be placed across the top of the lid with the edges below the lid/jar interface and attached to the jar material. This will require the visible breaking of the seal in order to open the container.
- Sample coolers and shipping containers should have Custody Seals attached in such a manner that the seal extends lengthwise from the top edge of the lid to the side of the cooler/container.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

None

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 08/14/2003	Initial Issue	N/A
01 09/08/2006	New template, new numbering of procedure, no content changes	Guy Gallello

Uncontrolled when printed: Verify latest version on ShawNet/Governance

Revision Level Revision Date	Revision Description	Responsible Manager
02 08/25/2011	Modified format only to align with Governance Management framework	Scott Logan

1. PURPOSE

The purpose of this procedure is to provide the requirements for completion and attachment of sample labels on environmental sample containers.

2. SCOPE

This procedure is applicable to all Shaw E & I projects/proposals where samples will be collected.

3. REFERENCES

- U.S. Environmental Protection Agency, 1986, *Test Methods for Evaluating Solid Waste; Physical/Chemical Methods*, SW-846, Third Edition.
- U.S. Army Corps of Engineers, *Requirements for the Preparation of Sampling and Analysis Plans*, EM200-1-3
- Shaw E & I, 2002, Sampler's Training Course Handout.

4. DEFINITIONS

- **Sample Label**—Any writing surface with an adhesive backing that can be used to document sample identification information. The sample label is attached to the sample container as a means of identification and, in some commercially available or laboratory-supplied containers, may be pre-attached. All Shaw E & I strategic alliance laboratories provide sample labels or pre-labeled containers in their sample container supply kits.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

- All sample labels must be completed in indelible ink. All corrections must be performed using standard single-line cross-out methods, and the initials of the individual making the change must be included beside the corrected entry.

- Sample labels should be completed and attached as samples are collected. Do not wait until final packaging to attach and/or complete the sample labels.
- Sample labels must be attached to the non-sealing portion of the container. Do not place labels on or across sample container caps.
- If the laboratory has provided pre-labeled containers, make sure to fill one for each parameter set needed. Laboratory pre-labeled containers are often bar-coded and it is important to provide a complete container set for each sample.
- The following information must be recorded on the Sample Label:
  - Sample Identification Number
  - Date and Time collected
  - Initials of person(s) responsible for collection
- If a space is provided, the *Analysis Requested* should also be added.
- If a *Description* is provided, remember it must match that on the Chain of Custody form for cross-referencing purposes.
- Cover the completed and attached label with clear plastic tape to prevent bleeding of the ink if it becomes wetted. *Do **not** perform this step for pre-weighed VOC vials, as the final weight values will be influenced by the mass of the tape. Protect these containers by enclosing the rack/holder in a plastic bag within the cooler.*

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

None

10. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
00 09/08/2006	Initial issue	N/A
01 09/08/2006	Updated template, procedure numbering change, updated Section 2- Scope, Edited content in section 6.	Guy Gallello
02 08/28/2011	Modified format only to align with Governance Management framework	Scott Logan

1. PURPOSE

The purpose of this procedure is to provide general instructions in the packaging and shipping of non-hazardous samples. The primary use of this procedure is for the transportation of samples collected on site to be sent off site for physical, chemical, and/or radiological analysis.

2. SCOPE

This procedure applies to the shipping and packaging of all non-hazardous samples. Non-hazardous samples are those that do not meet any hazard class definitions found in 49 CFR 107-178, including materials designated as Class 9 materials and materials that represent Reportable Quantities (hazardous substances) and/or materials that are not classified as *Dangerous Goods* under current IATA regulations.

In general most soil, air, and aqueous samples, including those that are acid or caustic preserved do **not** qualify as *hazardous materials* or *dangerous goods*. An exception is methanolic soil VOC vials: these containers are flammable in any quantity and **must** be packaged, shipped, and declared as *Dangerous Goods* whenever transported by air.

The Class 9 "Environmentally Hazardous" designation should only be applied to samples if they are known or suspected (via screening) to contain a sufficient concentration of contaminant to pose a health and/ or environmental risk if spilled in transport. Samples for which screening has shown a potential hazard (i.e. flammability) or those that are derived from a known hazard, including a site/facility with confirmed contamination by an *infectious substance* must also be shipped in accordance with the applicable DOT/IATA requirements. Refer to Shaw E & I SOP FS013.

Improper shipment of hazardous materials, especially willful misrepresentation and shipment as non-hazardous materials, is a violation of federal law and is punishable by fines and possible imprisonment of the guilty parties. It is also a violation of Shaw E & I policy and can result in disciplinary action up to and including termination of employment.

3. REFERENCES

- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, EM200-1-3, Washington, D.C.
- U.S. Department of Transportation Regulations, 49 CFR Parts 108-178
- International Air Transport Association (IATA), *Dangerous Goods Regulations*, current edition.

4. DEFINITIONS

- **Cooler/Shipping Container**—Any hard-sided insulated container meeting DOT's or IATA's general packaging requirements.
- **Bubble Wrap**—Plastic sheeting with entrained air bubbles for protective packaging purposes.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Packaging

- Use tape and seal off the cooler drain on the inside and outside to prevent leakage.
- Place packing material on the bottom on the shipping container (cooler) to provide a soft impact surface.
- Place a large (30-55 gallon or equivalent) plastic bag into the cooler (to minimize possibility of leakage during transit).
- Starting with the largest glass containers, wrap each container with sufficient bubble wrap to ensure the best chance to prevent breakage of the container.
- Pack the largest glass containers in the bottom of the cooler, placing packing material between each of the containers to avoid breakage from bumping.
- Double-bag the ice (chips or cubes) in gallon- or quart-sized resealable plastic freezer bags and wedge the ice bags between the sample bottles.
- Add bagged ice across the top of the samples.
- When sufficiently full, seal the inner protective plastic bag, and place additional packing material on top of the bag to minimize shifting of containers during shipment.
- Tape a gallon-sized resealable plastic bag to the inside of the cooler lid, place the completed chain of custody document inside, and seal the bag shut.
- Tape the shipping container (cooler) shut using packing tape, duct tape, or other tear-resistant adhesive strips. Taping should be performed to ensure the lid cannot open during transport.
- Place a custody seal on two separate portions of the cooler, to provide evidence that the lid has not been opened prior to receipt by the intended recipient.

6.2 Labeling

- A “This Side Up” arrow should be adhered to all sides of the cooler, especially ones without obvious handles.
- The name and address of the receiver and the shipper must be on the top of the cooler.
- The airbill must be attached to the top of the cooler.

6.3 Shipping Documentation

- A Cooler Shipment Checklist (Attachment 1) should be completed and kept in the project file.

