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The Port Authority of New York and New Jersey

Site Specific Health and Safety Plan

HHMT – Port Ivory Facility

September 2006

40 Western Avenue, Staten Island, New York

HMM 219559

The Port Authority of New York and New Jersey

Revised Site Specific Health and Safety Plan

HHMT – Port Ivory Facility

November 2006

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HMM 219559

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1.0 INTRODUCTION

This Site Specific Health and Safety Plan (SSHP) establishes guidelines and requirements for protecting the safety of personnel during the implementation of all subsequent investigative and/or remedial actions at the Howland Hook Marine Terminal (HHMT)-Port Ivory Facility located at 40 Western Avenue, Staten Island, New York. The additional investigations and/or remedial actions will be performed as part of the overall redevelopment effort of the Port Authority of New York and New Jersey (Port Authority) to construct an intermodal Facility at the HHMT-Port Ivory Facility. The portion of the Port Authority's redevelopment effort that involves environmental investigation and remediation is subject to New York State Department of Environmental Conservation (NYSDEC) and New York State Department of Health (NYSDOH) oversight in accordance with the Voluntary Cleanup Program (VCP). The VCP requires that a SSHP and a Community Air Monitoring Plan (CAMP) be submitted prior to beginning work proposed in the Site Investigation Workplan (SIWP) or Remedial Action Work Plan (RAWP). This SSHP is being submitted to meet that requirement with respect to all subsequent workplans that propose investigative or remedial efforts at the HHMT-Port Ivory Facility; the required CAMP is included as Appendix A to this SSHP. No activity related to additional investigations and/or remedial actions will be initiated prior to the Port Authority's receipt of approval of this SSHP and the CAMP, included in Appendix A.

Investigative activities at the HHMT-Port Ivory Facility are anticipated to include the following: drilling soil borings; collecting soil samples; excavating test pits and trenches; installing temporary and permanent monitoring wells; collecting groundwater samples; and, collecting light, non-aqueous phase liquid (LNAPL) samples. Subsequent remedial activities at the HHMT-Port Ivory Facility are anticipated to include the following general components: excavation of removal areas/trenches; pumping of water and/or LNAPL out of the removal areas/ trenches; temporarily staging the water and LNAPL at the HHMT-Port Ivory Facility; installing permanent monitoring wells; collecting soil, water, and LNAPL samples; disposing of the water and/or LNAPL; stockpiling of excavated soils; disposal of impacted soils; and, site restoration. While Port Authority personnel may complete some of the proposed activities, the bulk of the proposed activities will be completed by environmental contractor(s) retained by the Port Authority for completion of intrusive activities associated with the site. Hatch Mott MacDonald (HMM), an environmental consultant retained by the Port Authority, will assist the Port Authority with oversight and reporting requirements associated with the proposed activities.

HMM and other Port Authority subcontractors are required to adopt this SSHP or provide the Port Authority with a more stringent SSHP (contractor's SSHP) that addresses all hazards identified in this SSHP. While the Port Authority has a policy that includes health and safety provisions for its personnel at the HHMT-Port Ivory Facility, subcontractors of the Port Authority are not specifically addressed by the Port Authority's policies. Therefore, if, based on the Port Authority's review, the contractor's SSHP is insufficient for mitigation of any hazard, the Port Authority may reject the contractor's SSHP. The adoption of this SSHP does not relieve any contractor and its subcontractors of any obligations to provide a safe working environment in accordance with all applicable federal, state and local requirements including, but not limited to, Occupational Safety and Health Administration (OSHA) Regulations 29 CFR 1910 and 1926. All personnel covered by this SSHP are required to read the SSHP, sign the Compliance Agreement included in Appendix B, and abide by the provisions of the SSHP. As noted above, the Port Authority will maintain separate health and safety protocols for their own personnel.

An SSHP prepared by Conti Enterprises, Inc. and dated February 19, 2002 (Conti SSHP) forms the basis for this SSHP. The Conti SSHP was written for the demolition and remediation work previously conducted at the HHMT-Port Ivory Facility, and identifies many physical and chemical hazards that may potentially be encountered during performance of the proposed activities. This SSHP was prepared by selecting the hazards that were identified in the Conti SSHP and that apply to the proposed activities, and by appending to the list of hazards in the Conti SSHP any hazards that may potentially be encountered during implementation of the proposed activities. In addition, the health and safety activities required by the Conti SSHP for mitigation of each listed hazard are included with only minimal changes. Because the Conti SSHP was approved by the Port Authority's Risk Management Group and the hazards and health and safety activities in the Conti SSHP were modified only slightly in this SSHP, this SSHP will not require review by the Port Authority's Risk Management Group. Please note, Appendix C includes the entire Conti SSHP for comparison purposes. In addition, a statement is made in Sections 3 and 5 through 8

regarding the degree to which the Conti SSHP has been modified or supplemented by additional information. Sections 1, 2, and 4 contain project-specific information, and most information provided in these sections is not derived from the Conti SSHP.

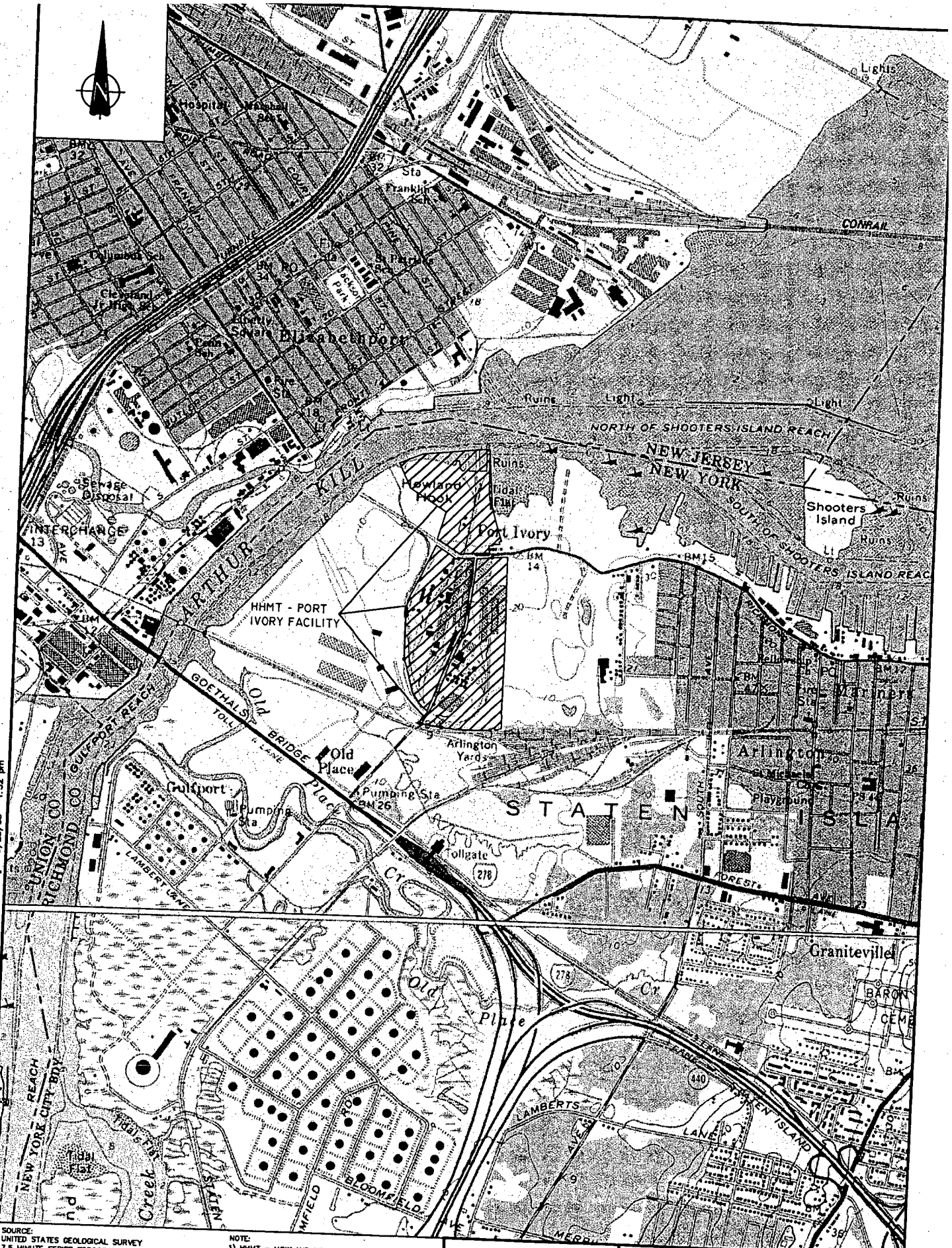
The health and safety guidelines and requirements presented herein are based on a review of available information and an evaluation of potential hazards. Because of the variety of possible work activities and site conditions which may be encountered, and the potential for substances to be present in soil or groundwater at concentrations above those previously detected, the procedures in this SSHP are considered the minimum procedures that should be followed by applicable entities. While the identification of additional procedures is the responsibility of the Site Safety and Health Officer (see below), any personnel at the site may suggest such procedures to the Port Authority and/or to the Site Safety and Health Officer. Before a new procedure is put in place, it shall be summarized in a addendum to this SSHP and will be approved by the Port Authority.

Site Background information is provided in Section 2. Section 3 lists key health and safety personnel and their responsibilities with regard to worker health and safety during implementation of the Project. Each component of work that is anticipated to be implemented during future investigative or remedial activities is described in more detail in Section 4, including a listing of the specific physical and chemical hazards associated with that work. Procedures and requirements that are not task-specific but are designed to reduce the health and safety hazards for all personnel working in, and visitors to, the exclusion zone are provided in Section 5. Procedures for mitigating the physical and chemical hazards that are identified for each task are identified in Section 6. Section 7 summarizes measures designed to protect public health and safety during the Project. Section 8 is an emergency response plan.

2.0 BACKGROUND AND SITE INFORMATION

As noted above, all environmental investigations and remedial efforts at the HHMT-Port Ivory Facility are being conducted under the auspices of the NYSDEC VCP. The HHMT-Port Ivory Facility is a 124.3-acre property that is located at 40 Western Avenue, Staten Island, New York that is currently being redeveloped by the Port Authority. As part of the overall site redevelopment, the Port Authority entered into the NYSDEC VCP in July 2004. The Port Authority's objective for entering into the VCP program with NYSDEC is to address the presence of contamination due to prior site activities unrelated to the Port Authority. Based on the Port Authority's schedule for redevelopment, the HHMT-Port Ivory Facility was partitioned into four Sites designated as Site 1, Site 2A/2B, Site 3 and Future Site 4/2C for the purpose of the VCP. With the exception of Future Site 4/2C, the Sites are subject to the VCP. Future Site 4/2C is anticipated to be included in the VCP in the near future. Because the activities that are anticipated at Future Site 4/2C are addressed herein, this SSHP will cover subsequent investigative and remedial work at all four sites. Figure 1 depicts the location of the HHMT-Port Ivory Facility including the individual boundaries of the four Sites.

On behalf of the Port Authority, HMM has performed environmental assessment and investigation activities to characterize site conditions and delineate historic fill material and contaminants in environmental media at the HHMT-Port Ivory Facility. HMM's environmental investigation efforts have included the performance of a Phase I Environmental Site Assessment with an additional file review (Phase I ESA), Site Investigation (SI), Remedial Investigation (RI), and Supplemental Remedial Investigation (SRI) at each of the Sites. Based on the results of these investigations, further investigative efforts are required at only a limited number of areas of concern (AOCs), all of which are associated with the presence of petroleum-based LNAPL and/or petroleum-impacted soil. In addition, remedial actions are warranted at locations where soil contains mobile LNAPL, concentrations of more than 500 mg/kg total poly-cyclic aromatic hydrocarbon (PAH) compounds, and/or other metals or compounds at concentrations significantly greater than those attributable to the former placement by Proctor and Gamble (P&G) of fill materials throughout the HHMT-Port Ivory Facility. Where required, remedial actions are anticipated to consist of the following components: the excavation of impacted soil; the pumping of groundwater and/or mobile LNAPL; temporary staging of the impacted soil, groundwater, and LNAPL; the collection of soil, groundwater, and LNAPL samples; and, the disposal of the impacted soil, groundwater, and LNAPL. These actions are described further in Section 4.0. Contact with impacted soil that remains in place will be controlled by engineering controls such as the construction of impervious surfaces and administrative



SOURCE:
UNITED STATES GEOLOGICAL SURVEY
7.5 MINUTE SERIES TOPOGRAPHIC QUADRANGLES
ELIZABETH AND ARTHUR KILL, NY–NJ
1967, PHOTOREVISED 1981

NOTE:
1) HHMT = HOWLAND HOOK MARINE TERMINAL

2000 0 2000 4000
SCALE IN FEET
1" = 2000'
CONTOUR INTERVAL = 10 FEET

Hatch Mott MacDonald
Certificate No. 24GA28075000

27 Bleeker Street
Millburn, New Jersey 07041

PORT AUTHORITY OF NY AND NJ
40 WESTERN AVENUE, STATEN ISLAND, NY

FIGURE 1
SITE LOCATION MAP
HHMT - PORT IVORY FACILITY

Designed	Drawn	Checked	Approved	Date

P:\232952mnd\Operable Unit Reports\Operable Unit 4\Figures\Figure 1.Site Location Plan 8-11-04.dwg 5/25/05 1:32 pm

controls such as site-wide environmental easements. Although construction of the impervious surfaces is considered to be part of the remedial action, this effort is not subject to this SSHP. The establishment of the administrative controls will not require any field activity, and is not a remedial activity subject to this SSHP. The protectiveness of these engineering and administrative controls will be monitored on an annual basis after the remedial actions have been completed; these post-remedial monitoring activities are addressed in this SSHP.

The presence of the LNAPL in AOCs located at Site 2B, Site 3, and Future Site 4/2C appears to be attributable to inactive pipelines believed to be situated within an easement previously owned by Tidewater Pipe Co., Ltd. and/or an easement formerly owned by Exxon Mobil and currently owned by Tosco. The easement information is based upon a drawing prepared by Anthony LoBianco, entitled "Map of Survey of Property in Borough of Staten Island, Richmond County, New York, N.Y.," and dated August 14, 1991 as amended September 23, 1991. The source for the LNAPL encountered at Site 1 is not currently known. No LNAPL remains at Site 2A and no AOC located at Site 2A is believed to warrant additional investigation.

Based on analytical data from environmental investigations previously completed at the Site, the presence of LNAPL and/or petroleum impacted soil has not significantly impacted soil or groundwater quality with respect to regulated substances. Soil and groundwater impacts have been detected at the HHMT-Port Ivory Facility, but these impacts are believed to be attributable to the former placement of fill at the HHMT-Port Ivory Facility by the previous owner/operator, P&G. The impacts that may potentially be encountered include those attributable to organic compounds and/or metals in the following contaminant classes that are adsorbed to soil, dissolved in groundwater, present in vapor or mist form in air, or components of the LNAPL: volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, polychlorinated biphenyls (PCBs), pesticides, and herbicides. In general, workers may be exposed to these contaminants via the following exposure pathways: inhalation, ingestion, or contact. As described in Section 4, personnel involved in certain components of future investigative or remedial activities may become exposed to the above-mentioned substances. The potential hazards associated with exposure to these substances, along with the procedures that should be followed to mitigate these potential hazards, are summarized in Section 6.2.

3.0 HEALTH AND SAFETY RESPONSIBILITIES OF KEY PERSONNEL

The following is a list of key personnel types and responsibilities relating to health and safety activities. The Port Authority personnel with the overall responsibility for the proposed activities can stop work at any time and/or require the replacement of any personnel covered by this SSHP who are not complying with this SSHP. Please note, the titles and responsibilities for each of the following employees are from the Conti SSHP, with the exceptions of the Air Monitoring personnel (added in this SSHP). The Conti SSHP included additional personnel that will not be utilized in this Project. Please also note, for most subsequent investigations and minor remedial actions (i.e., remedial actions that can be completed by the Port Authority and/or HMM without the assistance of additional contractors), many of the roles and responsibilities below may reside in one individual.

Health and Safety Manager (H&SM)

- Be responsible for the development, implementation, oversight and enforcement of the SSHP.
- Conduct initial site-specific training.
- Be present onsite during the first day of remedial activities at the startup of each new major phase.
- Visit the site as needed and at least once per month for the duration of activities, to audit the effectiveness of the SSHP.
- Be available for emergencies.
- Provide onsite consultation as needed to ensure that the SSHP is fully implemented.
- Coordinate any modifications to the SSHP with the Site Superintendent, the SSHO, and the Resident Engineer.
- Provide continued support for upgrading/downgrading of the level of personal protection.
- Be responsible for evaluating air monitoring data and recommending changes to engineering controls, work practices, and PPE.

Site Safety and Health Officer (SSHO)

Under the direction of the Safety and Health Manager, the SSHO shall be responsible for the implementation of this SSHP and for the daily coordination of safety activities with the Project Superintendent to ensure that the planned work objectives reflect adequate safety and health considerations. The SSHO will submit to the Resident Engineer the Certificates of Worker/Visitor Acknowledgements for site personnel prior to initial entry into a contamination reduction or exclusion zone. He will maintain a complete copy of this plan (and its supplements and addenda) at the site during all field activities and assure that all workers and visitors are familiar with it. He will perform site-specific training and briefing sessions for employee(s) prior to the start of field activities at the site and a briefing session each day before starting work. He will ensure the availability, proper use and maintenance of specified personal protective equipment, decontamination, and other safety and health equipment. He will maintain a high level of safety awareness among team members and communicate pertinent matters to them promptly. The Site Safety and Health Officer will:

- Assist and represent the Safety and Health Manager in on-site training and the day-to-day on-site implementation and enforcement of the accepted SSHP.
- Be assigned to the site on a full time basis for the duration of intrusive activities. The SSHO will have no duties other than Safety and Health related duties.
- Have the authority to ensure site compliance with specified safety and health requirements, Federal, state and OSHA regulations and all aspects of the SSHP. This includes, but is not limited to: activity hazard analyses, air monitoring; use of PPE, decontamination site control; standard operating procedures used to minimize hazards; safe use of engineering controls; the emergency response plan; confined space entry procedures; spill containment program; and preparation of records. This will be accomplished by performing a daily safety and health inspection and documenting results on the Daily Safety Inspection Log.
- Stop work activities if unacceptable health or safety conditions exist, and take necessary action to re-establish and maintain safe working conditions.
- Consult and coordinate any modifications to the SSHP with the Safety and Health Manager, and the Site Superintendent.
- Conduct accident investigations and prepare accident reports.
- Review results of daily quality control inspections and document safety and health findings in the Daily Safety Inspection Log.
- Coordinate with Site Management and the Safety and Health Manager, recommend corrective actions for identified deficiencies and oversee the corrective actions.

Air Monitoring Personnel

The Port Authority or SSHO will designate personnel for the monitoring of air quality in accordance with Section 6 of this SSHP. This individual/these individuals will have the following responsibilities:

- Monitor air quality in the breathing zone of the Exclusion Zone (EZ).
- Monitor air quality at the downwind and upwind perimeters of the EZ.
- Record all air quality measurements.
- Maintain all air quality measurement records at the jobsite.
- Know the action levels with respect to air quality.
- Alert the Site Safety and Health Officer if an action level has been exceeded.

4.0 ANTICIPATED FUTURE ACTIVITIES/COMPONENTS OF WORK

As previously stated, the Conti SSHP was prepared for a different project component of the overall HHMT-Port Ivory Site redevelopment. This Section relates specifically to anticipated investigative and remedial activities and therefore, has been prepared independently of the Conti SSHP. The goal of the proposed investigative activities is to confirm the presence or absence of a "hot spot" at any AOC that has not been fully characterized to date. The goal of the proposed remedial activities is to remove "hot spot" areas of contamination, prior to constructing engineering controls and establishing administrative controls. As indicated above, a "hot spot" consists of soil containing free (i.e., mobile) LNAPL, PAH compounds at a total concentration of more than 500 mg/kg, and/or other metals or compounds at concentrations significantly above those attributable to the prior placement (by P&G) of fill materials throughout the HHMT-Port Ivory Facility.

The following Subsections provide the following information regarding each of the proposed activities: methods to be followed, equipment to be used, and specific potential physical and chemical hazards associated with the activity. All work detailed below shall be performed in a safe and professional manner so that no existing structures that are scheduled to remain are damaged and so that the health and safety of construction workers and on-site personnel are protected. Because there is no residential neighborhood adjacent to the HHMT-Port Ivory Facility, it is not anticipated that the public will be exposed to vapors, except potentially to nuisance odors as they drive along Western Avenue and Richmond Terrace.

4.1 General Description of the Proposed Investigative and Remedial Actions

As noted above, the investigative activities that are anticipated to be performed at a limited number of AOCs at the HHMT-Port Ivory Facility are the following: drilling soil borings, collecting soil samples, excavating test pits and test trenches, installing temporary and permanent monitoring wells, collecting groundwater samples, and collecting LNAPL samples. Components of the remedial activities include the following: excavating removal areas/trenches, pumping groundwater and/or LNAPL from the trenches, stockpiling excavated soil, collecting soil samples, disposing impacted soil, temporarily storing the water and/or LNAPL, collecting water and/or LNAPL samples, disposing of the water and/or LNAPL, and restoring the site to its original conditions. In addition, following these remedial actions, engineering controls will be constructed, administrative controls will be established, and the protectiveness of these controls will be evaluated periodically thereafter. The construction of the engineering controls and the establishment of the administrative controls are not subject to the provisions of this SSHP. However, the groundwater monitoring activities that will be conducted periodically subsequent to the construction of the engineering controls and establishment of the administrative controls are subject to this SSHP. The groundwater monitoring activities are anticipated to include the following: monitoring well installation, measurement of the depth to groundwater, and collection of groundwater samples. Each of these activities is described below. Specifically, excavation, sampling, and well installation activities are anticipated to be completed during both investigative and remedial efforts, but there are no significant differences between the hazards associated with these activities during different phases of work. Therefore, these tasks will be described only once.

Please note, some physical hazards are not associated with any particular activities, but rather with outdoor work in general. These hazards include exposure to high/low ambient temperatures and the use of hand/power tools, which may be used to complete portions of almost every component of the proposed work. Procedures that should be followed to mitigate these physical hazards are provided in Section 6.1.

4.1.1 Drilling Soil Borings

The drilling of soil borings may be conducted during soil quality investigations. Due to the heterogeneous nature of the fill material placed at the HHMT-Port Ivory Facility by P&G and the generally soft weathered zone in the upper portions of the underlying shale bedrock, hollow stem auger methods will likely be used for the drilling of soil borings. Alternatively, relatively shallow soil borings may be drilled using direct push methods or manual methods.

Except for drilling conducted using manual methods, equipment used for drilling has the potential to contact and/or damage underground or overhead utility lines; depending upon the type of utility line encountered, contact with and/or damage to the line may create a hazard. For example, drilling into a high pressure natural gas utility line may potentially cause an explosion. In addition, depending upon the voltage of overhead electric lines, electricity can potentially arc from an overhead line and discharge into a nearby metal drill rig.

Drilling is generally a noisy activity, and exposure to high noise levels is a hazard often associated with drilling. Certain parts of a drill rig are subject to breaking due to high pressures and/or forces. For example, a cable that is being used to support steel casing or augers could potentially snap. As a result, flying debris is a potential hazard associated with the drilling of soil borings.

Drilling involves the use of heavy equipment such as drill rods, augers, casing, etc. Although this equipment can often be moved using cables or other automated portions of a drill rig, sometimes this heavy equipment must be moved manually. In addition, the drill rods, augers, casing often must be placed on the

ground in the vicinity of the drill rig. Drill cuttings are also managed in the vicinity of the drill rig. Therefore, handling heavy objects/material and walking/working surface are hazards associated with the drilling of soil borings.

In some instances, soil borings may be drilled in areas where LNAPL or other substances are present in surface soil, subsurface soil, and/or groundwater. Drilling activities are likely to disturb surface soil and bring subsurface materials to the land surface where personnel working in the vicinity of the drill rig may be exposed to LNAPL and/or other substances. Therefore, chemical hazards are also associated with drilling activities.

In summary, the following physical hazards are associated with drilling activities: underground or overhead utilities; exposure to high noise level; flying debris; handling heavy objects/materials; and, walking/working surface. Procedures that should be followed in order to mitigate these physical hazards are identified in Section 6.1. Chemical hazards due to environmental media are also associated with drilling activities. Procedures that should be followed to mitigate the chemical hazards are provided in Section 6.2.

4.1.2 Collecting Soil Samples

Soil samples may be collected during soil quality investigations or during remedial actions for waste characterization or post-excavation purposes. The methods and equipment used for collecting soil samples will vary depending upon the purpose of the soil sampling. However, regardless of the purpose of the soil sampling, the soil being sampled may potentially contain LNAPL and/or other substances. Soil samples may contain groundwater that may in turn contain chemical substances. In addition, soil sampling equipment will either be disposed of or decontaminated between uses. Decontamination typically involves the use of chemicals such as dilute nitric acid and organic solvents. Therefore, chemical hazards due to environmental media and operational chemicals are associated with soil sampling activities. Procedures that should be followed to mitigate these chemical hazards are provided in Section 6.2.

Soil sampling methods used during implementation of investigative activities or remedial activities, for the purpose of post-excavation soil samples, are essentially the same. In these instances, soil samples will be collected by transferring soil from the sampling device into laboratory-prepared sampling jars using a stainless steel sampling trowel or scoop. The sampling device is typically a hand auger or split spoon (if soil samples are collected at a soil boring location) or a backhoe or excavator bucket (if the soil sample is collected at a test pit or test trench location). Physical hazards associated with drilling and excavation activities are addressed separately in Sections 4.1.1 and 4.1.3, respectively. No physical hazards have been identified with respect to the collection of soil samples during soil quality investigations or during remedial activities for post-excavation purposes.

Soil samples collected for waste classification purposes and during the implementation of remedial activities will generally be collected from soil stockpiles. While the same sampling equipment will be used, the collection of soil samples from these stockpiles may result in two physical hazards. The surface of soil stockpiles is typically uneven, and, during precipitation events or cold conditions, may be unstable or slippery. In addition, fill materials, that may include metal debris, may be present at the surface of soil stockpiles. Therefore, physical hazards associated with the collection of soil samples from a soil stockpile include walking/working surface and contact with sharp objects/material. The procedures that should be followed in order to mitigate these potential hazards are provided in Section 6.1.

4.1.3 Excavating Test Pits and Test Trenches

The excavations of test pits and/or test trenches may be conducted during soil quality investigations. In addition, removal areas/trenches may be excavated during the implementation of remedial activities. Since the difference between test pits/test trenches and removal areas/trenches is primarily semantic, the excavation of these features will be discussed together in this section. Excavation of test pits, test trenches, and removal areas/trenches will be accomplished utilizing backhoes or excavators.

The backhoe or excavator has the potential to contact and/or damage underground or overhead utility lines; depending upon the type of utility line encountered, contact with and/or damage to the line may create a hazard. For example, severing a high pressure natural gas utility line may potentially cause an explosion.

In addition, depending upon the voltage of overhead electric lines, electricity can potentially arc from an overhead line and discharge into a nearby metal backhoe or excavator.

Excavating and disposing of soil are generally noisy activities, and exposure to high noise levels is a potential hazard associated with these activities. The use of hearing protection or exposure to loud noises for prolonged periods of time may create a situation in which an operator may not be able to hear verbal commands from personnel working in the vicinity of the machinery. Therefore, heavy equipment/vehicle traffic and noise are hazards associated with stockpiling soils.

In some instances, excavation activities may be conducted where LNAPL or other substances are present in surface soil, subsurface soil, and/or groundwater. Excavation activities are likely to disturb surface soil and bring subsurface materials to the land surface where personnel working in the vicinity of the excavation may be exposed to LNAPL and/or other substances. Therefore, chemical hazards are also associated with excavating activities.

Procedures that should be followed in order to mitigate underground and overhead utility hazards are identified in Section 6.1. As noted above, chemical hazards due to environmental media are also associated with drilling activities. Procedures that should be followed to mitigate the chemical hazards are provided in Section 6.2.

4.1.4 Installing Temporary and Permanent Monitoring Wells

Temporary or permanent wells will be installed at selected soil boring locations. Both temporary and permanent monitoring wells will be constructed of PVC riser and screen, a PVC bottom cap, a plastic spin-lock top cap, a #1 or #2 sand filter pack, and a bentonite or #00 sand seal. Deep wells may also involve the placement of permanent steel casing. At permanent monitoring well locations, the borehole will be grouted to land surface with a cement-bentonite mix and a concrete well box will be installed. The grout will be mixed in a drum by jetting water into the drum and mixing in the cement and bentonite; as the mixture becomes thicker, it will be pulled through the pump mounted on the side of the drill rig. Temporary wells may be installed in soil borings drilled exclusively by hand or through hollow stem augers. If installed in boreholes drilled exclusively by hand, the well diameter will be two inches. Wells installed in boreholes advanced using hollow stem auger methods may be either two or four inches in diameter. Please note, this section includes only those hazards associated with the installation of monitoring wells; hazards associated with the drilling of soil borings are discussed in Section 4.1.1, above.

During installation of steel casing or during the removal of the hollow stem augers, cables that are used to support the casing or augers may break. As a result, flying debris is a potential physical hazard associated with the installation of temporary or permanent monitoring wells.

Well installation involves the use of heavy equipment such as casing and augers. Although this equipment can often be moved using cables or other automated portions of a drill rig, sometimes this heavy equipment must be moved manually. In addition, the casing and augers often must be placed on the ground in the vicinity of the drill rig. Therefore, handling heavy objects/material and walking/working surface are hazards associated with the drilling of soil borings for temporary or permanent monitoring wells.

During monitoring well installation, fluids, including water and LNAPL (if present), that accumulated in the borehole are often displaced as the well, sand pack, and seal are inserted. Depending on the depth to water, these fluids can potentially flow out the top of the borehole to land surface. Workers may thereby come into contact with LNAPL and/or water containing potentially hazardous substances.

Procedures that should be followed in order to mitigate the following physical hazards are identified in Section 6.1: flying debris; handling heavy objects/material; and, walking/working surface. As noted above, chemical hazards due to environmental media are also associated with drilling activities. Procedures that should be followed to mitigate the chemical hazards are provided in Section 6.2.

4.1.5 Collecting Groundwater and/or LNAPL Samples

Because groundwater and LNAPL are both fluids, the collection of groundwater and LNAPL samples will be discussed together in this section. Groundwater and LNAPL samples may be collected during

groundwater quality investigations or during remedial actions for waste characterization purposes. The methods and equipment used for collecting these samples will vary depending primarily upon the size of the well or test pit from which the sample is to be collected and upon the depth to groundwater. In some cases, groundwater and LNAPL samples can be collected using a dedicated bailer or a decontaminated pond sampling apparatus. In these cases, the groundwater or LNAPL must be poured from the bailer or pond sampling apparatus into the laboratory-supplied sampling jars. In other instances, a pump may be used to purge the well prior to sample collection. The sample may be collected directly from the pump effluent tubing or using a bailer. The type of pump used will vary primarily based on the depth to water. If groundwater is relatively shallow, a negative pressure (i.e., vacuum) pump can be used. Otherwise, a positive pressure pump should be used. Some pumps are powered by generators, and some are powered by car battery.

If a pump is utilized in purging or sample collection, and if the pump is powered using a generator, exposure to high noise levels is a potential physical hazard. In addition, depending upon the amount of instrumentation used in the sampling and placed on the ground near the well, the walking/working surface may become a physical hazard.

Purging and sampling efforts hold the potential for workers to contact LNAPL or chemical substances in groundwater. Therefore, chemical hazards due to environmental media are associated with groundwater and LNAPL sampling.

In some cases, groundwater chemical parameters are measured and recorded during groundwater purging and sampling efforts. The meters used for the measurement of these parameters require calibration at least once per day. Components of the sampling apparatus (pumps, e.g.) may require decontamination between sample collection points. The decontamination process involves the use of chemicals such as dilute nitric acid and organic solvents. In addition, the generator runs on gasoline and requires oil periodically. Therefore, chemical hazards due to operational chemicals are also associated with the sampling of groundwater and LNAPL.

Therefore, physical hazards associated with the collection of groundwater and/or LNAPL samples include exposure to high noise levels and a cluttered walking/working surface. The procedures that should be followed in order to mitigate these potential hazards are provided in Section 6.1. Chemical hazards associated with the collection of groundwater and LNAPL samples include potential contact with both environmental and operational chemicals.

4.1.6 Pumping Groundwater or LNAPL

Groundwater or LNAPL may be pumped from trenches or test pits (trenches) during soil and groundwater quality investigations or during remedial actions. The methods and equipment used to pump groundwater from trenches includes the use of a 2 or 4-inch diameter high-volume positive pressure pumps utilizing 2 or 4-inch diameter hose, or, a vacuum truck.

If positive pressure pumps are used to pump water/LNAPL, and if the pump is powered using a generator, exposure to high noise levels is a potential physical hazard. In addition, power cords and larger diameter pump hoses may create a walking/working surface hazard. Certain types of high volume pumps and generators can be heavy and cumbersome. Therefore, handling heavy objects/materials also may present a potential hazard.

Vacuum trucks are typically large and operators may have limited visibility while approaching trenches. As a result, heavy equipment/vehicle traffic is a potential hazard. Also, the distance between the vacuum truck and the excavation is limited by the length of the hose, and the vacuum truck is often situated within 20 feet of the test pit or test trench. Therefore, the potential for trench collapse (excavation safety) is a potential hazard.

Chemical hazards due to environmental media may be associated with pumping groundwater and/or LNAPL. Personnel have the potential to contact LNAPL or chemical substances in groundwater while pumping these fluids. LNAPL and/or chemical substances in groundwater may adhere to the hose and/or

may be present in fluids within the pump; personnel therefore have the potential to contact LNAPL and/or chemicals in groundwater even after pumping has been completed.

The pumps may be powered by generators, which require gasoline and oil in order to run effectively. Therefore, chemical hazards due to operational chemicals are also associated with pumping groundwater or LNAPL.

Procedures that should be followed to mitigate the following physical hazards are identified in Section 6.1: exposure to high levels of noise; walking/working surfaces; handling heavy objects/materials; heavy equipment/vehicle traffic; and, excavation safety. Chemical hazards due to environmental media and operational chemicals are also associated with drilling activities. The procedures that should be followed in order to mitigate these potential chemical hazards are provided in Section 6.2.

4.1.7 Storage of Water and/or LNAPL

Groundwater and/or LNAPL pumped from excavations or wells cannot be discharged directly to the ground surface and must be stored for disposal or post-sampling discharge. Because groundwater and/or LNAPL may be pumped during soil and groundwater quality investigations as well as during remedial actions, these fluids may be stored during implementation of either investigative or remedial actions. The methods and equipment used for storing water and LNAPL may be pumped into various storage containers to be determined by the volume of fluid to be pumped. Storage containers may include 55 gallon drums, larger volume polyethylene Frac tanks, or in a vacuum truck.

Prior to pumping fluids into 55-gallon drums, the drums need to be moved to the vicinity of excavations or wells. The drums are heavy, cumbersome, and typically moved by hand. Therefore, handling heavy objects/materials is a potential hazard. Exposure to heat or high ambient temperatures may also present a potential hazard.

Frac tank storage systems may be small or large and are typically transported on specialized vehicles. Operators of these vehicles may have limited visibility while offloading tank systems. Therefore, heavy equipment/vehicle traffic may present a hazard.

When closed containers such as 55-gallon drums are used for the storage of water and/or LNAPL, the pressure of vapors within the container may increase to dangerous levels. While the pressure within a container is unlikely to cause the container to explode, threaded lids may potentially explode off the container as they are loosened. Therefore, flying debris may present a hazard.

Similarly, when a pressurized container is opened, vapors may explode out of the container to equalize internal and external pressure. As such, inhalation of these vapors is a potential chemical hazard.

Procedures that should be followed to mitigate the following physical hazards are identified in Section 6.1: handling heavy objects/materials; heat exposure/exposure to high ambient temperatures; heavy equipment/vehicle traffic; and, flying debris. Chemical hazards due to environmental media are also associated with storing water and/or LNAPL. The procedures that should be followed in order to mitigate these potential chemical hazards are provided in Section 6.2.

4.1.8 Stockpiling and Disposing of Soil

The stockpiling of soil excavated from test pits and test trenches may occur during soil quality investigations and during remedial actions. Soil that is determined to be impacted will be staged on, and covered by plastic sheeting. The plastic sheeting will be weighted down using sand bags or equivalent. Once stockpiled, the soil may be moved or loaded onto trucks for disposal using backhoes, excavators, or front end loaders. The disposal of any soil will be completed in accordance with local, state, and federal regulations and will be properly documented on manifests or bills of lading. Please note, this section does not address the hazards associated with soil excavation, which are listed in Section 4.1.3; however, the hazards that are associated with work in the vicinity of construction equipment, as identified in Section 4.1.3, are identified in this section also, as appropriate.

Excavating and disposing of soil are generally noisy activities, and exposure to high noise levels is a potential hazard associated with these activities. The use of hearing protection or exposure to loud noises for prolonged periods of time may create a situation in which an operator may not be able to hear verbal commands from personnel working in the vicinity of the machinery. Therefore, heavy equipment/vehicle traffic and noise are hazards associated with stockpiling soils.

The disposal of soil involves transferring the soil from a stockpile into the bed of a truck using construction equipment. During the transference of soil, there is the potential for soil to be dropped from the backhoe, excavator, or front end loader bucket, creating a potential flying debris hazard.

Stockpiling of soils involves the handling and placement of heavy and cumbersome rolls of plastic sheeting and sandbags (or equivalent) for securing sheeting. Large rolls of plastic sheeting may weigh as much as 90 pounds. Also, soil stockpiles generally have uneven walking/working surfaces.

Therefore, handling heavy objects/material, exposure to heat/high ambient temperatures, and walking/working surface are hazards associated with the stockpiling soil.

Soil that was excavated in areas where LNAPL or other substances are present in surface soil, subsurface soil, and/or groundwater may need to be stockpiled and disposed of. Therefore, chemical hazards due to environmental media are also associated with the stockpiling and disposal of soil.

Procedures that should be followed to mitigate the following physical hazards are identified in Section 6.1: handling heavy objects/materials; exposure to high noise levels; heavy equipment/vehicle traffic; and, flying debris. Chemical hazards due to environmental media are also associated with the stockpiling and disposal of soil. The procedures that should be followed in order to mitigate these potential chemical hazards are provided in Section 6.2.

4.1.9 Disposing of Water and/or LNAPL

Groundwater and LNAPL may be disposed of during soil and groundwater quality investigations or during remedial actions. Water and/or LNAPL may be transferred from wells or excavations and into various containers (55-gallon drums, Frac tanks, vacuum tank hopper) using bailers or pumps. Subsequently, the containerized fluid will need to be transported off site for disposal via vacuum trucks or tanker trucks. Alternatively, if the container is sufficiently small (e.g., a 55-gallon drum), the water could be transported off site in the container. The disposal of all water and LNAPL will be completed in accordance with local, state, and federal regulations and will be properly documented on manifests or bills of lading.

Vacuum trucks can be loud while in operation. The potential for exposure to high noise levels exists during their operation. In addition, the size of the tanker trucks and vacuum trucks results in restricted range of sight. Therefore, heavy equipment/vehicle traffic is a potential hazard for the disposal of water and/or LNAPL using vacuum trucks or tanker trucks.

When closed containers such as 55-gallon drums are used for the storage of water and/or LNAPL, the pressure of vapors within the container may increase to dangerous levels. While the pressure within a container is unlikely to cause the container to explode, threaded lids may potentially explode off the container as they are loosened. Therefore, flying debris may present a hazard.

Similarly, when a pressurized container is opened, vapors may explode out of the container to equalize internal and external pressure. Inhalation of these vapors is a potential chemical hazard.

Contact with the LNAPL or chemicals that may be dissolved in the water is also a potential chemical hazard. Contact with these substances could occur when a container is opened during water or LNAPL disposal activities.

Procedures that should be followed to mitigate the following physical hazards are identified in Section 6.1: handling heavy objects/materials; exposure to high noise levels; heavy equipment/vehicle traffic; and, flying debris. Chemical hazards due to environmental media are also associated with the disposal of water

and/or LNAPL. The procedures that should be followed in order to mitigate these potential chemical hazards are provided in Section 6.2.

4.1.10 Restoring the Site to its Original Condition

The restoration of the site to its original condition will be conducted following the completion of intrusive soil investigation, groundwater investigation, and remedial actions. Site restoration may involve a number of activities, including but not limited to the following: well abandonment, grouting soil borings, demobilizing equipment, grading, and repaving. Grading may involve net cut or net fill, and soil may need to be transported to the site if grades cannot be achieved with the soil currently present at the site. Due to the wide variety of potential site restoration activities, it is impossible to provide a comprehensive list of physical and chemical hazards.

However, in general, the physical hazards will include excavation safety, underground and overhead utilities, exposure to high noise levels, and working in the vicinity of heavy equipment/vehicle traffic (for grading activities, e.g.); the handling of heavy objects such as bags of concrete; flying debris and the operation of hand tools/power tools (when using stand-alone grout mixers or vibrating plate compactors, e.g.); and, walking/working surface (for any activity where equipment is temporarily staged on the ground or where grading activities will occur). Please note, the above is not an exhaustive list, and each newly initiated activity should be evaluated for additional hazards prior to its implementation. See Section 6.1 for a list of procedures that should be followed to mitigate these potential physical hazards.

Chemical hazards, attributable to both environmental media and operational chemicals, are also possible during completion of site restoration activities. Section 6.2 provides a list of procedures that should be followed to mitigate the potential chemical hazards.

5.0 GENERAL HEALTH AND SAFETY ACTIVITIES/REQUIREMENTS

While the health and safety activities that should be followed to mitigate physical and chemical hazards associated with specific tasks or activities are identified in Section 6.0 et sequential, this section lists general procedures and requirements that are either not associated with any proposed activity or are associated with the performance of all proposed activities. Following the procedures and meeting the requirements outlined below is anticipated to have a positive effect on the overall health and safety of the personnel working at the site. The activities and requirements provided below are from the Conti SSHP without modification, although these activities and requirements were, in some cases, in different sections of the Conti SSHP. The general health and safety activities and requirements include heat and cold stress prevention and treatment, training requirements for all workers, site security, health and safety meetings, recording injuries, and reading, signing, and complying with this SSHP. All records, including but not limited to the SSHP, workers' training records, and daily monitoring, log, and inspection records, that are identified within this SSHP will be maintained in files located at the field office. These activities and requirements are discussed in subsections 5.1 through 5.6, below.

Please note, references to Conti's medical surveillance program have been removed from this section. References to"Conti" in the following discussion should be construed as referring to any environmental contractor retained by the Port Authority to perform specific site work tasks.

5.1 Exposure to High/Low Ambient Temperatures

The Conti SSHP specified pulse monitoring only when the following two conditions are both met: 1) the ambient temperature reached 72.5° Fahrenheit and 2) the workers were in Level C PPE (see Section 6.2.1). It is not anticipated that workers will be required to wear Level C PPE; however, activities may be performed during the summer months when temperatures exceed 72.5 degrees Fahrenheit; therefore, workers may be exposed to high ambient temperatures. Heat stress monitoring/pulse monitoring program is anticipated to be required for the proposed activities. The subsection of Conti SSHP discussing heat stress monitoring/pulse monitoring is included below without revisions.

An ambient temperature of 72.5° F when workers are in Level C or higher, will be used as an action level to implement pulse monitoring, oral temperatures and administrative controls, including rest breaks and work rotation, to prevent employees from experiencing heat-related health effects including weight loss. The guidance for workers wearing permeable clothing is specified in the current version of the American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values for Heat Stress. If actual Clothing differs from the ACGIH standard ensemble in insulation value and/or wind and vapor permeability, changes should be made to the monitoring requirements and work rest period to account for these differences. ***Table 2 – "Frequency of Physiological Monitoring"*** provides the suggested frequency of physiological monitoring for fit and acclimatized workers.

The following parameters should be used when monitoring workers:

Heart rate - Count the radial pulse as early as possible in the rest period to ensure a more accurate reading. 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 at the same length. If, at the end of the following work period, the heart rate still exceeds 110 beats per minute, shorten the work period again by one-third.

Table 2 - Frequency of Physiological Monitoring

Adjusted Temperature Calculation	Normal Work Clothing	Impermeable Clothing
90 F (32.2 C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5 - 90.0 F (30.8 - 32.2 C)	After each 60 minutes of work	After each 30 minutes of work
82.5 - 87.5 F (28.1 - 30.8 C)	After each 90 minutes of work	After each 60 minutes of work
77.5 - 82.5 F (25.3 - 28.1 C)	After each 120 minutes of work	After each 90 minutes of work
72.5 - 77.5 F (22.5 - 25.3 C)	After each 150 minutes of work	After each 120 minutes of work

Oral Temperature - The utilization of oral temperature applies to the time immediately after the worker leaves the contamination reduction zone. Using a clinical thermometer, take the temperature for three minutes. If the oral temperature exceeds 99.6 F (37.6 C), shorten the next work cycle by one-third, without a change to the rest period. If the oral temperature still exceeds 99.6 F (37.6 C) at the end of the following work period, shorten the next work cycle by one-third. Do not permit a worker to perform duties requiring a semipermeable or impermeable garment if the oral temperature exceeds 100.6 F (38.1C). Ear canal readings are a valid method to monitor the temperature of workers who remain in the contamination reduction zone.

The oral temperature shall not exceed 100.4° F. If an employee's pulse rate exceeds the maximum age-adjusted heart rate (0.7(220-AGE)), and/or the oral temperature exceeds 100.4° F, the employee shall be required to stop work and rest at the work site or move to an air-conditioned room after proper decontamination. The affected employee may be allowed to return to work after his/her pulse rate has dropped below 100 beats per minute. The SSHO in consultation with the affected employee, and medical personnel if necessary, shall determine whether an employee is ready to return to work. Fluids shall be provided and rest breaks will be taken. The frequency of breaks will increase with the temperature. Such things as cooling vest; portable fans and breaks in air-conditioned areas shall be used if necessary.

When practicable, the most labor-intensive tasks should be carried out during the coolest part of the day. If necessary, a work/rest regimen will be instituted. The work/rest regimen consists of alternating periods of work and rest. The duration of these alternating periods will depend on the environmental conditions at the job site, i.e., the Web Bulb Globe Temperature, duration and type of activities performed.

A worker who becomes irrational or confused or collapses on the job should be considered a heat stroke victim, and medical help should be called immediately. Early recognition of symptoms and prompt emergency treatment is the key to aiding someone with heat stroke. While awaiting the ambulance, begin efforts to cool the victim down by performing the following:

- Move the victim to a cooler environment and remove outer clothing.
- Wet the skin with water, and fan vigorously or repeatedly apply cold packs or immerse the victim in a tub of cool (not ice) water.
- If no water is available, fanning will help promote cooling.

Any individual showing susceptibility to heat stress will be referred to a physician for evaluation. In addition, the use of prescription drugs can also contribute to the effects of heat stress and will be considered during the assignment of work.

Cool water or a sports drink that replaces electrolytes, such as Gatorade, will be made available to workers and encourage them to drink small amount frequently, e.g., one cup every 20 minutes. Ample supplies of liquids will be placed close to the work area.

The proposed activities may be performed during the winter months; therefore, workers may be exposed to low ambient temperatures. The subsection of the Conti SSHP discussing precautions to be taken in cold temperatures is included below without any revisions.

Cold injury (frostbite and hypothermia) and impaired ability to work are hazards to persons working outdoors in low temperatures at or below freezing. Extreme cold for a short time may cause severe injury to exposed body surfaces (frost nip or frostbite), or result in profound generalized cooling (hypothermia). Areas of the body which have high surface area-to-volume ratio such as fingers, toes, and ears, are the most susceptible to frost nip or frostbite.

Two factors influence the development of a cold weather injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical-protective equipment is removed if the clothing underneath is perspiration soaked. The windchill factor is the cooling effect of any combination of temperature and wind velocity or air movement. ***Table 3 – Windchill Index*** should be consulted when planning for exposure to low temperatures and wind. The windchill index does not take into account the specific part of the body exposed to cold, the level of activity, which affects body heat production, or the amount of clothing being worn.

Table 3 - Wind Chill Index

Wind (mph)	Actual Temperature (° F)												
	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25
	Equivalent Temperature (° F)												
5	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40
10	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47
15	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51
20	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55
25	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58
30	22	16	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60
35	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62
40	20	13	6	-1	-8	-15	-22	-29	-36	-42	-50	-57	-64

Wind Chill (°F) = 35.74 + 0.6215T - 35.75(V0.16) + 0.4275T(V0.16)
T = Air Temperature (°F)
V = Wind Speed (mph)

Frostbite occurs in 15 minutes or less

When practicable, the most sedentary tasks should be carried out during the warmest part of the day. If necessary, a light-work rotation schedule should be instituted or the work area heated. Heavy work that will cause heavy sweating that will result in wet clothing must also be monitored. The work/rest regimen consists of alternating periods of work and rest. The duration of these alternating periods will depend on the environmental conditions at the job site, i.e., the Wind Chill Temperature, duration and type of activities performed.

Table 4 - Maximum Daily Time Limits for Exposure at Low Temperatures gives the recommended time limits for working in various low temperature ranges.

Table 4 - Maximum Daily Time Limits for Exposure at Low Temperatures	
Temperature Range (F)	**Maximum Daily Exposure**
30 to 0	No limit, providing that the person is properly clothed.
0 to -30	Total work time: 4 hours. Alternate 1 hour in and 1 hour out of the low-temperature area.
-30 to -70	Two periods of 30 minutes each at least 4 hours apart. Total low temperature work time allowed is 1 hour.
-70 to -100	Maximum permissible work time is 5 minutes during an 8-hour working day. At these extreme temperatures, completely enclosed headgear, equipped with a breathing tube running under the clothing and down the leg to preheat the air, is recommended.

Table – 5 Work/Warm-up Schedule applies to any 4-hour work period with moderate to heavy work activity, with worm-up periods of ten (10) minutes in a warm location and with an extended break (e.g., lunch) at the end of the 4-hour period in a warm location. For light-to-moderate work (limited physical movement): apply schedule one step lower. For example, at -35° C (-30° F) with no noticeable wind, a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4-hour period.

Table 5 - Work/Warm-up Schedule											
Air Temperature - Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph wind		15 mph wind		20 mph wind	
°C (approx.)	°F (approx.)	Max Work Period	No. of Breaks	Max Work Period	No. of Breaks	Max Work Period	No. of Breaks	Max Work Period	No. of Breaks	Max Work Period	No. of Breaks
-26° to -28°	-15° to -19°	(Norm. Breaks) 1		(Norm. Breaks) 1		75 min	2	55 min	3	40 min	4
-29° to -31°	-20° to -24°	(Norm. Breaks) 1		75 min	2	55 min	3	40 min	4	30 min	5
-32° to -34°	-25° to -29°	75 min	2	55 min	3	40 min	4	30 min	5	Non-Emergency Work Should Cease	
-35° to -37°	-30° to -34°	55 min	3	40 min	4	30 min	5	Non-Emergency Work Should Cease			
-38° to -39°	-35° to -39°	40 min	4	30 min	5	Non-Emergency Work Should Cease					
-40° to -42°	-40° to -44°	30 min	5	Non-Emergency Work Should Cease							
-43° & below	-45° & below	Non-Emergency Work Should Cease									

To guard against cold injuries, workers should wear appropriate clothing and use warm shelters for removing personal protective equipment. The personal decontamination trailer will be used as a warm shelter when required. The SSHO may periodically monitor workers' physical conditions, specifically checking for symptoms of frostbite.

5.2 Required Training

Except as noted above, this subsection is from the Conti SSHP without modification.

Consistent with OSHA's 29 CFR 1910.120 regulation covering Hazardous Waste Operations and Emergency Response, all Site personnel who will be performing remedial activities, intrusive sampling, emergency response operations, or come in contact with contaminated material are required to be trained in accordance with the standard.

Prior to arrival on-site, Conti will be responsible for certifying that the employees meet the requirements of preassignment training, consistent with OSHA 29 CFR 1910.120 paragraph (e)(3). Conti will provide documentation certifying that each general Site worker has received a minimum of 40 hours of instruction off site, and a minimum of three days actual field experience under the direct supervision of a trained, experienced supervisor. All personnel must also receive 8 hours of refresher training annually. At no time should anyone be working on-site without the minimum training requirements. Consistent with OSHA 29 CFR 1910.120 paragraph (e)(4), individuals designated as Site Supervisors require an additional 8 hours of training.

5.3 Site Security

This subsection is from the Conti SSHP without modification. Please note that the following pertains not only to those personnel who will work in the exclusion zone, but also to all individuals covered by this SSHP who enter the exclusion zone. The Safety and Health Forms for the Site Entry and Exit Log are included in Appendix B.

All site personnel on this project will undergo safety orientation by the SSHO prior to starting work at the site. This training will include general site safety rules, hazardous locations, personal protective equipment guidelines, and onsite emergency procedures. All site personnel will satisfy the following requirements before initiating work onsite within the Exclusion or Contamination Reduction Zones:

- Receive and pass a physical examination, including certification of ability to wear respiratory protection.
- Receive adequate hazardous waste training according to 29 CFR 1910.120 or 29 CFR 1926.65.
- Receive a briefing on all aspects of the SSHP.
- Are properly dressed, equipped, and trained in accordance with all personal protective guidelines.
- Are thoroughly trained regarding decontamination procedures.
- All personnel performing tasks when respiratory protection is needed will comply with the requirements of this plan

All personnel entering and exiting the Exclusion and Contamination Reduction Zones will sign in and out through the Support Zone. The log will indicate the date and time entering and exiting, the location entered, personal protective equipment utilized and decontamination procedures, refer to ***Attachment 3 – Safety and Health Forms for the Site Entry and Exit Log.***

5.4 Health and Safety Meetings

This subsection is from the Conti SSHP without modification.

A well-ordered flow of information is essential to a good safety program. Conti, through a program of safety meetings at all levels, intends to accomplish the goals of safety awareness, education, and participation. The SSHO shall conduct daily safety meetings with ALL on-site personnel. An opportunity shall be provided for employees to voice safety-related concerns. The SSHO will submit a synopsis of each meeting including topics covered, safety-related concerns, action items to be addressed, status of previous items and a signed attendance list.

Prior to commencement of onsite field activities, all site employees will attend a site-specific safety and health training session. This session will be conducted by the Site Safety and Health Officer to ensure that personnel are familiar with the requirements of this Site-Specific Safety and Health Plan. The initial session will consist of the contents of this SSHP and specific procedures developed for the project. The SSHO shall also provide initial site-specific training for replacement employees.

As a minimum the site-specific training will include:

- Explanation of the Overall Site HASP.
- Health and Safety Personnel and Organization.
- Special attention to signs and symptoms of overexposure to known and suspected site contaminants.
- Health effects of site contaminants.
- Air monitoring description.
- Physical hazards associated with the project.
- Selection, use, and limitations of available safety equipment and proper procedures for its use.
- Personal hygiene and decontamination.
- Respirator facepiece fit testing.
- PPE fitting to determine proper size for individuals.
- Site rules and regulations.
- Work zone establishment and markings.
- Site communication and the "Buddy System".
- Emergency preparedness procedures.
- Equipment decontamination.
- Medical monitoring procedures.
- Review applicable Conti Standard Operating Procedures.
- Site Specific Hazard Communication.

Preparatory meetings will be conducted by the SSHO for site personnel prior to their initiating any new or differing site activities. At the Preparatory meetings, the SSHO will ensure that site personnel are knowledgeable of the SSHP and understand the hazards and controls of the activity to be performed (review Activity Hazard Analysis).

5.5 Recording Injuries

As a follow-up to an injury or possible exposure above established exposure limits, all employees are entitled to and encouraged to seek medical attention and physical testing. Depending upon the type of exposure, it is critical to perform follow-up testing within 24-48 hours. It will be up to the occupation physician to advise the type of test required to accurately monitor for exposure effects.

Any employee, who develops a time loss illness exceeding one working day, or injury during the period of the contract, must be evaluated by the occupational physician. A written statement indicating the employee's fitness, signed by the occupational physician must be submitted prior to the employee entering the work site.

5.6 Reading, Signing, and Complying with this SSHP

The following discussion is based on the Conti SSHP, except that references to the Conti medical surveillance program were removed.

All workers and visitors covered under this SSHP who enter the contamination reduction zone or the exclusion zone will be required to read and verify (i.e., sign the SSHP signature page) compliance with the provisions of this SSHP and appropriate appendices. In the event that any worker or visitor covered under this SSHP does not adhere to the provisions of this SSHP, he/she will be requested to leave the project area. All nonconformance incidents will be recorded in the Daily Safety and Inspection Log in Appendix B.

6.0 HAZARD ASSESSMENT

Hazardous material sites can cause a multitude of health and safety concerns any of which can result in serious injuries and/or illnesses of workers. Some hazards are a function of the physical, biological or chemical nature of the site itself. Others are a direct result of the construction being done. Based upon the information provided regarding the primary historical uses of the property and the knowledge of the current conditions, the overall Safety and Health hazard assigned to the contemplated activities at the Site is determined to be low to moderate.

This section provides procedures for mitigating potential physical and chemical hazards that have been associated with the specific proposed activities described in Section 4. Procedures and requirements that are anticipated to ensure the overall health and safety of workers, but that are associated with either all or none of the proposed activities listed in Section 4, are listed above in Section 5.

The procedures listed below are associated with hazards have been divided into two categories: physical and chemical hazards. Biological hazards are considered unlikely because the HHMT-Port Ivory Facility is generally not vegetated in the areas where work will occur and because of the low frequency of pedestrian and vehicular traffic at the HHMT-Port Ivory Facility. Section 6.1 addresses physical hazards, while Section 6.2 addresses chemical hazards.

6.1 Physical Hazards

Physical hazards that may potentially be encountered during implementation of the proposed activities include the following hazards identified in the Conti SSHP: heavy equipment/vehicle traffic, contact with sharp objects/material, exposure to high noise levels, flying debris, hand/power tools, handling heavy objects/material, walking/working surface, excavation, and underground and overhead utilities. For the purposes of this SSHP, the following physical hazards identified in the Conti SSHP Activity Hazard Analysis tables are considered to be included in the heavy equipment/vehicle traffic hazard: caught in/between moving parts, exposed to vehicle traffic, and struck by/against heavy equipment (Section 6.1.1).

Please note, the following physical hazards were identified in the Conti SSHP, but were deemed not applicable for the Project and therefore are not included in this SSHP: fall from different level, fire/explosion, welding and cutting, and overhead activities. The fall from a different level hazard address

falls from a height of at least six feet; it is not anticipated that workers will be on platforms elevated more than six feet above grade. The fire/explosion was written for hot work (e.g., welding, cutting using an acetylene torch, etc.), and the performance such hot work is not anticipated during additional investigations and/or remedial actions. The welding and cutting hazard also does not apply because hot work is not anticipated during additional investigations and/or remedial actions. Except for the machine operators, personnel are not anticipated to work above ground surface; therefore, no overhead activities are anticipated. Please note, if any of these potential hazards are encountered during additional investigations and/or remedial actions, the appropriate section in the Conti SSHP will be referred to until the environmental contractor's Site Safety and Health Officer can modify the SSHP and until the modification is approved by the Port Authority. The potential hazard will be discussed at the next day's toolbox meeting.

The subsections below describe the general health and safety actions that are required for work associated with the proposed activities in order to mitigate the potential hazards.

6.1.1 Heavy Equipment/Vehicle Traffic

This subsection is consistent with the Conti SSHP without edits. Please note, the Equipment Checklist, included in the Conti SSHP as Attachment 3, is included in Appendix C to this SSHP.

Considerations for controlling the movement of personnel and equipment in a construction area are vitally important to any project, as injuries may occur while working with or adjacent to such equipment. This category includes all operations, which utilize moving heavy equipment: excavators, loaders, graders, dozers, and trucks. Conti will take every precaution necessary to ensure the safety of the residents and the on-site personnel during traffic movement operations.

All workers will adhere to all applicable standards and regulations while operating heavy equipment at the site. Operators will be trained and experienced in the use and maintenance of the equipment they are operating. Equipment will be inspected on a daily basis to identify any worn parts, and/or unsafe conditions. Inspections will be documented using the Equipment Checklist, refer to ***Attachment 3 – Safety and Health Forms***. Any unsafe equipment will be removed from service until safety defects can be corrected. Equipment operators will not leave their machine unattended while it is running. Each piece of equipment will be equipped with a 5 lb ABC fire extinguisher. No vehicles or equipment will be operated in a careless or unsafe manner. Personnel will wear high visibility reflective vests when working around equipment/vehicles. All personnel will stay a minimum of 4 ft clear of the operational area of the equipment.

During remedial activities, it is often necessary to have a worker direct the operator. In these cases, close communication between the operator and the laborer is of critical importance. One designated person will give signals to the operator of both equipment and vehicles in the work area. Workers should not take any action unless they have made eye contact with the operator and clearly communicated their intentions. In addition, all machines are equipped with back-up alarms, which are checked daily and repaired immediately. Truck traffic will be controlled by a flagger/spotter, as required.

Maintenance and inspection of vehicles and heavy equipment is a vital part of the overall safety program. Conti has a fully staffed equipment maintenance shop that handles all preventative and overhaul work for our entire vehicle and equipment fleet. As part of the preventative maintenance, all equipment is checked for properly functioning safety devices (e.g., backup alarms, brakes, lights, fire extinguishers, etc.) Before each piece of equipment leaves the shop it must pass a safety checklist. All rental equipment is subjected to a similar inspection when delivered to the job site. Any piece of rental equipment that fails the inspection must be repaired by the vendor before it is accepted for use. In addition, all equipment is inspected in the field prior to the start of each day's activities. If a superintendent, operator, or safety officer detects a defect, a properly qualified mechanic is dispatched from the shop to make the repairs on-site.

6.1.2 Contact with Sharp Objects/Material

This hazard was not included in the Conti SSHP. Contacting the exposed ends of sharp objects/materials can potentially puncture the skin of workers not using appropriate personal protective equipment (PPE). In addition to sustaining a wound, the worker may become infected by tetanus infection, commonly called lockjaw. Tetanus is a bacterial disease that affects the nervous system. Infection with tetanus causes severe muscle spasms, leading to "locking" of the jaw so the patient cannot open his/her mouth or swallow, and may even lead to death by suffocation.

Sharp objects/materials shall be capped when possible so that the formerly sharp edge is covered with a blunt object that cannot produce a puncture wound. Objects that cannot be capped should be moved out of the work area when possible, marked with high-visibility surveying tape or equivalent, and identified as potential hazards in the daily toolbox safety briefing. All personnel sustaining puncture wounds shall receive tetanus shots as soon as possible following their doffing of PPE and overall decontamination.

6.1.3 Exposure to High Noise Levels

This subsection is consistent with the Conti SSHP without modification or edit. However, references to Conti's health monitoring program were removed from the discussion. The Site Safety and Health Officer for the environmental contractor conducting the work will make PPE that protects hearing available to all personnel covered by this SSHP.

Noise is found during remedial activities in such operations as transportation of materials and operation of heavy construction equipment. Noise has been defined as unwanted sounds. The human ear can tolerate a certain amount of sound without any harmful effects. The OSHA standard allows 90 dB (A) for a full 8 hours and for a lesser time when the levels exceed 90 db (A). It is usually safe to assume that if you need to shout to be heard at arms length, the noise level is at 90 dB (A) or above. Personnel operating or working around construction equipment or power tools will utilize hearing protection.

6.1.4 Flying Debris

This potential hazard was identified in the Conti SSHP, but was not explicitly described. Thus, the ensuing description of this potential hazard is new, although it is based on text in the Conti SSHP. The health and safety activities used to mitigate the hazard are consistent with those outlines in the Conti SSHP.

As described in the Conti SSHP, flying debris includes anything that becomes airborne due to the force applied to it. Objects that may potentially become airborne during implementation of the proposed activities include pieces of machines or hand tools, fragments of building materials that may be encountered during excavation, and soil. Soil may become airborne as dust during general construction activities or as clumps of soil during decontamination activities. Please note, the following health and safety activities address only the physical aspects of flying debris. Depending on the environmental quality of the soil, the airborne soil may also have associated chemical hazards.

Safety precautions that are required include checking the guards on equipment prior to each use, being aware of the materials encountered during excavation, and wearing appropriate PPE (i.e., at a minimum, hard hat and safety glasses/goggles/face shields). Dust can be controlled through misting with potable water.

6.1.5 Hand/Power Tools

This subsection is consistent with the Conti SSHP without modification or edit.

Hand and power tools are used for various site activities. Procedures for using hand and power tools are as follows:

- Persons using power tools shall be trained in their use.
- Ground Faults must be present on all electrical tools.
- Only tools in good condition shall be used.
- Tools shall be kept clean.
- Guards and shields shall be kept on all tools.
- Air couplings shall be secured.
- Non-sparking tools shall be used in hazardous areas.
- Proper eye protection is critical when using power tools. At a minimum, safety glasses will be required during site operations. Where appropriate, full-face shields will be utilized in addition to the glasses.

6.1.6 Handling Heavy Objects/Material

This hazard is referred to as "Material Handling" in portions of the Conti SSHP, and is referred to as "Handling Heavy Objects/Material" in the Activity Hazard Analysis tables. Although both terms are used

in the Conti SSHP, these terms appear to refer to the same hazard. The description of the hazard and the health and safety activities that are required in order to mitigate the hazard are consistent with the Conti SSHP without modification or edit.

Various materials and equipment may be handled manually during project operations. Care should be taken when lifting and handling heavy or bulky items to avoid back injuries. The following fundamentals address the proper lifting techniques that are essential in preventing back injuries:

- The size, shape, and weight of the object to be lifted must first be considered. Multiple employees or the use of mechanical lifting devices are required for heavy objects.
- The anticipated path to be taken by the lifter should be considered for the presence of slip, trip, and fall hazards.
- The feet shall be placed far enough apart for good balance and stability (typically shoulder width).
- The worker shall get as close to the load as possible. The legs shall be bent at the knees.
- The back shall be kept as straight as possible and abdominal muscles should be tightened.
- Twisting motions should be avoided when performing manual lifts.
- To lift the object, the legs are straightened from their bending position.
- A worker shall never carry a load that cannot be seen over or around.

When placing an object down, the stance and position are identical to that for lifting. The legs are bent at the knees and the object lowered. When two or more workers are required to handle the same object, workers shall coordinate the effort so that the load is lifted uniformly and that the weight is equally divided between the individuals carrying the load. When carrying the object, each worker, if possible, shall face the direction in which the object is being carried. In handling bulky or heavy items, the following guidelines shall be followed to avoid injury to the hands and fingers:

- A firm grip on the object is essential; leather gloves shall be used if necessary.
- The hands and object shall be free of oil, grease, and water which might prevent a firm grip, and the fingers shall be kept away from any points that could cause them to be pinched or crushed, especially when setting the object down.
- The item shall be inspected for metal slivers, jagged edges, burrs, and rough or slippery surfaces prior to being lifted.

6.1.7 Walking/Working Surface

This hazard identified in the Conti SSHP appears to be a compilation of the slip/hit/trip/fall hazard identified in that document and a "housekeeping" hazard. Therefore, the description of this hazard and the health and safety activities that are required in order to mitigate the hazard are from all applicable sections of the Conti SSHP without modification. Please see also Section 6.1.7, which addresses tripping hazards and housekeeping while carrying heavy objects/material.

In terms of slip, hit, trip, or fall hazards, the Conti SSHP provides the following.

Slip/trip/hit/fall injuries are the most frequent of all injuries to workers. They occur for a wide variety of reasons, but all injuries can be prevented by the following prudent practices:

- Spot-check the work area to identify hazards.
- Establish and utilize a pathway, which is most free of slip and trip hazards.
- Beware of trip hazards such as wet floors, slippery floors, and uneven surfaces or terrain.
- Carry only loads, that you can see over.
- Keep work areas clean and free of clutter; especially in storage rooms and walkways.
- Communicate hazards to on-site personnel
- Secure all loose clothing, ties, and remove jewelry while around machinery.
- Report and/or remove hazards.
- Keep a safe buffer zone between workers using equipment and tools.
- Workers must take particular care when walking on the geotextile-working mat.

In terms of housekeeping and general safety issues in the work area, the Conti SSHP requires that workers avoid walking on any stockpile, watch footing when entering an excavation, keep walkways and work areas clear of hoses, cords, other equipment, and clutter, restrict work area access to essential personnel, and wear appropriate footwear (i.e., steel-toe boots).

6.1.8 Excavation

The description of the hazard and the health and safety activities that are required in order to mitigate the hazard are consistent with the Conti SSHP without modification except that chemical hazards are discussed in Section 6.2. Please note, however, that the barricades used around the excavations will be high-visibility safety fencing with appropriate signs that read "KEEP OUT – SOIL EXCAVATION AREA."

The hazard associated with excavation is low to moderate. In general, the hazards encountered during soil excavation are: cave in of excavation sides with possible burial or crushing of workers. Causes of cave ins may include: (a) absence of shoring, (b) misjudgment of stability, (c) defective shoring, and (d) undercut sides. Other potential hazards are: falling during access/egress, while monitoring or dismounting equipment, or stumbling into excavation. An overhead hazard can result from material, tools, rock, and/or soil falling into the excavation. Flammable atmospheres may also be encountered in excavation.

During excavation, chemicals/hazardous substances may be encountered. See Section 6.2 regarding health and safety activities that are required to mitigate chemical hazards.

Conti will provide adequate shoring or sloping of sides of the excavation. Excavation/trenches will be inspected daily for changing conditions. Air monitoring for airborne contaminants shall be performed in areas where contaminated soils are encountered.

Excavation spoils will be directly loaded into transportation containers or stockpiled and covered at a designated area away from the work area. Excavation/trenches, regardless of the depth or width, shall be barricaded. The use of raised berms, caution signs and caution tape will be instituted to protect both the public and other personnel on the site. The excavation area will be delineated with caution tape during operations and barricaded/secured with safety fence at the end of each workday. Adequate means of exit, such as ladders, steps, ramps or other safe means of egress, will be provided and be within 25 feet of lateral travel.

Where personnel are required to enter excavations over 4 ft) in depth, sufficient stairs, ramps, or ladders will be provided to require no more than 25 ft. of lateral travel. At least two means of exit shall be provided for personnel working in excavations, where the width of the excavation exceeds 100 ft, two or more means of exit shall be provided on each side of the excavation.

6.1.9 Underground and Overhead Utilities

Caution will be exercised whenever the possibility of encountering unexpected subsurface obstructions exists while drilling. Before beginning intrusive activities, the ground surface area will be searched for evidence of potentially buried objects and all readily available sources of information (e.g. site utility drawings, public utility drawings, construction drawings, etc.) will be reviewed. If the proposed sampling location is not considered safe, the location will be modified to address safety issues. Markouts for underground utilities shall be maintained during all periods of intrusive work. To prevent disturbing potentially shallow underground utilities and buried objects, the Port Authority requires using manual equipment to drill/dig from the ground surface to approximately six feet below the ground surface. If no obstructions are encountered, the soil boring, test pit, or test trench will be completed by competent personnel using conventional methods.

Safety concerns will be adhered to during drilling activities. Personnel operating the drilling equipment should wear required personal protective equipment. Drilling activities should not commence within 10 feet of overhead electrical power lines or at a distance where in the event of equipment failure a portion of the drilling equipment would contact overhead electrical power lines. As noted in the Conti SSHP, the minimum distance of 10 feet will vary according to voltage the greater the voltage, the greater the distance between the lines and the equipment. Table 1 below from the Conti SSHP describes minimum clearance from energized overhead electrical lines.

Table 1 - Minimum Clearance From Energized Overhead Electrical Lines	
Nominal System Voltage	Minimum Rated Clearance
0 to 50 kV	10 Feet (3 m)
51 to 200 kV	15 Feet (4.5 m)
201 to 300 kV	20 Feet (6 m)
3001 to 500 kV	25 Feet (7.5 m)
501 to 750 kV	24 Feet (10.5 m)
751 to 1000 kV	31 Feet (13.5)

6.2 Chemical Hazards

Based on analytical data from the environmental investigations performed to date, the chemical hazards that may be encountered during additional investigations and/or remedial actions are related to the inhalation, ingestion, and dermal contact with VOCs, SVOCs, PCBs, pesticides and herbicides, and metals. In addition to the chemical hazards that may potentially arise due to the presence of LNAPL, impacted soil, and impacted groundwater, it is anticipated that an environmental contractor and/or a subcontractor may bring materials (Operational Chemicals) into the project area that may pose chemical hazards if used improperly. Section 6.2.1 discusses the potential chemical hazards associated with the presence of LNAPL, impacted soil, and impacted groundwater (Contaminants of Concern) in the project area. Section 6.2.2 discusses the potential chemical hazards associated with Operational Chemicals. Both subsections describe the general health and safety actions that are required for additional investigations and/or remedial actions in order to mitigate the potential hazards.

6.2.1 Chemical Hazards Related to Contaminants of Concern

As noted in the Conti SSHP, the greatest potential for exposure to Contaminants of Concern will be during intrusive activities (i.e., excavation and drilling). Exposure may also occur when handling waste materials such as excavated soil or pumped groundwater or LNAPL. As noted above, the anticipated routes of exposure are inhalation, ingestion, and direct contact. Based upon the analytical data generated from previous environmental investigations performed at the HHMT-Port Ivory Facility, the Contaminants of Concern include VOCs, SVOCs, PCBs, pesticides and herbicides, and metals. The following is a summary of what health and safety activities will be performed to mitigate the chemical hazards associated with the Contaminants of Concern. The summary is from the Conti SSHP without revision. A description of the air monitoring to be performed and associated action levels is provided in the Community Air Monitoring Plan, incorporated in Section 7 by reference. PPE is addressed below, and the initial levels of PPE to be worn are summarized in Table 7. References to "Conti" in the discussion below should be construed as references to an environmental contractor retained by the Port Authority to perform specific site work tasks.

General Procedures

A primary exposure route of concern at the site is direct contact of the skin and eyes with contaminated material. Air monitoring, using direct reading instruments, for particulate shall be performed during work activities. To protect workers against dermal contact, they will wear specified protective clothing, respirators and safety glasses for operations involving potential exposure to hazardous materials. Proper personal decontamination procedures will be emphasized during remedial construction activities.

Although ingestion should be the least significant route of exposure, employees will be made aware of ways in which this type of exposure can occur and methods to avoid such exposure. Deliberate ingestion of chemicals is unlikely. Personal hygiene habits that provide a route of entry for chemicals will be restricted. Proper decontamination procedures will reduce/eliminate potential of ingesting hazardous materials. Site personnel will wash their hands, face and other exposed parts of their skin before eating or smoking.

The use of engineering controls for the protection of personnel is the first means of mitigation. This involves the elimination of hazards and the isolation of the workers from the hazards. Implementation of engineering controls can reduce the need for personal protective equipment by separating the worker from the contaminated material. During remedial activities, dust and vapor may be generated. The SSHO will be constantly alert to the possibility of unacceptable dust and vapor levels.

Control measures will be implemented for all operations where dust is likely to be generated. Potential dust concentrations will be reduced primarily by careful planning and implementation of controls. There are a number of specific construction practices, which will reduce levels of airborne particulates. These include:

- Providing for a misting spray during excavation activities
- Applying water on and sweeping haul roads.
- Wetting and smashing equipment and building faces.
- Spraying mist on buckets during material handling and dumping.
- Hauling materials in properly tarped or watertight containers.
- Reducing the active work area surface and limiting the number of concurrent operations.
- Regular washing of contaminated equipment.

Designated Work Zones

Except for the definition of the Exclusion Zone, which is based upon the Conti SSHP, this section is consistent with the Conti SSHP without modification.

This section outlines site control measures to be implemented to minimize potential exposure to and accidental spread of hazardous substances during remedial activities. Listed below are the work zones that shall be established. The zone boundaries may be modified as necessary as new information becomes available.

The Site will be divided into the Exclusion Zone (EZ), Contamination Reduction Zone (CRZ), and Clean Zone. It should be recognized that the Site control zones will be modified continually. A map showing the work zones will be updated daily and posted in the Site office, if any, or on the outside of the company vehicle, if no office has been established. The SSHO will review the location of work zones at the daily safety briefing.

The Exclusion Zone (EZ) for the Project will consist of the following areas: areas where intrusive activities are actively occurring; areas where soil borings or excavations have been completely drilled or excavated but the boreholes or excavations remain open; areas where construction vehicles (e.g., excavators, drill rigs, trucks, construction equipment, etc.) are staged; areas within 5 feet of any monitoring well being sampled; and, areas of soil stockpiles.

The CRZ is where workers and equipment shall be decontaminated to minimize the spread of contaminants from the EZ into clean areas at the Site. The CRZ will consist of the area located in front of or next to the EZ so the personnel or equipment leaving the EZ can be decontaminated and all PPE can be removed. Emergency equipment to be located in this area will include first aid kits and other appropriate equipment.

The zone known as the Clean Zone is considered to be uncontaminated. This area shall be used as a storage area for operations equipment.

Appropriate PPE

This section provides an outline of the PPE and guidelines that will be implemented to minimize chemical, physical, and biological exposures and accidents during remedial activities. Where engineering controls and job hazard analyses do not eliminate all job hazards, employees will (where appropriate) wear PPE.

These include items such as, hard hats, face shields, safety goggles, glasses, hearing protection, foot guards, gloves etc. The SSHO will ensure that equipment selected will meet the following requirements:

- It will be appropriate for the particular hazard.
- It will be maintained in good condition.
- It will be properly stored when not in use, to prevent damage or loss.
- It will be kept clean, fully functional and sanitary.
- Must meet all applicable ANSI standards.

Personal clothing and jewelry can present additional safety hazards. Supervisors will ensure that workers wear appropriate clothing, which will not interfere with the PPE. All PPE will be selected in accordance with 29 CFR 1910.132. Conti will provide proper PPE to all employees. All protective clothing will be properly used, stored, selected, and maintained.

Selection of the appropriate PPE is a complex process, which should take into consideration a variety of factors. Key factors involved in this process are identification of the hazards, or suspected hazards, routes of potential exposure to employees (inhalation, skin absorption, ingestion, and eye or skin contact); and the performance of the PPE materials (and clothing seams) in providing a barrier to these hazards. The amount of protection provided by PPE is material-hazard specific. That is, protective equipment materials will protect well against some hazardous substances and poorly, or not at all, against others. In many instances, protective equipment materials cannot be found which will provide continuous protection from the particular hazardous substance. In these cases, the breakthrough time of the protective material should exceed the work duration.

Other factors in this selection process to be considered are matching the PPE to the employee's work requirements and task-specific conditions. The durability of PPE materials, such as tear strength and seam strength, should be considered in relation to the employee's tasks. The effects of PPE in relation to heat stress and task duration are a factor in selecting and using PPE. In some cases layers of PPE may be necessary to provide sufficient protection, or to protect expensive PPE inner garments, suits or equipment.

- **Level A:** The highest level of skin, eye, and respiratory protection (Level A PPE is not anticipated on this project).

Level B equipment, used as appropriate, is as follows:

- Positive pressure, full facepiece self-contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA (NIOSH-approved)
- Disposable coverall (Tyvek, Polycoated Tyvek or Saranex)
- Outer gloves: neoprene or nitrile
- Inner gloves: latex or nitrile
- Chemical resistant or disposable overboots.
- Steel-toed safety boots
- Hard hat

Level C equipment, used as appropriate, is as follows:

- Full-face, air purifying, cartridge-equipped respirators (NIOSH-approved) utilizing Organic Vapor/Acid Gas and HEPA filters (half-face if approved by SSHO). Cartridges and/or filters must be replaced as needed and, as a minimum, changed weekly.
- Disposable coverall (Tyvek, Polycoated Tyvek or Saranex).
- Outer gloves: leather, cotton, neoprene or nitrile
- Inner gloves: latex or nitrile
- Chemical resistant or disposable overboots
- Steel-toed safety boots
- Hard hat
- Safety glasses (if half-mask is utilized)
- Splash guards (worn during high pressure washing activities)

Modified Level D equipment, used as appropriate, is as follows:

- Regular Tyvek coveralls (Polycoated Tyvek as required)
- Outer gloves: leather, cotton, neoprene or nitrile
- Inner gloves: latex or nitrile (doubled)
- Chemical resistant or disposable overboots
- Steel-toed safety boots
- Hard hat
- Safety glasses
- Splash guards (worn during high pressure washing activities)

Level D equipment, used as appropriate, is as follows:

- Work uniform (Long pants and Shirt)
- Hard hat
- Steel-toed safety boots (with disposable overboots, as required)
- Safety glasses
- Leather or heavy cloth gloves (as needed)

Table 7 – Initial Levels of Protection

Task	Required PPE
Drilling soil borings, Collecting Soil Samples, Excavating test pits/trenches	Modified Level D
Installing Temporary and Permanent Monitoring Wells, Collecting Groundwater and/or LNAPL Samples, Pumping Groundwater or LNAPL, Storing Groundwater or LNAPL	Modified Level D, Evaluate need for poly-coated Tyvek suits
Stockpiling and Disposing of Soil	Modified Level D
Restoring Site to its Original Condition	Level D

Notes:

1) The SSHO will determine the need for poly-Tyvek suits to be worn.

2) Level D and Modified Level D PPE as described in Section 6.2.2.

3) PPE = Personal Protective Equipment.

Personal Protective Equipment alone should not be relied on to provide protection against hazards, but should be used in conjunction with guards, engineering controls, and sound work practices.

All personnel shall wear a hard hat that meets the requirements and specifications in ANSI Safety Requirements for Industrial Head Protection Z89.1-1969. Exceptions to this requirement are personnel in the site office and rest and eating areas.

Outer gloves used on the Site for remedial activities shall be either chemical resistant or general purpose. The appropriate glove shall be determined by the SSHO for a specific work task. Chemical resistant gloves shall be selected using appropriate chemical degradation guides. Cotton work gloves will be worn when work activities require the handling of sharp and rough-surfaced objects.

Welder's gloves or any other special type of gloves are considered outer gloves and are to be worn over inner gloves. These special outer gloves shall be stored on-site and shall be disposed of properly as PPE waste. Inner gloves shall always be chemical resistant, shall be selected using appropriate chemical degradation guides and shall be disposed of as PPE waste.

No contact lenses are allowed in the Exclusion Zone (EZ) and Contamination Reduction Zone (CRZ). Eye/Face protection shall be worn by all personnel in the CRZ and EZ. Double eye protection will be required when power-washing equipment during decontamination. All eye/face protection provided shall be ANSI Z87-1989 approved.

Footwear will be steel-toed safety boots. Chemical-resistant outer boot covers are to be worn in the Exclusion Zone, Contamination Reduction Zone. Boot racks will be provided in the CRZ for drying of outer boots.

To control and or minimize the threat of occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors, the primary objective of this program shall be to prevent atmospheric contamination. This shall be accomplished as far as feasible by accepted engineering control measures (for example, dust suppression). When effective engineering controls are not feasible, or while they are being instituted, appropriate respiratory protection shall be used. A respiratory protection program will be implemented that is compliant to the requirements of 29 CFR 1910.134 "Respiratory Protection." Respiratory protection equipment shall be NIOSH-approved and respirator use will conform to American National Standards Institute (ANSI) Z88.2.