7. ATTACHMENTS

- Attachment 1, Shaw E & I Cooler Shipment Checklist

8. FORMS

None

9. RECORDS

- Chain of Custody Form
- Chain of Custody Continuation Page(s)
- Cooler Shipment Checklist

10. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
00 06/05/2003	Initial issue	N/A
01 09/08/2006	Updated template and numbering of procedure, content was added to Section 2-Scope	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework.	Scott Logan

Attachment 1
Sample Shipment Checklist

Project Name _____ Project Number _____

Address _____ Date_____ Time _____

City, State, Zip _____ Fax No._____

Site Contact No. _____

SAMPLE CHECKLIST	YES	NO	COMMENTS
SAMPLE LIDS ARE TIGHT AND CUSTODY SEALS IN PLACE?	❒	❒	
ARE ALL SAMPLE NUMBERS, DATES, TIMES AND OTHER LABEL INFORMATION LEGIBLE AND COMPLETE?	❒	❒	
HAVE ALL SAMPLE NUMBERS, DATES, TIMES AND OTHER SAMPLING DATA BEEN LOGGED INTO THE SAMPLE LOG BOOK?	❒	❒	
DO SAMPLE NUMBERS AND SAMPLE DESCRIPTIONS ON THE LABELS MATCH THOSE ON THE COC?	❒	❒	
HAVE THE SAMPLES BEEN PROPERLY PRESERVED?	❒	❒	
HAVE THE CHAIN OF CUSTODIES BEEN FILLED OUT COMPLETELY AND CORRECTLY?	❒	❒	
DOES THE ANALYTICAL SPECIFIED ON THE COC MATCH THE ANALYTICAL SPECIFIED IN THE SCOPE OF WORK?	❒	❒	
HAVE THE COC'S BEEN PROPERLY SIGNED IN THE TRANSFER SECTION?	❒	❒	

PACKAGING CHECKLIST	YES	NO	COMMENTS
HAS EACH SAMPLE BEEN PLACED INTO AN INDIVIDUAL PLASTIC BAG?	❒	❒	
HAS THE DRAIN PLUG OF THE COOLER BEEN TAPED CLOSED WITH WATER PROFF TAPE FROM THE INSIDE?	❒	❒	
HAVE ALL THE SAMPLES BEEN PLACED INTO THE COOLER IN AN UPRIGHT POSITION?	❒	❒	
IS THERE ADEQUATE SPACING OF SAMPLES SO THAT THEY WILL NOT TOUCH DURING SHIPMENT?	❒	❒	
HAVE AN ADEQUATE NUMBER OF BLUE ICE PACKS OR WATER ICE BEEN PLACED AROUND AND ON TOP OF THE SAMPLE?	❒	❒	
HAS FRESH BLUE ICE OR WATER ICE BEEN ADDED TO THE COOLER THE DAY OF THE SHIPMENT?	❒	❒	
HAS THE COOLER BEEN FILLED WITH ADDITIONAL CUSHIONING MATERIAL?	❒	❒	
HAS THE COC BEEN PLACE IN A ZIPLOCK BAG AND TAPED TO THE INSIDE OF THE LID OF THE COOLER?	❒	❒	
HAVE CUSTODY SEALS BEEN PLACED ONTO THE LID?	❒	❒	
HAS THE COOLER BEEN LABELED "THIS SIDE UP"?	❒	❒	
IF REQUIRED, HAS THE COOLER BEEN LABELED WITH THE DOT PROPER SHIPPING NAME, UN NUMBER AND LABEL?	❒	❒	
HAS THE LABORATORY PERFORMING THE ANALYSES BEEN NOTIFIED OF THE SHIPMENT OF SAMPLES?	❒	❒	

PROBLEMS/RESOLUTIONS: _____

_____

_____

PREPARED BY: _____ SIGNATURE _____

1. PURPOSE

This procedure is intended to provide minimal guidelines for the decontamination of contact sampling equipment. Contact sampling equipment is equipment that comes in direct contact with the sample or the portion of a sample that will undergo chemical analyses or physical testing.

2. SCOPE

This procedure applies to all instances where non-disposable direct contact sampling equipment is utilized for sample collection and no project-specific procedure is in place. This procedure is not intended to address decontamination of peristaltic or other sampling pumps and tubing. The steps outlined in this procedure must be executed between each distinct sample data point.

3. REFERENCES

- U.S. Environmental Protection Agency, Region 4, 2001, *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual*, 980 College Station Road, Athens, Georgia. November.
- US Army Corp of Engineers, Washington, D.C., 2001, Requirements for the Preparation of Sampling and Analysis Plans (EM-200-1-3), February.

4. DEFINITIONS

- **Soap**—A standard brand of phosphate-free laboratory detergent, such as Liquinox®.
- **Organic Desorbing Agent**—A solvent used for removing organic compounds. The specific solvent would depend upon the type of organic compound to be removed. See Attachment 1 for recommendations.
- **Inorganic Desorbing Agent**—An acid solution for use in removing trace metal compounds. The specific acid solution would depend upon the type of inorganic compound to be removed. See Attachment 1 for recommendations.
- **Tap water**—Water obtained from any municipal water treatment system. An untreated potable water supply can be used as a substitute for tap water if the water does not contain the constituents of concern.
- **Distilled Water**—Water that has been purified via distillation. Distilled water can be purchased in most stores and is acceptable as a final rinse in non-trace analytical decontamination processes. Examples would include disposal profiling, HazCat, and other gross screening applications.
- **Analyte-free water**—Water that has been treated by passing through a standard deionizing resin column, and for organics either distillation or activated carbon units. At a minimum, the finished water should contain no detectable heavy metals or other inorganic compounds, and/or no detectable organic compounds (i.e., at or above analytical detection limits). Type I and Type II Reagent Grade Water meet this definition as does most laboratory-supplied blank water.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

Wear appropriate eye protection including safety goggles when working with corrosive liquids, especially when diluting concentrated materials to create low-percentage solutions and follow all project Health and Safety requirements. Decontamination wastes are to be recovered and handled as impacted project waste materials and must be disposed of in accordance with regulatory requirements.

A decontamination area should be established. Implements can either be immersed in a 5-gallon bucket containing each solution/rinse or the solutions can be contained in hand-held units made of an inert and compatible material; such as a Teflon™ wash bottle. The analyte-free water needs to be placed in a container that will be free of any compounds of concern.

Consult Attachment 1 for the decontamination solutions/solvents appropriate to the task. The minimum steps for decontamination are as follows:

1. Remove particulate matter and other surface debris by brushing and/or dipping in the soap solution.
2. Rinse thoroughly with tap water.
3. If necessary, rinse with other applicable solutions/solvents. If hexane is used, be sure to follow it with isopropyl alcohol to allow for the final water rinses to properly mix and contact the surface.
4. Final rinse three times to make sure all residual solutions/solvents are removed.
5. Place decontaminated equipment on a clean surface appropriate for the compounds of concern and allow to air dry.

7. ATTACHMENTS

- Attachment 1, Recommended Decontamination Procedures.

8. FORMS

None

9. RECORDS

None

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 06/05/2003	Initial issue	N/A
01 09/08/2006	Updated template and updated numbering of procedure, Sections 1 and 2 minor edits, added definition for Distilled Water, Section 6- extensive content changes	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management Framework	Scott Logan

Attachment 1
Recommended Decontamination Procedures

Compound	Detergent Wash	Tap Water	Inorganic Desorbing Agent	Tap Water	Organic Desorbing Agent1	Final Water Rinse4	Air Dry
Organic Constituents							
Volatile Organic Compounds	✓	✓			Methanol Purge & Trap grade	✓	✓
Base Neutrals/Acid Extractables/PCBs/Pesticides	✓	✓			Hexane followed by Isopropyl Alcohol	✓	✓
Organic Bases[2]	✓	✓	1% nitric acid	✓	Isopropyl Alcohol	✓	✓
Organic Acids[3]	✓	✓	1% nitric acid		Isopropyl Alcohol	✓	✓
Inorganic Constituents							
Trace Metals and Radio Isotopes	✓	✓	10% Nitric acid -Trace metals grade	✓		✓	✓
Cations/Anions	✓	✓				✓	✓
Acidic Compounds	✓	✓				✓	✓
Basic Compounds (caustic)	✓	✓	1% nitric acid	✓		✓	✓

1 – All organic solvents must be Pesticide Grade or better. The selection of appropriate solvent rinses should first consider if a *known or suspected* contaminant requires removal from sampling equipment. Secondly, identify whether the subsequent analytical protocol would be impacted by the proposed solvent or an impurity thereof (e.g., residual acetone present in isopropyl alcohol would be measured with certain volatile organics analysis).