Respirators shall be provided when such equipment is necessary to protect the health of the employee. Conti shall:

- Provide the respirators to Conti personnel, which are applicable and suitable for the purpose intended.
- Be responsible for the maintaining a written Respiratory Protective Program, in accordance with 29 CFR 1910.134 The employee shall use the provided respiratory protection in accordance with instructions and training received.
- Respirators shall be selected on the basis of hazards to which the worker is exposed.
- The user shall be instructed and trained in the proper use of respirators and their limitations.

- Respirators shall be regularly cleaned and disinfected.
- Respirators shall be stored in a convenient, clean, and sanitary location.
- Respirators used routinely shall be inspected during cleaning. Worn or deteriorated parts shall be replaced. Respirators for emergency use, such as self-contained devices, shall be thoroughly inspected at least once a month and after each use.
- Appropriate surveillance of work area conditions and degree of employee exposure or stress shall be maintained.
- There shall be regular inspections and evaluations to determine the continued effectiveness of the program.
- Employees will not be assigned to tasks requiring use of respirators unless it has been determined that they are physically able to perform the work and use the equipment. A physician shall determine whether an individual is physically fit to wear a respirator. The physician's clearance allows the worker to don a respirator and work in conditions of high ambient temperatures. Heat stress will be closely monitored by the SSHO.

Each respirator shall be individually assigned and not interchanged between workers without cleaning and sanitizing. The cartridges/filters shall be changed at the first sign of breakthrough based on contaminant warning properties or if the user experiences excessive breathing resistance. The SSHO will make final determination of the frequency of respirator cartridge/filter change-out. Respirators shall be cleaned and stored in an uncontaminated atmosphere after each use. Used cartridges will be disposed of with spent PPE. Self-contained breathing apparatus/supplied-air respirators shall be inspected before and after use and at least once monthly, if in storage for emergency use.

All employees working at the Site during remedial activities who have the potential of wearing a respirator shall be fit-tested to ensure they utilize the proper size respirator. Conti shall arrange for fit testing. Sub-contractors will provide the SSHO with fit-test documentation. The fit test is conducted according to the manufacturer's suggestions. The test shall consist of a taste and odorous vapor qualitative test. As per OSHA regulations, personnel that are unable to pass a fit test shall not enter a work area when respiratory protection is required. In addition, facial hair is prohibited from the respirator seal area. Any person with facial hair will not be permitted to enter a work area where respiratory protection is required, regardless of the fit test results. Documentation of the fit testing will be maintained on-site.

6.2.2 Chemical Hazards Related to Operational Chemicals

This subsection is consistent with the Conti SSHP without modification, although it is a compilation of several sections from the Conti SSHP.

Operational chemicals may be brought to the project-site for use in activities supporting the remedial activities. These chemicals are used for fuels in operating heavy equipment, glues for welding pipes, painting, etc. The use of operational chemicals is regulated by OSHA under the Hazard Communication Standard (29 CFR 1910.1200). MSDSs for operational chemicals are kept on file in the project office trailer. An inventory list of the anticipated operational chemicals (Hazardous Chemical Inventory List) for use at the project will be maintained at the site and updated as new material is received.

OSHA's standard for hazard communication requires that all workers be informed of potentially hazardous materials used in their work area. Conti provides employees with information and training on hazardous chemicals at their work site at the time of their initial assignment, annually, and whenever a new chemical is introduced into their work site that could present a potential hazard. Personnel are briefed on the general requirements of the OSHA hazard communication standard and duty-specific hazards by their immediate supervisor before they begin any duties on the work site. Personnel transferred from another site are also briefed on the duty-specific hazards by their immediate supervisor before they begin any duties on the work site.

7.0 COMMUNITY PUBLIC HEALTH PRESERVATION

Although no residential properties are situated adjacent to the project area, there is regular vehicle traffic and occasional pedestrian traffic along Western Avenue and Richmond Terrace, and there are tenant companies at the HHMT-Port Ivory Facility. During excavation and drilling, the presence of LNAPL, impacted soil, and impacted groundwater may generate chemical hazards (i.e., vapors and dust) that may migrate off site unless measures are taken to prevent this. The vapors and dust may potentially create health hazards for the pedestrians and drivers on Western Avenue and Richmond Terrace, and the tenants at the HHMT-Port Ivory Facility. Please note, these individuals are not covered under any portion of this HHSP; the community public health protection measures are aimed at preventing these individuals from being exposed to potential chemical hazards rather than requiring the individuals to take any actions.

Community public health preservation measures consist of the application of a Community Air Monitoring Plan (CAMP) and of site security measures. The site security measures are identified in Section 5.2, above. The CAMP, which is provided in Appendix A, was prepared by HMM in accordance with requirements of the NYSDOH and is dated June 2006. The CAMP shall be maintained at the jobsite by the environmental contractor.

The CAMP provides for air quality monitoring for volatile organic vapors and dust, specifies action levels for increasing concentrations of these vapors and dust, and identifies actions that must be taken when each action level is exceeded. Please see the CAMP provided in Appendix A for more information.

8.0 EMERGENCY ACTIONS AND CONTACTS

This section is consistent with the Conti SSHP without modification except that the emergency plan responsibilities designated to the Project Superintendent and Resident Engineer in the Conti SSHP are designated to the environmental contractor in this SSHP. All references to "Conti" should be construed as an environmental contractor.

This section describes the emergency response plan that shall be implemented by Conti employees to handle emergencies. The nature of the project, the contaminants present and the activities planned for the site are such that there is little potential for an emergency, which would result in a significant release of hazardous substances, and in any way threaten the adjoining community. However, there is always the potential at any construction site for emergency situations to occur which threaten the on-site workers. Possible examples of emergency situations during remedial activities include equipment fires, or contact of equipment with overhead power lines. In all of these cases, procedures will be implemented to minimize the possibility of an emergency situation. The procedures outlined below are designed to ensure that the workforce reacts quickly and appropriately to emergency situations, thereby protecting the health and well being of the individual workers. It is expected that modifications may be necessary upon actual site set-up and conditions. Furthermore, Conti Enterprises's Corporate Safety, Health and Environmental Program and Procedures Manual include Conti's Corporate Emergency Action Plan Policy and Guideline for Handling Emergencies.

During the site safety briefings held daily, all employees will be informed of the location of this plan, the procedures outlined in this plan, and the communication systems and evacuation routes to be used during an emergency.

On a continual basis, individual personnel should be constantly alert for indicators of potentially hazardous situations and for signs and symptoms in themselves and others that warn of hazardous conditions and exposures. Rapid recognition of dangerous situations can avert an emergency.

In the case of a medical emergency, the SSHO has the responsibility to coordinate directly with 911. As soon as possible thereafter, the SSHO will notify the Port Authority Resident Engineer of the emergency and the response. In the case of a non-medical emergency, the SSHO has the responsibility to evacuate all personnel to a designated safe location at the Site. The signal to evacuate may be given via air horn, so long as an emergency signal has been established, or radio. As soon as the evacuation is underway, the SSHO is responsible for notifying the Port Authority Resident Engineer of the nature and severity of the emergency. The Port Authority Resident Engineer will assume command of the response and will be responsible for apprising appropriate emergency personnel of the situation.

Decontamination of an injured or exposed worker will be performed if decontamination does not interfere with essential treatment. The objective is to successfully administer first aid without exposing rescue workers and the victim to contaminants. Project personnel will meet with the local hospital to discuss the possibility of having to treat injured personnel from the site.

If the hazards are low and decontamination can be performed, then a wash, rinse and removal of protective clothing will be performed.

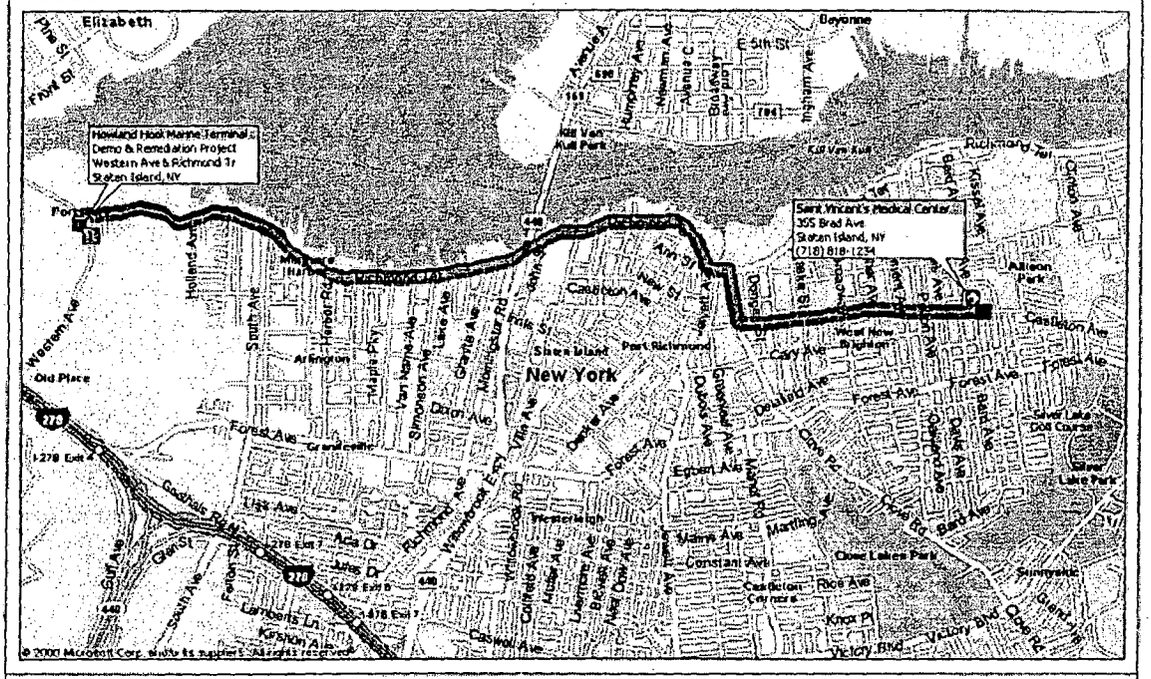
If the hazards are high and decontamination cannot be done, then the following procedures will be performed:

- Wrap the victim in blankets or plastic sheeting to reduce contamination of rescue workers or other personnel.
- Alert emergency and medical personnel to potential contamination. Emergency entry into the exclusion zone will be controlled by the SSHO. The SSHO will determine if the victim can be moved from the exclusion zone. If entrance into the exclusion zone is required, the SSHO will ensure that the emergency workers don the proper PPE.
- If required, arrange to have the SSHO, who is familiar with the site to accompany the victim to the hospital if required.

Both the Site Superintendent and the Site Safety and health Officer are trained in CPR and First Aid and have first aid kits for use in a medical emergency. First Aid Kits will be located in the main support area, Contamination Reduction Zone and at the work activity locations. Eyewash stations will be available at the Contamination Reduction Zone. Eyewash stations will be of the pressurized, 15-minute discharge type. On-site employees have a basic knowledge of first aid and will assist the Site Superintendent and SSHO. Community emergency services (EMS, Fire, and Police) shall be notified immediately if their resources are needed on site.

If necessary, the injured or sick party shall be taken to Saint Vincent's Medical Center – Please refer to ***Figure 2 – "Route to Hospital Map*** for directions to the area hospital. Route to the area hospital will be posted and easily visible at all times.

Figure 2 - Route to Hospital Map



Depart Howland Hook Marine Terminal on Local road(s) (North),
Turn RIGHT (East) onto Richmond Ter
Turn RIGHT (South) onto Clove Rd
Turn LEFT (East) onto Castleton Ave
Turn LEFT (North) onto Bard Ave
Arrive St Vincent's Medical Center [355 Bard Ave, Staten Island, NY 10310, Tel: (718) 876-1234]

When any emergency occurs on-site, the on-site SSHO and Project Superintendent shall be notified immediately. The Project Superintendent or the SSHO shall notify the client and his representatives. Please refer to the ***Table 11 – "Emergency Telephone Numbers"*** for emergency telephones. Emergency Telephones will be posted and easily visible at all times.

To notify any site workers of an emergency, workers can be signaled by way of hand held or mobile two-way radios or as a backup, the use of an emergency alarm (portable air horn). Any audible pattern of blasts from a portable air horn becomes difficult to interpret due to distance and the inhibitory effects of a respirator.

Table 11 – Emergency Telephone Numbers	
Police Department: Emergency Police Department	 911 718-876-8500
Fire Department: Emergency Fire Department/Ambulance Service	 911 718-727-1100
Hospital: Saint Vincent's Medical Center 355 Bard Ave, Staten Island, NY	 718-818-1234
Occupational Physician: Environmental Occupational Specialist (EOSI) Dr. Robert MacMillan	 508-698-0444
Port Authority of NY & NJ Mike Wallace, Resident Engineer	718-442-8972 973-390-5519 (Cell)
NYS Department of Environmental Conservation Emergency Spill Hotline Phone Number	 800-457-7362
National Response Center	800-424-8802
CHEMTREC	800-424-9300

All emergency communications will flow through the radio network. Outside emergency services will be notified, as necessary. The site evacuation alarm consists of one long blast on a horn, every 10 seconds. Any time the alarm system is activated; on site personnel will be notified immediately. Personnel will extinguish any nearby ignition source and prepare for emergency response activities. This alarm will also be used to alert personnel of a sudden release of hazardous materials.

The observer of the emergency condition will brief the responding personnel as to the nature and location of the incident. When they have assessed the situation, a decision whether or not to implement these procedures will be made. If these Emergency Contingency Procedures are not implemented, the "All Clear" will be given verbally by supervisory personnel. The "All Clear" will be used to indicate a return to normal (non-emergency) conditions following emergency response activities. The alarm signals will be prominently posted at the site. The audible alarm system will be discussed with each resident within hearing range of the alarm system.

There is a logical sequence of steps to follow in responding to emergencies, which should be followed by site personnel. This sequence involves identifying the emergency, investigating the extent of the emergency, deciding on the proper initial course of action, taking corrective action to rectify the situation, and following up with a post-emergency investigation.

Equipment breakdowns, power failures, injuries and natural disasters are usually rather dramatic and will capture the individual's attention immediately upon occurrence. In other cases, the individual may have prior warning of impending emergencies through weather reports in the case of natural disasters and trends in equipment performance in the case of some breakdowns.

Some emergency situations exist long before the operator is aware that an emergency exists. These cases may produce situations, which then become immediate and obvious. For example, unattended equipment may have minor breakdowns which go unnoticed; further operation thus leading to complete breakdown of the equipment resulting in possible injury to the unwary bystander.

In the event of a fire, explosion, accidental material release, or any other emergency, response activities will be initiated following the evaluation of the event. An assessment of the situation will be performed by the SSHO immediately upon notification. The Superintendent/SSHO is authorized to commit resources to the extent detailed in this plan. If it is determined that an emergency situation exists, he will then implement the appropriate emergency response activities.

In the event that a medical emergency or accident occurs in the Exclusion Zone, all personnel responding to the emergency should be outfitted in the Personal Protective Equipment appropriate for the situation. As a general rule, personnel should not enter the Exclusion Zone without donning the minimal level of PPE required. In the event that a worker is overcome or disabled for an unknown reason, the Superintendent/SSHO must make a determination as to the level of respiratory protection, which is appropriate. Specifically, a determination must be made as to whether Supplied Air Respirators are necessary for the protection of the responders.

The contingency plan will be activated by the Superintendent/SSHO immediately, in the event of a fire or explosion, or emissions of toxic chemicals in excess of limits set forth by Federal, State, and local agencies. In the event of a spill or material release, it will be up to the Superintendent/SSHO to make a determination as to when emergency conditions exist, as opposed to routine maintenance of the site. His determination will depend upon the location of the spill, the size of the spill, weather conditions and the proximity of the release to workers, the community and environmental receptors.

Once it becomes apparent that an emergency situation exists or that a disaster is impending, the Project Superintendent or his designee should immediately be notified and an immediate investigation conducted. Assessment of the emergency should include assessing the severity of the situation and collecting enough information to make an initial action decision.

Assessing the emergency should include identifying injured persons (if any), damage to buildings and equipment, noting potential impending damage if corrective action is not taken immediately, and itemizing resources required to correct the situation.

Although the potential for fire or explosion is minimal, sources of risk do exist. These sources include welding gases, gasoline for portable equipment, diesel fuel for the heavy equipment and combustible debris. In the event of an explosion, possible emergency conditions would exist. Unless extinguished immediately, a fire or explosion will trigger implementation of these procedures.

Material Spills could occur during truck loading and from vehicle accidents. Additionally, equipment fueling operations could produce spills. Ultimately, a spill could contaminate receiving surface water or cause a release of vapors to the air. A spill of fuel could also ignite. A small spill should be cleaned up immediately, but should not trigger activation of these procedures. Should an on site spill occur, the immediate response will include closing off the source of the spill, if possible, application of the sorbent material or sand bagging, and street sweeping, as appropriate. Any spill that results in a discharge to off site surface water will be contained with sorbent booms as needed. All spills will be investigated, and a written report will be provided to the regulatory agencies in accordance with applicable regulations.

In the event of severe weather, the Site Superintendent and/or the HSO have the authority to stop operations and direct evacuation procedures, if conditions warrant. All equipment will be secured and grounded. After the storm, a visual inspection will be performed by the Superintendent and/or the HSO to check for damage and hazards. These will be performed before any work is resumed. If damage or hazards are noted, the designated or other Conti personnel will evaluate the conditions and implement corrective actions to repair the damage or eliminate the hazard. These actions will begin as soon as possible and will take precedence over other site activities.

Once the extent of the emergency is known, the Superintendent and the SSHO will make an immediate decision as to what initial steps should be taken to remedy the emergency situation. This first action, in the case of large-scale emergencies, usually consists of notifying responsible authorities and/or calling for the necessary assistance in order of priority.

The individual(s) should not unduly endanger him or herself or others by attempting tasks for which the proper equipment is not available or with which he or she is unfamiliar. In all cases, if in doubt, wait until qualified help arrives before taking action.

When help arrives, the site superintendent/SSHO should immediately inform those called of the pertinent details of the situation. Corrective action should be continued until the situation is either under control or completely rectified. If corrective actions will take considerable time, a long-term effort to complete the task should be developed.

After the situation is corrected, the cause of the emergency event is to be determined and review of the corrective actions taken, etc. In the case of equipment failure, if negligence was not a factor, then revising maintenance procedures would be the most likely first preventive step. For natural disasters that cannot be prevented from recurring, the procedures followed in dealing with them can be reviewed to develop more effective action plans. The entire event, along with all of the responses, will be thoroughly documented for review by management and project supervisory personnel.

The purpose of this section is to define practices and procedures for the prevention, containment and cleanup of accidental discharges of hazardous substances during the project. These substances include both the contaminated material managed as a result of the remedial project, such as contaminated soils and

decontamination liquids, and construction materials typically found on any construction site, such as lubricating fluids, diesel fuel, gasoline, etc.

Spill prevention applies to all types of spills and can be described as the first and simplest approach to spill control. Human error is a major contributing factor to spills and releases. An awareness of spill consequences, preventive measures and countermeasures will greatly reduce spill occurrences. A sound prevention program includes careful work practices, constant inspection, and immediate notification and correction of deficiencies. In the event that a spill does occur, proper containment and cleanup procedures must then be followed in order to reduce the effect of the spill.

Prevention of unnecessary spills is of first priority. Prevention measures include:

- Operators and drivers will exercise extreme caution when transporting material around the site.
- When removing hoses from machines an appropriate and adequate supply of absorbents will be on hand. A supply of the following absorbents will be kept on-site: oil sorbent booms, rolls and pillows, universal towels and sheets and vermiculite.
- Hoses will be capped when not connected to their appropriate fitting.
- All containers will be inspected daily for decay. No open container shall be exposed to rainfall, snowfall, etc. without being emptied and cleaned of residue.
- All equipment will be inspected for leaks before and after service.
- Storage of material such as fuels, oils, and solvents on-site will be limited to the minimum required. All fluids will be stored in individual fluid containers appropriate and approved for the material. Most of the individual fluids containers will be further secured by storage in large, locked tool and equipment storage containers. Drums or other containers too large to be stored in containers will be stored raised off the ground on a liner and covered by plastic.

All spills will be reported immediately to appropriate field and office management personnel. The sequence of reporting will be as follows:

- Notification by workers to the Project Superintendent or Site Safety and Health Officer.
- The Project Superintendent or Safety and Health Officer will immediately notify the Resident Engineer Representative regardless of the size of the spill.
- Conti, and the Resident Engineer will jointly determine the nature of the spill, its size, direction of travel, if anyone has been injured as a result of the spill and whether it requires immediate notification to regulatory agencies.
- The Resident Engineer will have primary responsibility for notifying the regulatory agencies. Conti will have follow-up responsibility to verify that the notification is made in a timely manner.
- If a reportable spill occurs and the Resident Engineer cannot be immediately reached, Conti will primary responsibility to report the spill to the regulators (reportable spills will be called into the NYSDEC spill hotline within two hours of the incident and a spill number obtained).
- A full list of emergency contacts and telephone numbers is included this plan. This list includes Conti personnel as well as federal, state and local authorities. This list will be posted in all trailers on-site.

Upon notification of a spill, all project activity will be immediately suspended and all necessary equipment and personnel will be diverted to spill control and containment. In the event of a spill, and regardless of the size, a Spill Incident Report will be submitted to the Resident Engineer within 48 hours of the incident.

Given the nature of this project, all the necessary equipment and personnel necessary to deal with a release of hazardous substances will be available on site. In addition to the heavy equipment and personal protective equipment, which is critical to spill control, Conti will have on hand an ample amount of sorbent materials, UN1A2 open top drums and overpacks.

Prior to entering a spill area, all workers must be protected from any adverse effects of the spilled material. No one will enter any spill area alone. The Site Safety and Health Officer will determine the level of protection required for response activities. To the extent practicable, the area will immediately be cordoned off and, if appropriate, exclusion, contamination reduction and support zones will be established.

The decision to use confinement techniques such as diversion, diking and retention, are generally based on time, personnel, equipment and supplies. As mentioned above, all necessary resources will be available on-site at all times. To the extent the nature of the material is known, the decision should be made based upon a review of the harmful effects of the material. In the event of a large migrating spill, an unlikely circumstance, diversion techniques, such as placing a soil wall or absorbent boom ahead of the spill, shall be implemented first. Subsequently, diking techniques, such as using material such as sand covered with liner material (PVC, hypalon) should be implemented.

Once a spill has been contained and the source of the spill corrected and controlled, cleanup can begin. Spill cleanup can proceed at the same time as containment if feasible. Supervisory personnel will determine the appropriate cleanup methods. The Site Safety and Health Officer will determine the appropriate level of protection depending upon the nature of the material.

- The first action will be to absorb free liquids with absorbent pads, booms, pillows, or clay. The absorbent material will be placed in drums and moved to an appropriate storage location. Subsequent to the removal of free liquids, soil believed to be contaminated will be excavated and containerized in drums or stockpiled on poly sheeting and covered for further testing.
- Dry spills, while posing less of a risk of migration, will still require appropriate and immediate action. The nature of the spilled material will be ascertained. The spilled material will be recovered for reuse if appropriate. Material which cannot be recovered and residual contaminated soil will be shoveled into 55-gallon drums, placed in the drum storage area and sampled and analyzed for waste characterization and disposal.
- Once containerized, Conti Enterprises will provide for the appropriate sampling and analysis for waste characterization and disposal facility acceptance. Results of waste characterization analysis, waste profiles and manifests will be provided to the Construction Representative for review.
- All spilled material and visually contaminated soil will be excavated and containerized in the initial spill response. If there appears to be a possibility that contaminants have migrated into the surrounding soil, post-remedial sampling will be initiated. Soil samples will be taken from the areas of suspected contamination and analyzed for the compounds, which were released.

Personnel Decontamination - In general, all spill response operations will be performed in accordance with the provisions of the approved Site Safety and Health Plan.

A written report shall be made within 24 hours of incident resolution. The Resident Engineer will be provided with a copy. In addition, all key personnel will have a meeting within 48 hours of the incident to discuss and critique all of the aspects of the Emergency Contingency Plan according to new site conditions and lessons learned.

APPENDIX A

COMMUNITY AIR MONITORING PLAN (CAMP)

COMMUNITY AIR MONITORING PLAN

1.0 INTRODUCTION AND SCOPE OF PROGRAM

This Community Air Monitoring Plan (CAMP) establishes guidelines and requirements for protecting the health of the general public near, and of non-Port Authority personnel at, the Howland Hook Marine Terminal-Port Ivory (HHMT-Port Ivory) Facility during implementation of any environmental investigation or remedial effort. Such environmental investigations and remedial efforts are part of the overall redevelopment effort of the Port Authority of New York and New Jersey (Port Authority) to construct an intermodal facility at the HHMT-Port Ivory Facility and are subject to New York State Department of Environmental Conservation (NYSDEC) and New York State Department of Health (NYSDOH) oversight in accordance with the Voluntary Cleanup Program (VCP). The VCP requires that a Site-specific Health and Safety Plan and a CAMP be submitted prior to beginning work proposed in any Site Investigation or Remedial Action Work Plan. This CAMP is being submitted to meet that requirement. No activity related to additional environmental investigations and/or remedial actions will be initiated prior to the Port Authority's receipt of approval of this CAMP.

It is anticipated that intrusive activities will be performed from time to time during the environmental investigation and remediation of the HHMT-Port Ivory Facility. The implementation of intrusive activities potentially may mobilize any volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides and herbicides, polychlorinated biphenyls (PCBs), and metals that have been detected in the impacted soil and groundwater as well as the light, non-aqueous phase liquid (LNAPL) at the HHMT-Port Ivory Facility. Therefore, air quality monitoring activities are required in order to protect potential receptors, generally the public, tenants of the Port Authority, and non-Port Authority personnel who may be involved in the environmental investigation/remediation.

The HHMT-Port Ivory Facility is located in a portion of Staten Island that is dominated by industrial or commercial properties. Except for the residential property located along Richmond Terrace tot eh east of Future Site 4/2C, there are no residential properties adjacent to the Facility. Nevertheless, Western Avenue and Richmond Terrace, both public roadways, run through the HHMT-Port Ivory Facility. This CAMP will be protective with regard to the health of people who may be present at the residential property referenced above, pedestrians walking along these roadways, and people driving along these roadways.

The Port Authority leases some of the buildings and land at the HHMT-Port Ivory Facility. This CAMP will be protective with regard to the health of the tenants.

While the Port Authority has a policy that includes health and safety provisions for its personnel at the HHMT-Port Ivory Facility, subcontractors of the Port Authority are not specifically addressed by the Port Authority's policies. Therefore, this CAMP covers all

subcontractors who are covered by the Site-specific Health and Safety Plan applicable for the environmental investigation and/or remedial efforts addressed by that document.

This CAMP was prepared in accordance with applicable NYSDOH guidelines. All information required by the NYSDOH has been provided in this CAMP.

2.0 BACKGROUND AND SITE INFORMATION

As noted above, the Project is being conducted under the auspices of the NYSDEC VCP. The HHMT-Port Ivory Facility is a 124.3-acre property that is located at 40 Western Avenue, Staten Island, New York. See Figure 1 of the Site-specific Health and Safety Plan for the location of the HHMT-Port Ivory Facility.

As part of the overall site redevelopment, the Port Authority entered into the NYSDEC VCP in July 2004. The Port Authority's objective for entering into the VCP program with NYSDEC was to address the presence of contamination due to prior site activities unrelated to the Port Authority. Based on the Port Authority's schedule for redevelopment, the HHMT-Port Ivory Facility was partitioned into four Sites for the purpose of the VCP. Environmental investigation and/or remediation is anticipated on all four Sites. The four Sites have been designated as Site 1, Site 2A/2B, Site 3, and Future Site 2C/Site 4. With the exception of Future Site 2C/Site 4, the sites are subject to the VCP. Future Site 2C/ Site 4 is anticipated to be included in the VCP in the near future.

On behalf of the Port Authority, Hatch Mott MacDonald (HMM) has performed environmental assessment and investigation activities to characterize site conditions and delineate historic fill material and contaminants in environmental media at the HHMT-Port Ivory Facility. During these assessment and investigative activities, HMM encountered LNAPL at several locations across the site. Additional investigative activities that may include intrusive work are likely to be required at Site 1, Site 2B, and Site 3. Mobile LNAPL will be removed as part of remedial actions proposed for the site. Although additional remedial actions may be required, it is not currently possible to determine the nature and precise scope of these remedial actions.

Based on analytical data from the previous environmental investigations, soil and groundwater impacts exist at the HHMT-Port Ivory Facility. The impacts that may potentially be encountered include those attributable to organic compounds and/or metals in the following contaminant classes: VOCs, SVOCs, pesticides and herbicides, PCBs, and metals. These organic compounds and metals are adsorbed to soil, dissolved in groundwater, present in vapor or mist form in air, or components of the LNAPL encountered at the HHMT-Port Ivory Facility. In general, workers may be exposed to these contaminants via the following exposure pathways: inhalation, ingestion, or contact. Many of the potential hazards associated with these contaminants and pathways are discussed in the Site-specific Health and Safety Plan. This CAMP addresses only those hazards associated with contaminants that may be transported to receptors through the air via vapor and/or dust migration; in addition, this CAMP addresses exposure primarily via the inhalation pathway.

The Port Authority proposes "hot spot" removal and the assignment of an environmental easement as the appropriate Remedial Actions for the Site. These activities include the removal of impacted soils in areas with the highest concentrations of contaminants and the removal of mobile LNAPL. The environmental easement allows for background levels of impacted soil to remain at the site without negatively impacting human or ecological/environmental receptors. The environmental easement would limit the disturbance of soil and create a method to ensure the integrity of the impervious cover. Following the completion of the Remedial Actions, a post-remedial monitoring program will be implemented. For a detailed description of the Remedial Actions to be performed at the Site, please see the site-specific Health and Safety Plan.

3.0 AIR QUALITY MONITORING FREQUENCY

Air quality will be monitored on either a continuous or a periodic basis. Continuous air quality monitoring for VO vapors will be conducted at the Exclusion Zone (EZ) boundaries where ground intrusive activities are actively being implemented. The purpose of the continuous monitoring under these conditions is to document that changing subsurface conditions have not resulted in the release of volatile organic vapors at concentrations that could adversely affect air quality. Intrusive activities include, but are not limited to, the excavation of test pits or trenches, the drilling of soil borings, and the installation of monitoring wells.

Periodic air quality monitoring will be conducted at all EZ boundaries where continuous air monitoring is not conducted. Periodic air quality monitoring for VO vapors will be conducted where intrusive activities have been completed but the area has not been completely restored to preexisting conditions. For example, periodic air monitoring for VO vapors will be required during the collection of groundwater samples from existing monitoring wells. The frequency of periodic air quality monitoring for VO vapors will depend upon the nature of the work being conducted in the EZ. As a general guidance, the more likely that changing conditions will cause the air quality to change at the EZ boundary, the more frequent the periodic measurements must be. For example, the concentration of VO vapors volatilizing from a test trench that was previously excavated but that remains open is unlikely to change significantly (except to decrease with time). Periodic monitoring of VO vapors that may potentially volatilize from the test pit may therefore be conducted at the beginning and end of each work day unless action levels are exceeded, in which case the actions taken may include a more frequent periodic monitoring for VO vapor concentration. However, the concentration of VO vapors volatilizing from the water in a well may change during groundwater purging if impacted groundwater is drawn into the well. Therefore, periodic air quality monitoring during groundwater sample collection might reasonably consist of measuring VO vapor concentration upon arrival at a monitoring well, measuring the concentration every fifteen minutes throughout the purge period, measuring the concentration during sample collection (assuming a bailer is used), and measuring the concentration after closing the monitoring well.

Periodic air quality monitoring for airborne particulate matter will be conducted where the soil disturbance has occurred and the disturbed, impacted soil is staged uncovered above grade. Although stockpiles of impacted soil will be covered, periodic air monitoring for airborne particulate matter will be conducted at the boundaries of an EZ in the event that a stockpile of impacted soil within the EZ is temporarily uncovered. In this case, air quality monitoring for airborne particulate matter will be conducted at the beginning and end of each work day unless action levels are exceeded, in which case the actions taken may include a more frequent periodic monitoring for airborne particulate matter.

Please note, activities that would normally require only periodic air quality monitoring will be monitored continuously during the work day if such is justified by proximity to potential receptors. Locations where continuous air quality monitoring of VO vapors and/or airborne particulate matter may be justified include portions of the HHMT-Port Ivory Facility that are proximal to (within 20 feet of) Western Ave and/or Richmond Terrace, near the residential property located along Richmond Terrace to the east of Future Site 4, and near any building occupied by a tenant of the Port Authority.

4.0 LOCATIONS OF AIR QUALITY MONITORING STATIONS

The locations where air quality monitoring will be conducted at the HHMT-Port Ivory Facility will be determined based primarily on the locations and extent(s) of the EZ(s). At the Site, the EZ(s) will include all of the following areas:

- Areas where intrusive activities occur;
- Areas where excavations, borings or test pits are open and active;
- Areas where soil and/or groundwater is being handled for sampling purposes, on-Site storage, or off-Site disposal; and,
- Areas maintaining machinery such as excavators, drill rigs, trucks, construction equipment, etc that have not been thoroughly decontaminated.

At a minimum, two air quality monitoring stations will be established at each EZ where intrusive activities are being actively conducted. One air quality monitoring station will be established on the upwind boundary of the EZ. The second air quality monitoring station will initially be established on the downwind boundary of the EZ. The second air monitoring station may be moved away from the EZ boundary in a downwind direction if required based on an exceedance of the most stringent action level (see Table A for the action levels and required mitigative actions). Please note, the air monitoring personnel shall determine the wind direction based on a wind sock or similar equipment and shall move the air quality monitoring stations if wind direction changes for at least 30 minutes.

For intrusive activities conducted within 20 feet of the residence located along Richmond Terrace to the east of Future Site 4/2C, an air monitoring station will be established at the EZ boundary closest to the residence. Depending on the wind direction, the upwind or downwind station may also be the station located along the EZ boundary closest to the

residence. Therefore, for activities conducted within 20 feet of the residence, either two or three air quality monitoring stations will be required.

The air monitoring personnel shall carry the same equipment in order to monitor the air quality within the breathing zone immediately adjacent to the area where intrusive activities are being performed (i.e., work area). The concentrations of VO vapors and/or particulate matter measured within or immediately adjacent to the work area will represent the worst-case exposure. These measurements will also be used to identify the source of any VO vapor emission that may be detected at the downwind EZ boundary.

5.0 AIR QUALITY MONITORING EQUIPMENT

As noted above, based on the types of organic and metal contaminants that have been detected in groundwater, soil, and LNAPL at the HHMT-Pot Ivory Facility, air quality will be monitored for both VO vapors and particulate matter. The instruments utilized will be capable of detecting VO vapors and particulate matter at concentrations below the most stringent action levels (see Table A). In addition, the instruments utilized will be equipped with audible and visual alarms that will sound/be visible when an action level is exceeded.

It is anticipated that the monitoring instruments utilized for measuring the concentration of VO vapors will be photoionization detectors (PIDs). The PID will be capable of calculating 15-minute running average concentrations. Methane, ethane, and the major components of air are not detectable by a PID. The PID will be equipped with a lamp with an ionization potential suitable for detecting the VO vapors anticipated to be present in the area where intrusive activities are to be performed. The PID will be calibrated at the HHMT-Port Ivory Facility on a daily basis using a suitable gas of known concentration.

It is anticipated that the concentration of airborne particulate matter will be measured using a MiniRAM dust monitor or its equivalent. The MiniRAM dust monitor or its equivalent will be capable of calculating a running 15-minute (or less) average concentration. The instrument utilized will be capable of detecting particulate matter less than 10 micrometers in size. The instrument will be zeroed at the HHMT-Port Ivory Facility on a daily basis.

Please note that radiological contamination is not a concern at this Site. No additional monitoring will be required for such.

6.0 ACTION LEVELS AND REQUIRED RESPONSES

Action levels for concentrations of VO vapors are provided below in narrative format and are summarized in Table A. Please note, the actions to be taken if the action level(s) is/are exceeded at the northern monitoring station are the same as those listed below for an exceedance at the downwind station. The following are the action levels and required

responses for all intrusive activities conducted more than 20 feet away from the residential property located along Richmond Terrace to the east of Future Site 4.

- If the ambient air concentration of VO vapors in or adjacent to the work area or at the downwind EZ boundary exceeds 5 parts per million (ppm) above background but is less than 25 ppm above background for any 15-minute running average, work activities must be temporarily halted and monitoring continued. Work activities can continue when either of the two following conditions occurs:

    - The concentration of VO vapors in or adjacent to the work area or at the downwind EZ boundary is less than 5 ppm. Or,

    - Corrective actions have been taken to abate emissions and the concentration of VO vapors at a downwind location and in or adjacent to the work area is less than 5 ppm for a 15-minute average. The downwind location will be 200 feet downwind of the EZ or half the distance to the nearest potential receptor or commercial structure, whichever is less – but in no case less then 20 feet. The corrective actions may include one or more of the following: venting, covering or application of foam. Potential receptors include people walking or driving along Western Avenue or Richmond Terrace and tenants of the Port Authority. Therefore, the nearest public roadway or occupied building will be considered to be the receptor.

- If the concentrations of VO vapors in or adjacent to the work area or at the downwind EZ boundary are greater than 25 ppm above background, work activities must be halted. One or more of the corrective actions identified above must be implemented. Work may resume when the work plan has been modified to include activities designed to prevent the emission of VO vapors at concentrations greater than 5 ppm at the monitoring stations specified above.

The following are the action levels and required responses for all intrusive activities conducted within 20 feet of the residential property located along Richmond Terrace to the east of Future Site 4.

- If the ambient air concentration of VO vapors at the EZ boundary located closest to the residence exceed 1 ppm above background but is less than 25 ppm above background for any 15-minute running average, work activities must be temporarily halted, engineering controls (e.g., covering the source of the emissions and/or the application of vapor-suppressing foam) must be implemented, and monitoring must be continued. Work activities can continue when the ambient air concentration of VO vapors at the EZ boundary located closest to the residence are less than 1 ppm above background for a 15-minute average.

- If the concentrations of VO vapors in or adjacent to the work area, at the downwind EZ boundary, or at the EZ boundary closest to the residence are greater than 25 ppm above background, work activities must be halted. One or more of the corrective actions identified above must be implemented. Work may resume when the work plan has been modified to include activities designed to prevent the emission of VO vapors at concentrations greater than 1 ppm at the downwind EZ boundary and the EZ boundary closest to the residence.

Action levels for concentrations of airborne particulate matter are provided below in narrative format and are summarized in Table A. Please note, the visible emission of dust from the EZ is unacceptable, regardless of the concentration of airborne particulate matter measured using the MiniRAM dust meter or equivalent instrumentation. Therefore, visible dust emission is itself an action level as indicated below.

- If the 15-minute average concentration of airborne particulate matter in or adjacent to the work area or at the downwind EZ boundary exceeds 100 micrograms per cubic meter (mcg/m^3) above the background concentration or if airborne dust is observed leaving the work area, then dust suppression techniques, including misting soil with water from a certified clean water source such as a fire hydrant, if available, will be initiated. Work will continue with dust suppression techniques implemented periodically and/or as needed provided that the 15-minute average concentration of airborne particulate matter in or adjacent to the work area and at the downwind EZ boundary does not exceed 150 mcg/m^3 above the background concentration and provided that no visible dust is observed to be migrating from the EZ.

- If, after implementation of dust suppression techniques, the 15-minute average concentration of airborne particulate matter in or adjacent to the work area or at the downwind EZ boundary is greater then 150 mcg/m^3 above background, work will be stopped and a re-evaluation of activities will be initiated. Work will resume when dust suppression measures and other controls are successful in reducing the 15-minute average concentration in or adjacent to the work area and at the downwind EZ boundary to 150 mcg/m^3 or less above background and when no visible dust is observed to be migrating from the EZ.

7.0 AIR MONITORING RECORDS

The air monitoring personnel will be responsible for maintaining a daily log of the VO vapor and dust concentrations at each station in or adjacent to the work area. In addition, for the log of air quality measurements made in or adjacent to the work area, the air monitoring personnel will describe the location where the measurement was made, the activity being conducted, the distance from where the activity was conducted, and the approximate wind direction. For continuous air quality monitoring, VO vapor and airborne particulate matter concentrations measured at the downwind EZ boundary or the EZ boundary closest to the residential property located along Richmond Terrace shall be recorded at 15-minute intervals throughout the workday. Background air quality data,

i.e., data measured at the upwind EZ boundary, will be recorded prior to the initiation of work and every one hour thereafter. The hand-held air quality monitoring equipment will be used to measure instantaneous air quality within or immediately adjacent to the work area once per 30 minutes and whenever an exceedance is detected at the downwind EZ boundary.

Periodic air quality monitoring data must be recorded at a frequency approved by the Site Safety and Health Officer (SSHO) designated in the Port Authority-approved Site Specific Health and Safety Plan.

All air quality monitoring logs will be maintained at the HHMT-Port Ivory Facility and in a location accessible to both the SSHO and the air monitoring personnel. The logs will be provided to NYSDEC and/or NYSDOH officials upon request.

It is not anticipated that the jobsite will be staffed outside of the standard work day, on weekends, or on holidays. Therefore, the air quality monitoring log will not be maintained on these days, and actions will be taken to reduce the likelihood of an emission of VO vapors or airborne particulate matter at these times. Such actions may include temporarily covering all boreholes, test pits, test trenches, soil stockpiles, and other areas where wastes are stored to the extent practicable. All open test pits, test trenches, and boreholes will also be demarcated using high visibility plastic fencing or the equivalent. These precautions will also be recorded.