2 - Organic bases include amines, hydrazines.

3 - Organic acids include phenols, thiols, nitro and sulfonic compounds.

4- Use a grade of water appropriate to the application. For trace level analysis this must be Analyte Free Water. For non-trace applications store-bought distilled water is sufficient

Adapted from: Appendix E, Requirements for the Preparation of Sampling and Analysis Plans (EM-200-1-3), February 2001. US Army Corp of Engineers, Washington, D.C.

1. PURPOSE

The purpose of this procedure is to establish the means by which all subcontracted environmental analytical data will be reviewed for completeness and usability based upon comparison to the project action/decision levels and Data Quality Objectives before use in the intended decision-making processes.

2. SCOPE

This procedure applies to all subcontracted analytical data including faxed or e-mailed preliminary reports.

By way of its requirements, this procedure prohibits verbal communication of analytical results and establishes minimum deliverable standards that must be provided for all subcontracted analytical data reports–including faxed or e-mailed preliminary reports. These minimum standards include the following:

- Sample Results
- Chain of Custody – unless already available to the reviewer
- Sample Receipt Documentation – unless already available to the reviewer
- QC Summary – Laboratory Control Blank, Laboratory Control Spike, Matrix Spike, Matrix Spike Duplicate, Post-digest Spike
- Surrogate Summary – (if applicable)
- Hold-time Compliance Summary – or signed certification that all requirements were met
- Initial and Continuing Calibration Information – or signed certification that it meets prescribed requirements
- GC/MS Tuning Information – (if applicable) or signed certification that it meets prescribed requirements

This procedure should be performed only by or under the oversight of properly qualified individuals. Oversight may be accomplished through provision of a project-specific and well-defined checklist, training in its use, regular QA checks, and real-time availability for issue resolution.

3. REFERENCES

- U.S. Environmental Protection Agency, *National Functional Guidelines for Inorganic Data Review*, EPA 540/R-94-013.
- U.S. Environmental Protection Agency, *National Functional Guidelines for Organic Data Review*, EPA 540/R-94-012.
- U.S. Department of Defense, 2002, Department of Defense Quality Systems Manual for Environmental Laboratories, Final, June.
- U.S. Army Corps of Engineers, Requirements for the Preparation of Sampling and Analysis Plans, EM-200-1-3.

4. DEFINITIONS

- **Data Usability Review (DUR)**—The cursory review of an analytical data package for completeness and compliance with the ordered analysis, specified quality, and method/project-specific protocols before the data is used as input to a particular project decision-making process. The DUR process identifies any potential data quality issues and informs the data users of the effect on the data usability.

- **Data Quality Objectives**—The empirical statements and quantitative measures necessary for a given set of measurements to be usable in the planned decision.

- **Data Quality Indicators**—Field and laboratory measures for which compliance with specified requirements or limits can be construed to support attainment of the Data Quality Objectives in a given data set.

- **Analytical Data Package**—The manner in which analytical results are provided from subcontractor laboratories. Analytical Data Packages can be received via fax, e-mail, or postal mail.

- **QC Summary**—A summary table of laboratory QC sample results.

- **Laboratory Control Blank (LCB)**—Reagent Water or Clean Solid Matrix analyzed in the same manner as a sample to determine the Target Analyte concentration contribution due to contamination in the entire analytical system.

- **Laboratory Control Spike (LCS)**—Reagent Water or Clean Solid Matrix spiked with a known concentration of target analytes and analyzed as a sample to determine the method accuracy of the analytical system.

- **Matrix Spike**—A sample spiked with a known concentration of target analyte and analyzed along with the rest of the analytical batch. The percent recovery of the target analytes is used to determine the effect on accuracy due to the sample matrix.

- **Matrix Spike Duplicate**—A duplicate of the Matrix Spike used to determine the analytical precision, expressed as Relative Percent Difference (RPD) of the analytical system.

- **Surrogate Compound**—In several organic methods, a compound similar in structure and chemical behavior to the target analytes, which is added to each Sample and QC Sample at a known concentration before the analysis begins. The surrogate recovery is used to approximate the recovery of the target compounds based upon the behavior of chemically similar analytes.

- **Post-digest Spike**—In metals analyses, used to determine the possibility of chemical interferences and digestion deficiencies. If the normal QC results are unacceptable, a known concentration of the target analyte is added to the sample digestate. The recovery is then used to determine if reanalysis or data qualification is warranted.

- **QC Acceptance Range**—The limits that define QC results demonstrating compliant accuracy and precision.

- **Qualified Person**—An individual capable through knowledge, education, formal training, and/or experience in the establishment and verification of analytical Data Quality Objectives. The Qualified Person is usually a chemist or environmental professional with several years of environmental analytical experience.

- **Trip Blank**—In VOC analysis, a container of Reagent Grade Water that is included in the sample cooler and analyzed by the laboratory to determine if cross-contamination may have occurred in shipping.
- **Ambient or Field Blank**—Reagent Grade Water containerized during sample collection activities and analyzed at the laboratory. The results are used to determine if sample results may be biased by site environmental factors.
- **Equipment Blank**—Final rinseate collected during sample equipment decontamination and analyzed by the laboratory. The results indicate the effectiveness of the decontamination procedure.
- **Field Duplicate**—An additional sample aliquot or, in some cases, a collocated sample that is collected and analyzed. The results are compared with the original samples as an indication of the overall precision of the entire sampling and analytical process.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that the activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 First-Level Review of the Data Package

Verify that the package contains all of the required elements listed in Section 2. If any items are missing, contact the laboratory immediately and correct the situation.

Compare the reported results to the Chain of Custody request, and verify that all expected samples and analyses results were reported. If results are missing, contact the laboratory and correct the situation. If the “missing” data is not available yet, perform partial review of the data provided and hold the package for follow-up once the non-reported results are provided.

6.2 Second-Level Review

Consult the project Chemical Quality Plan (SAP, QAPP, etc.) for information concerning sample types and analysis requirements.

Compare the reported analytes, methods, and detection limits to those in the project plan for the specific analyses. Be sure to account for indicated and reasonable increased reporting limits due to dilutions or sample effects. Address any discrepancies with the laboratory directly.

Compare the results to project action-levels, and circle or otherwise mark all results above the limits.

6.3 QC Level Review

Consult the project Data Usability Review Checklists and/or the project Chemical Quality Plan and evaluate all provided QC results against project acceptance limits.

Mark or flag any results that are outside of the project limits and note on the applicable checklist (if using one).

Also evaluate any Field QC results such as Duplicates and Trip Blanks against requirements and note any issues.

6.4 Usability Review

If all QC results for all samples are within the acceptance ranges, complete the appropriate section of the checklist and then date and sign the completed checklist.

If all QC is acceptable and you are not using a checklist, you must indicate data usability directly on the data package itself or on a separate cover sheet. To do this, date and initial the QC Summary pages and write "QC acceptable data OK for use" on the cover sheet or QC Summary page.