Table A – Action Levels and Required Responses for VO Vapor Concentrations

*VO Vapor Concentration (ppm) – Locations > 20 feet from Residence	RESPONSE
< 5 (15-minute average concentration and relative to background)	Monitor as specified in CAMP
Between 5 and 25 (15-minute average concentration and relative to background)	Work activities temporarily halted. Continue monitoring as specified in CAMP. Take corrective actions (let vent, cover, and/or apply foam) if VO vapor concentration remains greater than 5 ppm. Continue work when the VO vapor concentration is less than 5 ppm at either the downwind EZ boundary or at a downwind location as specified in the narrative.
> 25 (15-minute average concentration and relative to background)	Cease work and take corrective actions (let vent, cover, and/or apply foam).
***VO Vapor Concentration (ppm) – Locations within 20 feet of Residence**	**RESPONSE**
< 1 (15-minute average concentration and relative to background)	Monitor as specified in CAMP
Between 1 and 25 (15-minute average concentration and relative to background)	Work activities temporarily halted. Continue monitoring as specified in CAMP. Take corrective actions (cover and/or apply foam) if VO vapor concentration remains greater than 1 ppm. Continue work when the VO vapor concentration is less than 1 ppm at the downwind EZ closest to the residence.
> 25 (15-minute average concentration and relative to background)	Cease work and take corrective actions (cover and/or apply foam). Reevaluate work plan prior to resuming work.
***Airborne Particulate Matter Concentration (mcg/m^3)**	**RESPONSE**
<100 (15-minute average concentration and relative to background), no visible dust emissions from EZ	Monitor as specified in CAMP
Between 100 and 150 (15-minute average concentration and relative to background), no visible dust emissions from EZ	Apply dust suppression techniques. Continue monitoring as specified in CAMP.
> 150 (15-minute average concentration and relative to background) or visible dust emissions from EZ	Cease work and re-evaluate methods. Apply dust suppression techniques. Continue work when airborne particulate matter concentrations decrease to below 150 mcg/m^3.

APPENDIX B

HEALTH AND SAFETY FORMS

COMPLIANCE AGREEMENT

All personnel covered by this SSHP (See Section 1) must read this SSHP or have all components of the SSHP summarized by the Site Health and Safety Officer.

SSHP COMPLIANCE AGREEMENT:
By signing, you are indicating that you are familiar with all components of this SSHP, either because you read them or they were explained to your satisfaction. You are further indicating that you agree to abide by all requirements of this SSHP and have received an orientation to the Project worksite.

Name	Signature	Date

SITE ENTRY AND EXIT LOG

Project Number:	Project Name:	Project Supervisor:

Employee Name	Company	Task	Time In	Time Out

Equipment Inspection Form

Date:	Project Name.:	Project No.:
Equipment Make & Model:	Equipment No:	Equipment Hours:

This form is to be used for the initial equipment inspection upon arrival at the project and Daily inspection during use. Corrective actions are required for all deficiencies noted during the inspections.

EQUIPMENT CHECKLIST

Inspection Item	*Yes*	*No*	*Comment/Corrective Action*
Fluid Level?			
Horn Operable?			
Emergency/Parking Brake System?			
Hydraulic System Operable w/No leaks?			
Engine and Transmission			
Parking Brake System?			
Headlights Operable?			
Taillights Operable?			
Brake Lights Operable?			
Audible (Reverse) Alarm System?			
Unobstructed rear View?			
Windshields?			
Windshield Wipers and Washer Fluid?			
Defroster/Defogger?			
Cab Shield or Canopy?			
Seatbelts Available and Used?			
Fire Extinguishers?			
Rear View Mirror?			
Fender/Mud Flaps?			

Comments

Inspection Performed By:	Date:	Time:

Tool-Box Safety Briefing Sheet

Date:	Project:

Topics of Toolbox Safety Meeting

- ☐ Hardhats and Safety Shoes
- ☐ Eye & Ear Protection
- ☐ Work Zones and Site Control
- ☐ Heat and Cold Stress
- ☐ Designated Smoking Zone
- ☐ Review Previous Accidents
- ☐ Accident Reporting/Investigation
- ☐ Activity Hazard Analysis _____
- ☐ Activity Hazard Analysis _____
- ☐ Ladder for Excavation
- ☐ Entering Excavation
- ☐ Confined Space Entry
- ☐ Ground Fault Interrupters
- ☐ First Aid and Fire Protection
- ☐ Hazardous Communication
- ☐ Fall Protection (6 Foot Rule)
- ☐ Activity Hazard Analysis _____
- ☐ Other_____

Site Specific Hazards

Attendees

Conti Employees	Subcontractors & Visitors

Daily Operations

Site Safety and Health Officer:

Daily Air Monitoring Report

Project Number:	Project Name:	Project Supervisor:
Date:	**Duration of Monitoring**	

Work Location and Task:

Instrument:		**Instrument:**		**Instrument:**	
Reading	**Time**	**Reading**	**Time**	**Reading**	**Time**
Calibration:		**Calibration:**		**Calibration:**	

Perimeter Samples Collected:

Personnel Samples Collected:

Perimeter and Personnel Sample Results From Previous Day (Provide Data when Received):

Comments:

Name:	**Title:**
Signature:	Date:

Daily Air Monitoring Report (Cont.)

Project Number:	Project Name:	Project Supervisor:

Instrument:		Instrument:		Instrument:	
Reading	**Time**	**Reading**	**Time**	**Reading**	**Time**
Calibration:		**Calibration:**		**Calibration:**	

Signature:	Date:

Daily Safety and Inspection Log

Project Number:	Project Name:	Project Supervisor:
Date:	**Weather Condition:**	
Summary of Day's Work Activity:		
Violations of the Site Safety and Health Plan:		
Protective Clothing and Equipment Being Used by Task:		
Physical Condition of Workers (any heat or cold stress or other medical problems):		
Accidents or Breach of Procedures:		
Description of Monitoring and Air sampling Taken:		
Miscellaneous:		
Name:	Title:	
Signature:	Date:	

APPENDIX C

CONTI SITE SAFETY AND HEALTH PLAN (SSHP), DATED FEBRUARY 19, 2002

ENTERPRISES

February 22, 2002

Attention: Mr. William Grabler, PE
The Port Authority of NY & NJ (PANYNJ)
New York Marine Terminals
Construction Division – Engineering Dept.
90 Columbia St.
Brooklyn, NY 11201

Re: **Contract: HH - 234,323**
Howland Hook - Remediation and Demolition

Subject: **WO#01 HASP – Addendum No. 1**

Dear Mr. Grabler:

In response to comments from George Wojnar of PA Risk Management please include this with our HASP as Addendum Number 1.

1. Location of HASP during project.
2. Location of training records.
3. Location of monitoring records.

These documents will be maintained in files located in the jobsite field office.

Please call me at 973/824-5846 to discuss how we can meet your reporting requirements.

Very truly yours,
Conti Enterprises, Inc.

William Weber
Project Engineer

cc: A. Gonzalez

CORPORATE HEADQUARTERS:
Conti Enterprises, Inc. 3001 South Clinton Avenue South Plainfield, NJ 07080
Telephone (908) 755-3185 Fax (908) 754-5285 www.conticorp.com

Howland Hook Marine Terminal
Demolition and Site Remediation
Staten Island

Site Safety And Health Plan

Prepared for

The Port Authority of NY & NJ
90 Columbia Street
Brooklyn, NY 11201

Submitted by

Conti Enterprises, Inc
3001 South Clinton Ave
South Plainfield, NJ 07080

Prepared by

Conti Environmental, Inc
3001 South Clinton Ave
South Plainfield, NJ 07080

February 19, 2002
DRAFT

Howland Hook Marine Terminal
Demolition and Site Remediation Project
Staten Island, New York

Site Safety and Health Plan Approvals

Prepared for

The Port Authority of NY & NJ
90 Columbia Street
Brooklyn, NY 11201

Submitted by

Conti Enterprises, Inc
3001 South Clinton Ave
South Plainfield, NJ 07080

Prepared by

Conti Environmental, Inc
3001 South Clinton Ave
South Plainfield, NJ 07080

William Weber — 2/20/02

Bill Weber, Project Engineer — *Date*
Conti Enterprises, Inc

Al Aballo — 2/19/02

Al Aballo, Director of Health and Safety — *Date*
Conti Enterprises, Inc

Aldo M. Gonzalez — 2/19/02

Aldo M. Gonzalez, CSP, Safety and Health Manager — *Date*
Conti Environmental, Inc

Melinda Horan — 2/15/2002

Melinda Horan, Certified Industrial Hygienist — *Date*
MHB Associates, Inc

FIGURES

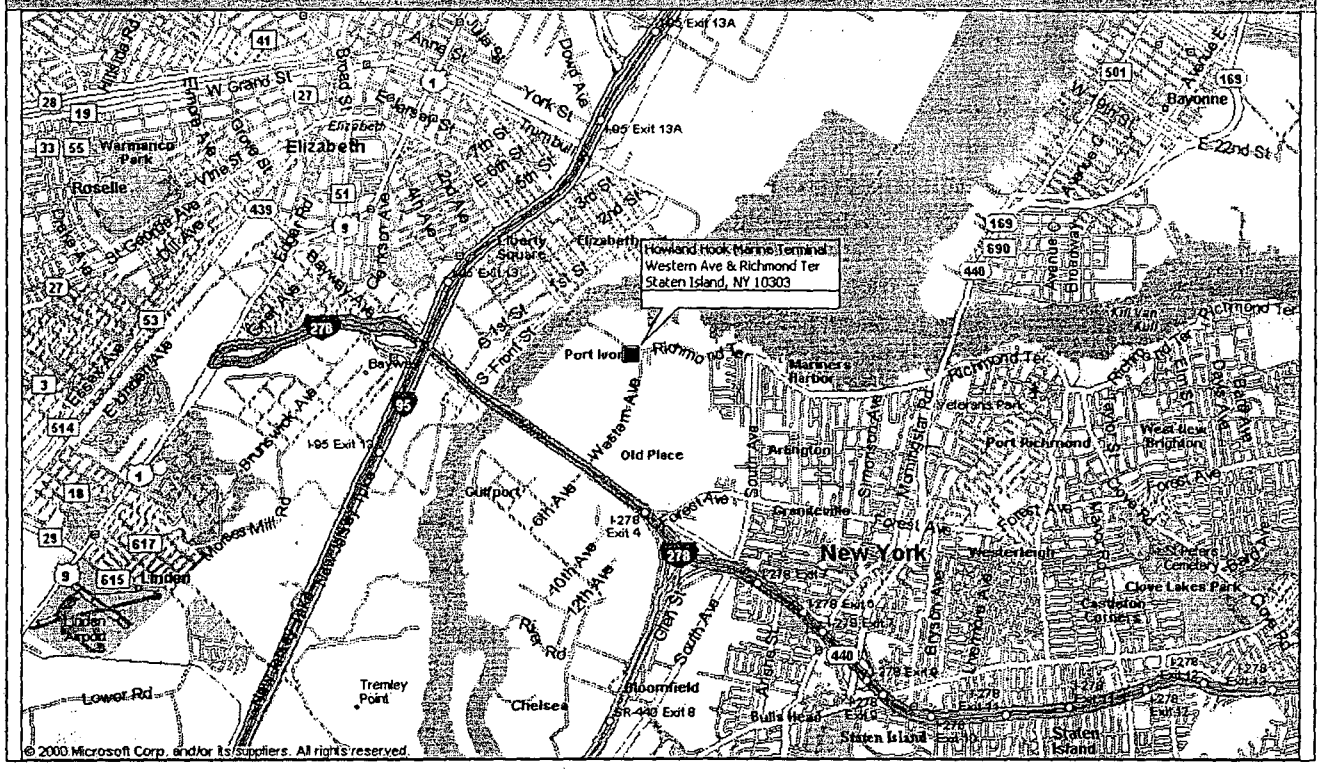
TABLES

ATTACHMENTS

1.0 INTRODUCTION

Conti Enterprises, Inc. is under contract to the Port Authority of NY & NJ to perform demolition and site remediation activities at the Howland Hook Marine Terminal, Staten Island, NY (former Proctor & Gamble Facility). Remedial activities under Work Order No. 1 include the demolition and removal of eight (8) structures, including buildings, associated foundations, pits and equipment within the buildings, utility disconnection, removal and disposal and site restoration. Conti Environmental was tasked as a subcontractor to prepare this Site Specific Safety and Health Plan. Refer to ***Figure 1 – Site Location Map.***

Figure 1 – Site Location Map



1.1 Plan Objective

The objective of this Site Safety and Health Plan (SSHP) is to define the requirements and designate protocols to be followed during the remedial activities at the Howland Hook Marine Terminal project. Applicability extends to Conti personnel, Conti's subcontractors, and visitors inclusive of Port Authority of NY & NJ personnel and representatives, engineers and subcontractors. Work performed under this contract will comply with applicable Federal, State, and Local Safety and Occupational Health laws and regulations. Through careful planning and implementation of corporate and site-specific safety protocols, Conti will strive for zero accidents and incidents on the project.

1.2 Safety and Health Policy Statement

The Conti Companies management is committed to the safety of each and every employee. There is no place at Conti for an employee who will not work safely or who will endanger the safety of his fellow workers. It is

essential that all Managers and Supervisors insist on the maximum safety performance and awareness of all employees under their direction, by enthusiastically and consistently administering all safety rules and regulations. It is the Conti's policy to take the necessary actions, in engineering, planning, designing, assigning and supervising work operations, to create a safe work-site. The Conti Companies will:

- Maintain safe and healthful working conditions.
- Provide and assure the use of all necessary personnel protection equipment to ensure the safety and health of site employees and the public at large.
- Require that site work be planned to provide a range of protection based on the degree of hazards encountered under actual working conditions.
- Provide site workers with the information and training required to make them fully aware of known and suspected hazards that may be encountered and of the appropriate methods for protecting themselves, their co-workers and the public at large.

1.3 Project Safety and Health Expectations

The safety and health of workers, clients and the public and the protection of the environment are fundamental responsibility assumed by Conti under this contract. Conti will:

- Promote project safety with an objective of zero lost-time accident
- Manage activities in a proactive way that effectively increase the protection of site workers, the public and the environment
- Reduce safety and health risk by identifying and eliminating hazards from site activities.
- Carry out site activities in a manner that complies with all applicable safety, health and environmental laws and regulations.

The success of our S&H Program is ensured by our ability to seamlessly integrate our S&H Procedures into a Site Specific Document that establishes safe and healthy work conditions for on-site operations.

1.4 Project Safety and Health Compliance Program

Compliance with the requirements of applicable Federal, State and local laws will be accomplished through a combination of written programs, employee training, workplace monitoring, and system enforcement. Continued and regular inspections by supervisors and safety personnel as well as the culture of ownership and total involvement in the safety program will produce an atmosphere of voluntary compliance. However, disciplinary action for violations of project requirements will be taken, when necessary.

All site personnel and visitors entering a Contamination-Reduction Zone and Exclusion Zone at the site will be required to read and verify compliance with the provisions of this SSHP and specific appendices. In addition, visitors will be expected to comply with relevant OSHA requirements such as medical surveillance, training, and personal protective equipment. In the event that a person does not adhere to the provisions of the SSHP, he/she will be requested to leave the work area. All nonconformance incidents will be recorded in the Daily Safety and Inspection Log.

The Site Safety and Health Officer will conduct impromptu surveillance on a daily basis of all work areas and subcontractor's activities to ensure that safety, and health is properly implemented. In addition, any reports from employees concerning unsafe work practices, acts, or conditions will be investigated promptly. Unsafe acts, practices, or conditions will be reported to the responsible supervisor at the time of inspection.

The safe and efficient work practices of this company require a spirit of teamwork and cooperation from all employees. Also required are uniform standards of expected behavior. Employees who refuse or fail to follow the standard set forth by this plan, the Conti Companies Safety, Health and Environmental Program and Procedures Manual and/or Regulatory standards, will subject themselves to disciplinary action up to, and including discharge. In cases not specifically mentioned, employees are expected to use good judgment and refer any questions to their supervisors.

1.5 References

During development of this SSHP consideration was given to current safety and health standards as defined by United States Environmental Protection Agency (USEPA), Occupational Safety and Health Administration (OSHA) and the National Institute for Occupational Safety and Health (NIOSH). Specifically, the following reference sources have been utilized in the development of this SSHP:

- OSHA Regulations: 29 CFR 1910 and 1926
- USEPA Standard Operating Safety Guides, June 1992
- NIOSH/OSHA/Coast Guard (USCG)/USEPA "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities"
- NIOSH Pocket Guide to Chemical Hazards, June 1997
- American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values for Chemical Substances and Chemical Agents, 2000
- Hazardous Waste Handbook for Health & Safety, Martin, Lippitti, Prothero, 1987
- Handbook of Toxic and Hazardous Chemicals and Carcinogens, Sittig, 1985

In addition to the above-referenced documents, Conti has established a comprehensive and realistic Safety, Health and Environmental Program; based on past experience, sound engineering practice, employee training and enforcement of Safety and Health regulations to prevent unreasonable Safety and Health risks. For specific procedures/programs associated with this project, refer to the Conti Safety, Health and Environmental Program, which will be available onsite.

1.6 Site Safety and Health Plan Revisions

The development and preparation of this Site Safety and Health Plan has been based on site-specific information provided to Conti. Should any unforeseen hazard become evident during the performance of the work, the Site Safety and Health Officer (SSHO) shall bring such hazard to the attention of the resident Engineer both verbally and in writing for resolution as soon as possible. In the interim, Conti will take necessary actions to maintain safe working conditions in order to safeguard on-site personnel, visitors, the public, and the environment. Modifications of any portion or provisions of the SSHP will be requested in writing from the Resident Engineer by the SSHO, and authorized in writing. No changes to the SSHP will be allowed until the item has been reviewed and an addendum prepared and approved by Safety and Health Manager. Changes to Site Specific Safety and Health Plan will be documented and approved by using the ***"Safety and Health Plan Revision Request Form"*** Refer to Attachment 3 – Safety and Health Forms

2.0 ORGANIZATION AND RESPONSIBILITIES

While the Conti, Inc. Safety and Health Department directs and supervises the overall Safety, Health and Environmental Program, the responsibility for Safety and Health extends throughout our organization from top management to every employee. For this reason, it is each person's duty to notify the management personnel if a hazardous condition is identified and to make a "stop work" call if the condition represents an immediate

danger to life or health, until the SSHO can make a further determination. The following are the Conti project personnel positions and responsibilities for this project.

- **Senior Engineer** Pat Hogan
- **Project Engineer:** Bill Weber
- **Project Superintendent:** Brain Emrick
- **Director of Health and Safety:** Al Aballo
- **Safety and Health Manager:** Aldo M. Gonzalez, CSP
- **Certified Industrial Hygienist** Melinda Horan, CIH
- **Occupational Physician:** Dr. Robert MacMillan, EOSI
- **Site Safety and Health Officer:** TBD

2.1 Senior Engineer

The Senior Engineer directs and manages all aspects of the project in compliance with all contract and technical requirements. The Senior Engineer will monitor and control all subcontractors to achieve optimal performance and ensure safe, high quality performance that complies with all contract requirements.

2.2 Project Engineer

The Project Engineer reports to the Senior Engineer. His responsibilities include coordinating project activities with the Project Superintendent and serving as the primary liaison with the Resident Engineer. The Project Engineer prepares all correspondence, submittals, and other documentation required for the project and coordinate, schedules and administers the contract. The Project Engineer prepares reports and documentation, supervises inspection personnel, reviews and approves procurement and subcontract activities.

2.3 Project Superintendent

The Project Superintendent supervises and coordinates all construction crew activities relating to site preparation, excavation, and restoration. The Project Superintendent has the operational responsibility for the implementation of the SSHP on this project. This includes establishing an attitude of concern for safety matters by initiating prompt corrective action of hazards brought to his attention and ensuring that the project safety and health requirements are initiated and observed by all project personnel.

The Superintendent plans and requires that all work be performed in compliance with this SSHP, the Conti Companies Safety, Health and Environmental Program and/or the client's safety program including all applicable local, state and federal regulations. He shall impress upon all subcontractors' supervisory personnel a sense of responsibility and accountability of each individual to maintain a safe workplace and to work in a safe manner.

2.4 Director of Health and Safety

Responsible to the Vice President of Construction, the Director of Health and Safety formulates, administers and coordinates programs for the company to reduce the risk of loss due to employee injury, regulatory non-compliance, general liability, fire, theft or damage.

2.5 Safety and Health Manager

The Safety and Health Manager will develop written detailed policies and procedures covering elements in the Safety, Health and Environmental Program. The Safety and Health Manager will:

- Be responsible for the development, implementation, oversight and enforcement of the SSHP.
- Conduct initial site-specific training.
- Be present onsite during the first day of remedial activities at the startup of each new major phase.
- Visit the site as needed and at least once per month for the duration of activities, to audit the effectiveness of the SSHP.
- Be available for emergencies.
- Provide onsite consultation as needed to ensure that the SSHP is fully implemented.
- Coordinate any modifications to the SSHP with the Site Superintendent, the SSHO, and the Resident Engineer.
- Provide continued support for upgrading/downgrading of the level of personal protection.
- Be responsible for evaluating air monitoring data and recommending changes to engineering controls, work practices, and PPE.

2.6 Certified Industrial Hygienist

Under direction of the Safety and Health Manager, the CIH will assist in the development, implementation and enforcement of the Site Specific Safety and Health Plan, provide consultation, review air monitoring data, and assist in safety audits and document review.

2.7 Occupational Physician

Under the direction of the Safety and Health Manager, the Occupational Physician will be responsible for the determination of medical surveillance protocols and for review of examination/test results performed in compliance with 29 CFR 1910.120(f), and 1926.53(f). The Occupational Physician will provide the Safety and Health Manager with a written opinion of each employee's ability to perform hazardous remedial work.

2.8 Site Safety and Health Officer (SSHO)

Under the direction of the Safety and Health Manager, the SSHO shall be responsible for the implementation of this SSHP and for the daily coordination of safety activities with the Project Superintendent to ensure that the planned work objectives reflect adequate safety and health considerations. The SSHO will submit to the Resident Engineer the Certificates of Worker/Visitor Acknowledgements for site personnel prior to initial entry into a contamination reduction or exclusion zone. He will maintain a complete copy of this plan (and its supplements and addenda) at the site during all field activities and assure that all workers and visitors are familiar with it. He will perform site-specific training and briefing sessions for employee(s) prior to the start of field activities at the site and a briefing session each day before starting work. He will ensure the availability, proper use and maintenance of specified personal protective equipment, decontamination, and other safety and health equipment. He will maintain a high level of safety awareness among team members and communicate pertinent matters to them promptly. The Site Safety and Health Officer will:

- Assist and represent the Safety and Health Manager in on-site training and the day-to-day on-site implementation and enforcement of the accepted SSHP.
- Be assigned to the site on a full time basis for the duration of intrusive activities. The SSHO will have no duties other than Safety and Health related duties.

- Have the authority to ensure site compliance with specified safety and health requirements, Federal, state and OSHA regulations and all aspects of the SSHP. This includes, but is not limited to: activity hazard analyses, air monitoring; use of PPE, decontamination site control; standard operating procedures used to minimize hazards; safe use of engineering controls; the emergency response plan; confined space entry procedures; spill containment program; and preparation of records. This will be accomplished by performing a daily safety and health inspection and documenting results on the Daily Safety Inspection Log.
- Stop work activities if unacceptable health or safety conditions exist, and take necessary action to re-establish and maintain safe working conditions.
- Consult and coordinate any modifications to the SSHP with the Safety and Health Manager, and the Site Superintendent,
- Conduct accident investigations and prepare accident reports.
- Review results of daily quality control inspections and document safety and health findings in the Daily Safety Inspection Log.
- Coordinate with Site Management and the Safety and Health Manager, recommend corrective actions for identified deficiencies and oversee the corrective actions.

2.9 Subcontractors

Subcontractors utilized during remedial activities at the Howland Hook Marine Terminal Project are covered by this SSHP and will be provided a copy of the plan prior to commencing work. The Conti SSHO will verify that subcontractor employee training; medical clearance, and respirator fit test records are current and will monitor and enforce compliance with the established plan and standard operating procedures. As with all site personnel, subcontractors will be briefed on the provisions of this plan and attend all daily toolbox and weekly safety meetings.

Conti will continually monitor a subcontractor's safety performance. Conti will observe subcontractors for hazards or unsafe practices that are both readily observable and occur in common work areas. The SSHO will note subcontractor work practices on the daily Safety and Health report. If non-compliance or unsafe conditions or practices are observed, the subcontractor safety representative will be notified and corrective action will be required. The subcontractor will determine and implement necessary controls and corrective actions. If repeat non-compliance/unsafe conditions are observed, the subcontractor will be required to stop affected work until adequate corrective measures are implemented.

3.0 HAZARD/RISK ANALYSIS

Hazardous material sites can cause a multitude of health and safety concerns any of which can result in serious injuries and/or illnesses of workers. Some hazards are a function of the physical, biological or chemical nature of the site itself. Others are a direct result of the construction being done. Based upon the information provided regarding the primary historical uses of the property and the knowledge of the current conditions, the overall Safety and Health hazard assigned to the contemplated activities at the Site is determined to be low to moderate.

3.1 Scope of Work

The scope of work for Work Order No. 1 includes the demolition and removal of eight (8) structures, including buildings, associated foundations, pits and equipment within the buildings. Utility disconnection, removal and disposal and site restoration are also included in this work order. The buildings involved in this work order are #'s 1A, 1B, 5, 12, 13, 16, 17 and 20. All existing pipes, subsurface structures, building materials, pavement and

miscellaneous materials removed during the course of this project shall be legally disposed of off the project site in accordance with the Port Authority of NY & NJ contract specification section 02050. This project also included the removal and proper disposal of Asbestos containing and hazardous materials. This work was all completed before the demolition phase of Work Order # 1 began.

Before each building is demolished, the existing utility connections will be located and terminated. This process will require test-pitting locations for finding the existing pipes and then capping those pipes. The excavation for these pits will average 4' to 6' in depth and 8' to 10' in width.

Each building will then be razed to ground level by use of a PC 1000 Excavator with a large 6-yd bucket. Once the building has been brought to the ground, the PC1000, along with a PC400 with a grapple attachment, will sort through the debris material and create separate piles for each type of material found. The steel pile will be sorted through with the PC400 w/grapple and placed into containers according to the grade of steel present. This steel will be sent to an outside scrap yard for recycling. Laborers will cut the longer pieces with a burning torch on the ground. Any wood found in the debris will be placed into a separate container and sent out to be pulverized. The masonry pile will be separated into concrete and brick and this also will be loaded into containers to be sent out to an outside source for recycling. No demolition debris will be kept on site.

Once the buildings are razed and the debris removed from the slab, the process of removing the slabs and foundations will begin. First, a combination hoe with a 2' bucket will excavate along the foundation to an average depth of 4' and cast the soil to the outside perimeter of the building. The PC 400, now with a hydraulic impact hammer attachment, will break up sections of the floor slab, as needed, for the PC1000 to remove and cast off to the side of the building. This material, as well as any foundation material, will be kept separate from other concrete material while awaiting the results of soil testing from the areas around the location where this material was removed. Once the slab is removed, the foundations will be removed by use of the PC1000 being sure to minimize any ground disturbance. This concrete material is expected to remain on site until such time that it can be determined to be free of any harmful contaminates, at which time it will be broken into 2' sections to be sent for recycling.

The excavated material from the foundation removal process is expected to be used to backfill the locations of foundation removal provided that it is determined to be suitable material. Should this material be found to be unsuitable, it will be trucked to an on-site stockpile location to be selected by the PANYNJ for testing and off-site disposal. It will be placed on a layer of suitable plastic liner material (min. 6 mil plastic sheeting) and covered with haybale burms around the perimeter to maintain any water run-off. This material would remain on site until an approved disposal site and methods have been selected by the PANYNJ.

3.2 Activity Hazard Analysis

Conti has developed an Activity Hazard Analysis (AHA) for major phase of work during the Howland Hook Marine Terminal remedial activities. A major phase of work is defined as a an operation involving a type of activity presenting hazards not experienced in previous operations or where a new subcontractor or work crew is to perform the specified phase. The analysis will define the activity being performed and identify the sequence of work, the specific hazards anticipated, and the control measures to be implemented to eliminate or reduce each hazard. Refer to ***Attachment 1 - "Activity Hazard Analysis".*** An AHA shall also be prepared when new tasks are added, job situations change, or when it becomes necessary to alter safety requirements. Work will not proceed on a particular task/work area until the AHA has been reviewed and a preparatory meeting has been conducted. General hazards associated with remedial activities are described below

A preparatory meeting will be conducted by the SSHO for site personnel prior to their initiating any new or differing site activities. At the preparatory meeting, the SSHO will ensure that site personnel are knowledgeable of the SSHP and understand the hazards and controls of the activity to be performed.

3.3 Hazards

The following potential hazards may be encountered during remedial activities at the Howland Hook Marine Terminal Project.

3.3.1 Physical Hazards

Potential safety hazards include electrical, heavy equipment/ vehicle traffic; material handling, hot work, and hand and power tools. Safety hazards associated with the project are presented below.

3.3.1.1 Electrical

During activities on the project heavy equipment will be operating in the vicinity of an overhead electrical line adjacent to the access road. Equipment Operators will be instructed to keep their distance from overhead electrical lines. Heavy equipment may not work any closer to an overhead electrical line than the 10 Feet. This distance will vary according to voltage the greater the voltage, the greater the clearance between any part of the equipment and the power line Refer to ***Table 1 - Minimum Clearance From Energized Overhead Electrical Lines***. When required, a spotter will be utilized to maintain a safety distance between equipment and overhead wires. The basic rule is "Don't locate equipment in a position where it can come in contact with overhead power lines." Maintain the required distance from the lines. Overhead Electrical power lines will be considered energized unless the person owning such line or operating officials of the electrical utility supplying the line assures that it is not energized and it has been visibly grounded.

Table 1 – Minimum Clearance From Energized Overhead Electrical Lines

Nominal System Voltage	Minimum Rated Clearance
0 to 50 kV	10 Feet (3 m)
51 to 200 kV	15 Feet (4.5 m)
201 to 300 kV	20 Feet (6 m)
3001 to 500 kV	25 Feet (7.5 m)
501 to 750 kV	24 Feet (10.5 m)
751 to 1000 kV	31 Feet (13.5)

There are various means of insulating the wires, as well as barriers and alarms that may be available to reduce the risk of injury to workers, but the use of such devices does not change the requirements of any other applicable standards or laws. In addition, these and other measures (such as grounding the equipment itself) may not be fully effective but may create a false sense of security. Only the utility company is authorized to de-energize, insulate or handle the lines. No one else may attempt these operations.

Electrical equipment used on-site may also pose a hazard to workers. Whenever possible Conti will use low-voltage equipment with ground-fault interrupters and watertight, corrosion-resistant connecting cables to help minimize this hazard. In addition, lightning is a hazard during outdoor operations, particularly for workers handling metal containers or equipment. In the event of an electrical storm, all operations will cease for the duration of the storm.

No employee shall be permitted to work in the proximity of any part of an electrical power circuit unless the person is protected against electric shock by de-energizing the circuit and grounding it, or it has been locked and tagged out. These procedures will be utilized when work has to be performed on energized equipment.

All electrical wiring and equipment shall be intrinsically safe for use in potentially explosive environments and atmospheres. Ground-fault circuit interrupters are standard for use at the site.

For detailed electric safety procedures, refer to SOP 40 – Electrical Procedures in the Conti Safety, Health and Environmental Program and Procedures Manual.

3.3.1.2 Heavy Equipment/Vehicle Traffic

Considerations for controlling the movement of personnel and equipment in a construction area are vitally important to any project, as injuries may occur while working with or adjacent to such equipment. This category includes all operations, which utilize moving heavy equipment: excavators, loaders, graders, dozers, and trucks. Conti will take every precaution necessary to ensure the safety of the residents and the on-site personnel during traffic movement operations.

All workers will adhere to all applicable standards and regulations while operating heavy equipment at the site. Operators will be trained and experienced in the use and maintenance of the equipment they are operating. Equipment will be inspected on a daily basis to identify any worn parts, and/or unsafe conditions. Inspections will be documented using the Equipment Checklist, refer to ***Attachment 3 – Safety and Health Forms***. Any unsafe equipment will be removed from service until safety defects can be corrected. Equipment operators will not leave their machine unattended while it is running. Each piece of equipment will be equipped with a 5 lb ABC fire extinguisher. No vehicles or equipment will be operated in a careless or unsafe manner. Personnel will wear high visibility reflective vests when working around equipment/vehicles. All personnel will stay a minimum of 4 ft clear of the operational area of the equipment.

During remedial activities, it is often necessary to have a worker direct the operator. In these cases, close communication between the operator and the laborer is of critical importance. One designated person will give signals to the operator of both equipment and vehicles in the work area. Workers should not take any action unless they have made eye contact with the operator and clearly communicated their intentions. In addition, all machines are equipped with back-up alarms, which are checked daily and repaired immediately. Truck traffic will be controlled by a flagger/spotter, as required.

Maintenance and inspection of vehicles and heavy equipment is a vital part of the overall safety program. Conti has a fully staffed equipment maintenance shop that handles all preventative and overhaul work for our entire vehicle and equipment fleet. As part of the preventative maintenance, all equipment is checked for properly functioning safety devices (e.g., backup alarms, brakes, lights, fire extinguishers, etc.) Before each piece of equipment leaves the shop it must pass a safety checklist. All rental equipment is subjected to a similar inspection when delivered to the job site. Any piece of rental equipment that fails the inspection must be repaired by the vendor before it is accepted for use. In addition, all equipment is inspected in the field prior to the start of each day's activities. If a superintendent, operator, or safety officer detects a defect, a properly qualified mechanic is dispatched from the shop to make the repairs on-site.

For detailed heavy equipment/vehicle traffic safety procedures, refer to SOP 30 – Motor Vehicle and Mechanical Equipment in the Conti Safety, Health and Environmental Program and Procedures Manual.

3.3.1.3 Material Handling

Various materials and equipment may be handled manually during project operations. Care should be taken when lifting and handling heavy or bulky items to avoid back injuries. The following fundamentals address the proper lifting techniques that are essential in preventing back injuries:

- The size, shape, and weight of the object to be lifted must first be considered. Multiple employees or the use of mechanical lifting devices are required for heavy objects.
- The anticipated path to be taken by the lifter should be considered for the presence of slip, trip, and fall hazards.
- The feet shall be placed far enough apart for good balance and stability (typically shoulder width).
- The worker shall get as close to the load as possible. The legs shall be bent at the knees.
- The back shall be kept as straight as possible and abdominal muscles should be tightened.
- Twisting motions should be avoided when performing manual lifts.
- To lift the object, the legs are straightened from their bending position.
- A worker shall never carry a load that cannot be seen over or around.

When placing an object down, the stance and position are identical to that for lifting. The legs are bent at the knees and the object lowered. When two or more workers are required to handle the same object, workers shall coordinate the effort so that the load is lifted uniformly and that the weight is equally divided between the individuals carrying the load. When carrying the object, each worker, if possible, shall face the direction in which the object is being carried. In handling bulky or heavy items, the following guidelines shall be followed to avoid injury to the hands and fingers:

- A firm grip on the object is essential; leather gloves shall be used if necessary.
- The hands and object shall be free of oil, grease, and water which might prevent a firm grip, and the fingers shall be kept away from any points that could cause them to be pinched or crushed, especially when setting the object down.
- The item shall be inspected for metal slivers, jagged edges, burrs, and rough or slippery surfaces prior to being lifted.

For detailed Material Handling procedures, refer to SOP 29 – Material Handling, Storage, Use & Disposal Procedures in the Conti Safety, Health and Environmental Program and Procedures Manual.

3.3.1.4 Hand and Power Tools

Hand and power tools are used for various site activities. Procedures for using hand and power tools are as follows:

- Persons using power tools shall be trained in their use.
- Ground Faults must be present on all electrical tools.
- Only tools in good condition shall be used.
- Tools shall be kept clean.
- Guards and shields shall be kept on all tools.
- Air couplings shall be secured.
- Non-sparking tools shall be used in hazardous areas.
- Proper eye protection is critical when using power tools. At a minimum, safety glasses will be required during site operations. Where appropriate, full-face shields will be utilized in addition to the glasses.

For detailed Hand and Power Tool safety procedures, refer to SOP 25 – Hand and Power Tools Operation Procedures in the Conti Safety, Health and Environmental Program and Procedures Manual.

3.3.1.5 Noise

Noise is found during remedial activities in such operations as transportation of materials and operation of heavy construction equipment. Noise has been defined as unwanted sounds. The human ear can tolerate a certain amount of sound without any harmful effects. The OSHA standard allows 90 dB (A) for a full 8 hours and for a lesser time when the levels exceed 90 db (A). It is usually safe to assume that if you need to shout to be heard at arms length, the noise level is at 90 dB (A) or above. Personnel operating or working around construction equipment or power tools will utilize hearing protection. Based on the nature of activities to be performed on site, the use of heavy equipment, power tools and other noise producing devices, Conti personnel are enrolled in a Hearing Conservation Program that meets the requirements of OSHA regulation 29 CFR 1910.95 as part of our Medical Surveillance Program. OSHA requires employee to be part of a Hearing Conservation Program when their exposure is 85 dB (A) or above.

Based upon Conti's past experience, it is known that the noise levels emanating from the operation of the heavy equipment often exceed what is allowable for worker exposure. Consequently, equipment operators and personnel working near the equipment are required to wear hearing protection. Conti will provide hearing protection to all site personnel. Additionally, to verify personnel exposure Conti will perform should level measurements during remedial activities.

3.3.1.6 Excavation

The hazard associated with excavation is low to moderate. In general, the hazards encountered during soil excavation are: cave in of excavation sides with possible burial or crushing of workers. Causes of cave ins may include: (a) absence of shoring, (b) misjudgment of stability, (c) defective shoring, and (d) undercut sides. Other potential hazards are: falling during access/egress, while monitoring or dismounting equipment, or stumbling into excavation. An overhead hazard can result from material, tools, rock, and/or soil falling into the excavation. Flammable atmospheres may also be encountered in excavation.

During excavation chemical/hazardous substance may be encountered. Potential chemicals of concern are addressed in Section 3.3.2 Chemical Hazard and Attachment 2 – Material Safety Data Sheets.

Conti will provide adequate shoring or sloping of sides of the excavation. Excavation/trenches will be inspected daily for changing conditions. Air monitoring for airborne contaminants shall be performed in areas where contaminated soils are encountered.

Excavation spoils will be directly loaded into transportation containers or stockpiled and covered at a designated area away from the work area. Excavation/trenches, regardless of the depth or width, shall be barricaded. The use of raised berms, caution signs and caution tape will be instituted to protect both the public and other personnel on the site. The excavation area will be delineated with caution tape during operations and barricaded/secured with safety fence at the end of each workday. Adequate means of exit, such as ladders, steps, ramps or other safe means of egress, will be provided and be within 25 feet of lateral travel.

Where personnel are required to enter excavations over 4 ft) in depth, sufficient stairs, ramps, or ladders will be provided to require no more than 25 ft. of lateral travel. At least two means of exit shall be provided for personnel working in excavations, where the width of the excavation exceeds 100 ft, two or more means of exit shall be provided on each side of the excavation.

For detailed Excavation/Trenching safety procedures, refer to SOP 37– Trenching and Excavation Procedures and SOP 39 – One call Damage Prevention System in the Conti Safety, Health and Environmental Program and Procedures Manual.

3.3.1.7 Slip/Trip/Hit/Fall

Slip/trip/hit/fall injuries are the most frequent of all injuries to workers. They occur for a wide variety of reasons, but all injuries can be prevented by the following prudent practices:

- Spot-check the work area to identify hazards.
- Establish and utilize a pathway, which is most free of slip and trip hazards.
- Beware of trip hazards such as wet floors, slippery floors, and uneven surfaces or terrain.
- Carry only loads, that you can see over.
- Keep work areas clean and free of clutter; especially in storage rooms and walkways.
- Communicate hazards to on-site personnel
- Secure all loose clothing, ties, and remove jewelry while around machinery.
- Report and/or remove hazards.
- Keep a safe buffer zone between workers using equipment and tools.
- Workers must take particular care when walking on the geotextile-working mat.

For detailed Slip/Trip/Hits/Falls prevention procedures, refer to SOP 20 – Fall Protection Program, SOP 27 Stairways and Ladder and SOP36 Signs, Signaling, Tags, and Barricade Procedures in the Conti Safety, Health and Environmental Program and Procedures Manual.

3.3.1.8 Heat Stress

Heat stress may be a hazard for workers wearing protective clothing even if the temperature is moderate. The same protective materials that shield the body from chemical exposure prevent heat and moisture from dissipating. Personal protective clothing can therefore create a hazardous condition. Depending on the ambient temperature and the work being performed, heat stress can occur very rapidly - within as little as 15 minutes.

In its early stages, heat stress can cause discomfort and inattention, resulting in impaired functional abilities that can threaten the safety of both the individual and his co-workers. Personnel will be instructed to recognize the symptoms of the onset of heat stress. While it is not anticipated that heat stress monitoring will be required for this project, the SSHO may periodically check all personnel working in thermal stress areas to ensure that the symptoms are recognized. Frequency of heat stress monitoring and checks for symptoms of heat stress will increase with rises in air temperature, humidity, and the degree of exposure to high temperature areas.

An ambient temperature of 72.5° F when workers are in Level C or higher, will be used as an action level to implement pulse monitoring, oral temperatures and administrative controls, including rest breaks and work rotation, to prevent employees from experiencing heat-related health effects including weight loss. The guidance for workers wearing permeable clothing is specified in the current version of the American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values for Heat Stress. If actual Clothing differs from the ACGIH standard ensemble in insulation value and/or wind and vapor permeability, changes should be made to the monitoring requirements and work rest period to account for these differences. ***Table 2 – "Frequency of Physiological Monitoring"*** provides the suggested frequency of physiological monitoring for fit and acclimatized workers.