If any QC is non-compliant, review its impact to use as project data by referencing the QC Results Impact Table attached to this SOP and consult with the Qualified Person to determine final acceptability. Note on the Data Report itself or checklist all discrepancies and the reasons for data acceptance, qualification, or rejection. If a Qualified Person has made the decision, this should also be noted.

If any of the data is determined to be unusable, immediately notify the Project Manager and project site personnel.

6.5 Reporting of Usability Review Results

Project personnel must be provided either a spreadsheet summary of the results with an attached, signed and dated Statement of Usability, or the complete Data Package with the project-specific Data Usability Review documentation. At **no time** are results to be communicated verbally.

7. ATTACHMENTS

- Attachment 1, Project QC Impact Table

8. FORMS

None

9. RECORDS

- Data Usability Results

10. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
00	Initial issue.	N/A

Revision Level Revision Date	Revision Description	Responsible Manager
06/05/2003		
01 09/08/2006	Updated template and numbering of procedure	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework	Scott Logan

Attachment 1
Project QC Impact Table

QC Data Discrepancy	Result Non-detect	Result >10% Below Action-level	Result Within 10% of or Above Action-level	Result Greater than 10% Above Action-level
DISPOSAL				
Trip Blank Contaminated	No effect	No effect	No effect	No effect
LCB Contaminated	No effect on data	No effect on data	No effect unless contamination is >10% of action-level→reject	No effect unless contamination is =/> the difference between result and action-level
LCS Low Recovery	If MS/MSD are acceptable or Surrogates are acceptable and the RL is at most 20% of action-level→Data accepted	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted Otherwise, flag and qualify that results may in fact be greater than action-level	If MS/MSD are acceptable or Surrogates are acceptable and LCS is within 10% of acceptance limit and result is above action-level→Data accepted Otherwise, flag and qualify result as suspected to be above action-level	No effect on data
LCS High Recovery	No effect on data	No effect on data	If MS/MSD are acceptable or Surrogates are acceptable evaluate potential bias in QC and accept data	No effect on data
Matrix Spike Low %R	If MSD and LCS acceptable and Surrogates or Post-spike within range Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range Data is accepted with precision qualifier	No effect on data	No effect on data
Matrix Spike High %R	No effect on data	No effect on data	No effect on data	No effect on data
MS/MSD RPD High	No effect on data	No effect on data	No effect on data	No effect on data
Surrogate %R Low	If surrogate %R values are at least 70% of acceptance limit, Data is acceptable	If surrogate %R values are at least 70% of acceptance limit, Data is acceptable	No effect on data	No effect on data

QC Data Discrepancy	Result Non-detect	Result >10% Below Action-level	Result Within 10% of or Above Action-level	Result Greater than 10% Above Action-level
Surrogate %R High	No effect on data	No effect on data	If surrogate %R values are within 30% of acceptance limit→Data is acceptable	No effect on data
REMEDIATION or TREATMENT MONITORING				
Trip Blank Contaminated	No effect	No effect	If TB is greater than 10% of action-level or result→reject data	No effect
Duplicate Precision outside limits	No effect unless Duplicate is either above or within 50% of action-level - in this case qualify sample data and report with Duplicate result as "highest probable value"	No effect unless Duplicate is either above or within 30% of action-level - in this case qualify result as "assumed above action-level"	If Duplicate is either above or within 20% of action-level→qualify result as "assumed above action-level"	No effect-report result even if Duplicate is below action-level
LCB Contaminated	No effect on data	No effect on data	If LCB is greater than 10% of action-level or sample result→Data is unacceptable	No effect on data
LCS Low Recovery	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted	No effect on data
LCS High Recovery	No effect on data	No effect on data	If MS/MSD are acceptable or Surrogates are acceptable evaluate for bias→Data accepted	No effect on data
Matrix Spike Low %R	If %R>50 and LCS acceptable-Data accepted	If %R>50 and LCS acceptable-Data accepted	If %R>50 LCS acceptable→Data accepted (evaluate potential low bias in results below action-level)	No effect
Matrix Spike High %R	No effect on data	No effect on data	If MSD and LCS acceptable and Surrogates or Post-spike within range→Data is accepted with precision qualifier	No effect on data

QC Data Discrepancy	Result Non-detect	Result >10% Below Action-level	Result Within 10% of or Above Action-level	Result Greater than 10% Above Action-level
MS/MSD RPD High	No effect on data unless perceived native concentration in MS or MSD result would be above action-level. In this case, reject data as highly suspect and advise review of sampling and lab sub-sampling procedures	No effect on data unless perceived MS or MSD native concentration would be above action-level. In this case, qualify results as potentially above action-level	If the perceived native result of either the MS or MSD is greater than 110% of action-level→qualify data as being above action-level	No effect on data
Surrogate %R Low	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are at least 80% of acceptance limits, Data is acceptable	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are at least 80% of acceptance limits, Data is acceptable	No effect on data	No effect on data
Surrogate %R High	No effect on data	No effect on data	If Surrogate %R is greater than 120% of acceptance limit, Data is unacceptable	No effect on data
VERIFICATION or CLOSURE ANALYSIS				
LCB Contaminated	No effect on data Comment LCB contamination	No effect on data Comment LCB contamination	If LCB is greater than 10% of action-level or sample result, Data is unacceptable	If LCB is greater than 10% of action-level or sample result, Data is unacceptable
LCS Low Recovery	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted
LCS High Recovery	No effect on data	No effect on data	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted (evaluate potential bias in reported result)	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted
Matrix Spike Low %R	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier

QC Data Discrepancy	Result Non-detect	Result >10% Below Action-level	Result Within 10% of or Above Action-level	Result Greater than 10% Above Action-level
Matrix Spike High %R	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier
MS/MSD RPD High	No effect on data	If sample result is greater then 90% of action-level, Data is unacceptable	If RPD is greater than 110% of acceptance limit, Data is unacceptable	If RPD is greater than 110% of acceptance limit, Data is unacceptable
Surrogate %R Low	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are at least 80% of acceptance limits, Data is acceptable	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are at least 80% of acceptance limits, Data is acceptable	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are at least 80% of acceptance limits, Data is acceptable	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are at least 80% of acceptance limits, Data is acceptable
Surrogate %R High	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are within 20% of acceptance limits, Data is acceptable	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are within 20% of acceptance limits and other QC is within acceptance limits, Data is acceptable	If any Surrogate %R is greater than 110% of acceptance limit, Data is unacceptable	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are within 20% of acceptance limits, Data is acceptable

1. PURPOSE

The purpose of this procedure is to provide the methods and procedures for measurement of groundwater well water levels and for conducting LNAPL measurements. Well water levels can either be determined as part of the well purging/sampling effort or be independently determined to provide information on site hydrology.

2. SCOPE

This procedure is applicable to all Shaw E & I projects where groundwater level and/or LNAPL measurements are taken.

3. REFERENCES

- American Society of Testing and Materials, D4750-87 (Reapproved 2001), *Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well)*, West Conshohocken, PA.
- U.S. Department of the Interior, 1977 (updated 1984), *National Handbook of Recommended Methods for Water-Data Acquisition*, Chapter 2, Reston, VA.