The following parameters should be used when monitoring workers:

Heart rate - Count the radial pulse as early as possible in the rest period to ensure a more accurate reading. 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 at the same length. If, at the end of the following work period, the heart rate still exceeds 110 beats per minute, shorten the work period again by one-third.

Table 2 - Frequency of Physiological Monitoring		
Adjusted Temperature Calculation	**Normal Work Clothing**	**Impermeable Clothing**
90 F (32.2 C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5 - 90.0 F (30.8 - 32.2 C)	After each 60 minutes of work	After each 30 minutes of work
82.5 - 87.5 F (28.1 - 30.8 C)	After each 90 minutes of work	After each 60 minutes of work
77.5 - 82.5 F (25.3 - 28.1 C)	After each 120 minutes of work	After each 90 minutes of work
72.5 - 77.5 F (22.5 - 25.3 C)	After each 150 minutes of work	After each 120 minutes of work

Oral Temperature - The utilization of oral temperature applies to the time immediately after the worker leaves the contamination reduction zone. Using a clinical thermometer, take the temperature for three minutes. If the oral temperature exceeds 99.6 F (37.6 C), shorten the next work cycle by one-third, without a change to the rest period. If the oral temperature still exceeds 99.6 F (37.6 C) at the end of the following work period, shorten the next work cycle by one-third. Do not permit a worker to perform duties requiring a semipermeable or impermeable garment if the oral temperature exceeds 100.6 F (38.1C). Ear canal readings are a valid method to monitor the temperature of workers who remain in the contamination reduction zone.

The oral temperature shall not exceed 100.4° F. If an employee's pulse rate exceeds the maximum age-adjusted heart rate (0.7(220-AGE)), and/or the oral temperature exceeds 100.4° F, the employee shall be required to stop work and rest at the work site or move to an air-conditioned room after proper decontamination. The affected employee may be allowed to return to work after his/her pulse rate has dropped below 100 beats per minute. The SSHO in consultation with the affected employee, and medical personnel if necessary, shall determine whether an employee is ready to return to work. Fluids shall be provided and rest breaks will be taken. The frequency of breaks will increase with the temperature. Such things as cooling vest; portable fans and breaks in air-conditioned areas shall be used if necessary.

When practicable, the most labor-intensive tasks should be carried out during the coolest part of the day. If necessary, a work/rest regimen will be instituted. The work/rest regimen consists of alternating periods of work and rest. The duration of these alternating periods will depend on the environmental conditions at the job site, i.e., the Wet Bulb Globe Temperature, duration and type of activities performed.

A worker who becomes irrational or confused or collapses on the job should be considered a heat stroke victim, and medical help should be called immediately. Early recognition of symptoms and prompt emergency treatment is the key to aiding someone with heat stroke. While awaiting the ambulance, begin efforts to cool the victim down by performing the following:

- Move the victim to a cooler environment and remove outer clothing.
- Wet the skin with water, and fan vigorously or repeatedly apply cold packs or immerse the victim in a tub of cool (not ice) water.
- If no water is available, fanning will help promote cooling.

Any individual showing susceptibility to heat stress will be referred to a physician for evaluation. In addition, the use of prescription drugs can also contribute to the effects of heat stress and will be considered during the assignment of work.

Cool (50°-60°F) water or a sport drink, such as Gatorade will be made available to workers and encourage them to drink small amounts frequently, e.g., one cup every 20 minutes. Ample supplies of liquids will be placed close to the work area.

For detailed Heat Stress prevention procedures, refer to SOP 26 – Heat and Cold Stress Management in the Conti Safety, Health and Environmental Program and Procedures Manual.

3.3.1.9 Cold Stress

Cold injury (frostbite and hypothermia) and impaired ability to work are hazards to persons working outdoors in low temperatures at or below freezing. Extreme cold for a short time may cause severe injury to exposed body surfaces (frost nip or frostbite), or result in profound generalized cooling (hypothermia). Areas of the body which have high surface area-to-volume ratio such as fingers, toes, and ears, are the most susceptible to frost nip or frostbite.

Two factors influence the development of a cold weather injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical-protective equipment is removed if the clothing underneath is perspiration soaked. The windchill factor is the cooling effect of any combination of temperature and wind velocity or air movement. ***Table 3 – Windchill Index*** should be consulted when planning for exposure to low temperatures and wind. The windchill index does not take into account the specific part of the body exposed to cold, the level of activity, which affects body heat production, or the amount of clothing being worn.

Table 3 - Wind Chill Index

Wind (mph)	Actual Temperature (° F)												
	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25
	Equivalent Temperature (° F)												
5	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40
10	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47
15	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51
20	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55
25	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58
30	22	16	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60
35	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62
40	20	13	6	-1	-8	-15	-22	-29	-36	-42	-50	-57	-64
Wind Chill (°F) = 35.74 + 0.6215T - 35.75(V0.16) + 0.4275T(V0.16) T = Air Temperature (°F) V = Wind Speed (mph)							***Frostbite occurs in 15 minutes or less***						

When practicable, the most sedentary tasks should be carried out during the warmest part of the day. If necessary, a light-work rotation schedule should be instituted or the work area heated. Heavy work that will cause heavy sweating that will result in wet clothing must also be monitored. The work/rest regimen consists of alternating periods of work and rest. The duration of these alternating periods will depend on the environmental conditions at the job site, i.e., the Wind Chill Temperature, duration and type of activities performed.

Table 4 - Maximum Daily Time Limits for Exposure at Low Temperatures gives the recommended time limits for working in various low temperature ranges.

Table 4 - Maximum Daily Time Limits for Exposure at Low Temperatures	
Temperature Range (F)	**Maximum Daily Exposure**
30 to 0	No limit, providing that the person is properly clothed.
0 to -30	Total work time: 4 hours. Alternate 1 hour in and 1 hour out of the low-temperature area.
-30 to -70	Two periods of 30 minutes each at least 4 hours apart. Total low temperature work time allowed is 1 hour.
-70 to -100	Maximum permissible work time is 5 minutes during an 8-hour working day. At these extreme temperatures, completely enclosed headgear, equipped with a breathing tube running under the clothing and down the leg to preheat the air, is recommended.

Table – 5 Work/Warm-up Schedule applies to any 4-hour work period with moderate to heavy work activity, with worm-up periods of ten (10) minutes in a warm location and with an extended break (e.g., lunch) at the end of the 4-hour period in a warm location. For light-to-moderate work (limited physical movement): apply schedule one step lower. For example, at -35° C (-30° F) with no noticeable wind, a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4-hour period.

Table 5 - Work/Warm-up Schedule											
Air Temperature - Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph wind		15 mph wind		20 mph wind	
^{0}C (approx.)	^{0}F (approx.)	Max Work Period	No. of Breaks	Max Work Period	No. of Breaks	Max Work Period	No. of Breaks	Max Work Period	No. of Breaks	Max Work Period	No. of Breaks
-26^{0} to -28^{0}	-15^{0} to -19^{0}	(Norm. Breaks) 1		(Norm. Breaks) 1		75 min	2	55 min	3	40 min	4
-29^{0} to -31^{0}	-20^{0} to -24^{0}	(Norm. Breaks) 1		75 min	2	55 min	3	40 min	4	30 min	5
-32^{0} to -34^{0}	-25^{0} to -29^{0}	75 min	2	55 min	3	40 min	4	30 min	5	Non-Emergency Work Should Cease	
-35^{0} to -37^{0}	-30^{0} to -34^{0}	55 min	3	40 min	4	30 min	5	Non-Emergency Work Should Cease			
-38^{0} to -39^{0}	-35^{0} to -39^{0}	40 min	4	30 min	5	Non-Emergency Work Should Cease					
-40^{0} to -42^{0}	-40^{0} to -44^{0}	30 min	5	Non-Emergency Work Should Cease							
-43^{0} & below	-45^{0} & below	Non-Emergency Work Should Cease									

To guard against cold injuries, workers should wear appropriate clothing and use warm shelters for removing personal protective equipment. The personal decontamination trailer will be used as a warm shelter when required. The SSHO may periodically monitor workers' physical conditions, specifically checking for symptoms of frostbite.

For detailed Cold Stress prevention procedures, refer to SOP 26 – Heat and Cold Stress Management in the Conti Safety, Health and Environmental Program and Procedures Manual.

3.3.1.10 Fires, Explosions, and Hot Work

If required the SSHO will establish areas approved for welding, cutting, and other hot work. Hot work

(welding, burning, cutting, etc.) conducted on-site must comply with the following Hot Work Procedures. A Hot Work Permit shall be obtained from the SSHO, if required. All personnel shall be protected from welding radiation, flashes, sparks, molten metal, and slag. All welding, burning, and cutting equipment shall be inspected daily by the operator. Defective equipment shall be tagged and removed from service, replaced or repaired, and re-inspected before again being placed in service. All welders shall be properly trained in the safe operation of their equipment, safe welding/cutting practices, and welding/cutting respiratory and fire protection.

Cutting or welding shall NOT be permitted in the presence of explosive atmospheres (mixtures of flammable/combustible gases, vapors, liquids, or dusts with air), or explosive atmospheres that may develop inside un-cleaned or improperly prepared drums, tanks, or other containers, and equipment which has previously contained such materials.

Where practical, all combustible material shall be relocated at least 35 feet away from the hot work site. Where relocation is impractical, combustibles shall be protected with flame proofed covers or otherwise shielded. At a minimum, two fully charged and operable fire extinguishers, appropriate for the type of possible fire (10-ABC), shall be available at the work area. A fire watch shall be required whenever hot work is performed and a minimum of 30 minutes after hot work is complete.

A hot work permit will be completed by the SSHO, reviewed with personnel who will perform the hot work, and posted near the work area. The hot work permit is good only for the date issued and is valid only for the eight-hour shift for which it is issued. If at any time during the hot work operation a change in conditions at the work site is suspected, such as a release of flammable gases or vapors in the work area, work shall be stopped immediately and the SSHO shall be notified. Such work stoppage invalidates the hot work permit, and a new permit shall be completed after inspections and tests have been performed by the SSHO. ***Refer to Attachment 3 – Safety and Health Forms for the Hot Work Permit.***

For detailed Fire and Explosion prevention procedures, refer to SOP 21 Fire Prevention and Protection Procedures in the Conti Safety, Health and Environmental Program and Procedures Manual.

3.3.2 Chemical Hazards

Based upon the information provided by the Port Authority of NY & NJ (DRAFT Distribution of Select Metals and SVOCs in Soils, Sheet EV 04 through EV-07), the chemical hazards associated with site operations are related to inhalation, ingestion, and skin exposure to soil contaminated with Heavy Metals and Semi-Volatile Organic Compound. Please refer to **Attachment 2 - Material Safety Data Sheets.** The ranges of soil contaminant of concern levels are described in **Table 6 – Contaminants of Concern.** The greatest potential for exposure to the contaminants of concern will be during intrusive activities (i.e. building slab demolition/excavation).

3.3.2.1 Exposure Route

A primary exposure route of concern at the site is direct contact of the skin and eyes with contaminated material. Air monitoring, using direct reading instruments, for particulate shall be performed during work activities. To protect workers against dermal contact, they will wear specified protective clothing, respirators and safety glasses for operations involving potential exposure to hazardous materials. Proper personal decontamination procedures will be emphasized during remedial construction activities.

Although ingestion should be the least significant route of exposure, employees will be made aware of ways in which this type of exposure can occur and methods to avoid such exposure. Deliberate ingestion of chemicals is unlikely. Personal hygiene habits that provide a route of entry for chemicals will be restricted. Proper

decontamination procedures will reduce/eliminate potential of ingesting hazardous materials. Site personnel will wash their hands, face and other exposed parts of their skin before eating or smoking.

Table 6 – Contaminants of Concern

General Area	Contaminant	Range (mg/kg)	Depth (ft)	NYS Background
Building 20	Arsenic	8.5-140	0-4	
	Chromium	83	0-1.3	
	Cadmium	1.8	0-1.5	
	Lead	950	0-2	
	Mercury	0.24	0-1.3	
	Benzo[b]fluoranthene	2-63	1.7-3.5	
	1,2 Benzphenanthracene	2.4	2.5-3.5	
	Phenol	5.5	1.7-1.9	
	Benzo[a]anthracene	86	1.7-1.9	
	Benzo[k]fluoranthene	22	1.7-1.9	
	Benzo[a]pyrene	44	1.7-1.9	
	Indeno[1,2,3-cd]pyrene	19	1.7-1.9	
Buildings 12 & 13	Arsenic	8.8 – 20	0-6	
	Cadmium	2	6-6	
	Chromium	11	6.5-8	
	Mercury	0.24 – 0.26	0-2/7-8	
Building 5	Arsenic	260	0-2	
	Chromium	15	0-2	
	Mercury	1	0-2	
	1,2 Benzphenanthracene	0.53	0-2	
Buildings 1A & 1B	Arsenic	8.7 –310	2-10	
	Chromium	12 –24	2-4/14-16	
	Mercury	0.41 –0.48	2-4	
	1,2 Benzphenanthracene	1.1	2-4	
	Phenol	1.2 – 3.7	2-8	
	Benzo[b]fluoranthene	2.5	2-4	
Building 16	Chromium	22 – 130	2.4-4/6-8	
	Mercury	0.33	6-8	
	Phenol	0.20 – 0.37	2.4-14	
Building 17	Arsenic	13-20	8-17	
	Cadmium	51	12-14	
	Chromium	16-25	8-17	
	Mercury	0.47	8-10	
	Phenol	0.19 –7.3	.6-1.3/8-17	

3.3.2.2 Operational Chemicals/Hazard Communication Program

Operational chemicals may be brought to the project-site for use in activities supporting the remedial activities. These chemicals are used for fuels in operating heavy equipment, glues for welding pipes, painting, etc. The use of operational chemicals is regulated by OSHA under the Hazard Communication Standard (29 CFR 1910.1200). MSDSs for operational chemicals are kept on file in the project office trailer. An inventory list of

the anticipated operational chemicals (Hazardous Chemical Inventory List) for use at the project will be maintained at the site and updated as new material is received.

3.4 Engineering Controls

The use of engineering controls for the protection of personnel is the first means of mitigation. This involves the elimination of hazards and the isolation of the workers from the hazards. Implementation of engineering controls can reduce the need for personal protective equipment by separating the worker from the contaminated material. During remedial activities dust and vapors may be generated. The Site Superintendent and SSHO will be constantly alert to the possibility of unacceptable dust and vapor levels.

Control measures will be implemented for all operations where dust is likely to be generated. Potential dust concentrations will be reduced primarily by careful planning and implementation of controls. There are a number of specific construction practices, which will reduce levels of airborne particulates. These include:

- Providing for a misting spray during excavation activities
- Applying water on and sweeping haul roads.
- Wetting and smashing equipment and building faces.
- Spraying mist on buckets during material handling and dumping.
- Hauling materials in properly tarped or watertight containers.
- Reducing the active work area surface and limiting the number of concurrent operations.
- Regular washing of contaminated equipment.

4.0 SAFETY AND HEALTH TRAINING

Consistent with OSHA's 29 CFR 1910.120 regulation covering Hazardous Waste Operations and Emergency Response, all Site personnel who will be performing remedial activities, intrusive sampling, emergency response operations, or come in contact with contaminated material are required to be trained in accordance with the standard.

4.1 General Hazardous Waste Operation Training

Prior to arrival on-site, Conti will be responsible for certifying that the employees meet the requirements of preassignment training, consistent with OSHA 29 CFR 1910.120 paragraph (e)(3). Conti will provide documentation certifying that each general Site worker has received a minimum of 40 hours of instruction off site, and a minimum of three days actual field experience under the direct supervision of a trained, experienced supervisor. All personnel must also receive 8 hours of refresher training annually. At no time should anyone be working on-site without the minimum training requirements. Consistent with OSHA 29 CFR 1910.120 paragraph (e)(4), individuals designated as Site Supervisors require an additional 8 hours of training.

4.2 Preparatory Meetings

Preparatory meetings will be conducted by the SSHO for site personnel prior to their initiating any new or differing site activities. At the Preparatory meetings, the SSHO will ensure that site personnel are knowledgeable of the SSHP and understand the hazards and controls of the activity to be performed (review Activity Hazard Analysis).

4.3 Site-Specific Training

Prior to commencement of onsite field activities, all site employees will attend a site-specific safety and health training session. This session will be conducted by the Site Safety and Health Officer to ensure that personnel are familiar with the requirements of this Site-Specific Safety and Health Plan. The initial session will consist of the contents of this SSHP and specific procedures developed for the project. The SSHO shall also provide initial site-specific training for replacement employees.

As a minimum the site-specific training will include:

- Explanation of the Overall Site HASP.
- Health and Safety Personnel and Organization.
- Special attention to signs and symptoms of overexposure to known and suspected site contaminants.
- Health effects of site contaminants.
- Air monitoring description.
- Physical hazards associated with the project.
- Selection, use, and limitations of available safety equipment and proper procedures for its use.
- Personal hygiene and decontamination.
- Respirator facepiece fit testing.
- PPE fitting to determine proper size for individuals.
- Site rules and regulations.
- Work zone establishment and markings.
- Site communication and the "Buddy System".
- Emergency preparedness procedures.
- Equipment decontamination.
- Medical monitoring procedures.
- Review applicable Conti Standard Operating Procedures.
- Site Specific Hazard Communication.

4.4 Safety Meetings

A well-ordered flow of information is essential to a good safety program. Conti, through a program of safety meetings at all levels, intends to accomplish the goals of safety awareness, education, and participation.The SSHO shall conduct daily safety meetings with ALL on-site personnel. An opportunity shall be provided for employees to voice safety-related concerns. The SSHO will submit a synopsis of each meeting including topics covered, safety-related concerns, action items to be addressed, status of previous items and a signed attendance list.

4.5 Monthly Supervisor Safety Meeting

Monthly Supervisor Safety Meeting will be conducted by the SSHO to review past activities, incidents, lessons learned, plan for new or changed operations, review pertinent aspects of appropriate activity hazard analyses, establish safe working procedures for anticipated hazards, and provide pertinent safety and health training and motivation.

4.6 Hazard Communication Training

OSHA's standard for hazard communication requires that all workers be informed of potentially hazardous materials used in their work area. Conti provides employees with information and training on hazardous

chemicals at their work site at the time of their initial assignment, annually, and whenever a new chemical is introduced into their work site that could present a potential hazard. Personnel are briefed on the general requirements of the OSHA hazard communication standard and duty-specific hazards by their immediate supervisor before they begin any duties on the work site. Personnel transferred from another site are also briefed on the duty-specific hazards by their immediate supervisor before they begin any duties on the work site.

4.7 Excavation/Trenching Competent Person

Supervisory and other essential personnel engaged in excavation activities are required to complete Competent Person Training. This training provides knowledge about soil analysis and classification, use of protective systems and the requirements of the OSHA Excavation Standard 29 CFR 1926.650 – 652, Subpart P.

4.8 First Aid/CPR Training

At least two site personnel will be required to complete first aid and cardiopulmonary resuscitation (CPR) training and receive the appropriate certification. CPR certification is renewed annually; first aid certification is renewed every three years. All first aid/CPR training is American Red Cross-approved or in accordance with OSHA standards. Additionally First Aid/CPR qualified personnel received bloodborne pathogen training as required by 29 CFR 1910.1030.

5.0 MEDICAL SURVEILLANCE PROGRAM

The Medical Surveillance Program is designed to track the physical condition of employees on a regular basis as well as survey pre-employment or baseline conditions prior to potential exposures. The Medical Surveillance Program is a part of the overall Conti Safety and Health program.

5.1 Baseline Medical Monitoring

Each employee must receive a baseline physical, which can be part of an annual medical monitoring program, prior to being permitted to enter the Exclusion Zone or Contamination Reduction Zone. The content of the physical has been determined by Conti's Occupational Physician as suggested by NIOSH/OSHA/USCG/EPA's Occupational Safety & Health Guidance Manual for Hazardous Waste Site Activities. The minimum medical monitoring requirements for work at the Site is as follows:

- Complete medical and work histories
- Physical examination
- Pulmonary function tests (FVC and FEV1)
- Blood chemistry (CBC & SMAC 24)
- Urinalysis with microscopic examination.
- Audiometric Testing
- Eye examination and visual acuity
- Chest X-Ray (as directed by the Occupational Physician)
- Electrocardiogram (as directed by the Occupational Physician)
- Other Biological testing as prescribed by the Occupation Physician
- Serum Lead
- Zinc Protoporphyrin

The medical surveillance provided to the employee includes a judgment by the medical examiner of the ability of the employee to use either positive- or negative-pressure respiratory protection equipment. Any employee found to have a medical condition, which could directly or indirectly be aggravated by exposure to these site contaminants, or by the use of respiratory equipment, will not be employed for the project. A copy of the medical examination is provided at the employee's request. The employees will be informed of any medical conditions that would result in work restriction or that would prevent them from working at hazardous waste sites.

5.2 Periodic Monitoring

In addition to a baseline physical, all employees require a physical every 12 months unless the advising physician believes a shorter interval is appropriate. The Occupational Physician has prescribed an adequate medical evaluation, which fulfills OSHA 29 CFR 1910.120 requirements. The preassignment medical outlined above is applicable.

All personnel working on the Site that enter an active Exclusion or Contamination Reduction Zone will verify currency (within 12 months) with respect to medical monitoring. Conti will obtain a copy of the physician's written opinion detailing the employee's ability to perform hazardous waste site work.

At termination of employment or reassignment to an activity or location that does not represent a risk of exposure to hazardous substances, an employee may be required to take an exit physical. If his/her last physical was within the last 6 months, the advising medical consultant has the right to determine adequacy and necessity of an exit exam.

5.3 Exposure/Injury/Medical Support

As a follow-up to an injury or possible exposure above established exposure limits, all employees are entitled to and encouraged to seek medical attention and physical testing. Depending upon the type of exposure, it is critical to perform follow-up testing within 24-48 hours. It will be up to the occupation physician to advise the type of test required to accurately monitor for exposure effects.

Any employee, who develops a time loss illness exceeding one working day, or injury during the period of the contract, must be evaluated by the occupational physician. A written statement indicating the employee's fitness, signed by the occupational physician must be submitted prior to the employee entering the work site.

5.4 Medical Records

The results of medical testing and full medical records will be maintained in accordance with 29 CFR Part 1910.20. A copy of the medical certification will be kept on the Site for each person entering the Contamination Reduction Zone and Exclusion Zone.

6.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

This section provides an outline of the PPE and guidelines that will be implemented to minimize chemical, physical, and biological exposures and accidents during remedial activities. Where engineering controls and job hazard analyses do not eliminate all job hazards, employees will (where appropriate) wear PPE.

These include items such as, hard hats, face shields, safety goggles, glasses, hearing protection, foot guards, gloves etc. The SSHO will ensure that equipment selected will meet the following requirements:

- It will be appropriate for the particular hazard.
- It will be maintained in good condition.
- It will be properly stored when not in use, to prevent damage or loss.
- It will be kept clean, fully functional and sanitary.
- Must meet all applicable ANSI standards.

Personal clothing and jewelry can present additional safety hazards. Supervisors will ensure that workers wear appropriate clothing, which will not interfere with the PPE. All PPE will be selected in accordance with 29 CFR 1910.132. Conti will provide proper PPE to all employees. All protective clothing will be properly used, stored, selected, and maintained.

6.1 PPE Hazard Assessment

Selection of the appropriate PPE is a complex process, which should take into consideration a variety of factors. Key factors involved in this process are identification of the hazards, or suspected hazards, routes of potential exposure to employees (inhalation, skin absorption, ingestion, and eye or skin contact); and the performance of the PPE materials (and clothing seams) in providing a barrier to these hazards. The amount of protection provided by PPE is material-hazard specific. That is, protective equipment materials will protect well against some hazardous substances and poorly, or not at all, against others. In many instances, protective equipment materials cannot be found which will provide continuous protection from the particular hazardous substance. In these cases, the breakthrough time of the protective material should exceed the work duration.

Other factors in this selection process to be considered are matching the PPE to the employee's work requirements and task-specific conditions. The durability of PPE materials, such as tear strength and seam strength, should be considered in relation to the employee's tasks. The effects of PPE in relation to heat stress and task duration are a factor in selecting and using PPE. In some cases layers of PPE may be necessary to provide sufficient protection, or to protect expensive PPE inner garments, suits or equipment.

The following are guidelines, which Conti Enterprises uses to select PPE. Based on the site characterization and analysis performed during the remedial activities, a combination of PPE has been selected from the different protection levels (i.e., A, B, C, D Modified or D) as being suitable to the hazards of the work to be performed. Section 3.0 of this plan characterizes and analyzes, the chemical and physical hazards, specific tasks/operations, routes of exposure, and concentrations of contaminants. Characteristics, capabilities and limitations are summarized in this section.

- **Level A:** The highest level of skin, eye, and respiratory protection (Level A PPE is not anticipated on this project).
- **Level B:** Should be worn when the highest level of respiratory protection is needed, but a lower level of skin protection is needed, compared to that of level A (Level B PPE is not anticipated on this project).
- **Level C:** Should be worn when the criteria for using air-purifying respirators are met, and a lesser or the same level of skin protection is needed, compared to that of level B.
- **Level D Modified:** Should be worn when respiratory protection is not warranted but minimal dermal protection is necessary.
- **Level D:** Level D provides minimal protection against chemical hazards. A work uniform consisting of coveralls and/or long pants and sleeves may be worn in any area without the potential for significant respiratory or skin contact hazards.

Personal Protective Equipment alone should not be relied on to provide protection against hazards, but should be used in conjunction with guards, engineering controls, and sound work practices.

6.1.1 Head Protection

All personnel shall wear a hard hat that meets the requirements and specifications in ANSI Safety Requirements for Industrial Head Protection Z89.1-1969. Exceptions to this requirement are personnel in the site office and rest and eating areas.

6.1.2 Hand Protection

Outer gloves used on the Site for remedial activities shall be either chemical resistant or general purpose. The appropriate glove shall be determined by the SSHO for a specific work task. Chemical resistant gloves shall be selected using appropriate chemical degradation guides. Cotton work gloves will be worn when work activities require the handling of sharp and rough-surfaced objects.

Welder's gloves or any other special type of gloves are considered outer gloves and are to be worn over inner gloves. These special outer gloves shall be stored on-site and shall be disposed of properly as PPE waste. Inner gloves shall always be chemical resistant, shall be selected using appropriate chemical degradation guides and shall be disposed of as PPE waste.

6.1.3 Eye/Face Protection

No contact lenses are allowed in the Exclusion Zone (EZ) and Contamination Reduction Zone (CRZ). Eye/Face protection shall be worn by all personnel in the CRZ and EZ. Double eye protection will be required when power-washing equipment during decontamination. All eye/face protection provided shall be ANSI Z87-1989 approved.

6.1.4 Footwear

Footwear will be steel-toed safety boots. Chemical-resistant outer boot covers are to be worn in the Exclusion Zone, Contamination Reduction Zone. Boot racks will be provided in the CRZ for drying of outer boots.

6.1.6 Respiratory Protection

To control and or minimize the threat of occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors, the primary objective of this program shall be to prevent atmospheric contamination. This shall be accomplished as far as feasible by accepted engineering control measures (for example, dust suppression). When effective engineering controls are not feasible, or while they are being instituted, appropriate respiratory protection shall be used. A respiratory protection program will be implemented that is compliant to the requirements of 29 CFR 1910.134 "Respiratory Protection." Respiratory protection equipment shall be NIOSH-approved and respirator use will conform to American National Standards Institute (ANSI) Z88.2.

Respirators shall be provided when such equipment is necessary to protect the health of the employee. Conti shall:

- Provide the respirators to Conti personnel, which are applicable and suitable for the purpose intended.
- Be responsible for the maintaining a written Respiratory Protective Program, in accordance with 29 CFR 1910.134 The employee shall use the provided respiratory protection in accordance with instructions and training received.
- Respirators shall be selected on the basis of hazards to which the worker is exposed.
- The user shall be instructed and trained in the proper use of respirators and their limitations.

- Respirators shall be regularly cleaned and disinfected.
- Respirators shall be stored in a convenient, clean, and sanitary location.
- Respirators used routinely shall be inspected during cleaning. Worn or deteriorated parts shall be replaced. Respirators for emergency use, such as self-contained devices, shall be thoroughly inspected at least once a month and after each use.
- Appropriate surveillance of work area conditions and degree of employee exposure or stress shall be maintained.
- There shall be regular inspections and evaluations to determine the continued effectiveness of the program.
- Employees will not be assigned to tasks requiring use of respirators unless it has been determined that they are physically able to perform the work and use the equipment. A physician shall determine whether an individual is physically fit to wear a respirator. The physician's clearance allows the worker to don a respirator and work in conditions of high ambient temperatures. Heat stress will be closely monitored by the SSHO.

Each respirator shall be individually assigned and not interchanged between workers without cleaning and sanitizing. The cartridges/filters shall be changed at the first sign of breakthrough based on contaminant warning properties or if the user experiences excessive breathing resistance. The SSHO will make final determination of the frequency of respirator cartridge/filter change-out. Respirators shall be cleaned and stored in an uncontaminated atmosphere after each use. Used cartridges will be disposed of with spent PPE. Self-contained breathing apparatus/supplied-air respirators shall be inspected before and after use and at least once monthly, if in storage for emergency use.

All employees working at the Site during remedial activities who have the potential of wearing a respirator shall be fit-tested to ensure they utilize the proper size respirator. Conti shall arrange for fit testing. Sub-contractors will provide the SSHO with fit-test documentation. The fit test is conducted according to the manufacturer's suggestions. The test shall consist of a taste and odorous vapor qualitative test. As per OSHA regulations, personnel that are unable to pass a fit test shall not enter a work area when respiratory protection is required. In addition, facial hair is prohibited from the respirator seal area. Any person with facial hair will not be permitted to enter a work area where respiratory protection is required, regardless of the fit test results. Documentation of the fit testing will be maintained on-site.

6.2 Levels of Protection

The level of protection must correspond to the level of hazards known or suspected for the specific work activity.

6.2.1 Level B

Level B equipment, used as appropriate, is as follows:

- Positive pressure, full facepiece self-contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA (NIOSH-approved)
- Disposable coverall (Tyvek, Polycoated Tyvek or Saranex)
- Outer gloves: neoprene or nitrile
- Inner gloves: latex or nitrile
- Chemical resistant or disposable overboots.
- Steel-toed safety boots
- Hard hat

6.2.2 Level C

Level C equipment, used as appropriate, is as follows:

- Full-face, air purifying, cartridge-equipped respirators (NIOSH-approved) utilizing Organic Vapor/Acid Gas and HEPA filters (half-face if approved by SSHO). Cartridges and/or filters must be replaced as needed and, as a minimum, changed weekly.
- Disposable coverall (Tyvek, Polycoated Tyvek or Saranex).
- Outer gloves: leather, cotton, neoprene or nitrile
- Inner gloves: latex or nitrile
- Chemical resistant or disposable overboots
- Steel-toed safety boots
- Hard hat
- Safety glasses (if half-mask is utilized)
- Splash guards (worn during high pressure washing activities)

6.2.3 Modified Level D

Modified Level D equipment, used as appropriate, is as follows:

- Regular Tyvek coveralls (Polycoated Tyvek as required)
- Outer gloves: leather, cotton, neoprene or nitrile
- Inner gloves: latex or nitrile (doubled)
- Chemical resistant or disposable overboots
- Steel-toed safety boots
- Hard hat
- Safety glasses
- Splash guards (worn during high pressure washing activities)

6.2.4 Level D

Level D equipment, used as appropriate, is as follows:

- Work uniform (Long pants and Shirt)
- Hard hat
- Steel-toed safety boots (with disposable overboots, as required)
- Safety glasses
- Leather or heavy cloth gloves (as needed)

6.3 Initial Levels of Protection

Based upon the nature of the remedial activities to be performed at the Site, the initial levels of protection to be used are outlined in ***Table 7, "Initial Levels of Protection"***. This table lists each work task and the initial level of protection. The initial level of protection is defined as that level in which work commences.

Once the need for PPE is established, a careful evaluation of the hazards is necessary so that a selection can be made that minimizes the risk to the user. For chemical situations, knowing the hazard includes being aware of: the type of chemical, the physical state (liquid, solid or gas), and the physiological effect (toxic, corrosive, etc.). Knowing the level of exposure is also important when selecting protective clothing and equipment. After the

appropriate level of PPE has been determined, the choice of Chemical Protective Clothing (CPC) material must be considered. Among the most important factor in selecting the appropriate CPC is chemical resistance. ***Table 7, "Initial Level of Protection"*** identifies the CPC as they relate to each task.

Table 7 - Initial Levels of Protection

Task	CPC	Level of PPE
Site Preparation/Mobilization	None	Level D
Utility Disconnect/Capping	None	Level D
Building Demolition	None	Level D
Segregate Demolition Debris	None	Level D
Load Out Building Demolition Debris	None	Level D
Removal of Slab/Foundations	Reg. Tyvek	Level D/Level D Modified
Backfill Operations	None	Level D
Stockpile Slab/Foundation Debris	None	Level D
Site Restoration/Demobilization	None	Level D

Air monitoring using direct-reading instruments and personal air sampling will be performed to determine if an upgrade or downgrade from initial PPE levels is warranted. All decisions on the level of protection will be based upon a conservative interpretation by the SSHO of the information provided by air monitoring results, environmental results and other appropriate information.

7.0 AIR MONITORING PLAN

The air-monitoring plan will serve to outline procedures to identify and quantify airborne chemical contaminants during remedial activities. Both real-time monitoring and air sampling will be conducted throughout the duration of the project to establish the maximum levels of personal protection required, as well as to verify that worker exposure levels and respiratory protection are adequate. Available site information indicates that the primary concerns with respect to contamination at the site are related to inhalation of petroleum hydrocarbon and direct contact with dust/particulates generated during contaminated material handling. As a result, engineering controls will be utilized to the maximum extent possible to control the production of dust/particulates during the project. Engineering controls may include the use of tarps or coverings, water misting or dust control additives. Air monitoring will be performed by the SSHO. Data will be reviewed by the Safety and Health Manager with consultation of the CIH, if needed.

7.1 Real-Time Air Monitoring

7.1.1 Organic Vapor Monitoring

During the remedial activities, organic vapor levels will be monitored during intrusive activities with a PID set at the appropriate span setting and equipped with an 10.2 eV probe or equivalent device (a copy of the PID Operator's Manual will be kept on-site). Real-time air monitoring equipment calibration will be performed in accordance with the manufacturer's recommendation prior to field use. Calibration information will be recorded on the Daily Air Monitoring Report. Maintenance and calibration procedures for all air monitoring devices will be maintained on site.

7.1.2 Combustible Gases/Carbon Monoxide/Oxygen Levels/Hydrogen Sulfide

A Gastech or MSA Portable Gas Monitor will be utilized to monitor for explosive and oxygen enriched/deficient atmospheres and concentrations of hydrogen sulfide during intrusive operations. A copy of the Operator's Manual will be kept on-site. The Portable Gas Monitor also will be utilized for all intrusive activities and activities where the potential for disruption of utilities exists. Calibration information will be recorded on the Daily Air Monitoring Report. Maintenance and calibration procedures for all air monitoring devices will be maintained on site.

7.1.3 Particulate Monitoring

Particulate (Real-time) air monitoring will be performed, , on a continuous basis, using a MIE Personal/Data RAM Particulate Monitor (RAM). A copy of the appropriate Operator's Manual will be kept on-site. Air monitoring results will be recorded on the Daily Air Monitoring Report. SHSO and the superintendent will be constantly alert to the possibility of unacceptable dust levels being generated by remedial activities. Unacceptably high levels of airborne particulate, or excessive dust conditions, will trigger dust control measures. Should dust control measures prove ineffective and unacceptable levels of particulate are present for a sustained period, the SHSO may suspend work activities pending further evaluation of the situation.

7.1.4 Equipment Calibration

Real-time air monitoring equipment calibration will be performed in accordance with the manufacturer's recommendation prior to field use. Calibration information will be recorded on the Daily Air Monitoring Report. Maintenance and calibration procedures for all air monitoring devices will be maintained on site.

7.2 Operational Action Levels

A decision-making protocol for an upgrade in levels of protection and/or withdrawal of personnel from an area based on atmospheric hazards is outlined in ***Table 8 – "Operational Action Levels".*** The Action Levels for particulate is based on combining the contaminants of concern found at the site at their highest concentration and formulating a mixture Permissible Exposure Limit with a safety factor of 4. Refer to ***"Table 9 – Particulate Exposure Calculation".***

7.3 Personal Air Sampling

In addition to the real-time monitoring performed during material handling activities (Site Grading), the personal air-monitoring program will provide for the determination of worker's airborne exposure levels. Such a determination will be made from laboratory analysis of air samples collected from workers during an 8- hour work shift. The selection of the worker to be monitored for daily exposure will be done by the SSHO based on his professional judgment of the characteristics of the job and locations in each work area. Personal sampling will be conducted in a manner representative of exposure of workers at those locations or jobs where the potential for maximum exposure is predicted. Personal air monitoring results will be used to verify personnel exposure during the remedial project. Samples will be collected from representative workers during material handling activities. Refer to ***Table 10 – "Proposed Site Air Monitoring"***

Table 8 - Operational Action Levels

Contaminants	Action Level	Action to Take
Volatile Organic Compounds	1 To 10 PPM Above Background At The Breathing Zone And Sustained For 1 Minute	Level D, Continuous Air Monitoring Quantify with Colorimetric Tubes.
	10 To 100 PPM Above Background At The Breathing Zone And Sustained For 1 Minute	Upgrade To Level C, Continuous Air Monitoring
	100 To 300 PPM Above Background At The Breathing Zone And Sustained For 1 Minute	Upgrade To Level B, Continuous Air Monitoring
	> 300 PPM Above Back Ground At The Breathing Zone And Sustained For 1 Minute	Stop Work, Evacuate Work Zone And Evaluate with Continuous Air Monitoring
Combustible Gas In Air	Less Than 10% LEL	Continue With Caution And Air Monitoring
	Greater Than 10% LEL	Stop Work, Immediate Withdrawal Of Personnel, and investigate
Oxygen In Air	Less Than 19.5%	Stop Work &Ventilate Or Upgrade To Level B
	19.5 To 23.5%	Level D, Continue Work With Air Monitoring
	Greater Than 23.5%	Stop Work, Immediate Withdrawal Personnel And Evaluate
Particulate in Air Action Level Based on Particulate Exposure Calculation	0 mg/m^3 to 1 mg/m^3	Level D No Action Taken
	1 mg/m^3 to 2 mg/m^3	Level D Initiate Dust Control
	2 mg/m^3 to 4 mg/m^3	Upgrade To Level C, Air Monitoring And Initiate Dust Control
	Greater than 4 mg/m^3	Stop Work and Investigate

Table 9 - Particulate Exposure Calculation

Chemical	Exposure Limit (mg/m3)	Maximum Soil Concentration (mg/kg)	Exposure Limit Based on Single Compound (EL Mix, mg/m3)	Dust Quotient for Each Compound (level/limit)	Problem from Single Compound [5mg/m3)/Elmix]
Arsenic	0.01	310	8.06	3.10E+04	0.620
Cadmium	0.005	51	24.51	1.02E+04	0.204
Chromium	0.5	130	961.54	2.60E+02	0.005
Lead	0.05	950	13.16	1.90E+04	0.380
Mercury	0.025	1.	6,250.	4.00E+01	0.001
PNAs (Totals)	0.2	236	211.51	1.18E+03	0.024
			Sum	**6.17E+04**	
Dust Exposure Level at Mixture PEL =			**4.053**		**1.234**

The SSHO will designate two-crew members in an active work area to wear the sampling device. In general, samples will be collected from those workers and site conditions representing the highest potential for exposure. Initially, two workers will be monitored the first day of each activity at the site. If sampling results are above the Action Levels additional personal sampling will be performed.

Table 10 - Proposed Site Air Sampling

Contaminant	Task/Activity	Sampling Type and Method	Analysis Method
Total Dust	Material Handling Activities	BZ- Personal	NIOSH 0500

8.0 ACCIDENT PREVENTION PROCEDURES/PRACTICES

8.1 Medical and First Aid Requirements

Applicable Standards:

OSHA 29 CFR 1926.23, & 1926.50
Conti SOP 23, Medical and First Aid Equipment Requirements

First-aid kits/stations and required contents are maintained in a serviceable condition. Unit-type kits have all items in the first-aid kit individually wrapped, sealed, and packaged in comparable sized packages. First-aid stations will be located as close as practicable to the highest concentration of personnel. First-aid stations will be well-marked and available to personnel during all working hours. First-aid stations will be equipped with a first-aid kit, the size of which will be dependent upon the number of personnel normally employed at the work site.

Emergency telephone numbers and Route to the Area Hospital will be clearly posted and easily visible at all times. There should be OSHA posters prominently displayed and warning signs posted for any known or potential hazard(s) present. Material Safety Data Sheets (MSDS) must be available on the job site at all times.

8.2 Hazardous Substances

Applicable Standards:

OSHA 29 CFR 1926.53 & 1910.1200
Conti SOP 41, Hazard Communication Program

When hazardous substances are used in the workplace, the hazard communication program dealing with Material Safety Data Sheets (MSDS), labeling and employee training will be in operation. MSDS materials will be readily available for each hazardous substance used. A training program plus regular question and answer sessions on dealing with hazardous materials will be given to keep employees informed. The program will include an explanation of what an MSDS is and how to use and obtain one; MSDS contents for each hazardous substance or class of substances; explanation of the "Right to Know"; identification of where employees can see the employer's written hazard communication program and where hazardous substances are present in their work area; the health hazards of substances in the work area, how to detect their presence, and specific protective measures to be used; as well as informing them of hazards of non-routine tasks and unlabeled pipes.

8.3 Fall Protection

Applicable Standards:

OSHA 29 CFR 1926.500, 501, 502, 503; 1926.106
Conti SOP 20, Fall Protection Program

To access high and low places on jobsites, a variety of equipment may be used such as ladders, scaffolding, suspended platforms, aerial lifts, stairways, and climbing lines. The use of these access systems often presents fall hazards. In addition, employees may be exposed to falls while working on elevated structures, climbing onto and off of equipment, and even while walking by falling through holes or by slipping or tripping.

To protect employees when they are exposed to fall hazards, some form of fall protection must be used. The most common forms of fall protection are guardrails, personal fall arrest systems, hole covers, and safety nets. Any one or all of these forms of fall protection may be used on construction worksites. The current OSHA standards also require that employees receive training regarding fall protection issues, and that the training is documented. An alternate fall arrest program may be implemented in cases where none of the traditional methods of fall protection are feasible. Components of our fall protection plans are listed below:

Personal Fall Arrest System - The three main parts of a personal fall arrest system are the body belt or harness, the lanyard/lifeline, and a suitable anchorage. Particular attention must be paid to the anchorage point(s) to ensure that they are capable of supporting 5,000 lb. (22.2 kN) or two times the maximum load on an engineered system.

Guardrail Systems - Guardrail systems consist of a toprail, midrail, and if necessary a toeboard. Guardrail systems can be made of various materials.

Safety Nets - Safety nets need to be provided for all workplaces 25 ft (7.6 m) or more above surfaces where the use of ladders, scaffolds, catch platforms, temporary floors, safety lines, or safety belts is impractical. Safety nets must extend 8 ft (2.4 m) beyond the edge of the surface where employees are exposed. Nets will be hung no more than 25 ft (7.6 m) below the work surface with sufficient clearance to prevent user's contact with the surfaces or structures below. Safety nets must be impact load tested prior to commencing operations.

Training - All employees must receive training on the nature of the fall hazards at the site and on how to avoid falls. Employees should be familiar with the use of all personal fall arrest systems and must wear the equipment when necessary.

The requirements of all applicable OSHA regulations notwithstanding, the minimum fall protection requirements on our projects may include the following:

- All fall protection systems must meet the requirements of Part 1926, Subpart M.
- For situations where lifelines are interrupted, double lanyards are necessary to ensure that the worker is continuously protected from falling by attaching one lanyard ahead of the discontinuity prior to unhooking the trailing lanyard.
- Climbing on forms, false work, or the structure to gain access to work areas is expressly prohibited. However, it is not intended to prohibit the use of ladders for access to work areas, provided the operation is in compliance with OSHA Part 1926 Subpart X and other relevant requirements.
- Where scaffolds are necessary to provide temporary access to work areas, they must be in compliance with §1926.451. Scaffolds must include a toprail, midrail, and toeboard in compliance with 1926.451, on all open sides and ends. Personal fall arrest systems meeting the criteria of Part 1926 Subpart M are required to protect workers during installation and removal of the railings, and in situations where physical restrictions preclude installation of a standard railing.

- Fall protection is required for open sides or ends of roofs and for openings in floors, as required in Part 1926 Subpart M. In no case will a height of fall 6 ft (1829 mm) or greater from the side, end, or opening in a floor remain unprotected.
- All workers in approved personnel aerial lifts must use a personal fall arrest system meeting the criteria of Part 1926 Subpart M, with the lanyard attached to the boom or basket, as required by OSHA 1926.556.
- Because falls from structural members constitute a serious and clearly recognizable hazard, fall protection for all steel or concrete beams and other structural elements must be in place prior to erection. This will provide fall protection for workers involved in the initial erection and in subsequent operations until the deck forms are in place. This fall protection will consist of personal fall arrest systems, safety nets, or other means meeting the requirements of Part 1926 Subpart M.
- During the initial connection of structural elements, workers exposed to moving members will be required to tie off only if they are not exposed to a greater risk from the moving member. Initial connection is defined as that period during placement or removal of structural members while the member is supported by a crane or other lifting device.
- Instances in which it is impossible to provide fall protection for workers are rare. Where an individual worker must rig the fall protection system, and it cannot be accomplished from an aerial lift or by tying-off to the existing structure, momentary exposure to a fall hazard may be unavoidable. It is essential that adequate planning of construction procedures minimize such occurrence of unprotected exposure to fall hazards. It is equally essential that the fall protection systems utilized actually enhance safety, rather than creating a secondary hazard.

8.4 Electrical

Applicable Standards:

OSHA 29 CFR 1926.400 through 449, 1910.301 through 399, 1926.550(a)(15)
Conti SOP 40, Electrical Procedures

Electricity is a serious workplace hazard that must be respected at all times. It is important to remember that exposure to even a little electric current can kill! The best protection around electricity is distance--ample distance between the worker and the conductive materials. The following safe work practices and procedures will help prevent electrical accidents on the jobsite.

Workers should observe and strictly obey all warning and danger signs around electrical apparatus. They should never close a switch that has a danger tag on it signed by or placed there by someone else. Untrained people must not open any electrical enclosures. The one exception is that the door on a circuit breaker panel board may be opened to operate the switches, but other types of electrical enclosures should not be opened.

Extension cords or any power tools or equipment must not be used when the cords are frayed, worn out, or the wires are bare. Defective equipment should be reported to the supervisor and turned in for repair. Report all unguarded or broken light bulbs. Do not hang lights by their cords unless the light was designed to be suspended in that manner.

Installation Safety Requirements: Live parts of electrical equipment operating at 50 volts or more must be guarded against accidental contact. Entrance to rooms and other guarded locations containing exposed live parts must be marked with conspicuous warning signs forbidding unqualified persons from entering. All pull boxes and breaker boxes must be labeled to indicate the equipment they switch. Electric installations that exceed 600 volts and that are open to unqualified persons must be made with metal-enclosed equipment or enclosed in a vault or area controlled by a lock. In addition, equipment must be marked with appropriate caution signs.

Conductors and equipment must be protected from overcurrent in accordance with their ability to safely conduct current, and the conductors must have sufficient current carrying capacity to carry the load. Fuses and circuit breakers must also be located or shielded so that employees will not be burned or otherwise injured by their operation.

All wiring components and utilization equipment in hazardous locations must be maintained in a explosion-proof condition without loose or missing screws, gaskets, threaded connections, seals, or other impairments to a tight condition. Unless identified for use in the operating environment, no conductors or equipment can be located:

- In damp or wet locations.
- Where exposed to gases, fumes, vapors, liquids, or other agents having a deteriorating effect on the conductors or equipment.
- Where exposed to excessive temperatures.

Ground Fault Circuit Interrupters To ensure electrical safety from shocks on all construction sites, all 120-volt, single-phase, 15- and 20-amp receptacle outlets must be protected by ground fault circuit interrupters (GFCIs), or assured equipment grounding conductor program must be established. In an assured equipment grounding program, one or more **competent persons** must be designated to implement and enforce the following assured equipment grounding safety procedures at all construction jobsites.

Each 120-volt extension cord, tool, piece of equipment, and receptacle needs to be inspected and tested before first use, before equipment is returned to service following repairs, before equipment is used after any incident that can be reasonably suspected to have caused damage.

Each extension cord, tool, or piece of equipment should be visually inspected by the user before each day's use to determine signs of damage. Equipment found to be damaged or defective (frayed or damaged insulation, crushed cable, loose or missing covers or screws, and missing ground prong on plugs, etc.) must not be used until repaired. Equipment suspected to be damaged or defective should be inspected and tested prior to use.

Overhead Transmission and Distribution Lines - A significant hazard on construction jobsites is the accidental contact of moving equipment with live overhead power distribution and service lines. Where work must be done near live lines, the movement of all equipment such as cranes, excavators and other equipment must be guided by an observer who can observe the clearance of the equipment from energized lines and give timely warning to equipment operators. The minimum clearance between live lines and any jobsite equipment is 10 ft (3.0 m), and the clearance increases with increasing line voltages.

8.5 Lockout and Tagout

Applicable Standards:

OSHA 29 CFR 1926.417 & 1910.147
Conti SOP 28, Lockout/Tagout (Hazardous Energy) Procedures)

Whenever maintenance, servicing, or repairs are done to equipment, tools and machinery, there is a potential for injury from the accidental energization or movement of the equipment. Prior to beginning any work on equipment, steps must be taken to identify the energy sources present in the equipment, and to ensure that the energy sources are neutralized.

Hazardous energy sources fall into categories such as electrical, pneumatic, hydraulic, and potential (gravity, springs, etc.). One simple control in the construction industry has been to unplug cord-connected equipment. Vehicles and other motorized equipment can be protected from accidental starting by disconnecting the battery.

Other controls include the use of identifiable padlocks on disconnects, breaker switches, and valves. Stored energy has the potential for release with great kinetic force and potential for injury

All machinery or equipment capable of movement must be de-energized or disengaged and blocked or locked out during cleaning, servicing, adjusting or setting up operations, whenever required. The lockout procedure requires that stored energy (i.e. mechanical, hydraulic, air) be released or blocked before equipment is locked out for repairs. Appropriate employees are provided with individually keyed personal safety locks. Employees are required to keep personal control of their key(s) while they have safety locks in use. Employees must check the safety of the lockout by attempting a start up after making sure no one is exposed. Where the power disconnector does not also disconnect the electrical control circuit, the appropriate electrical enclosures must be identified. The control circuit can also be disconnected and locked out.

Temporary electrical service installation and will be performed by a qualified electrician. Work may only be performed on de-energized equipment. Lockout/Tagout procedures will be implemented to assure the safety of personnel during electrical work activities.

Underground electric lines will be located and clearly marked. These utilities will be protected, removed or relocated as needed to do the work safely. The excavation work will not be allowed to endanger the underground utility or the people doing the work. Barricades, shoring, or other supports as needed will protect utilities left in place that are exposed by the excavation

8.6 Scaffolds

Applicable Standards:

OSHA 29 CFR 1926.451 through 454
Conti SOP 34, Scaffolds Procedures

Use of scaffolds exposes workers to a number of different hazards. According to OSHA, the two predominant hazards when working on scaffolds are falling from the scaffold and being struck by a falling object while working on or below a scaffold. The falls are most commonly caused by either the planking or scaffold support structures giving way, or by falling off the edges of the work platforms. In addition to the fall hazards, workers have been electrocuted when either the scaffold structures or conductive tools and materials being used on the scaffold have come into contact with electrical sources.

In the OSHA standards all scaffolds are divided into two general classes: supported scaffolds or suspension scaffolds. A supported scaffold means "one or more platforms supported by outrigger beams, brackets, poles, legs, uprights, posts, frames, or similar rigid support." A suspension scaffold is defined as "one or more platforms suspended by ropes or other non-rigid means from an overhead structure(s)."

A key requirement in the OSHA standards is that scaffolds can only be erected, moved, dismantled, or altered under the supervision of a competent person. Such activities can only be performed by experienced and trained employees that are selected by the competent person. Other duties of the competent person include:

- Determining if scaffold components from different manufacturers can be used together.
- Determining if galvanic actions are taking place when scaffolding materials of dissimilar metals are used together.
- Inspecting the inboard connections of outriggers to support structures before using suspension scaffolds.
- Inspecting wire ropes on suspension scaffolds before and after every shift.
- Evaluating how to keep suspension scaffolds from swaying.
- Determining whether and how a safe means of access can be provided to scaffold erectors.
- Determining when the weather is too severe to work on scaffolds.

- Determining when and how fall protection can be provided to employees erecting and dismantling scaffolds.
- Inspecting manila and synthetic ropes used as toprails and midrails for strength requirements as frequently as necessary.
- Providing work skills and safety training to all employees in scaffold work.

The general requirements for all scaffolds are covered in 1926.451. Guidance regarding scaffold capacities, platform construction, access, use, and fall protection are covered in this section. There are also generic criteria for all supported and suspended scaffolds. Some highlights of this section, including the following points:

- Each scaffold and scaffold component must be capable of supporting, without failure, its own weight and at least four times the maximum intended load applied or transmitted to it.
- Each suspension rope, including connecting hardware, used on adjustable suspension scaffolds will be capable of supporting, without failure, at least six times the maximum intended load applied or transmitted to that rope.
- Scaffolds must be designed by a qualified person and will be constructed and loaded in accordance with that design.
- Each platform will be fully planked or decked between the front uprights and the guardrails at the rear of the scaffold. The front edge of all platforms will not be more than 14 in (34.3 cm) from the face of the work, unless employees are provided some form of fall protection. Each end of a platform, unless it is cleated or hooked, must extend over the centerline of its support at least 6 in (15.2 cm) to ensure that the platform does not slip off its support.
- When a supported scaffold height-to-base-width ratio exceeds four to one (4:1), the scaffold must be restrained from tipping by guying, tying, bracing, or equivalent means.
- Supported scaffold poles, legs, posts, frames, and uprights will bear on base plates, mud sills, or other adequate firm foundation. Footings will be level, sound, rigid, and capable of supporting the loaded scaffold without settling or displacement.
- Suspension scaffold outriggers must securely support the scaffold. Requirements for outrigger connections to the roof or deck, counterweights, outrigger beams, wire ropes, hoists, and other suspension scaffold support devices are given in 1926.451(d).
- When scaffold platforms are more than 2 ft (0.6 m) ***above or below*** a point of access, portable ladders, hook-on ladders, stair towers (scaffold stairways/towers), stairway-type ladders (such as ladder stands), ramps, walkways, integral prefabricated scaffold access, or direct access from another scaffold, structure, personnel hoist, or similar surface will be used. Crossbraces will not be used as a means of access.
- Safe means of access for each employee erecting or dismantling a scaffold (using the devices or methods above) must be provided, where the provision of safe access is feasible and does not present a greater hazard. The competent person must determine the feasibility and safety of providing the various means of access.
- Scaffolds will not be moved horizontally while employees are on them, unless the scaffolds have been specifically designed for such movement.
- Scaffolds will not be erected, used, dismantled, altered, or moved such that they or any conductive material handled on them might come closer to exposed and energized power lines than 10 ft (3.0 m) plus 4 in (10.2 cm) for each 1 kilovolt (kv) of line voltage greater than 50 kv. For live insulated lines with less than 300 volts, the minimum distance will be 3 ft (0.9 m). Where possible, electrical lines should be de-energized or moved prior to the erection and use of scaffolds near the lines.
- Ladders will not be used on scaffolds to increase the working level height of employees. Ladders may, under certain circumstances, be used on "large area scaffolds." A large area scaffold is a supported scaffold erected over substantially the entire work area.
- Each employee on a scaffold more than 10 ft (3.0 m) above a lower level will be protected from falling to that lower level. Guardrail and/or personal fall arrest systems must be used as a means of fall protection.

- To the extent feasible and safe, each employee erecting or dismantling a supported scaffold must be provided fall protection. The competent person must determine the feasibility and safety of providing the fall protection during supported scaffold erection. During the deployment of suspension scaffolds, fall protection must also be provided whenever employees are exposed to a fall of 6 ft (1.8 m) or more.
- In addition to wearing hardhats, each employee on a scaffold will be provided with additional protection from falling hand tools, debris, and other small objects through the installation of toeboards, screens, or guardrail systems, or through the erection of debris nets, catch platforms, or canopy structures that contain or deflect the falling objects. Alternatively, employees must be kept out of areas where falling objects may strike them.

The scaffold standard requires general training for all employees who perform work while on scaffolds. These employees must be trained by a qualified person, and the training will include information about the nature of the electrical hazards, fall hazards, and falling object hazards associated with working on scaffolds. Additional training must be provided to those employees involved in erecting, disassembling, moving, operating, repairing, maintaining, or inspecting a scaffold. This additional training must be provided by a competent person, and will cover the safe means for accomplishing the tasks above. The training must also focus on the need for access provisions and fall protection during scaffold set-up, take-down, and maintenance activities.

8.7 Motor Vehicles And Mechanized Equipment

Applicable Standards:

OSHA 29 CFR 1926.600 through 606, 1926.1000 through 1003
Conti SOP 30, Motor Vehicles and Mechanized Equipment

Many potential hazards are associated with the use of motor vehicles and mechanized equipment on construction projects. Motor vehicles may be involved in accidents due to mechanical failures or operator errors, resulting in injuries to operators themselves or to bystanders. To minimize accidents resulting from the use of motor vehicles, the following safety procedures need to be implemented and enforced on all company projects:

- All equipment left unattended at night, adjacent to highways or construction areas, should have lights, reflectors, and/or barricades to identify location of the equipment.
- Supervisory personnel will ensure that all machinery and equipment is inspected prior to each use to verify that it is in safe operating condition.
- Rated load capacities and recommended rules of operation must be conspicuously posted on all equipment at the operator's station.
- Wire rope must be taken out of service when one of the following conditions exist:
  - In running ropes, six random distributed broken wires in one lay or three broken wires in one strand or one lay.
  - Wear of one-third the original diameter or outside individual wires.
  - Kinking, crushing, hoist caging, heat damage, or any other damage resulting in distortion of the rope structure.
  - In standing ropes, more than two broken wires in one lay in sections beyond connections, or more than one broken wire at an end connection.
- A fire extinguisher of 5 BC rating or higher should be available at all operator stations. Where ordinary combustible materials (wood, paper, plastics) are present, an extinguisher suitable for class A fires should also be available for use.
- When vehicles or mobile equipment are stopped or parked, the parking brake must be set. Equipment on inclines must have the wheels chocked as well as the parking brake set.
- All vehicles or combinations of vehicles must have in operable condition at least:
  - Two headlights.

- Two taillights.
- Brake lights.
- Audible warning device at operator's station.
- Seat belts properly installed.
- Appropriate number of seats for occupants.
- Service, parking, and emergency brake system.

- Operators should not travel in reverse with motor equipment having an obstructed rear view unless:
  - The vehicle is equipped with an audible, functioning reverse signal alarm.
  - The vehicle is backed up only under the guidance of an observer who says that it is safe to do so.
- Only those trained in the use of a specific type of machinery should be allowed to operate the machinery. Operators of heavy equipment and trucks greater than 26,000 lbs (11,794 kg) gross vehicle weight used in traffic must have a commercial drivers license.
- Materials handling equipment such as scrapers, front-end loaders, dozers, and similar equipment must be provided with Rollover Protective Structures (ROPS).
- Accessible areas within the swing radius of cranes, backhoes, and other rotating machinery need to be barricaded to prevent employees from being struck or crushed by the rotating parts of the machinery or their loads.
- Employees should not ride on or in motor vehicles unless seats with seat belts are provided.

8.8 Hand And Power Tools

Applicable Standards:

OSHA 29 CFR 1926.300 through 307
Conti SOP 25, Hand and Power Tool Operating Procedures

Tools are such a common part of construction work that it is difficult to remember that they may pose hazards. Workers must learn to recognize the hazards associated with the different types of tools and the safety precautions necessary to prevent injuries from those hazards. To prevent accidents resulting from the use of hand- and power-operated hand tools, management personnel need to implement and enforce the following safe work procedures on all construction jobsites.

Broken, defective, burned, or mushroomed tools should not be used. They should be reported and turned in for replacement. The proper tool and equipment should be selected and used for each task. For example, a wrench should not be used as a hammer or a screwdriver as a chisel. Leaving tools on scaffolds, ladders, or any overhead working surfaces is hazardous because they may fall. Racks, bins, hooks, or other suitable storage space must be provided to permit convenient arrangement of tools. Striking two hardened steel surfaces together is hazardous because pieces of metal may break off; i.e., two hammers, or a hammer and hardened steel shafts should not be struck together. The practice of throwing tools from one location to another, from one employee to another, or dropping them to lower levels will be prohibited. When it is necessary to pass tools or material under the above conditions, suitable containers and/or ropes must be used.

Wooden tool handles must be sound, smooth, and in good condition and securely fastened to the tool. Sharp-edged or pointed tools should never be carried in employee's pockets. Only non-sparking tools will be used in locations where sources of ignition may cause a fire or explosion. Tools requiring heat treating should be tempered, formed, dressed, and sharpened by workmen experienced in these operations. Tools designed to accommodate guards must be equipped with such guards when in use.

All rotating, reciprocating or moving parts of equipment (belts, gears, shafts, flywheels, etc.) must be guarded to prevent contact by employees using such equipment. Guarding must meet requirements set forth in ANSI B15.1-1953. All hand-held power tools (e.g., circular saws, chain saws, and percussion tools) without a positive accessory holding means must be equipped with a constant pressure switch that will shut off the power

when pressure is released. A positive "on-off" control must be provided on platen sanders, grinders with wheels 2 in in diameter or less, routers, planers, laminate trimmers, nibblers, shears, scroll saws, and jigsaws with blade shanks ¼ in wide or less.

A momentary contact "on-off" control must be provided on all hand-held powered drills, tapers, fasteners drivers, horizontal, vertical and angle grinders with wheels greater than 2 in in diameter. Besides safety hazards, the use of power tools sometimes creates potential health hazards as well. The use of jackhammer and chiseling equipment often results in silica and nuisance dust exposures that can sometimes be controlled by wetting the work surfaces. Many times, however, the use of dust/mist respirators is required to prevent overexposures.

In addition to dust hazards, the hand vibration inherent in the use of some power tools may result in a restriction of bloodflow to the hands and fingers, causing numbness or tingling. If workers consistently experience these symptoms after the use of power tools, they should contact their supervisor so that steps may be taken to prevent further harm to the nerves and blood vessels in their hands. The use of a different tool, changes to the offending tool to reduce vibrations, and/or the use of special gloves may be recommended to deal with the vibration problems.

Electric Tools - Electric tools present several dangers to the user; the most serious is the possibility of electrocution. The following safe work procedures for electric tools must be implemented and enforced at all company construction projects. Tools must: (1) have a three-wire cord with ground and be grounded, or (2) be double insulated, or (3) be powered by a low-voltage isolation transformer. A Ground Fault Circuit Interrupter (GFCI) must be used or the tool must be double-insulated to prevent the worker from electrical shock hazards. Never remove the third prong from the plug. Electric tools should be operated within their design limitations.

In general, gloves and safety footwear are recommended during use of electric tools. However, gloves should not be worn when they are a potential entanglement hazard with reciprocating or rotating tools.
When not in use, tools should be stored in a dry place. Electric tools should not be used in damp or wet locations.

Powered Abrasive Wheel Tools - Power abrasive wheel tools present a special safety problem because they may throw off flying fragments. The following safe work procedures for powered abrasive wheel tools need to be implemented and enforced at all company construction projects. Portable grinding tools must be equipped with safety guards to protect workers from flying fragments as well as the moving wheel surface. Inspecting and sound- or ring-testing abrasive wheels prior to mounting is required to ensure that they are free from cracks or defects. Checking to ensure that the abrasive wheel RPM rating is appropriate for the tool will also help prevent wheel failures. The following work rules are appropriate for using a powered grinder:

- Always use eye protection and a face shield.
- Turn off the power when not in use.
- Never clamp a hand-held grinder in a vise.
- To prevent the wheel from cracking, the user should ensure that it fits freely on the spindle.
- Grinding wheel users should never stand directly in front of the wheel during start-up because there is always a possibility that the wheel may disintegrate (explode) when accelerating to full speed.

Pneumatic Tools - Pneumatic tools are powered by compressed air and include chippers, drills, hammers, and sanders. The following safe work procedures for pneumatic tools must be implemented and enforced at all company construction projects. Pneumatic tools that shoot nails, rivets, or staples and operate at pressures more than 100 lbs/in^2 must be equipped with a special device to keep fasteners from being ejected unless the muzzle is pressed against the work surface. Eye protection is required and face protection recommended for employees working with pneumatic tools.

Hearing protection is required when working with noisy tools such as jackhammers. When using pneumatic tools, users should check to see that the tools are fastened securely to the hose to prevent the hose from becoming disconnected. All hoses exceeding ½ in inside diameter must have a safety device at the supply source or branch line to reduce pressure in the event of hose failure.

Airless spray guns that atomize paints and fluids at high pressures (1,000 lbs or more per in^2) must be equipped with automatic or visual manual safety devices that will prevent pulling the trigger until the safety device is manually released. Workers operating a jackhammer are required to wear safety glasses, safety footwear, and hearing protection. Compressed air guns should never be pointed toward anyone. A safety clip or retainer must be installed to prevent attachments from being unintentionally shot from the barrel of the tool.

Liquid-Fueled Tools - Liquid-fueled tools are usually powered by gasoline. Vapors that can burn or explode and give off dangerous exhaust gases are the most serious hazards associated with liquid-fuel tools. The following safe work procedures for liquid-fueled tools need to be implemented and enforced at all company construction projects.

Gas or fuel should be handled, transported, and stored in approved flammable liquid containers. These containers, also known as safety cans, are no more than 5 gallons in capacity and have a spring-closing lid and spout cover that will safely relieve internal pressure when subjected to fire exposure. Before refilling the tank for a fuel-powered tool, the user must shut down the engine and allow it to cool to prevent accidental ignition of hazardous vapors. Effective ventilation and/or personal protective equipment is necessary when using a fuel-powered tool inside a closed area. Fire extinguishers must be readily available in the work area.

Powder-Actuated Tools Powder-actuated tools operate like a loaded gun and should be treated with the same respect and precautions. Only assigned, qualified operators should operate powder-actuated tools. The following safe work practices and procedures for powder-actuated tools need to be implemented and enforced at all company construction projects. All powder-actuated tools must meet ANSI A10.3 requirements for design, operation, and maintenance. Powder-actuated tools must never be used in an explosive or flammable atmosphere. Before using a powder-actuated tool, the worker should inspect it to determine that it is clean, that all moving parts operate freely, and that the barrel is free from obstructions.

Never point the tool at anyone. Do not load a tool unless it is to be used immediately. Never leave a loaded tool unattended, especially where it would be available to unauthorized persons. Suitable eye and face protection is essential when using a powder-actuated tool. In case of misfire, the operator should hold the tool in the operating position for at least 30 seconds, then attempt to operate the tool for a second time. If the tool misfires again, wait another 30 seconds (still holding the tool in the operating position) and then proceed to remove the explosive load from the tool in strict accordance with the manufacturer's instructions.

If the tool develops a defect during use, it should be tagged and taken out of service immediately until it is properly repaired. Warning signs should be posted within the area of operation of any powder-actuated tool. Powder-actuated tool operators must be qualified and carry a card certifying this fact at all times. Failure to comply with any or all safety procedures governing the use of powder-actuated tools will be sufficient cause for the immediate revocation of the operator's card.

8.9 Fire Protection And Prevention

Applicable Standards:

OSHA 29 CFR 1926.150 through 159
Conti SOP 21, Fire Prevention and Protection Procedures

Fire on construction projects is a constant hazard that can cause loss of life, equipment and material. To assist in preventing fires on construction projects, all personnel must comply with the following safe work practices and procedures:

Fire Protection- Access to all available firefighting equipment must be maintained at all times. Firefighting equipment must be inspected monthly and maintained in operating condition. Defective or exhausted equipment must be replaced immediately. All firefighting equipment should be conspicuously located at each jobsite. One fire extinguisher, rated not less than 2A, should be provided for each 3,000 sq ft of the protected work area. Travel distance from any point of the protected area to the nearest fire extinguisher must not exceed 100 ft. Extinguisher exposed to freezing conditions will be protected from freezing. Employees should not remove or tamper with fire extinguishers installed on equipment or vehicles or in other locations unless authorized to do so or in case of fire. After using a fire extinguisher, it must be recharged or replaced with another fully charged extinguisher. Extinguishers must be selected based on the anticipated fire hazards. To aid in the proper selection of fire extinguishers, the classes of fires are as follows:

- Class A (wood, paper, trash) - use water, dry chemical, or foam extinguisher.
- Class B (flammable liquids, gas, oil, paints, grease) - use foam, carbon dioxide, or dry chemical extinguisher.
- Class C (electrical) - use carbon dioxide or dry chemical extinguisher.
- Class D (combustible metals) - use dry powder extinguisher only.

Fire Prevention - Internal combustion engine-powered equipment should be located so that exhausts are away from combustible materials. Smoking is prohibited at all projects. Project will be conspicuously posted: "No Smoking or Open Flame." Portable battery-powered lighting equipment must be approved for the type of hazardous locations encountered. Combustible materials must be piled no higher than 20 ft (6.1 m). Depending on the stability of the material being piled, this height may be reduced.

Portable fire extinguishing equipment, suitable for anticipated fire hazards on the jobsite, must be provided at convenient, conspicuously accessible locations. Firefighting equipment must be kept free from obstacles, equipment, materials, and debris that could delay emergency use of such equipment. Employees should familiarize themselves with the location and use of the project's firefighting equipment. All oily rags, waste, and similar combustible materials must be placed in metal containers. The containers must be emptied on a daily basis. Storage of flammable substances on equipment or vehicles should be prohibited unless such unit has adequate storage area designed for such use.

Flammable and Combustible Liquids - Explosive liquids, such as gasoline, will not be used as cleaning agents. Gasoline and similar combustible liquids must be stored, transported, and handled in approved and labeled containers in well-ventilated areas free from heat sources. Approved wooden or metal storage cabinets must be labeled in conspicuous lettering: "Flammable-Keep Fire Away." Storage in an approved storage cabinet should not exceed 60 gallons of flammable or 120 gallons of combustible liquids. Storage of containers will not exceed 1,100 gallons in any one pile or area. Separate piles or groups of containers by a 5 ft clearance. Never place a pile or group within 20 ft of a building. A 12 ft wide access way must be provided within 200 ft of each container pile to permit approach of fire control apparatus.

The use of flammable liquids and spray finishing needs to conform to the requirements of 1926.66 and 1926.152. Paints and reducers should be stored away from heat sources and out of the sun. Airless spray painting apparatus should be of a type approved for hazardous locations. Any electrically or fuel-powered equipment used to mix, convey, and spray flammable and combustible liquids must carry an approval from a nationally recognized testing laboratory. Pneumatically operated equipment is usually suitable for use with flammable and combustible finishes.

Fire Extinguishers - Portable fire extinguishers are provided in adequate number and type (10 lb. ABC) and are located throughout the site. Fire extinguishers are located in readily accessible locations. Fire extinguishers are recharged regularly and the date of last inspection noted on their tags. Extinguishers should be placed free from obstructions or blockage. All extinguishers must be fully charged and in their designated places unless in use. All employees are periodically instructed in the use of extinguishers and fire protection procedures. Fire Extinguishers will be located in the following areas:

- ***Support Zone (Field):*** (1) 10 lb ABC multipurpose dry chemical type fire extinguishers.
- ***Decontamination Reduction Zone:*** (2) 10 lb ABC multipurpose dry chemical type fire extinguishers.
- ***Exclusion Zone:*** (1) 10 lb ABC multipurpose dry chemical type fire extinguishers.
- ***Equipment:*** All of Conti's heavy equipment are supplied with ABC multipurpose dry chemical type fire extinguishers. ABC type fire extinguishers can also be found in all vehicles.

8.10 Sanitation

Applicable Standard:

OSHA 29 CFR 1926.51
Conti SOP 33, Sanitation Procedures

Employees should not be required to perform work under unsanitary conditions. Adequate supplies of potable water will be provided at the jobsite. Containers used for drinking water will be clearly marked and not used for any other purpose. Cups must not be shared by employees. Outlets for non-potable water (i.e., firefighting purposes) are not to be used by employees for drinking, washing, or cooking purposes. All construction projects must have an adequate number of toilets on the jobsite Hand washing facilities need to be provided in near proximity to the jobsite. Hand washing facilities should also be present when employees are applying paints, coatings, herbicides, and insecticides or in other operations where contaminants may be harmful to the employees.

8.11 Confined Space Entry

Applicable Standards:

OSHA 29 CFR 1910.146, 1926.21(b)(6)
Conti SOP 15, Confined Space Entry Procedures

A confined space is a space that; is large enough and so configured that an employee can physically enter and perform assigned work, has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits) and is not designed for continuous employee occupancy. Simply working in a confined space is not necessarily a hazard. However, if certain hazardous conditions exist prior to, or are created during entry, then the confined space must be treated with utmost care.

Conditions that make a confined space especially dangerous (i.e., make it a permit-required space) are that the confined space:

- Contains or has the 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 that slopes downward and tapers to a smaller cross-section.
- Contains any other recognized serious safety or health hazard.

A hazardous atmosphere includes spaces that may expose employees to flammable gases, vapors, mists, or dusts; to an oxygen deficiency (<19.5 percent) or oxygen enriched environment (>23.5 percent); to air

contaminants in excess of the PEL, or to any other atmospheric condition that is an immediate danger to life and health (IDLH).

When a permit-required space is present, the following hierarchy of controls should be used on the space:

- Avoid entry.
- Eliminate the hazards that make the confined space a permit-required space. Ventilation, lockout/tagout, block and bleed, and other procedures can be used to eliminate hazards. Hazard elimination must be verified by air monitoring and other test procedures.
- Eliminate the hazards to the point that only atmospheric hazards remain. Use the "atmospheric hazard only" procedures entry system discussed in 1910.146(c)(5).
- Minimize and control hazards to the fullest extent possible, and enter only after the requirements of a full permit entry have been satisfied.

Employees must receive training on confined spaces so that they will acquire the understanding, knowledge, and skills necessary for a safe entry into the confined space. Confined space training should be documented.

8.12 Welding And Cutting

Applicable Standards:

OSHA 29 CFR 1926.350 through 354
Conti SOP14, Compressed Gas Cylinder (Welding and Cutting) Procedures

Welding and cutting operations present various safety and health hazards. Welding and cutting operations on lead-painted surfaces often create lead fumes by "boiling off" the lead. These lead fumes may cause lead poisoning if inhaled or ingested in excessive amounts. Other metal fumes such as iron oxide, chromium, zinc, manganese, and cadmium may also be present during welding and cutting operations. Safety hazards such as fire may result in fatalities, serious injuries, and/or property damage. Therefore, in an effort to eliminate or reduce the hazards associated with welding and cutting operations, the following rules and procedures should be included and enforced in any welding safety program.

Welding and Cutting - Only qualified welders should be authorized to do welding, heating, or cutting. Inspect work areas for fire hazards and proper ventilation before welding or cutting. Avoid welding or cutting sparks and hot slag. Be alert to hot surfaces and avoid touching metal surfaces until they have cooled. Place compressed gas cylinders in an upright position and secure in place to prevent dropping or falling. Handle with extreme care and do not store near any sources of heat. Remove any combustibles when welding or cutting must be done. If removal is not feasible, cover combustibles with a noncombustible material. When welding near any combustible material, another employee must be posted to serve as a fire watch. Make sure this person has a fire extinguisher available and keep him/her in the area after welding/cutting is completed until all danger of fire is past.

A hot-work permit system may be used at some jobsites, such as welding in permit-required confined spaces containing hazardous materials. When working in the vicinity of welding operations, wear approved eyewear and avoid looking directly at the flash as serious flash burns could result. When opening valves on tanks that have regulators installed, be sure the pressure adjustment screw is all the way out and do not stand in front of the regulator. An internal failure could rupture the regulator and cause the adjustment screw to become a missile. Primers, paints, and other coatings should be removed, where feasible, from the area to be heated and for at least 4 in on all sides.

Gas Welding and Cutting - When transporting, moving, and storing compressed gas cylinders, always ensure that the valve protection caps are in place and secured. Secure cylinders on a cradle, slingboard, or pallet when

hoisting. Never hoist or transport the cylinders by means of magnet or choker slings. Move cylinders by tilting and rolling them on their bottom edges. Do not allow cylinders to be dropped, struck, or come into contact with other cylinders violently. Secure cylinders in an upright (vertical) position when transporting by powered vehicles. Do not hoist cylinders by lifting on the valve protection caps. Do not use bars under valves or valve protection caps to pry cylinders loose when frozen. Use warm, not boiling, water to thaw cylinders loose.

Remove regulators and secure valve protection caps prior to moving cylinders, unless cylinders are firmly secured on a special carrier intended for transport. Close the cylinder valve when work is finished, when cylinders are empty, or when cylinders are moved at any time. Secure compressed gas cylinders in an upright position (vertical) except when cylinders are actually being hoisted or carried. Oxygen cylinders should be stored at least 20 ft from other combustible materials such as acetylene. Alternatively, oxygen and fuel gas cylinders may be separated by a 5 ft-high non-combustible barrier with at least a 30-minute fire resistance rating.

Arc Welding and Cutting - Use only manual electrode holders that are specifically designed for arc welding and cutting. All current-carrying parts passing through the portion of the holder must be fully insulated against the maximum voltage encountered to ground. All arc welding and cutting cables must be completely insulated, flexible type, and capable of handling the maximum current requirements of the work in progress. Employees should report any defective equipment to their supervisor immediately and refrain from using such equipment. Shield all arc welding and cutting operations, whenever feasible, by noncombustible or flameproof screens to protect employees and other persons working in the vicinity from the direct rays of the arc.

Fire Prevention - Welders should locate the nearest fire extinguisher in their work area in case of a fire emergency. Fire extinguishing equipment must be immediately available in the work area. Never use matches or cigarette lighters to light torches. Use only friction lighters to light torches. Never strike an arc on gas cylinders. Move objects to be welded, cut, or heated to a designated safe location. If the objects cannot be readily moved, then all movable fire hazards in the vicinity must be taken to a safe place or otherwise protected. Fuel lines should have flashback arrestors. Do not weld, cut, or heat where the application of flammable paints, or the presence of other flammable compounds, or heavy dust concentrations creates a hazard. Additional employees must be assigned to guard against fire while the actual welding, cutting, or heating is being performed when the operation is such that normal fire prevention precautions are not sufficient. Prior to applying heat to a drum, container, or hollow structure, provide a vent or opening to release any built-up pressure during the application of heat. Never cut, weld, or heat on drums, tanks, process lines, or containers that have contained flammable liquids until they have been purged and cleaned.

8.13 Floor And Wall Openings

Applicable Standards:

OSHA 29 CFR 1926.500 through 503
Conti SOP 36, Signs, Signaling, Tags and Barricade Procedures

All floor openings must be guarded by a standard railing and toeboards or cover. Ladderway floor openings or platforms must be guarded by standard railings with toeboards on all exposed sides, except at entrance to opening, where a swinging gate allows passage through the railing. Barricades for warning workers of hazards must be at least 6 ft back from the edge of the hazard and 42 in high. Hole covers must be strong enough to support possible loads and secured in place to prevent slipping. Guard all open-sided floors or platforms 6 ft (1.8 m) or more above the adjacent floor or ground level with a toprail, midrail, and toeboard. Guard all wall openings that have a drop of more than 4 ft (1.2 m), and where the bottom of the opening is less than 3 ft (0.9 m) above the working surface with a toprail, midrail, and toeboard. Do not store materials within 6 ft (1.8 m) of floor openings or the roof.

8.14 Trenching and Excavations

Applicable Standards:

OSHA 29 CFR 1926.650 through 652
Conti SOP 37, Trenching and Excavation Procedure

Trenching and excavation work presents a serious risk to all employees. The greatest risk is the cave-in of a trench or excavation. Cave-in accidents are much more likely to result in worker fatalities than any other excavation-related accidents. Other hazards include contact with buried utilities. Because of the hazards associated with excavation work, the following safe work practices and procedures will be implemented and enforced at all company construction projects:

- Remove or support all surface encumbrances whenever their location creates a hazard to employees.
- Identify underground installation (e.g., sewer, utility, fuel) locations prior to opening an excavation. Contact utility companies or owners to advise on the proposed work and ask for the locations of utility underground installations prior to opening an excavation. Additionally, the Underground Facilities Protection Organization (UFPO) can be contacted at 1-800-962-7962 for assistance in identifying utilities in your area.
- Protect, support, or remove underground installations, as necessary, to safeguard employees working in open excavations.
- Structural ramps used by employees as a means of access or egress from excavations must be designed by a **competent person**.
- Structural ramps for access and egress of equipment must be designed by a **competent person** qualified in structural design.
- All excavations or trenches that are 4 ft (1.2 m) or more in depth must have a stairway, ladder, ramp, or other safe means of access and egress within 25 ft (7.6 m) of travel in any direction.
- The edges of a trench or excavation must be barricaded when the excavation is not readily seen because of plant growth or some other visual barrier.
- No employees are permitted underneath loads handled by lifting or digging equipment.
- A warning system (e.g., barricades, signals, or stop logs) must be used when mobile equipment is operated adjacent to an excavation.
- Testing must be conducted in excavations where oxygen-deficient atmospheres exist or could reasonably be expected to exist before employees are permitted to enter excavations greater than 4 ft (1.2 m) in depth.

Take adequate precautions, such as proper respiratory protection or ventilation, to prevent employee exposure to oxygen-deficient and other hazardous atmospheres. Emergency rescue equipment must be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation.

Never work in excavations where water has accumulated or is accumulating, unless adequate precautions have been taken to protect you against the hazards posed by water accumulation.

A **competent person** must conduct inspections of excavations prior to the start of work and as necessary throughout each shift. Inspections must also be made after every rainstorm. Precautions must be taken before employees enter *a trench of any depth* that shows signs of water accumulation or wall-sloughing due to moisture. Preventive precautions include the use of support or shield systems to prevent cave-ins, and the use of water removal pumps.

Trenches 5 ft or more in depth must be shored or sloped back to an angle of incline required to prevent cave-ins. The angle of incline required varies with differences in the soil type, environmental conditions of

exposure, and the application of surcharge loads. Any excavation in unstable soil may require shoring or sloping.

Backfilling and removal of trench boxes or supports will progress together from the bottom of the trench. Jacks, supports, or braces will be released slowly, and in unstable soil, ropes will be used to pull out the jacks and braces from above and clear of the excavation. All personnel will be clear of the trench.

Materials must be placed 2 ft or more from the edge of the excavation. Precautions must be taken to prevent such materials from falling into the excavation.