4. DEFINITIONS

- **Measuring Tape**—Steel or plastic tape with graduations to 0.01 feet. The tape shall not stretch more than 0.05 feet under normal use.
- **Electronic Measuring Device**—Commercial probe and cable designed to register a signal when the probe contacts water. The cable must have graduations to 0.01 feet.
- **Oil/water Interface Probe**- a specialized electronic measuring device that detects organic liquids. It is used to determine the interface and physical extent of any oil within the well.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

Two techniques are discussed below: the measuring-tape method and the electronic method.

6.1 Equipment

The following equipment should be used when measuring groundwater levels:

- Decontaminated, weighted tape with graduations to 0.01 feet. The weight should be sufficient to ensure plumbness of the tape, but slender enough so as not to raise the water level significantly when submerged in the water.
- Decontaminated, commercial electronic water-level measuring device.
- Engineer's rule, graduated to 0.01 feet.
- Oil/water interface probe and meter.

6.2 Weighted Steel Tape

The following procedure should be used when measuring groundwater levels with a measuring tape:

1. Unlock the well cover and remove the cap.
2. Locate the reference point on the riser pipe.
3. Don a pair of clean gloves.
4. Slowly lower the weighted tape down the well until the bottom is reached, indicated by a bump and sudden slack in the line.
5. Straighten the tape out, removing the slack, and measure the distance at the reference point.
6. Record the reading at the reference point as Depth to Bottom (DTB).
7. Withdraw the tape from the well and record the reading at the wet/dry interface as Depth to Water (DTW).
8. The difference between the two measurements is the depth of the water column (DWC).
9. Dry and decontaminate the wetted portion of the tape.

6.3 Electronic Measurement

The following procedure should be used when measuring groundwater levels with an electronic water-level measuring device:

1. Check for proper instrument response by inserting the probe in water. Fix or replace the instrument as needed.
2. Unlock the well cover and remove the cap.
3. Locate the reference point on the riser pipe.
4. Don a pair of clean gloves.
5. Slowly lower the probe down the well until the signal indicates that the water has been contacted.

6. Record the reading at the reference point as DTW.
7. Withdraw the probe and repeat steps 5 & 6. Duplicate measurements should agree within 0.02 feet. If not, continue with measurements until 0.02 feet precision is achieved.
8. Lower the probe until the bottom of the well is reached, as indicated by slack in the line.
9. Pull slightly to remove the slack, measure at the reference point, and record as DTB.
10. Determine the water column length as (DTB-DTW) and record as DWC.
11. Remove the probe from the well and decontaminate it.

6.4 Light Non-Aqueous Phase Liquids

Oil or other light non-aqueous phase liquids (LNAPL) may be floating on the water in selected wells. If so, measure the LNAPL level and the water level using an oil/water interface probe as follows:

1. Check for proper instrument response by inserting the probe in water. Instruments typically indicate LNAPL with a steady indicator light and tone, while water is indicated by an intermittent light and tone.
2. Unlock the well cover and remove the cap.
3. Locate the reference point on the riser pipe.
4. Don a pair of clean gloves.
5. Slowly lower the oil/water interface probe down the well until the signal indicates that LNAPL has been contacted (typically a steady indicator light and tone).
6. Record the reading at the reference point as DTNAPL.
7. Continue lowering the probe until the signal indicates that water has been contacted (typically an intermittent light and tone).
8. Record the reading at the reference point as DTW.
9. Determine the depth of LNAPL as (DTW-DTNAPL) and record it.
10. Withdraw the probe and repeat steps 5 & 6. Duplicate measurements should agree within 0.02 feet. If not, continue with measurements until 0.02 feet precision is achieved.
11. Lower the probe until the bottom of the well is reached, as indicated by slack in the line.
12. Pull slightly to remove the slack, measure at the reference point, and record as DTB.
13. Determine the water column length as (DTB-DTW) and record as DWC.
14. Remove the probe from the well and decontaminate it.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

- Measurements recorded in Field Logbook or Field Logsheet

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 08/18/2003	Initial Issue.	N/A
01 9/11/2006	Updated template and numbering of procedure, minor edit to Section 2-Scope, added definition of Oil/Water Interface Probe.	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework.	Scott Logan

1. PURPOSE

The purpose of this procedure is to provide the methods and techniques to be utilized when sampling aqueous liquids using bailer methods. This procedure does not apply to the use of depth-integrated modified bailer systems such as the Kemmerer Sampler. Bailers should not be utilized when sampling for trace levels of VOCs in wells containing high solids loads or wells that have been purged using micro techniques.

2. SCOPE

This procedure is applicable to all Shaw E & I projects where samples will be collected using a bailer. These may include groundwater wells, water treatment pools, frac tanks, and other containers.

It is not applicable to direct push groundwater sampling. See Procedure EID-GS-009 for suggested direct push groundwater sampling methods.

3. REFERENCES

- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, Appendix C, Section C.2, EM200-1-3, Washington, D.C.
- American Society of Testing and Materials, D6634-01, *Standard Guide for Selection of Purging and Sampling Devices for Ground-Water Monitoring Wells*, West Conshohocken, PA.
- American Society of Testing and Materials, D4448-01, *Standard Guide for Sampling Ground-Water Monitoring Wells*, West Conshohocken, PA.

4. DEFINITIONS

- **Bailer**—A device used to collect aqueous liquid samples typically consisting of a long tube with a check valve system attached to a rope or cable. The bailer is lowered into the liquid, and once the desired depth is reached, the check valve is set by causing an upward motion. Bailers are constructed of stainless steel, polyethylene plastic, or Teflon™. Those made of polyethylene and Teflon™ can be considered disposable and utilized for one-time use.
- **Single check valve bailer**—The most commonly used type of bailer; a tubular bailer with a bottom check valve that allows water to enter the bailer while it is lowered. The weight of the water in the bailer closes the check valve upon retrieval.
- **Top-filling bailer**—A tubular bailer that is only open on the top. The bailer is lowered beneath the water surface and water enters the top of the bailer. This type of bailer should **not** be used for environmental sampling. However, it is a very effective well purging device.
- **VOC sampling device/attachment**—A detachable spigot usually constructed of polyethylene or Teflon™ that can be attached to the bottom of a bailer to regulate the flow while emptying the device, preventing agitation of the liquid as it exits.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure and utilizing materials of a construction specified in the project plans or applicable to the contaminants of concern and other aspects of the sampling effort. These may include well diameter, well construction materials, depth to water, and the presence of DNAPL or LNAPL contaminants. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager or designee is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Equipment

The following equipment should be used for sampling aqueous liquids using bailer methods:

- Dedicated bailer; construction depending upon contaminants of concern and intended data use per the project plan. Disposable bailers should be utilized for one sample location only.
- Dedicated polyethylene/Teflon™-coated string or Teflon™-coated steel cable for lowering and raising the bailer.
- Tripod with mechanical winch for lowering and raising the bailer (typically only for deep or large-diameter wells).
- Plastic sheeting.

6.2 Sampling

The following procedure should be used when sampling aqueous liquids using bailer methods:

1. Don a pair of clean gloves.
2. Securely attach the required amount of string or cable to the bailer.
3. Spread a new piece of plastic sheeting around the well so as to keep the bailer rope from contacting the ground. This step is not necessary if sampling treatment pools or storage tanks.
4. If required, unlock the well cover and remove the cap.
5. If sampling a well, measure the static water level and total well depth as described in Procedure EID-FS-108.

6. Purge the well as detailed in Procedure EID-FS-110 using a separate bailer or other device. **Do not purge and sample with the same bailer.** The project planning documents should specify a well purging endpoint, which may include either of the following:
   - A selected number of well volumes
   - Water property stabilization as indicated by pH, conductivity, turbidity, or temperature measurements, etc.
7. Collect the sample immediately after purging, if applicable, by slowly lowering the bailer to the desired sampling depth and stopping briefly.
8. Set the check valve by pulling upward on the string/cable and then slowly raise the bailer to the surface.
9. Wipe the bailer body with a paper towel or tissue to prevent liquid on the outside from entering the sample containers.
10. If using one, attach the VOC device to the bottom of the bailer.
11. Transfer the groundwater sample immediately to the sample bottles.
    - Fill VOA vials first by opening the VOC device spigot and allowing the liquid to slowly fill the container without agitation and to a meniscus slightly above the top of the vial.
    - Cap and check all VOA vials for entrained air by slowly tipping and observing for bubbles. If any are present, discard the sample and collect again as above.
    - If not using a VOC attachment, the liquid can be collected by pushing up on the check valve or pouring from the top of the bailer.
12. Continue lowering and retrieving the bailer as needed to fill all required sample bottles.
13. Add preservatives to the samples as needed, and place the sample bottles on ice.
14. Note that most sample bottles come with preservatives already added. If such is the case, do not overfill the bottles.
15. Replace the well cap, if required, and lock the cover.
16. Record the sampling information.
17. Dispose of or decontaminate the bailer and string/rope as required in the project plan.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

- Measurements recorded in Field Logbook or Field Logsheet
- Sampling information recorded in Field Logbook or Field Logsheet

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 08/17/2003	Initial issue.	N/A
01 09/11/2006	Updated template and numbering of procedure.	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework.	Scott Logan

1. PURPOSE

This procedure is intended to provide the methods to be used for preparing groundwater wells for sampling. Preparation includes accessing the well, screening for VOCs (if required), measuring depth and water column height, determining the well volume, and purging the stagnant groundwater from the monitoring well. This procedure presents methods for purging using both bailer and pump techniques. This procedure does not address low-flow or micro-purging, which is covered in Procedure No. EID-FS-111.

2. SCOPE

This procedure is applicable to all Shaw E & I projects where groundwater samples will be collected from a monitoring well and where no project/program-specific procedure is in place. Unless specifically directed in project/program plans, well purging will be considered complete when 3 to 5 well volumes have been removed from the well and/or the well water quality parameters (pH, specific conductivity, temperature, dissolved oxygen) collected during purging have stabilized for three consecutive readings.

3. REFERENCES

- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, Appendix C, Section C.2, EM200-1-3, Washington, D.C.
- American Society for Testing and Materials, D6634-01, *Standard Guide for Selection of Purging and Sampling Devices for Ground-Water Monitoring Wells*, West Conshohocken, PA.
- American Society for Testing and Materials, D4448-01, *Standard Guide for Sampling Ground-Water Monitoring Wells*, West Conshohocken, PA.

4. DEFINITIONS

- **Bailer**—A device used to collect water typically consisting of a long tube with a check valve system attached to a rope or cable. The bailer is lowered into the water, and once the desired depth is reached, the check valve is set by causing an upward motion on the bailer. Bailers are constructed of stainless steel, polyethylene plastic, or Teflon™. Bailers made of polyethylene and Teflon™ may be considered disposable.
- **Pump**—An electric, compressed air, or inert gas driven device that raises liquids by means of pressure or suction. The types of pumps used for well purging should be chosen based on the well size and depth, the type of contaminants, and the specific factors affecting the overall performance of the sampling effort. Pump types that may be used include centrifugal, peristaltic, centrifugal submersible, gas displacement, and bladder pumps.
- **Well Purging**—The action of removing stagnant groundwater using mechanical means from a monitoring well. Well purging is performed prior to collecting groundwater samples from a well for purposes of attaining representative samples from the groundwater zone where the monitoring well is screened.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure and utilizing materials of a construction specified in the project plans or applicable to the contaminants of concern and other aspects of the sampling effort. These aspects may include well diameter, well construction materials, depth to water, and the presence of DNAPL or LNAPL contaminants. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Considerations

When planning for the well sampling task, the following variables should be reviewed to determine which well purging method to use:

- **Recharge capacity of each well:** The recharge capacity of a well will determine how fast the well should be purged. The purge rate should be the same as the recharge rate of the groundwater zone to prevent drawing the water table down and creating a cascading effect of groundwater entering the well along the well screen. If recharge rates are greater than 0.5 gallons per minute, bailers or pumps may be used to remove water from the well. Wells with slow recharge rates (<0.5 gpm) may need to be sampled using other methods such as low-flow or micro-purge techniques that do not agitate the well and therefore do not require full purging.

- **Well construction details, including well depth, diameter, screened interval, screen size, material of construction, and depth to water table:** The diameter and well depth will determine the size of the pump or bailer that will be required to remove water. The screen opening size will limit the rate at which water can be removed from the well due to high flow rates through the screen creating turbulent flow.

- **Groundwater quality, including type and concentration of chemical compounds present:** Choose a device that is constructed of materials compatible with the chemicals in the groundwater. Chemical contaminants can also dictate the rate at which the water can be removed from the well. Whenever possible, wells that contain VOCs should be purged using low-flow purging methods to prevent volatilization.

- **Presence of LNAPL or DNAPL:** If LNAPL or DNAPL are present, it is not recommended that the well be purged, due to the potential for creating a contaminated smear zone.

6.2 Equipment

The following equipment is recommended for use in conducting well purging:

- Bailers and line
- Pump and discharge hose/line
- Water level indicator
- Swabbing materials
- pH meter–if desired
- Specific conductance meter–if desired
- Temperature meter or gauge–if desired
- Nephelometer-turbidity–if desired
- Dissolved Oxygen meter–if desired
- Photoionization detector (PID)
- Drums or tanks to contain the purge water
- Field log book or sheets
- Calculator
- Plastic sheeting to spread around sampling area

6.3 Pre-Purging

To prevent cross contamination of other wells on site, upgradient and background wells should be sampled first. The procedure for pre-purging is as follows:

- Prepare the area surrounding the well by placing plastic sheeting on the ground surface to prevent potential cross-contamination of the purging and sampling implements.
- Place and secure the drum, tank, or suitable purge-water container in close proximity to the well for the collection and storage of purge water. *Purge water must be containerized and disposed of in the manner specified in the project/program plan or as the client directs.* ***Never*** *return purge water to the well.* If in doubt or where requirements are not specified, handle all purge water as waste and dispose of it accordingly.
- If screening for organics, measure and record the background organic vapors in the ambient air using a PID in accordance with manufacturer recommendations.
- Open the well casing, remove the well cap, and immediately measure and record the organic vapor levels from the head space within the well casing using a PID, if required, in accordance with manufacturer recommendations.
- Measure the depth to the static water level and the depth to the bottom of the well using the water level indicator in accordance with Procedure EI-FS108, *Water Level Measurements.*
- Calculate the volume of water within the well casing and screen as follows:

  $V = [\pi(di/2)^2 (TD-H)] (7.48)$

  Where:

  V = volume of groundwater in the casing, gallons

  di = inside diameter of casing, feet

TD = total well depth, feet

H = depth to the static water level, feet

Alternatively, for typical well casing diameters, the Volume can be determined as follows:

$V = CF \times (TD-H)$

Where:

V = volume of groundwater in casing, gallons

CF = Casing Factor, gallons per linear foot-from table below

Well Diameter (inches)	Casing Factor (CF) (gallons/foot)
2	0.16
4	0.65
6	1.47
8	2.61
10	4.08
12	5.88

6.4 Well Purging by Bailing

The well must not be bailed dry; water should be purged from the well at the same rate as it recharges to prevent loss of contaminants through degassing and to prevent agitation, which may release false levels of fine-grained particles or sediments to the groundwater zone. Water level measurements may be performed to verify that water levels remain constant during bailing.