8.15 Stairways and Ladders

Applicable Standards:

OSHA 29 CFR 1926.1050 through 1060
Conti SOP 27, Stairway and Ladder Procedures

Stairways and ladders are a major source of injuries and fatalities among construction workers. Because of the potential hazards involved in using stairways and ladders, the following safety practices and procedures need to be implemented and enforced at all construction projects. Ladders that project into passageways or doorways where they could be struck by personnel, moving equipment, or materials being handled must be secured to prevent accidental displacement or be protected by barricades. Workers should always face the ladder and use both hands when going up and down ladders. Materials and tools should be lowered or raised by a rope or other mechanical means. Hold on to the railing on stairways. The areas around the top and base of ladders must be free of tripping hazards such as loose materials, trash, and electrical cords. The same holds true for the bottom of stairways and on stairway platforms.

Ladders - Ladders must be capable of supporting four times the maximum intended load. Ladder rungs, cleats, and steps must be parallel, level, and uniformly spaced (not less than 10 in nor more than 14 in). Do not tie or fasten ladders together to provide longer sections unless they are specifically designed for such use. All stepladders must be equipped with a metal spreader or locking device. Do not paint wooden ladders, except to stencil for identification. Maintain ladders free from oil, grease, and other slipping hazards. Ladders must extend at least 3 ft above the upper landing surface and be secured. The horizontal distance for the base of the ladder should extend 1 ft for every 4 ft in vertical distance. Wood job-made ladders must be used at an angle so that the horizontal distance is one-eighth the working length of the ladder. Do not use ladders on slippery surfaces unless they have been properly secured or provided with slip-resistant ft. Do not move, shift, or extend ladder while occupied. Never stand on the top step of a stepladder.

A competent person on a periodic basis and after any occurrence that could affect their performance, must inspect ladders. Ladders with structural defects must be tagged with "Do Not Use" or similar language and withdrawn from service until repaired. Never use a metal ladder when working on electrical equipment or near electrical equipment where contact is possible. Any employee who uses a ladder or stairway must receive training by a **competent person** in the following areas:

- Types of fall hazards.
- Correct procedures for erecting, securing, maintaining, and disassembling fall protection systems.
- Proper construction (man-made), use, placement, and handling.
- Maximum intended load-carrying capacities.
- Requirements contained within 29 CFR 1926 Subpart X.

Stairways - Stairways that are not permanent parts of the structure must have landings of not less than 30 inches in the direction of travel. A platform must be provided where doors or gates open directly on a stairway. Metal

pan landings and metal pan treads must be filled in with wood or other materials if they are to be used prior to being finished. Maintain all parts of stairways free from hazardous projections, such as protruding nails. Eliminate slippery conditions on stairways before the stairways are used to reach other levels.

8.16 Materials Handling, Storage, Use, And Disposal

Applicable Standards:

OSHA 29 CFR 1926.250 through 252
Conti SOP 29, Material Handling, Storage, Use & Disposal Procedures

In the handling of materials, employees must know the following: There must be safe clearance for equipment through aisles and doorways. Vehicles must be shut off and brakes must be set prior to loading or unloading. Containers of combustibles or flammable, when stacked while being moved, must be separated by dunnage sufficient to provide stability. Trucks and trailers will be secured from movement during loading and unloading operations. Hand trucks must be maintained in safe operating condition. Chutes must be equipped with sideboards of sufficient height to prevent the handled materials from falling off. At the delivery end of rollers or chutes, provisions must be made to brake the movement of the handled materials. Hooks with safety latches or other arrangements will be used when hoisting materials, so that slings or load attachments won't accidentally slip off the hoist hooks. Securing chains, ropes, chokers or slings must be adequate for the job to be performed. When hoisting material or equipment, provisions must be made to assure no one will be passing under the suspended loads.

Stack, rack, block, interlock, or otherwise secure all materials and supplies to prevent sliding, falling, or collapse. Post the maximum safe load limits for floors within buildings and structures in a conspicuous location. Never exceed the maximum safe load limit. Keep aisles and passageways clear to provide for the free and safe movement of material handling equipment and employees. Use ramps, blocking, or grading when a difference in road or working levels exists to ensure the safe movement of vehicles between the two levels. Do not place material within 6 ft of any hoistway or floor opening inside buildings under construction, nor within 10 ft of an exterior wall that does not extend above the material being stored. Stack bagged materials by stepping back the layers and cross-keying the bags at least every 10 bags high. Do not store materials on scaffolds or runways in excess of supplies needed for immediate operations. Remove all nails from used lumber prior to stacking. Stack lumber on level and solidly supported sills. Do not stack lumber higher than 20 ft (16 ft if handled manually).
Stack and block structural steel, poles, pipe, bar stock, and other cylindrical materials, unless racked, so as to prevent spreading or tilting. Attach handles or holders to the load to reduce the possibility of pinching or smashing fingers. Unload materials close to the point of final use to avoid unnecessary lifting. Do not stack non-compatible materials in the same pile.

Manual Materials Handling - Employees working alone should not attempt to lift or move a load that is too heavy for one person - get help! When working with materials stored in silos, hoppers, tanks, or similar storage areas, be aware that confined spaces may exist. Attach handles or holders to the load to reduce the possibility of pinching or smashing fingers. Wear protective gloves and clothing (i.e., aprons), if necessary, when handling loads with sharp or rough edges. When pulling or prying objects, workers should be properly positioned. Riding loads, slings, the ball, crane hook, or other material hoisting equipment is prohibited.

Engineering Controls - Engineering controls should be used, if feasible, to redesign the job so that the lifting task becomes less hazardous. This includes reducing the size or weight of the object lifted, changing the height of a pallet or shelf, or installing a mechanical lifting aid

OSHA standard 1926.251 provides guidance about the limitations and uses of slings used in conjunction with other material handling equipment for the movement of material by hoisting. Slings covered by this standard

include those made of alloy steel chain, wire rope, metal mesh, natural or synthetic fiber rope, and synthetic web (nylon, polyester, and polypropylene). Some general work practices related to rigging include:

- Rigging equipment must be inspected prior to use on each shift and during its use to ensure that it is safe. Defective rigging equipment will be removed from service.
- Rigging equipment must not be loaded in excess of its recommended safe working load. The standard provides load capacity tables for various types of slings and associated hardware.
- Rigging equipment, when not in use, must be removed from the immediate work area.
- Custom rigging must be marked to indicate the safe working loads and will be proof-tested prior to use to 125 percent of their rated load.

In addition to these general guidelines, the standard has specific requirements related to alloy steel chains, wire rope, natural and synthetic rope, and synthetic webbing. Employees performing rigging work should be adequately trained in the safety and functional aspects of rigging for materials handling operations.

8.17 Signs, Signals, And Barricades

Applicable Standards:
OSHA 29 CFR 1026.200 – 203
DOT Manual on Uniform Traffic Control Devices (MUTCD)
Conti SOP 36, Signs Signaling, Tags and Barricades

The use of signs, signals, and barricades is essential to make employees aware that an immediate or potential hazard exists. Both traffic and health hazards such as airborne lead are examples of hazards on bridge renovation/demolition sites that require signs and other devices. The following sections discuss the primary ways that employees are made aware of hazards in their work areas.

Accident Prevention Signs/Tags - Signs, signals, regulated areas, and barricades must be used on each construction project as appropriate.

Danger Signs are used wherever an immediate hazard (i.e., exposed electrical conductor) exists. The danger signs must have red as the predominant color in the upper panel and a white lower panel for additional sign wording.

Caution Signs are used to warn against potential hazards or to caution against unsafe practices. The caution signs must have yellow as the predominant color with a black upper panel (yellow lettering of "caution" on the upper panel) and a yellow lower panel for additional sign wording.

Exit Signs, when required, should be in legible red ¾-in (1.9 cm) stroke letters, not less than 6 in (15.2 cm) high, on a white field.

Safety Instruction Signs, when used, must be white with a green upper panel and white lettering to convey the principal message. Any additional wording must be in black lettering on the white background.

Directional Signals must be white with a black panel and a white directional symbol. Any additional wording must be in black lettering on the white background.

Traffic Signs must be posted at points of hazards in all construction areas. All traffic control signs or devices must conform to the DOT MUTCD and ANSI D6.1-1971, *Manual on Uniform Traffic Control Devices for Streets and Highways.*

Accident Prevention Tags are used as a temporary means of warning employees of an existing hazard, such as defective tools, equipment, etc.

Out of Order Tags are used to designate equipment that requires repair or maintenance. Equipment with such a tag may not be used until the tag is removed.

Signaling - Flagmen or other appropriate traffic controls must be provided for operations where signs, signals, and barricades do not provide the necessary protection on or adjacent to a highway or street. Signaling directions must conform to DOT *Manual on Uniform Traffic Control Devices* (MUTCD) and ANSI D6.1-1971, *Manual on Uniform Traffic Control Devices for Streets and Highways*. Stop/Slow sign paddles must be used by flagmen when hand signaling. Red flags, at least 18 in square, may be temporarily used in traffic control. Flagmen are required to wear a red or orange reflective warning vest and a hard hat while flagging. Required signs and symbols must be visible at all times when work is being done, and removed or covered promptly when the hazard no longer exists.

Cones, Barrels, Barricades, and Barriers - Channeling devices such as cones, barrels, or barricades are required for jobsite roadways presenting a hazard to motorized equipment or vehicles. Barriers may also provide a greater degree of work zone protection. Consult traffic control resources such as the DOT MUTCD for guidance on establishing and working in road construction work zones.

7.18 Cranes, and Hoists

Applicable Standards:

OSHA 29 CFR 1926.550 - 556
Conti SOP 16, Cranes and Heavy Equipment

The target goal of a crane safety program is zero crane accidents. To achieve this goal, the following safe work procedures must be implemented and enforced at all company projects:

- Crane operators are required to comply with crane manufacturer's specifications and limitations applicable to the operation of any and all cranes, derricks, and hoists.
- Rated load limits and recommended operating speeds, special hazard warnings, or instructions must be posted on all equipment.
- Hand signals to crane and derrick operators must conform to the applicable ANSI standard for the type of crane being used.
- A **competent person** who is knowledgeable in proper crane setup and operation activities must inspect all machinery and equipment prior to each use, and during use, to ensure it is in safe operating condition.
- Any defective parts must be repaired or replaced before use.
- A **competent person** who is knowledgeable in crane inspection techniques must perform an annual inspection of the hoisting machinery and provide a copy of the dates and results of inspections for each hoisting machine and piece of equipment to the site superintendent.
- All moving parts or equipment (belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheel, etc.) must be guarded to prevent contact by employees.
- Accessible areas within the swing radius of the rotating superstructure of the crane must be barricaded to prevent an employee from being struck or crushed by the crane.
- Exhaust pipes must be guarded or insulated to prevent contact by employees.
- Windows in cabs must be of safety glass, or equivalent, that introduces no visible distortions.
- Where necessary, a ladder or steps must be provided to allow access to a cab roof.
- Platforms and walkways must have anti-skid surfaces.

- A fire extinguisher of 5ABC rating must be accessible at all operator stations or cabs of equipment. No part of a crane or load is permitted within 10 ft (3.0 m) of electric power lines, except where electrical distribution and transmission lines have been de-energized and visibly grounded. A person will be designated to observe clearance of the equipment and provide timely warning to the crane operator.
- No employee is permitted to work beneath a suspended load.

As part of a crane safety program, site superintendents will develop a working knowledge of the client's requirements for operating construction cranes, derricks, or hoists on project property. Interview prospective crane operators prior to site employment to ascertain competence and qualifications and Check the prospective crane operator's past experience with previous employers, if possible. The Superintendent or his designee will conduct daily inspections to observe compliance with established company and client crane and rigging procedures and immediately shut down any crane operations that jeopardize the safety of any jobsite personnel.

8.19 Demolition

Applicable Standards:

OSHA 20 CFR 1926.850 - 860
Conti SOP 18 Demolition Procedures

Prior to starting demolition operations, an engineering survey must be performed by a **competent person** to determine the condition of the framing, floors, and walls. In some jurisdictions, the competent person must be a professional engineer. All electric, gas, water, steam, sewer, and other service lines must be shut off, capped, or otherwise controlled. If hazardous chemicals, gases, explosives, flammable materials, or similarly dangerous substances have been used in pipes, tanks, or other equipment on the property, testing and purging must be performed to eliminate the hazard prior to demolition.

Employees should never enter any area that may be adversely affected by demolition operations unless they are needed to perform these operations. During demolition, a **competent person** must make continued inspections as the work progresses to detect hazards resulting from weakened or deteriorated floors, or walls, or loosened material

8.20 Housekeeping

Applicable Standard:

29 CFR 1910.25
Conti Safety, Health and Environmental Program Section 6- Housekeeping

A policy of trash removal and the maintenance of good housekeeping practices should be implemented on all jobsites. The accumulation of construction debris may pose a significant fire hazard in addition to tripping and falling hazards.

Good housekeeping practices are the result of planning and organization. All personnel on the site must work together to maintain a clean worksite. The prompt removal of waste materials will permit a free flow of traffic through the work areas. Daily, or more frequent, inspections will be conducted by the general contractor to verify that the housekeeping controls are in place and being enforced.

Housekeeping activities in themselves may pose health hazards such as exposures to dusts, biological agents, and discarded chemicals. Liquid and solid waste chemicals must be placed in leak-proof containers for proper disposal.

9.0 SITE CONTROL MEASURES

This section outlines site control measures to be implemented to minimize potential exposure to and accidental spread of hazardous substances during remedial activities. Listed below are the work zones that shall be established. The zone boundaries may be modified as necessary as new information becomes available.

9.1 Work Zones

The Site will be divided into Exclusion, Contamination Reduction and Support Zones. It should be recognized that the Site control zones will be modified continually. A map showing the work zones will be updated daily and posted in the Site office. The SSHO will review the location of work zones at the daily safety briefing.

The SSHO and at least one person who has completed Supervisor's Training will be present at the Site whenever work is performed in the Exclusion Zone or Contamination Reduction Zone. Similarly, at least two First aid/CPR-trained individual will be present at the Site when work is performed in those zones.

9.1.1 Exclusion Zone (EZ)

This zone, commonly known as the Hot Zone, is where there will be direct contact with the potentially contaminated material. PPE shall be required in this zone. The SSHO shall enforce these requirements. The level of PPE required shall be based on hazard, Site condition and air monitoring performed. The outer boundary of the Exclusion Zone will be delineated with orange safety fence. The Exclusion Zone specifically consists of the each of the buildings. Modification to the size and boundary of the Exclusion Zone will be made in the field by the SSHO based on operations and wind direction. The Exclusion Zone may be subdivided into different areas of contamination and different levels of PPE may be assigned based upon the expected type and degree of hazard.

All activities in exclusion zone will be conducted using the "buddy system". This involves a buddy who is able to provide his or her partner with assistance, observe for signs of chemical or heat exposure, check integrity of PPE and go for help when needed.

9.1.2 Contamination Reduction Zone (CRZ)

This zone, commonly known as the Warm Zone, is where workers and equipment shall be decontaminated. This shall minimize the spread of contaminants from the Exclusion Zone into clean areas. The Contamination Reduction Zone will consist of the area located in front of or next to the exclusion zone so that personnel or equipment exiting the EZ can be decontaminated and doff the PPE. Emergency equipment to be located in this area will include eye wash stations, fire extinguishers, first aid kits and other appropriate equipment. The Contamination Reduction Zones or personal decontamination stations will be established adjacent to the Exclusion Zones. These stations will provide a means for prompt removal of potentially contaminated outer PPE at a location convenient to operations.

9.1.3 Support Zone

This zone, commonly known as the Clean Zone, is considered to be uncontaminated. This area shall be used as a storage area for operations equipment and where break and toilet and shower facilities will be located.

9.2 Site Entry and Exit Control Log

All site personnel on this project will undergo safety orientation by the SSHO prior to starting work at the site. This training will include general site safety rules, hazardous locations, personal protective equipment guidelines, and onsite emergency procedures. All site personnel will satisfy the following requirements before initiating work onsite within the Exclusion or Contamination Reduction Zones:

- Receive and pass a physical examination, including certification of ability to wear respiratory protection.
- Receive adequate hazardous waste training according to 29 CFR 1910.120 or 29 CFR 1926.65.
- Receive a briefing on all aspects of the SSHP.
- Are properly dressed, equipped, and trained in accordance with all personal protective guidelines.
- Are thoroughly trained regarding decontamination procedures.
- All personnel performing tasks when respiratory protection is needed will comply with the requirements of this plan

All personnel entering and exiting the Exclusion and Contamination Reduction Zones will sign in and out through the Support Zone. The log will indicate the date and time entering and exiting, the location entered, personal protective equipment utilized and decontamination procedures, refer to ***Attachment 3 – Safety and Health Forms for the Site Entry and Exit Log.***

10.0 PERSONAL HYGIENE AND DECONTAMINATION

Decontamination (Decon) is the process of removing or neutralizing potentially harmful contaminants that have accumulated on personnel and equipment in order to reduce the spread of contamination outside the work area. Decontamination is critical to the Safety and Health of Site workers and it protects the community by minimizing the off-site migration of contaminants. One of the most important aspects of controlling contaminated material migration is the prevention of the spread of contamination. Good contamination prevention will minimize employee and public exposure.

All personnel and equipment leaving the Exclusion Zone must be decontaminated in the Contamination Reduction Zone prior to entering the Support Zone. The decontamination process is composed of a series of steps performed in a specific sequence. The basic concept is that more heavily contaminated items will be decontaminated and removed first, followed by decontamination and removal of inner, less contaminated items.

During remedial activities at the Site, all items taken into the Exclusion Zone must be considered contaminated and must be carefully inspected and/or decontaminated before leaving the Site. All contaminated vehicles, equipment and material shall be cleaned and decontaminated to the satisfaction of the SSHO prior to leaving the Site. Decontamination procedures will be posted at every decontamination station throughout the project.

10.1 Personal Decontamination

Personnel exiting the Exclusion Zone during remedial activities at the Site shall follow the procedure below.

As the worker leaves the Exclusion Zone, he places his equipment and tools in the Exclusion Zone or Contamination Reduction Zone. After the worker places his equipment and tools down, gross contamination will be removed from outer clothing and boots. Workers will then remove their outer boots and outer gloves and place them in plastic garbage bag-lined containers.

Once outer gloves are removed, workers will remove all outer garments and place them in plastic garbage bag lined containers. Once workers are fully decontaminated and all garments are removed, workers will remove their respirators (applicable to level C) followed by removal of inner gloves. Used cartridges and inner gloves will be placed into plastic garbage bags.

All decontamination stations will be established on (2) - 6 mil. plastic sheets, covered with approximately 2 inches of stone. The stone will be replaced of as often as is deemed appropriate.

10.2 Respirator Decontamination

Respirators are to be decontaminated, cleaned and sanitized before reuse. Cartridges and/or filters must be replaced as needed and, as a minimum, changed daily. The respirators are then cleaned with cleaning and sanitizing solutions, wiped dry and placed into sanitary containers or bags and sealed closed.

10.3 Equipment Decontamination

Nearly all contractor hardware (not consumable) is considered to be recoverable. As such, they will be decontaminated using the proper equipment, i.e. brushes, sprayers, detergent and, if necessary, other appropriate solvents. Large heavy equipment will be decontaminated with pressure steam wash as required.

The decontamination area for vehicles and equipment leaving the Exclusion Zone will be located within the Contamination Reduction Zone. Equipment will be decontaminated over 2 layers of 6-mil plastic placed on the ground. Scrapers and brushes will be used to remove gross contamination prior to final decontamination. A pressure steam cleaner will be used for the final cleaning and decontamination of the equipment. The combination of dry removal with the brushes and use of the steam cleaner will minimize the generation of contaminated liquid. All solids and liquids will be collected for disposal. Efforts will be made to minimize soil (even non-contaminated soil) from being tracked off-site. Dirt and mud will be removed from trucks and vehicles leaving the Site to the extent practicable.

10.4 Decontamination Log

A decontamination log will be maintained and will list the equipment name and model number, the equipment I.D. number, the activities the equipment was used for, the method of decontamination, amount of decontamination, date and time of decontamination and names of personnel doing the decontamination. This log will be maintained by the SSHO and included in the Safety and Health Report. Refer to ***Attachment 3 – Safety and Health Forms for the Equipment Decontamination Log.***

10.5 Personal Hygiene and Sanitation

Hands and face shall be thoroughly washed before eating, smoking, drinking, chewing gum or tobacco.

When possible, avoid contact with contaminated materials.

Temporary support facilities such as wash facilities, eating areas, changing areas, and portable toilets will be located in the Support Zone. This area will remain "clean" and free of contamination.

An adequate supply of potable water will be provided to the employees working at the Site. Clearly labeled potable containers will be used to dispense drinking water. Containers will be cleaned at the beginning of each

day. The containers will be equipped with taps to access the water. Clean disposable cups will be provided daily.

Portable toilet facilities will be provided on-site for employees and will be located in the Support Zone.

Eating, drinking, smoking, chewing gum or tobacco or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited during remedial activities except in designated eating or smoking areas outside the Exclusion and Contaminant Reduction Zones. Conti employees, subcontractor employees, and service personnel are required to thoroughly decontaminate themselves prior to entering the Support Zone.

11.0 EMERGENCY CONTINGENCY PLAN

This section describes the emergency response plan that shall be implemented by Conti employees to handle emergencies. The nature of the project, the contaminants present and the activities planned for the site are such that there is little potential for an emergency, which would result in a significant release of hazardous substances, and in any way threaten the adjoining community. However, there is always the potential at any construction site for emergency situations to occur which threaten the on-site workers. Possible examples of emergency situations during remedial activities include equipment fires, or contact of equipment with overhead power lines. In all of these cases, procedures will be implemented to minimize the possibility of an emergency situation. The procedures outlined below are designed to ensure that the workforce reacts quickly and appropriately to emergency situations, thereby protecting the health and well being of the individual workers. It is expected that modifications may be necessary upon actual site set-up and conditions. Furthermore, Conti Enterprises's Corporate Safety, Health and Environmental Program and Procedures Manual include Conti's Corporate Emergency Action Plan Policy and Guideline for Handling Emergencies.

11.1 Pre-Emergency Planning

During the site safety briefings held daily, all employees will be informed of the location of this plan, the procedures outlined in this plan, and the communication systems and evacuation routes to be used during an emergency.

On a continual basis, individual personnel should be constantly alert for indicators of potentially hazardous situations and for signs and symptoms in themselves and others that warn of hazardous conditions and exposures. Rapid recognition of dangerous situations can avert an emergency.

11.2 Personnel Responsibilities

All on-site employees have a role in mitigating an emergency incident. The Project Superintendent has primary responsibility for responding to and directing emergency response operations to correct emergency situations. This includes taking appropriate measures to ensure the safety of site personnel and the public. He is additionally responsible for ensuring that corrective measures have been implemented, appropriate authorities notified, and follow-up reports completed. The SSHO shall assist and advise the Project Superintendent, and will direct any emergency medical responses.

The following is an outline of job titles and corresponding responsibilities during an emergency.

- The Site Superintendent directs emergency response activities; serves as liaison with appropriate Client and Client representatives personnel and subcontractors. In the event of an emergency the Project Superintendent will be the Incident Commander.

- The Site Safety and Health Officer recommends that work be stopped if any operation threatens worker or public health or safety. Advises Site Manager of emergency procedures if necessary. Provides emergency medical care on site. Notifies emergency services. The SSHO will assume the responsibility of Incident Commander if the Project superintendent is off-site.

11.3 Evacuation Routes and Procedures

In the event of an emergency that necessitates an evacuation of the site, on-site personnel shall be notified by hand-held or mobile two-way radios to leave the area by immediate emergency exit. An alternate method of communication will be the use of a portable air horn sounded in regularly spaced, repeated blasts.

During an evacuation, all non-emergency radio transmissions shall cease. The SSHO, in conjunction with the Project Superintendent, shall control the scene until the appropriate municipal and state agencies arrive and a site specific Incident Command System (ICS) should be implemented. Since site conditions, i.e., wind direction, precipitation, and work location, change often, the SSHO will determine the appropriate evacuation procedures.

All personnel shall assemble/muster at the Contamination Reduction Zone (CRZ) or Support Zone. Access to the site will be restricted. All non-emergency radio transmissions shall cease.

11.4 Emergency Decontamination Procedures

Decontamination of an injured or exposed worker will be performed if decontamination does not interfere with essential treatment. The objective is to successfully administer first aid without exposing rescue workers and the victim to contaminants. Project personnel will meet with the local hospital to discuss the possibility of having to treat injured personnel from the site.

If the hazards are low and decontamination can be performed, then a wash, rinse and removal of protective clothing will be performed.

If the hazards are high and decontamination cannot be done, then the following procedures will be performed:

- Wrap the victim in blankets or plastic sheeting to reduce contamination of rescue workers or other personnel.
- Alert emergency and medical personnel to potential contamination. Emergency entry into the exclusion zone will be controlled by the SSHO. The SSHO will determine if the victim can be moved from the exclusion zone. If entrance into the exclusion zone is required, the SSHO will ensure that the emergency workers don the proper PPE.
- If required, arrange to have the SSHO, who is familiar with the site to accompany the victim to the hospital if required.

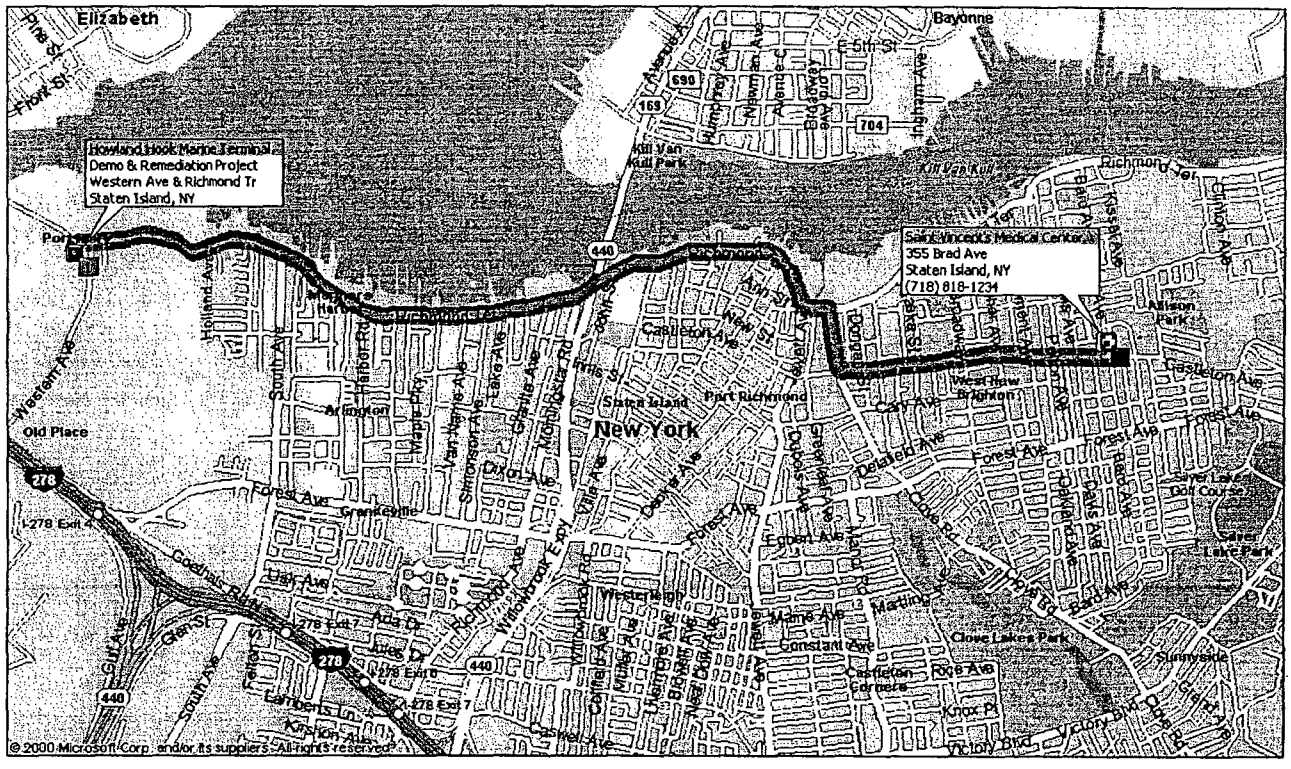
11.5 Medical Treatment/First Aid

Both the Site Superintendent and the Site Safety and health Officer are trained in CPR and First Aid and have first aid kits for use in a medical emergency. First Aid Kits will be located in the main support area,

Contamination Reduction Zone and at the work activity locations. Eyewash stations will be available at the Contamination Reduction Zone. Eyewash stations will be of the pressurized, 15-minute discharge type. On-site employees have a basic knowledge of first aid and will assist the Site Superintendent and SSHO. Community emergency services (EMS, Fire, and Police) shall be notified immediately if their resources are needed on site.

If necessary, the injured or sick party shall be taken to Saint Vincent's Medical Center – Please refer to ***Figure 2 – "Route to Hospital Map*** for directions to the area hospital. Route to the area hospital will be posted and easily visible at all times.

Figure 2 - Route to Hospital Map



Depart Howland Hook Marine Terminal on Local road(s) (North),
Turn RIGHT (East) onto Richmond Ter
Turn RIGHT (South) onto Clove Rd
Turn LEFT (East) onto Castleton Ave
Turn LEFT (North) onto Bard Ave
Arrive St Vincent's Medical Center [355 Bard Ave, Staten Island, NY 10310, Tel: (718) 876-1234]

11.6 Emergency Alarms/Notifications and Procedures

When any emergency occurs on-site, the on-site SSHO and Project Superintendent shall be notified immediately. The Project Superintendent or the SSHO shall notify the client and his representatives. Please refer to the ***Table 11 – "Emergency Telephone Numbers"*** for emergency telephones. Emergency Telephones will be posted and easily visible at all times.

To notify any site workers of an emergency, workers can be signaled by way of hand held or mobile two-way radios or as a backup, the use of an emergency alarm (portable air horn). Any audible pattern of blasts from a portable air horn becomes difficult to interpret due to distance and the inhibitory effects of a respirator.

Table 11 – Emergency Telephone Numbers	
Police Department:	
Emergency	911
Police Department	718-876-8500
Fire Department:	
Emergency	911
Fire Department/Ambulance Service	718-727-1100
Hospital:	
Saint Vincent's Medical Center 355 Bard Ave, Staten Island, NY	718-818-1234
Occupational Physician:	
Environmental Occupational Specialist (EOSI) Dr. Robert MacMillan	508-698-0444
Conti Companies	908-561-7600
Pat Hogan, Senior Engineer	908-307-5454 (Cell)
Al Aballo, Director of Health and Safety	908-307-1506 (Cell)
Aldo M. Gonzalez, Safety and Health Manager	908-403-6237 (Cell)
Bill Weber, Project Engineer	908-337-4761 (Cell)
Brain Emrick, Project Superintendent	908-307-6427 (Cell)
Port Authority of NY & NJ	718-442-8972
Mike Wallace, Resident Engineer	973-390-5519 (Cell)
NYS Department of Environmental Conservation	
Emergency Spill Hotline Phone Number	800-457-7362
National Response Center	800-424-8802
CHEMTREC	800-424-9300

All emergency communications will flow through the radio network. Outside emergency services will be notified, as necessary. The site evacuation alarm consists of one long blast on a horn, every 10 seconds. Any time the alarm system is activated; on site personnel will be notified immediately. Personnel will extinguish any nearby ignition source and prepare for emergency response activities. This alarm will also be used to alert personnel of a sudden release of hazardous materials.

The observer of the emergency condition will brief the responding personnel as to the nature and location of the incident. When they have assessed the situation, a decision whether or not to implement these procedures will be made. If these Emergency Contingency Procedures are not implemented, the "All Clear" will be given verbally by supervisory personnel. The "All Clear" will be used to indicate a return to normal (non-emergency) conditions following emergency response activities. The alarm signals will be prominently posted at the site. The audible alarm system will be discussed with each resident within hearing range of the alarm system.

11.7 Implementation Of The Plan

There is a logical sequence of steps to follow in responding to emergencies, which should be followed by site personnel. This sequence involves identifying the emergency, investigating the extent of the emergency, deciding on the proper initial course of action, taking corrective action to rectify the situation, and following up with a post-emergency investigation.

Equipment breakdowns, power failures, injuries and natural disasters are usually rather dramatic and will capture the individual's attention immediately upon occurrence. In other cases, the individual may have prior

warning of impending emergencies through weather reports in the case of natural disasters and trends in equipment performance in the case of some breakdowns.

Some emergency situations exist long before the operator is aware that an emergency exists. These cases may produce situations, which then become immediate and obvious. For example, unattended equipment may have minor breakdowns which go unnoticed; further operation thus leading to complete breakdown of the equipment resulting in possible injury to the unwary bystander.

In the event of a fire, explosion, accidental material release, or any other emergency, response activities will be initiated following the evaluation of the event. An assessment of the situation will be performed by the SSHO immediately upon notification. The Superintendent/SSHO is authorized to commit resources to the extent detailed in this plan. If it is determined that an emergency situation exists, he will then implement the appropriate emergency response activities.

In the event that a medical emergency or accident occurs in the Exclusion Zone, all personnel responding to the emergency should be outfitted in the Personal Protective Equipment appropriate for the situation. As a general rule, personnel should not enter the Exclusion Zone without donning the minimal level of PPE required. In the event that a worker is overcome or disabled for an unknown reason, the Superintendent/SSHO must make a determination as to the level of respiratory protection, which is appropriate. Specifically, a determination must be made as to whether Supplied Air Respirators are necessary for the protection of the responders.

11.7.1 Conditions for Implementation

The contingency plan will be activated by the Superintendent/SSHO immediately, in the event of a fire or explosion, or emissions of toxic chemicals in excess of limits set forth by Federal, State, and local agencies. In the event of a spill or material release, it will be up to the Superintendent/SSHO to make a determination as to when emergency conditions exist, as opposed to routine maintenance of the site. His determination will depend upon the location of the spill, the size of the spill, weather conditions and the proximity of the release to workers, the community and environmental receptors.

Once it becomes apparent that an emergency situation exists or that a disaster is impending, the Project Superintendent or his designee should immediately be notified and an immediate investigation conducted. Assessment of the emergency should include assessing the severity of the situation and collecting enough information to make an initial action decision.

Assessing the emergency should include identifying injured persons (if any), damage to buildings and equipment, noting potential impending damage if corrective action is not taken immediately, and itemizing resources required to correct the situation.

11.7.1.1 Fire or Explosion

Although the potential for fire or explosion is minimal, sources of risk do exist. These sources include welding gases, gasoline for portable equipment, diesel fuel for the heavy equipment and combustible debris. In the event of an explosion, possible emergency conditions would exist. Unless extinguished immediately, a fire or explosion will trigger implementation of these procedures.

11.7.1.2 Material Spills

Material Spills could occur during truck loading and from vehicle accidents. Additionally, equipment fueling operations could produce spills. Ultimately, a spill could contaminate receiving surface water or cause a release

of vapors to the air. A spill of fuel could also ignite. A small spill should be cleaned up immediately, but should not trigger activation of these procedures. Should an on site spill occur, the immediate response will include closing off the source of the spill, if possible, application of the sorbent material or sand bagging, and street sweeping, as appropriate. Any spill that results in a discharge to off site surface water will be contained with sorbent booms as needed. All spills will be investigated, and a written report will be provided to the regulatory agencies in accordance with applicable regulations.

11.7.1.3 Severe Weather

In the event of severe weather, the Site Superintendent and/or the HSO have the authority to stop operations and direct evacuation procedures, if conditions warrant. All equipment will be secured and grounded. After the storm, a visual inspection will be performed by the Superintendent and/or the HSO to check for damage and hazards. These will be performed before any work is resumed. If damage or hazards are noted, the designated or other Conti personnel will evaluate the conditions and implement corrective actions to repair the damage or eliminate the hazard. These actions will begin as soon as possible and will take precedence over other site activities.

11.7.2 Initial Action

Once the extent of the emergency is known, the Superintendent and the SSHO will make an immediate decision as to what initial steps should be taken to remedy the emergency situation. This first action, in the case of large-scale emergencies, usually consists of notifying responsible authorities and/or calling for the necessary assistance in order of priority.

The individual(s) should not unduly endanger him or herself or others by attempting tasks for which the proper equipment is not available or with which he or she is unfamiliar. In all cases, if in doubt, wait until qualified help arrives before taking action.

11.7.3 Corrective Action

When help arrives, the site superintendent/SSHO should immediately inform those called of the pertinent details of the situation. Corrective action should be continued until the situation is either under control or completely rectified. If corrective actions will take considerable time, a long-term effort to complete the task should be developed.

11.7.4 Follow-through

After the situation is corrected, the cause of the emergency event is to be determined and review of the corrective actions taken, etc. In the case of equipment failure, if negligence was not a factor, then revising maintenance procedures would be the most likely first preventive step. For natural disasters that cannot be prevented from recurring, the procedures followed in dealing with them can be reviewed to develop more effective action plans. The entire event, along with all of the responses, will be thoroughly documented for review by management and project supervisory personnel.

11.8 Spill Response and Control Plan

The purpose of this section is to define practices and procedures for the prevention, containment and cleanup of accidental discharges of hazardous substances during the project. These substances include both the contaminated material managed as a result of the remedial project, such as contaminated soils and

decontamination liquids, and construction materials typically found on any construction site, such as lubricating fluids, diesel fuel, gasoline, etc.

Spill prevention applies to all types of spills and can be described as the first and simplest approach to spill control. Human error is a major contributing factor to spills and releases. An awareness of spill consequences, preventive measures and countermeasures will greatly reduce spill occurrences. A sound prevention program includes careful work practices, constant inspection, and immediate notification and correction of deficiencies. In the event that a spill does occur, proper containment and cleanup procedures must then be followed in order to reduce the effect of the spill.

11.8.1 Prevention

Prevention of unnecessary spills is of first priority. Prevention measures include:

- Operators and drivers will exercise extreme caution when transporting material around the site.
- When removing hoses from machines an appropriate and adequate supply of absorbents will be on hand. A supply of the following absorbents will be kept on-site: oil sorbent booms, rolls and pillows, universal towels and sheets and vermiculite.
- Hoses will be capped when not connected to their appropriate fitting.
- All containers will be inspected daily for decay. No open container shall be exposed to rainfall, snowfall, etc. without being emptied and cleaned of residue.
- All equipment will be inspected for leaks before and after service.
- Storage of material such as fuels, oils, and solvents on-site will be limited to the minimum required. All fluids will be stored in individual fluid containers appropriate and approved for the material. Most of the individual fluids containers will be further secured by storage in large, locked tool and equipment storage containers. Drums or other containers too large to be stored in containers will be stored raised off the ground on a liner and covered by plastic.

11.8.2 Reporting

All spills will be reported immediately to appropriate field and office management personnel. The sequence of reporting will be as follows:

- Notification by workers to the Project Superintendent or Site Safety and Health Officer.
- The Project Superintendent or Safety and Health Officer will immediately notify the Resident Engineer Representative regardless of the size of the spill.
- Conti, and the Resident Engineer will jointly determine the nature of the spill, its size, direction of travel, if anyone has been injured as a result of the spill and whether it requires immediate notification to regulatory agencies.
- The Resident Engineer will have primary responsibility for notifying the regulatory agencies. Conti will have follow-up responsibility to verify that the notification is made in a timely manner.
- If a reportable spill occurs and the Resident Engineer cannot be immediately reached, Conti will primary responsibility to report the spill to the regulators (reportable spills will be called into the NYSDEC spill hotline within two hours of the incident and a spill number obtained).
- A full list of emergency contacts and telephone numbers is included this plan. This list includes Conti personnel as well as federal, state and local authorities. This list will be posted in all trailers on-site.

Upon notification of a spill, all project activity will be immediately suspended and all necessary equipment and personnel will be diverted to spill control and containment. In the event of a spill, and regardless of the size, a Spill Incident Report will be submitted to the Resident Engineer within 48 hours of the incident.

11.8.3 Spill Response Equipment

Given the nature of this project, all the necessary equipment and personnel necessary to deal with a release of hazardous substances will be available on site. In addition to the heavy equipment and personal protective equipment, which is critical to spill control, Conti will have on hand an ample amount of sorbent materials, UN1A2 open top drums and overpacks.

11.8.4 Confinement and Containment

Prior to entering a spill area, all workers must be protected from any adverse effects of the spilled material. No one will enter any spill area alone. The Site Safety and Health Officer will determine the level of protection required for response activities. To the extent practicable, the area will immediately be cordoned off and, if appropriate, exclusion, contamination reduction and support zones will be established.

The decision to use confinement techniques such as diversion, diking and retention, are generally based on time, personnel, equipment and supplies. As mentioned above, all necessary resources will be available on-site at all times. To the extent the nature of the material is known, the decision should be made based upon a review of the harmful effects of the material. In the event of a large migrating spill, an unlikely circumstance, diversion techniques, such as placing a soil wall or absorbent boom ahead of the spill, shall be implemented first. Subsequently, diking techniques, such as using material such as sand covered with liner material (PVC, hypalon) should be implemented.

11.8.5 Cleanup

Once a spill has been contained and the source of the spill corrected and controlled, cleanup can begin. Spill cleanup can proceed at the same time as containment if feasible. Supervisory personnel will determine the appropriate cleanup methods. The Site Safety and Health Officer will determine the appropriate level of protection depending upon the nature of the material.

- The first action will be to absorb free liquids with absorbent pads, booms, pillows, or clay. The absorbent material will be placed in drums and moved to an appropriate storage location. Subsequent to the removal of free liquids, soil believed to be contaminated will be excavated and containerized in drums or stockpiled on poly sheeting and covered for further testing.
- Dry spills, while posing less of a risk of migration, will still require appropriate and immediate action. The nature of the spilled material will be ascertained. The spilled material will be recovered for reuse if appropriate. Material which cannot be recovered and residual contaminated soil will be shoveled into 55-gallon drums, placed in the drum storage area and sampled and analyzed for waste characterization and disposal.
- Once containerized, Conti Enterprises will provide for the appropriate sampling and analysis for waste characterization and disposal facility acceptance. Results of waste characterization analysis, waste profiles and manifests will be provided to the Construction Representative for review.
- All spilled material and visually contaminated soil will be excavated and containerized in the initial spill response. If there appears to be a possibility that contaminants have migrated into the surrounding soil, post-remedial sampling will be initiated. Soil samples will be taken from the areas of suspected contamination and analyzed for the compounds, which were released.