The procedure for well purging by bailing is as follows:

- Attach new bailer line to a clean bailer or new disposable bailer. Attach the other end of the bailer line to the protective casing or your wrist allowing sufficient length to reach the well screen depth.
- Slowly lower the bailer down the well to avoid agitating the water and begin bailing groundwater by allowing water to pass through the bailer check valve into the bailer. Remove the filled bailer and empty the water into the purge-water container.
- If water quality parameters are not being used to determine stabilization, remove 5 well volumes from the well and then sample using a freshly decontaminated reusable or unused disposable bailer. **Do not sample with the same bailer used to purge.**
- If water quality parameters are being used to determine stabilization, two well volumes should be removed and the water quality parameters measured and recorded as the last bailer amount is removed from the well. This should be done by filling measurement containers with water directly from the bailer and taking readings.
- Continue purging until 3 to 5 well volumes have been removed from the well and three consecutive water quality parameter reading sets yield results within 10 percent of each other. For pH use +/- 0.3 units as the standard.

- Once stabilization has been achieved, collect the sample using a freshly decontaminated reusable or unused disposable bailer. **Do not sample with the same bailer used to purge.**

6.5 Well Purging Using a Pump

The well must not be pumped dry; water should be purged from the well at the same rate as it recharges to prevent loss of contaminants through degassing and to prevent agitation, which may release false levels of fine-grained particles or sediments to the groundwater zone. Water level measurements may be performed to verify that water levels remain constant during pumping.

The procedure for well purging using a pump is as follows:

- Review and understand the proper operating and maintenance instruction for each type of pump that is used prior to placing the pump in the well. Each pump type has specific procedures for operation.
- Assemble the pump and discharge line in accordance with manufacturer instructions. Ensure the pump discharge line is long enough so that the pump intake can be located within the well screen area and the discharge end can reach the purge water container.
- Lower the pump into the well until it is submerged and at the desired pumping depth.
- Start the pump and begin monitoring discharge rates and volume collected.
- If water quality parameters are not being used to determine stabilization, remove 5 well volumes from the well and then sample using the appropriate method.
- If water quality parameters are being used to determine stabilization, remove 2 well volumes and measure and record the water quality parameters at regular intervals as the purging continues. This can be accomplished either by using in-line direct-reading instruments or by collecting the pump discharge into appropriate measurement containers.
- Continue purging until 3 to 5 well volumes have been removed from the well and three consecutive water quality parameter reading sets yield results within 10 percent of each other. For pH use +/- 0.3 units as the standard.
- Once the stabilization has been achieved, collect the sample using a method applicable to the well and contaminants of concern.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

- Measurements recorded in Field Logbook or Field Logsheet
- Calculations recorded in Field Logbook or Field Logsheets

10. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
00	Initial issue.	N/A

Uncontrolled when printed: Verify latest version on ShawNet/Governance

Revision Level Revision Date	Revision Description	Responsible Manager
12/10/2003		
01 09/21/2006	Updated template and numbering of procedure, content was added to Section 1- Purpose	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework	Scott Logan

1. PURPOSE

This procedure is intended to provide general guidance and methods for using a field meter to measure water quality parameters from groundwater or surface water that is being purged, sampled, or monitored.

2. SCOPE

This procedure is applicable to all Shaw E & I projects where water quality monitoring is required using a water quality meter. The water quality meter may be a stand-alone meter or it may be a combined multi-probe unit used to measure temperature, pH, specific conductance, and/or other water quality parameters. The most common methods used for measuring water quality are instruments that measure in-situ parameters in one of the following two ways:

- Water is extracted from its source using a pump and measured in a flow-through cell or in some instances captured and then measured in individual aliquots. This method is preferred when monitoring wells are sampled for laboratory analysis of chemical parameters, and groundwater purging is required.
- The meter is submerged directly into the sample source, such as a monitoring well or surface water body, to collect in-situ monitoring parameters.

3. REFERENCES

- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans, Appendix C*, EM-200-1-3, Washington, D.C.
- American Society of Testing and Materials, *Standard Guide for Selection of Purging and Sampling Devices for Ground-Water Monitoring Wells*, D6634-01, West Conshohocken, PA.
- American Society of Testing and Materials, *Standard Guide for Sampling Ground-Water Monitoring Wells*, D4448-01, West Conshohocken, PA.

4. DEFINITIONS

- **Water Quality Meter**—A device used to measure specific field parameters indicative of water quality, such as temperature, pH, specific conductance, and/or other parameters. The meter may be stand-alone or it may be a combined multi-probe unit.
- **Pump**—An electric, compressed air, or inert gas-driven device that raises liquids by means of pressure or suction. The types of pumps that should be used for water quality monitoring should be chosen based on the well size and depth, the type of contaminants, and the specific factors affecting the overall performance of the sampling or monitoring effort. The types of pumps that may be used include centrifugal, peristaltic, centrifugal submersible, gas displacement, and bladder pumps.
- **pH**—The negative log of the hydrogen ion concentration (-log10 [H+]); a measure of the acidity or alkalinity of a solution, numerically equal to 7 for neutral solutions, increasing with increasing alkalinity and decreasing with increasing acidity. The scale is 0 to 14.
- **Turbidity**—A measure of overall water clarity determined by measuring the degree to which light traveling through a water column is scattered by the suspended organic (including algae)

and inorganic particles. Turbidity is commonly measured in Nephelometric Turbidity Units (NTU), but may also be measured in Jackson Turbidity Units (JTU).

- **Specific Conductance (SC)**—A measure of how well water can conduct an electrical current. Conductivity increases with increasing amount and mobility of ions such as chloride, nitrate, sulfate, phosphate, sodium, magnesium, calcium, and iron, and can be used as an indicator of water pollution. The unit of conductance is expressed as microsiemens (1/1,000,000 siemen) per centimeter, or µS/cm.
- **Oxidation-Reduction (Redox) Potential**—A measure in volts of the affinity of a substance for electrons compared with hydrogen. Liquids that are more strongly electronegative than hydrogen (i.e. capable of oxidizing) have positive redox potentials. Liquids less electronegative than hydrogen (i.e. capable of reducing) have negative redox potentials.
- **Dissolved Oxygen (DO)**—Refers to the amount of oxygen expressed as mg/L that is contained in particular water. The amount of oxygen that can be held by the water depends on the water temperature, salinity, purity, and pressure.
- **Salinity**—The amount of dissolved salts in water, generally expressed in parts per thousand (ppt).

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager or designee is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Equipment

The following equipment is recommended for use in performing water quality measurements:

- Water Quality Meter(s)
- Spare parts such as alkaline batteries (if used) and sensor probes
- Pump and discharge hose/line for use with a flow-through cell
- Paper towels or lint-free wipes
- De-ionized water
- Sample gloves

- Calibration solutions for all parameters being measured; within expiration dates
- Plastic sheeting
- Logbook or log sheets

6.2 General Instructions

- Ensure that the measuring range of the instrument encompasses the expected sample concentration or units.
- Before going to the field, locate all necessary field supplies such as deionized water, calibration solutions, decontamination supplies, and spare parts.
- Consult the instrument's operation manual as well as the project-specific sampling plan to verify that you have prepared the proper equipment and supplies to successfully complete the work.

6.3 Calibration

*Calibration **must** be performed **at least once per day** during operation. Calibrate the meter according to the instrument's operating manual. If sampling and monitoring is being performed for long periods of time, periodically check the instrument calibration using the operating manual's recommended frequency.*

In order to avoid limiting the field personnel to one particular model, only general calibration instructions are presented in this procedure.

- Locate a clean, protected area in which to set up and calibrate the instrument. Ensure that sufficient supplies of de-ionized water, clean paper towels, buffer solutions, and standard solutions are available.
- Inspect the meter and probes for damage. Some of the probes are very delicate or have a thin membrane installed over the probe. Be careful when handling the meter/probes so as not to damage them. If damaged, replace probes in accordance with the instrument's operating manual or obtain a different meter.
- Turn on the meter and allow it to "warm-up" for the manufacturer-specified time (usually 15 to 30 minutes). Check the battery power to determine if the meter has sufficient power to operate for the monitoring period. Replace the batteries, if necessary.
- Calibrate the meter according to the instrument's operating manual. In general, calibration is performed by immersing the probe(s) in aliquots of calibration standard solution(s) and following certain meter keystrokes to set the calibration for each parameter. *Do not immerse the probe into the stock container of the solution. Always transfer a small amount of the solution into a separate container to calibrate the probe(s).* If calibrating for multiple parameters using more than one solution, be sure to wipe off and rinse the probe with de-ionized water between solutions.
- Recheck each parameter after calibration by immersing the probe into the calibration solution and reading it like a sample reading. If the agreement is not within 25% of the solution's known concentration, repeat the calibration process with a new solution aliquot.
- Discard the used calibration solution aliquots when finished into an appropriate waste container.
- Record the calibration data in the field logbook or log sheet.

6.4 Operation of the Instrument

- If using a flow-through cell system, attach the extraction pump and lines in accordance with the pump and meter manufacturer's instructions. Allow the lines to fill and the probes to become immersed before switching the instrument to its measurement mode.
- If using a down-hole system, allow a few minutes for the probe to stabilize before taking a reading.
- Operate the meter in accordance with the instrument's operating manual.
- Collect the field parameter reading(s) per the project requirements, and record them in a field logbook or on log sheets.
- Decontaminate the meter before collecting data from the next sample source. For a flow-through system, flush the lines with three line volumes of de-ionized water or replace with new ones between samples.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

- Logbook or Logsheet

10. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
00 01/19/2004	Initial issue.	N/A
01 09/22/2006	Updated template and numbering of procedure.	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework.	Scott Logan

Appendix D

Field Forms

TEXTRON, INC.
FIELD SAMPLING DATA SHEET
WELL PURGE – WATER QUALITY MEASUREMENTS

Site Name: Textron, Wheatfield, NY
Project Number: 135428
Well Number: _____
Date: _____
Field Personnel: _____

Physical Condition of Well: _____
Well Diameter: _____
Air Monitoring Results: _____
Depth to Water: _____
Depth to Bottom: _____
Purge Volume: _____
Volume Removed: _____

*Volume Factors: (circle one)
1.25-inch well = 0.064 gal/ft
2-inch well = 0.163 gal/ft
4-inch well = 0.653 gal/ft

Purge Method: circle one

Stainless Steel Bailer	Dedicated Poly Tubing from Sampling Port	Whale Pump with ET Tubing	Polyethylene Bailer	Grundfos Submerisble Pump

Purge Water Disposal: _____

PARAMETERS	pH	Spec. Cond.	Temp.	Sample
Units	s.u.	ms/cm	^{o}C	Description

Initial Purge _____

Final Purge _____

Sampling Method: circle one

Stainless Steel Bailer	Dedicated Poly Tubing from Sampling Port	Whale Pump with ET Tubing	Polyethylene Bailer	Grundfos Submerisble Pump

Sample Number: _____
Sample Collection Date/Time: _____
Analysis Requested: _____

Notes: _____

Sampler Signature: _____

Shaw Environmental, Inc.
Monitoring Well Development Field Data Sheet

Project Name: Project Number:

Water Level Data

Date: ____________ Start Time: ___________ **Well ID:** ___________

Initial Total Casing Length__________________________ (feet)

Depth to Water (from top of casing)_________________ (feet)

a) Height of Water Column_________________________ (feet)

*Volume Factors:
2-inch well = 0.163 gal/ft
4-inch well = 0.653 gal/ft
6-inch well = 1.468 gal/ft

Well Volume ([a] x volume factor *) = ______ (feet) x ______ gallons/foot = _______ gallons

Development Data

Date: ____________ Time:______________ (start) ____________ (finish)

Method: ____
(Waterra, bailer, submersible pump, etc.)

Time							
Specific Conductivity							
pH							
Turbidity							
Temperature							
ORP							
DO							

Time							
Specific Conductivity							
pH							
Turbidity							
Temperature							
ORP							
DO							

Time							
Specific Conductivity							
pH							
Turbidity							
Temperature							
ORP							
DO							

Did well dry out? (If yes, how many times) Actual Volume Removed________ (gallons)

Personnel:____

COMMENTS:

PID Calibration Form

DATE

Name

UNIT TYPE

UNIT Number

Calibration Standard/Concentration	Cal Standard/ Reading	% difference

Well Inspection Form
Textron, Inc.
Wheatfield, New York

Well Designation: _____

Date of Inspection: _____ (month/day/year)

Time of Inspection: _____

Inspector's Name: _____

Item	Types of Problems	Status U	Status A	Comments	Action	Date
Well Condition	Flagging Visibility (if applicable)					
	Well Number Readable on Outer Casing					
	Integrity of Surface Seal/Apron					
	Integrity of Surface Casing					
	Corrosion					
	Inner Casing/Screen Integrity					
	Measuring Point Visibility					
	Total Depth					
	Siltation					
	Recharge Rate					
	Other					
Security	Security Cap in Place					
	Lock in Place					
	Lock Functional					
	Other					

Status: U - Unacceptable
A - Acceptable
NA - Not applicable

FIELD INSTRUMENT CALIBRATION LOG

Date: _____.

Project Name: _____. Project Number: _____.

Field Calibration by: _____. Instrument Source: _____.

Instrument Manufacturer: _____. Model Number: _____.

Probe Type	Time	Standard Concentration	Calibrated Reading	Remarks
pH Meter		4.00 s.u.		
		7.00 s.u.		
		10.00 s.u.		
		4.00 s.u.		
		7.00 s.u.		
		10.00 s.u.		
		4.00 s.u.		
		7.00 s.u.		
		10.00 s.u.		
Conductivity Meter		3,000 umhos/cm		
		5,000 umhos/cm		
		30,0000 umhos/cm		
		3,000 umhos/cm		
		5,000 umhos/cm		
		30,0000 umhos/cm		
		3,000 umhos/cm		
		5,000 umhos/cm		
		30,0000 umhos/cm		
Dissolved Oxygen Calibrate with Water-Saturated Air		mm Hg		
		mm Hg		
		mm Hg		
Turbidimeter		NTU		
		NTU		
		NTU		
ORP		150 MV		
		150 MV		
		150 MV		