Personnel Decontamination - In general, all spill response operations will be performed in accordance with the provisions of the approved Site Safety and Health Plan.

11.9 Report/Review

A written report shall be made within 24 hours of incident resolution. The Resident Engineer will be provided with a copy. In addition, all key personnel will have a meeting within 48 hours of the incident to discuss and critique all of the aspects of the Emergency Contingency Plan according to new site conditions and lessons learned.

12.0 INSPECTION AND REPORTING

12.1 Safety and Health Inspections

Safety and Health inspections will be conducted to discover, through specific, methodical auditing, checking, or inspection procedures, conditions and work practice that lead to job accidents and illnesses.

The Health And Safety Manager shall be responsible for ensuring that inspections are conducted at the frequency stated; reviewing the Daily Safety and Inspection Logs for completeness, thoroughness, and trends; performing bi-monthly project inspections; and training site personnel on proper inspection techniques. The Health and Safety Officer shall be responsible for ensuring that daily inspections are conducted; reviewing the inspections findings and corrective actions for applicability and thoroughness; and providing the site management personnel with a summary of inspection findings each month.

12.2 Daily Safety and Inspections Log

The SSHO shall insure that all aspects of the SSHP are complied with on a daily basis. Only one warning shall be given to individuals not complying with the SSHP. The SSHO has the authority to shut the work down and ban any individual from the Site. If deficiencies are noted, they will be recorded on the Daily Safety and Inspection Log and will be corrected immediately. The Daily Safety and Inspection Log will include the date, work area, employees present at the work area, PPE and work equipment in each area, specific safety and health issues and notes and the signature of the preparer. Refer to ***Attachment 3 – Safety and Health Forms for the Daily Safety and Inspection Log.***

12.3 Incident Reports

Incident reporting will ensure an immediate report on all incident/accidents and to provide an effective follow-up for corrective action in order to eliminate unsafe practices and unsafe conditions. An **Incident/Accident Form** must be completed within 24 hours of the Incident/Accident. This report is utilized in the event of injuries, off-site releases, utility breaks, or accidents. Immediately following the incident/accident, the Site Superintendent and the Site Safety and Health Officer will initiate and Incident/Accident Investigation. An Accident Report shall be completed and submitted to the Resident Engineer with in 2 days. ***Refer to Attachment 3 – Safety and Health Forms for the Incident/Accident Form***

"Near misses" will be documented by the Site Safety and Health Officer and discussed at the morning safety briefings to educate the work force to potentially hazardous operations or practices.

12.4 Daily Air Monitoring Report

The Daily Air Monitoring Report will be prepared by the SSHO. The Report will include all air monitoring data collected including real-time monitoring, personal monitoring within the Exclusion Zone. **Refer to *Attachment 3 – Safety and Health Forms for the Daily Air Monitoring Report***

12.5 Weekly Safety Meeting/Daily Tool Box Talks

As part of Conti Enterprises's Corporate Safety and Health Program, a Weekly Safety Meeting is conducted on Monday mornings and Daily toolbox Talks. This safety meeting outlines current industry safety issues and allows for discussion of job-specific issues. In addition, a daily site briefing will be held to discuss current work activities and hazards for the day along with the air monitoring results from the previous day. The SSHO/Superintendent will conduct Daily Tool Box Talks and Weekly Safety Meetings with ALL on-site personnel Refer to ***Attachment 3 – Safety and Health Forms for Daily Toolbox Talks and Weekly Safety Meetings.***

In addition to the daily toolbox talks and the weekly safety meeting, Conti will conduct monthly project management safety meetings. All site management, including sub-contractor personnel, are required to attend. Topics of discussion will include: hazards identified and abated during the previous month, any outstanding action, new tasks to be performed, site concerns etc. The SSHO will submit a synopsis of each meeting including topics covered, safety-related concerns, action items to be addressed, status of previous items and a signed attendance list.

ATTACHMENT 1
ACTIVITY HAZARD ANALYSIS

ACTIVITY HAZARD ANALYSIS

Project: **Howland Hook Marine Terminal Demolition & Remediation Project** DATE: **February 14, 2002**

Activity: **Mobilization/Site Prep** AHA NUMBER: **HHMT-001**

Potential Safety/Health Hazard	Recommended Controls
Chemical Spill during refueling operations or general equipment maintenance	Good Housekeeping Practices--Maintain Spill Response Equipment--Practice Spill Prevention at ALL Times--Proper Chemical Storage--Spill Control And Countermeasures Plan In Place For Spills Encountered During Work Activities—**Report ALL Spills to the SSHO**
Contact With Sharp Objects/Material	Identify And Guard Sharp/Protruding Objects (I.E., Rebar Caps)--Use Caution And Be Aware Whenever Working Around Sharp Objects--Wear Appropriate Personal Protection Equipment (I.E., Gloves)
Contact With Underground Utilities	Contact Local Mark-Out Authority to Identify And Mark Underground Utilities--Keep Heavy Equipment At Least 10 Feet From Power Lines--When An Unknown Hazard Has Been Encountered, Work Will Stop Until Hazards And Controls Are Identified And In Place
Electrical Shock	Electrical Work Performed By Qualified Person--Use Ground Fault Interrupter Circuits (GFIC)--Inspect and replace damaged Electrical Cords And Tools--Follow Lockout/Tagout Procedures as required--Keep Heavy Equipment At Least 10 Feet From Power Lines
Exposed To Vehicle Traffic	Develop, Implement and Follow Traffic Control Plan--Flaggers/Spotters Assigned Where Necessary--Use Safety Reflective Vest When Working Around Active Traffic
Exposure To High Noise Levels	Wear Appropriate Personal Protection Equipment (I.E., Ear Plugs/Muffs)--Instruct Personnel On Use Of Hearing Protection--Employees On Hearing Conservation Program
Exposure To High/Low Ambient Temperatures	Discuss Signs/Symptoms Of Heat/Cold Stress--Drink Cool/Warm Liquids, As Appropriate--Monitor Temperature
Fall From Different Level	Fall Protection Equipment Required If Task >6 Ft--Proper Ladder Placement And Selection
Hand/Power Tools	Ensure Personnel Are Trained On Specific Tools--Inspect Tools Before Each Use--Use Correct Tool For The Job--Make Use Of All Safety Devices And Ensure They Are Functioning
Handling Heavy Objects/Material	Use Proper Lifting Techniques--Utilize Proper Hoisting/Material Handling Techniques and/or Equipment--Use Buddy System For Heavy, Awkward Loads--Distribute Loads Evenly
Struck By/Against Heavy Equipment	Only Qualified employees will be authorized to a operate Heavy equipment--Approach Equipment Within The Operators View--Equipped With Back-Up Alarm/Seatbelt--Inspect Equipment Regularly--Hand Signal By DESIGNATED Worker
Walking/Working Surface	Good Housekeeping Practices--Keep Walkways And Work Areas Clear Of Hoses, Cords, And Clutter--Restrict Site To Essential Personnel--Wear Appropriate Safety Shoes

ACTIVITY HAZARD ANALYSIS

Project: **Howland Hook Marine Terminal Demolition & Remediation Project** DATE: **February 14, 2002**

Activity: **Utility Disconnect/Capping** AHA NUMBER: **HHMT-002**

Potential Safety/Health Hazard	Recommended Controls
Contact With Sharp Objects/Material	Identify And Guard Sharp/Protruding Objects (I.E., Rebar Caps)--Use Caution And Be Aware Whenever Working Around Sharp Objects--Wear Appropriate Personal Protection Equipment (I.E., Gloves)
Exposure To High Noise Levels	Employees On Hearing Conservation Program--Instruct Personnel On Use Of Hearing Protection--Wear Appropriate Personal Protection Equipment (I.E., Ear Plugs/Muffs)
Exposure To High/Low Ambient Temperatures	Discuss Signs/Symptoms Of Heat/Cold Stress--Drink Cool/Warm Liquids, As Appropriate--Monitor Temperature--Monitor Work And Adjust Work-Rest Regimen--Physiological Monitoring Of Workers
Hand/Power Tools	Ensure Personnel Are Trained On Specific Tools--Inspect Tools Before Each Use--Make Use Of All Safety Devices And Ensure They Are Functioning--Store Tools In Proper Place--Use Correct Tool For The Job
Handling Heavy Objects/Material	Distribute Loads Evenly--Plan Ahead When Moving Materials/Items--Use Buddy System For Heavy, Awkward Loads--Use Proper Lifting Techniques--Utilize Proper Hoisting/Material Handling Techniques and/or Equipment--Wear appropriate PPE And Keep Guards In Place
Inhalation/Contact With Hazardous Material	Ensure site personnel have the appropriate HAZWOPER, Medical Clearance and Site Specific Training--Follow Decontamination Procedures--Follow Emergency Contingency Procedures--Implement Site Controls Areas--Perform Dust/Vapor Suppression--Perform Real-Time Air Monitoring----Wear appropriate PPE for Task/Activity Performed
Struck By/Against Heavy Equipment	Approach Equipment Within The Operators View--Equipment Properly Secured When Not In Use--Equipped With Back-Up Alarm/Seatbelt--Flaggers/Spotters Assigned Where Necessary--Hand Signal By DESIGNATED Worker--Inspect Equipment Regularly--Keep Heavy Equipment At Least 10 Feet From Power Lines--Only Qualified employees will be authorized to a operate Heavy equipment--Restrict Pedestrian Traffic--Swing Radius Roped Off Or Guarded--Use Safety Reflective Vest When Working Around Equipment
Walking/Working Surface	Avoid Walking On Spoils Pile and Watch Footing When Entering Excavation----Keep Walkways And Work Areas Clear Of Hoses, Cords, And Clutter--Restrict Site To Essential Personnel--Wear Appropriate Safety Shoes
Confine Space Entry	Identify and post all confine spaces that will be encountered during planned activities (Permitted and Non-permitted)--Perform Air Monitoring and Provide Local Ventilation--Review and Implement Confine Space Entry Procedures prior to entering any confine space--Wear Appropriate Level Of Personal Protection (I.E., Level B)
Contact With Underground Utilities	Competent Person On Site During Excavation Activities--Contact Local Mark-Out Authority to Identify And Mark Underground Utilities--Keep Heavy Equipment At Least 10 Feet From Power Lines--When An Unknown Hazard Has Been Encountered, Work Will Stop Until Hazards And Controls Are Identified And In Place
Oxygen Deficient Atmospheres	Follow Confined Entry Procedures--Investigation Oxygen Deficiency -- Perform Air Monitoring and Provide Local Ventilation--Wear Appropriate Level Of Personal Protection (I.E., Level B)

ACTIVITY HAZARD ANALYSIS

Potential Safety/Health Hazard	Recommended Controls
Excavation Cave-In	Barricade Open Excavations--Be Aware Of Cave-In Potential--Competent Person On Site During Activity--Contact Local Mark-Out Authority to Identify And Mark Underground Utilities--Keep Vehicles/Equipment At Sufficient Distance From Edge Of Excavation--Maintain Proper Slope For Soil Classification--Maintain Spoils 2 Ft From Edge Of Excavation--Perform Daily Excavation/Trench Inspection--Provide Access/Egress To Excavation--When An Unknown Hazard Has Been Encountered, Work Will Stop Until Hazards And Controls Are Identified And In Place

ACTIVITY HAZARD ANALYSIS

Project: **Howland Hook Marine Terminal Demolition & Remediation Project**

DATE: **February 14, 2002**

Activity: **Building Demolition**

AHA NUMBER: **HHTM-003**

Potential Safety/Health Hazard	Recommended Controls
Caught In/Between Moving Parts	Backup Alarm On Moving/Swinging Equipment--Identify Or Post Areas Where Guarding Is Not Feasible--Inspect and Ensure All Guards Are In Place--Swing Radius Of equipment Identified and Barricaded
Chemical Spill	Good Housekeeping Practices--Maintain Spill Response Equipment--Practice Spill Prevention at ALL Times--Proper Chemical Storage--Spill Control And Countermeasures Plan In Place For Spills Encountered During Work Activities
Contact With Sharp Objects/Material	Identify And Guard Sharp/Protruding Objects (I.E., Rebar Caps)--Use Caution And Be Aware Whenever Working Around Sharp Objects--Wear Appropriate Personal Protection Equipment (I.E., Gloves)
Exposed To Vehicle Traffic	Develop, Implement and Follow Traffic Control Plan--Flaggers/Spotters Assigned Where Necessary--Use Safety Reflective Vest When Working Around Active Traffic
Exposure To High Noise Levels	Employees On Hearing Conservation Program--Instruct Personnel On Use Of Hearing Protection--Wear Appropriate Personal Protection Equipment (I.E., Ear Plugs/Muffs)
Exposure To High/Low Ambient Temperatures	Discuss Signs/Symptoms Of Heat/Cold Stress--Drink Cool/Warm Liquids, As Appropriate--Monitor Temperature--Monitor Work And Adjust Work-Rest Regimen--Physiological Monitoring Of Workers
Fall From Different Level	Develop and Implement Fall Protection Plan as required--Fall Protection Equipment Required If Task >6 Ft--Install Guardrails on scaffold >10 Ft(Top, Mid And Toe Rails)--Personnel Trained On Fall Protection--Proper Ladder Placement And Selection--Warning Line System, and/ Safety Monitor as Required
Fire/Explosion	Fire Extinguisher Inspected And In Place--Fire Watch during and after Hot Work procedures--Follow Hot Work Permit Procedures--Good Housekeeping Practices--Ignition Sources Eliminated Or Protected
Flying Debris	Ensure guards are installed and working on tools/equipment--Initiate Dust Control Measures--Wear Appropriate Personal Protection Equipment (I.E., Safety glasses/goggles/face shields)
Hand/Power Tools	Ensure Personnel Are Trained On Specific Tools--Inspect Tools Before Each Use--Make Use Of All Safety Devices And Ensure They Are Functioning--Store Tools In Proper Place--Use Correct Tool For The Job
Handling Heavy Objects/Material	Distribute Loads Evenly--Plan Ahead When Moving Materials/Items--Use Buddy System For Heavy, Awkward Loads--Use Proper Lifting Techniques--Utilize Proper Hoisting/Material Handling Techniques and/or Equipment--Wear appropriate PPE And Keep Guards In Place
Inhalation/Contact With Hazardous Material	Ensure site personnel have the appropriate HAZWOPER, Medical Clearance and Site Specific Training--Follow Decontamination Procedures--Follow Emergency Contingency Procedures--Implement Site Controls Areas--Perform Dust/Vapor Suppression--Perform Real-Time Air Monitoring----Wear appropriate PPE for Task/Activity Performed
Struck By/Against Heavy Equipment	Approach Equipment Within The Operators View--Equipment Properly Secured When Not In Use--Equipped With Back-Up Alarm/Seatbelt--Flaggers/Spotters Assigned Where Necessary--Hand Signal By DESIGNATED Worker--Inspect Equipment Regularly--Keep Heavy Equipment At Least 10 Feet From Power Lines--Only Qualified employees will be authorized to a operate Heavy equipment--Restrict Pedestrian Traffic--Swing Radius Roped Off Or Guarded--Use Safety Reflective Vest When Working Around Equipment

ACTIVITY HAZARD ANALYSIS

Potential Safety/Health Hazard	Recommended Controls
Overhead Activities	Check For Loose Items Overhead--Do Not Walk Near Or Under Unstable Slopes, Equipment, Or Loads--Hard Hats Worn at ALL times--Install toe boards on Guardrails--Restrict access to area of potential overhead hazard--Rigging Hardware Will Be Inspected Before Each Use--Stay In View Of The Operator If Possible And Be Aware Of Possible Equipment Movement Overhead--Stay Out From Under Suspended Loads--Use Tag Lines, As Appropriate.
Structural Collapse	Perform Pre- Work Inspection--Restrict access to building or demolition areas--Restrict non-essential personnel
Walking/Working Surface	Avoid Walking On Spoils Pile and Watch Footing When Entering Excavation----Keep Walkways And Work Areas Clear Of Hoses, Cords, And Clutter--Restrict Site To Essential Personnel--Wear Appropriate Safety Shoes
Welding and Cutting	Control And Protect Cylinders During Use (I.E., Acetylene Torches, Etc.)--Fire Watch During And 30 Minutes After Work--Have Fire Extinguisher In Place--Obtain Hot Work Permit For Welding/Cutting/Grinding/Spark Producing Tasks And Follow All Requirements On The Hot Work Permit--Use Proper Gloves And Tinted Welding Masks

ACTIVITY HAZARD ANALYSIS

Project:	**Howland Hook Marine Terminal Demolition & Remediation Project**	DATE:	**February 14, 2002**
Activity:	**Segregate-Stockpile and Load demolition Debris**	AHA NUMBER:	**HHTM-004**

Potential Safety/Health Hazard	Recommended Controls
Caught In/Between Moving Parts	Backup Alarm On Moving/Swinging Equipment--Identify Or Post Areas Where Guarding Is Not Feasible--Inspect and Ensure All Guards Are In Place--Swing Radius Of equipment Identified and Barricaded
Chemical Spill	Good Housekeeping Practices--Maintain Spill Response Equipment--Practice Spill Prevention at ALL Times--Proper Chemical Storage--Spill Control And Countermeasures Plan In Place For Spills Encountered During Work Activities
Contact With Sharp Objects/Material	Identify And Guard Sharp/Protruding Objects (I.E., Rebar Caps)--Use Caution And Be Aware Whenever Working Around Sharp Objects--Wear Appropriate Personal Protection Equipment (I.E., Gloves)
Exposed To Vehicle Traffic	Develop, Implement and Follow Traffic Control Plan--Flaggers/Spotters Assigned Where Necessary--Use Safety Reflective Vest When Working Around Active Traffic
Exposure To High Noise Levels	Employees On Hearing Conservation Program--Instruct Personnel On Use Of Hearing Protection--Wear Appropriate Personal Protection Equipment (I.E., Ear Plugs/Muffs)
Exposure To High/Low Ambient Temperatures	Discuss Signs/Symptoms Of Heat/Cold Stress--Drink Cool/Warm Liquids, As Appropriate--Monitor Temperature--Monitor Work And Adjust Work-Rest Regimen--Physiological Monitoring Of Workers
Fall From Different Level	Develop and Implement Fall Protection Plan as required--Fall Protection Equipment Required If Task >6 Ft--Install Guardrails on scaffold >10 Ft(Top, Mid And Toe Rails)--Personnel Trained On Fall Protection--Proper Ladder Placement And Selection--Warning Line System, and/ Safety Monitor as Required
Fire/Explosion	Fire Extinguisher Inspected And In Place--Fire Watch during and after Hot Work procedures--Follow Hot Work Permit Procedures--Good Housekeeping Practices--Ignition Sources Eliminated Or Protected
Flying Debris	Ensure guards are installed and working on tools/equipment--Initiate Dust Control Measures--Wear Appropriate Personal Protection Equipment (I.E., Safety glasses/goggles/face shields)
Hand/Power Tools	Ensure Personnel Are Trained On Specific Tools--Inspect Tools Before Each Use--Make Use Of All Safety Devices And Ensure They Are Functioning--Store Tools In Proper Place--Use Correct Tool For The Job
Handling Heavy Objects/Material	Distribute Loads Evenly--Plan Ahead When Moving Materials/Items--Use Buddy System For Heavy, Awkward Loads--Use Proper Lifting Techniques--Utilize Proper Hoisting/Material Handling Techniques and/or Equipment--Wear appropriate PPE And Keep Guards In Place
Inhalation/Contact With Hazardous Material	Ensure site personnel have the appropriate HAZWOPER, Medical Clearance and Site Specific Training--Follow Decontamination Procedures--Follow Emergency Contingency Procedures--Implement Site Controls Areas--Perform Dust/Vapor Suppression--Perform Real-Time Air Monitoring----Wear appropriate PPE for Task/Activity Performed

ACTIVITY HAZARD ANALYSIS

Potential Safety/Health Hazard	Recommended Controls
Struck By/Against Heavy Equipment	Approach Equipment Within The Operators View--Equipment Properly Secured When Not In Use--Equipped With Back-Up Alarm/Seatbelt--Flaggers/Spotters Assigned Where Necessary--Hand Signal By DESIGNATED Worker--Inspect Equipment Regularly--Keep Heavy Equipment At Least 10 Feet From Power Lines--Only Qualified employees will be authorized to a operate Heavy equipment--Restrict Pedestrian Traffic--Swing Radius Roped Off Or Guarded--Use Safety Reflective Vest When Working Around Equipment
Overhead Activities	Check For Loose Items Overhead--Do Not Walk Near Or Under Unstable Slopes, Equipment, Or Loads--Hard Hats Worn at ALL times--Install toe boards on Guardrails--Restrict access to area of potential overhead hazard--Rigging Hardware Will Be Inspected Before Each Use--Stay In View Of The Operator If Possible And Be Aware Of Possible Equipment Movement Overhead--Stay Out From Under Suspended Loads--Use Tag Lines, As Appropriate.
Walking/Working Surface	Avoid Walking On Spoils Pile and Watch Footing When Entering Excavation----Keep Walkways And Work Areas Clear Of Hoses, Cords, And Clutter--Restrict Site To Essential Personnel--Wear Appropriate Safety Shoes
Welding and Cutting	Control And Protect Cylinders During Use (I.E., Acetylene Torches, Etc.)--Fire Watch During And 30 Minutes After Work--Have Fire Extinguisher In Place--Obtain Hot Work Permit For Welding/Cutting/Grinding/Spark Producing Tasks And Follow All Requirements On The Hot Work Permit--Use Proper Gloves And Tinted Welding Masks

ACTIVITY HAZARD ANALYSIS

Project: **Howland Hook Marine Terminal Demolition & Remediation Project** DATE: **February 14, 2002**

Activity: **Removal of Slab/Foundations** AHA NUMBER: **HHMT-005**

Potential Safety/Health Hazard	Recommended Controls
Caught In/Between Moving Parts	Backup Alarm On Moving/Swinging Equipment--Identify Or Post Areas Where Guarding Is Not Feasible--Inspect and Ensure All Guards Are In Place--Swing Radius Of equipment Identified and Barricaded
Chemical Spill	Good Housekeeping Practices--Maintain Spill Response Equipment--Practice Spill Prevention at ALL Times--Proper Chemical Storage--Spill Control And Countermeasures Plan In Place For Spills Encountered During Work Activities
Contact With Sharp Objects/Material	Identify And Guard Sharp/Protruding Objects (I.E., Rebar Caps)--Use Caution And Be Aware Whenever Working Around Sharp Objects--Wear Appropriate Personal Protection Equipment (I.E., Gloves)
Contact With Underground Utilities	Competent Person On Site During Excavation Activities--Contact Local Mark-Out Authority to Identify And Mark Underground Utilities--Keep Heavy Equipment At Least 10 Feet From Power Lines--When An Unknown Hazard Has Been Encountered, Work Will Stop Until Hazards And Controls Are Identified And In Place
Excavation Cave-In	Barricade Open Excavations--Be Aware Of Cave-In Potential--Competent Person On Site During Activity--Contact Local Mark-Out Authority to Identify And Mark Underground Utilities--Keep Vehicles/Equipment At Sufficient Distance From Edge Of Excavation--Maintain Proper Slope For Soil Classification--Maintain Spoils 2 Ft From Edge Of Excavation--Perform Daily Excavation/Trench Inspection--Provide Access/Egress To Excavation--When An Unknown Hazard Has Been Encountered, Work Will Stop Until Hazards And Controls Are Identified And In Place
Exposed To Vehicle Traffic	Develop, Implement and Follow Traffic Control Plan--Flaggers/Spotters Assigned Where Necessary--Use Safety Reflective Vest When Working Around Active Traffic
Exposure To High Noise Levels	Wear Appropriate Personal Protection Equipment (I.E., Ear Plugs/Muffs)--Instruct Personnel On Use Of Hearing Protection--Employees On Hearing Conservation Program
Exposure To High/Low Ambient Temperatures	Discuss Signs/Symptoms Of Heat/Cold Stress--Drink Cool/Warm Liquids, As Appropriate--Monitor Temperature--Monitor Work And Adjust Work-Rest Regimen--Physiological Monitoring Of Workers
Flying Debris	Ensure guards are installed and working on tools/equipment--Initiate Dust Control Measures--Wear Appropriate Personal Protection Equipment (I.E., Safety glasses/goggles/face shields)
Inhalation/Contact With Hazardous Material	Ensure site personnel have the appropriate HAZWOPER, Medical Clearance and Site Specific Training--Follow Decontamination Procedures--Follow Emergency Contingency Procedures--Implement Site Controls Areas--Perform Dust/Vapor Suppression--Perform Real-Time Air Monitoring--Review Material Safety data Sheet--Wear appropriate PPE for Task/Activity Performed

ACTIVITY HAZARD ANALYSIS

Potential Safety/Health Hazard	Recommended Controls
Struck By/Against Heavy Equipment	Approach Equipment Within The Operators View--Equipment Properly Secured When Not In Use--Equipped With Back-Up Alarm/Seatbelt--Flaggers/Spotters Assigned Where Necessary--Hand Signal By DESIGNATED Worker--Inspect Equipment Regularly--Keep Heavy Equipment At Least 10 Feet From Power Lines--Only Qualified employees will be authorized to a operate Heavy equipment--Restrict Pedestrian Traffic--Swing Radius Roped Off Or Guarded--Use Safety Reflective Vest When Working Around Equipment
Walking/Working Surface	Avoid Walking On Spoils Pile and Watch Footing When Entering Excavation--Good Housekeeping Practices--Barricade Open Excavations--Keep Walkways And Work Areas Clear Of Hoses, Cords, And Clutter--Restrict Site To Essential Personnel--Wear Appropriate Safety Shoes
Welding and Cutting	Control And Protect Cylinders During Use (I.E., Acetylene Torches, Etc.)--Fire Watch During And 30 Minutes After Work--Have Fire Extinguisher In Place--Obtain Hot Work Permit For Welding/Cutting/Grinding/Spark Producing Tasks And Follow All Requirements On The Hot Work Permit--Use Proper Gloves And Tinted Welding Masks

ACTIVITY HAZARD ANALYSIS

Project:	**Howland Hook Marine Terminal Demolition & Remediation Project**	DATE:	**February 14, 2002**
Activity:	**Stockpile and Load Slab/Foundation Debris**	AHA NUMBER:	**HHTM-006**

Potential Safety/Health Hazard	Recommended Controls
Caught In/Between Moving Parts	Backup Alarm On Moving/Swinging Equipment--Identify Or Post Areas Where Guarding Is Not Feasible--Inspect and Ensure All Guards Are In Place--Swing Radius Of equipment Identified and Barricaded
Chemical Spill	Good Housekeeping Practices--Maintain Spill Response Equipment--Practice Spill Prevention at ALL Times--Proper Chemical Storage--Spill Control And Countermeasures Plan In Place For Spills Encountered During Work Activities
Contact With Sharp Objects/Material	Identify And Guard Sharp/Protruding Objects (I.E., Rebar Caps)--Use Caution And Be Aware Whenever Working Around Sharp Objects--Wear Appropriate Personal Protection Equipment (I.E., Gloves)
Exposed To Vehicle Traffic	Develop, Implement and Follow Traffic Control Plan--Flaggers/Spotters Assigned Where Necessary--Use Safety Reflective Vest When Working Around Active Traffic
Exposure To High Noise Levels	Employees On Hearing Conservation Program--Instruct Personnel On Use Of Hearing Protection--Wear Appropriate Personal Protection Equipment (I.E., Ear Plugs/Muffs)
Exposure To High/Low Ambient Temperatures	Discuss Signs/Symptoms Of Heat/Cold Stress--Drink Cool/Warm Liquids, As Appropriate--Monitor Temperature--Monitor Work And Adjust Work-Rest Regimen--Physiological Monitoring Of Workers
Fall From Different Level	Develop and Implement Fall Protection Plan as required--Fall Protection Equipment Required If Task >6 Ft--Install Guardrails on scaffold >10 Ft(Top, Mid And Toe Rails)--Personnel Trained On Fall Protection--Proper Ladder Placement And Selection--Warning Line System, and/ Safety Monitor as Required
Fire/Explosion	Fire Extinguisher Inspected And In Place--Fire Watch during and after Hot Work procedures--Follow Hot Work Permit Procedures--Good Housekeeping Practices--Ignition Sources Eliminated Or Protected
Flying Debris	Ensure guards are installed and working on tools/equipment--Initiate Dust Control Measures--Wear Appropriate Personal Protection Equipment (I.E., Safety glasses/goggles/face shields)
Hand/Power Tools	Ensure Personnel Are Trained On Specific Tools--Inspect Tools Before Each Use--Make Use Of All Safety Devices And Ensure They Are Functioning--Store Tools In Proper Place--Use Correct Tool For The Job
Handling Heavy Objects/Material	Distribute Loads Evenly--Plan Ahead When Moving Materials/Items--Use Buddy System For Heavy, Awkward Loads--Use Proper Lifting Techniques--Utilize Proper Hoisting/Material Handling Techniques and/or Equipment--Wear appropriate PPE And Keep Guards In Place
Inhalation/Contact With Hazardous Material	Ensure site personnel have the appropriate HAZWOPER, Medical Clearance and Site Specific Training--Follow Decontamination Procedures--Follow Emergency Contingency Procedures--Implement Site Controls Areas--Perform Dust/Vapor Suppression--Perform Real-Time Air Monitoring----Wear appropriate PPE for Task/Activity Performed

ACTIVITY HAZARD ANALYSIS

Potential Safety/Health Hazard	Recommended Controls
Struck By/Against Heavy Equipment	Approach Equipment Within The Operators View--Equipment Properly Secured When Not In Use--Equipped With Back-Up Alarm/Seatbelt--Flaggers/Spotters Assigned Where Necessary--Hand Signal By DESIGNATED Worker--Inspect Equipment Regularly--Keep Heavy Equipment At Least 10 Feet From Power Lines--Only Qualified employees will be authorized to a operate Heavy equipment--Restrict Pedestrian Traffic--Swing Radius Roped Off Or Guarded--Use Safety Reflective Vest When Working Around Equipment
Overhead Activities	Check For Loose Items Overhead--Do Not Walk Near Or Under Unstable Slopes, Equipment, Or Loads--Hard Hats Worn at ALL times--Install toe boards on Guardrails--Restrict access to area of potential overhead hazard--Rigging Hardware Will Be Inspected Before Each Use--Stay In View Of The Operator If Possible And Be Aware Of Possible Equipment Movement Overhead--Stay Out From Under Suspended Loads--Use Tag Lines, As Appropriate.
Walking/Working Surface	Avoid Walking On Spoils Pile and Watch Footing When Entering Excavation----Keep Walkways And Work Areas Clear Of Hoses, Cords, And Clutter--Restrict Site To Essential Personnel--Wear Appropriate Safety Shoes
Welding and Cutting	Control And Protect Cylinders During Use (I.E., Acetylene Torches, Etc.)--Fire Watch During And 30 Minutes After Work--Have Fire Extinguisher In Place--Obtain Hot Work Permit For Welding/Cutting/Grinding/Spark Producing Tasks And Follow All Requirements On The Hot Work Permit--Use Proper Gloves And Tinted Welding Masks

ACTIVITY HAZARD ANALYSIS

Project: **Howland Hook Marine Terminal Demolition & Remediation Project**

DATE: **February 14, 2002**

Activity: **Site Backfilling Activities**

AHA NUMBER: **HHMT- 007**

Potential Safety/Health Hazard	Recommended Controls
Caught In/Between Moving Parts	Backup Alarm On Moving/Swinging Equipment--Identify Or Post Areas Where Guarding Is Not Feasible--Inspect and Ensure All Guards Are In Place--Swing Radius Of equipment Identified and Barricaded
Exposed To Vehicle Traffic	Develop, Implement and Follow Traffic Control Plan--Flaggers/Spotters Assigned Where Necessary--Use Safety Reflective Vest When Working Around Active Traffic
Exposure To High Noise Levels	Wear Appropriate Personal Protection Equipment (I.E., Ear Plugs/Muffs)--Instruct Personnel On Use Of Hearing Protection--Employees On Hearing Conservation Program
Exposure To High/Low Ambient Temperatures	Discuss Signs/Symptoms Of Heat/Cold Stress--Drink Cool/Warm Liquids, As Appropriate--Monitor Temperature--Monitor Work And Adjust Work-Rest Regimen--Physiological Monitoring Of Workers
Flying Debris	Ensure guards are installed and working on tools/equipment--Initiate Dust Control Measures--Wear Appropriate Personal Protection Equipment (I.E., Safety glasses/goggles/face shields)
Struck By/Against Heavy Equipment	Approach Equipment Within The Operators View--Equipment Properly Secured When Not In Use--Equipped With Back-Up Alarm/Seatbelt--Flaggers/Spotters Assigned Where Necessary--Hand Signal By DESIGNATED Worker--Inspect Equipment Regularly--Keep Heavy Equipment At Least 10 Feet From Power Lines--Only Qualified employees will be authorized to a operate Heavy equipment--Restrict Pedestrian Traffic--Swing Radius Roped Off Or Guarded--Use Safety Reflective Vest When Working Around Equipment
Walking/Working Surface	Avoid Walking On Spoils Pile and Watch Footing When Entering Excavation--Good Housekeeping Practices--Barricade Open Excavations--Keep Walkways And Work Areas Clear Of Hoses, Cords, And Clutter--Restrict Site To Essential Personnel--Wear Appropriate Safety Shoes

ACTIVITY HAZARD ANALYSIS

Project: **Howland Hook Marine Terminal Demolition & Remediation Project** DATE: **February 14, 2002**

Activity: **Demobilization/Site Restoration** AHA NUMBER: **HHMT-008**

Potential Safety/Health Hazard	Recommended Controls
Caught In/Between Moving Parts	Swing Radius Roped Off Or Guarded--Restrict Pedestrian Traffic--Backup Alarm On Moving/Swinging Equipment--Identify Or Post Areas Where Guarding Is Not Feasible--Inspect and Ensure All Guards Are In Place
Chemical Spill	Good Housekeeping Practices--Maintain Spill Response Equipment--Practice Spill Prevention at ALL Times--Proper Chemical Storage--Spill Control And Countermeasures Plan In Place For Spills Encountered During Work Activities
Contact With Sharp Objects/Material	Identify And Guard Sharp/Protruding Objects (I.E., Rebar Caps)--Use Caution And Be Aware Whenever Working Around Sharp Objects--Wear Appropriate Personal Protection Equipment (I.E., Gloves)
Contact With Underground Utilities	Contact Local Mark-Out Authority to Identify And Mark Underground Utilities--Keep Heavy Equipment At Least 10 Feet From Power Lines--When An Unknown Hazard Has Been Encountered, Work Will Stop Until Hazards And Controls Are Identified And In Place
Electrical Shock	Electrical Work Performed By Qualified Person--Use Ground Fault Interrupter Circuits (GFIC)--Inspect and replace damaged Electrical Cords And Tools--Grounding And Bonding Equipment--Follow Lockout/Tagout Procedures as required--Keep Heavy Equipment At Least 10 Feet From Power Lines
Exposed To Vehicle Traffic	Develop, Implement and Follow Traffic Control Plan--Flaggers/Spotters Assigned Where Necessary--Use Safety Reflective Vest When Working Around Active Traffic
Exposure To High Noise Levels	Wear Appropriate Personal Protection Equipment (I.E., Ear Plugs/Muffs)--Instruct Personnel On Use Of Hearing Protection--Employees On Hearing Conservation Program
Exposure To High/Low Ambient Temperatures	Discuss Signs/Symptoms Of Heat/Cold Stress--Drink Cool/Warm Liquids, As Appropriate--Monitor Temperature
Fall From Different Level	Fall Protection Equipment Required If Task >6 Ft--Proper Ladder Placement And Selection
Hand/Power Tools	Ensure Personnel Are Trained On Specific Tools--Inspect Tools Before Each Use--Use Correct Tool For The Job--Make Use Of All Safety Devices And Ensure They Are Functioning
Handling Heavy Objects/Material	Use Proper Lifting Techniques--Utilize Proper Hoisting/Material Handling Techniques and/or Equipment--Use Buddy System For Heavy, Awkward Loads--Distribute Loads Evenly
Struck By/Against Heavy Equipment	Only Qualified employees will be authorized to a operate Heavy equipment--Approach Equipment Within The Operators View--Equipped With Back-Up Alarm/Seatbelt--Inspect Equipment Regularly--Hand Signal By DESIGNATED Worker
Walking/Working Surface	Good Housekeeping Practices--Keep Walkways And Work Areas Clear Of Hoses, Cords, And Clutter--Restrict Site To Essential Personnel--Wear Appropriate Safety Shoes

ATTACHMENT 2
MATERIAL SAFETY DATA SHEETS

Material Safety Data Sheet Collection
Genium Publishing Corp.
1171 RiverFront Center
Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2000-07

Arsenic
MSDS 296
ARS2340

Section 1 - Chemical Product and Company Identification 54.1

Material Name: Arsenic
CAS Number: 7440-38-2
Chemical Formula: As
Structural Chemical Formula: As_4
Synonyms: ARSEN; ARSENIA; ARSENIC; ARSENIC-75; ARSENIC BLACK; ARSENICALS; COLLOIDAL ARSENIC; GRAY ARSENIC; GREY ARSENIC; METALLIC ARSENIC
General Use: In metallurgy for hardening copper, lead alloys. In the manufacture of certain types of glass.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
Arsenic		>98

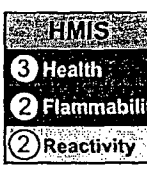
OSHA PEL
TWA: 0.5 mg/m^3; as As.

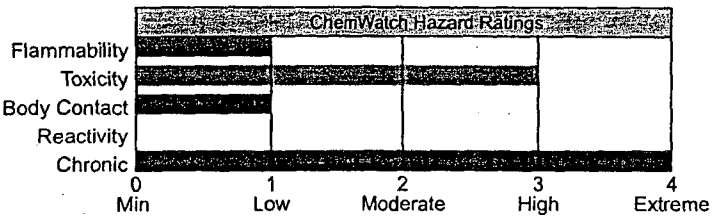
NIOSH REL
STEL: 0.002 mg/m^3; Ceiling (15 min) as As.

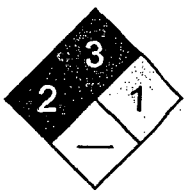
ACGIH TLV
TWA: 0.01 mg/m^3; as As.

IDLH Level
5 mg/m^3; as As.

Section 3 - Hazards Identification







Fire Diamond

ANSI Signal Word
Warning!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Brittle, crystalline, silvery-black metal. Irritating to eyes/skin/respiratory tract. Also causes: damage to blood-forming organs, nervous and cardiovascular systems. Cancer hazard. Generally found as a powder which is flammable.

Potential Health Effects

Primary Entry Routes: inhalation, ingestion of dust and fumes, skin absorption
Target Organs: liver, kidneys, skin, lungs, lymphatic system
Acute Effects
Inhalation: The dust is toxic and discomforting to the upper respiratory tract and lungs.
Acute inhalation exposure can cause cough, chest pain, shortness of breath, dizziness, headache, pulmonary edema and extreme general weakness.
Prolonged or repeated exposure can cause perforation of the nasal septum.
High exposures can cause poor appetite, nausea, vomiting and muscle cramps. Heart effects with abnormal EKG can also occur with very high exposures.
Eye: The dust may produce eye discomfort causing smarting, pain and redness.
Skin: The material is moderately discomforting to the skin and may be harmful.
Exposure may result in abnormal redness (caused by capillary congestion), burning, itching, swelling, skin eruptions and dermatitis.
Toxic effects may result from skin absorption.

Repeated skin contact can cause thickened skin and/or patchy areas of darkening and loss of pigment. Some persons develop white lines on the nails.

Ingestion: The solid/dust is discomforting to the gastrointestinal tract and is toxic and may be fatal if swallowed. Symptoms of acute poisoning by ingestion, which develop within 4 hours include epigastric pain, vomiting and watery diarrhea. Blood may appear in vomitus and stools. If amount ingested is sufficiently high, shock may develop, followed by death within 24 hours.

Considered an unlikely route of entry in commercial/industrial environments.

Carcinogenicity: NTP - Class 1, Known to be a carcinogen; IARC - Group 1, Carcinogenic to humans; OSHA - Listed as a carcinogen; NIOSH - Listed as carcinogen; ACGIH - Class A1, Confirmed human carcinogen; EPA - Class A, Human carcinogen; MAK - Class A1, Capable of inducing malignant tumors as shown by experience with humans.

Chronic Effects: Symptoms of chronic poisoning by inhalation include weight loss, nausea and diarrhea alternating with constipation, pigmentation and eruption of the skin, loss of hair, peripheral neuritis, blood disorders (anemia), striations on fingernails and toenails.

Long-term exposure can cause an ulcer or hole in the 'bone' dividing the inner nose. Hoarseness and sore eyes also occur.

High or repeated exposure can cause nerve damage with 'pins and needles', burning, numbness, and later weakness of arms and legs. Repeated exposure can also damage the liver, causing narrowing of the blood vessels, or interfere with the bone marrow's ability to make red blood cells.

Many cases of skin cancer have been reported among people exposed to arsenic through medical treatment with inorganic trivalent arsenic compounds. In some instances skin cancers have occurred in combination with other cancers, such as liver angiosarcoma, intestinal and urinary bladder carcinomas and meningioma. Epidemiological studies of cancer after medical treatment have shown an excess of skin cancers but no clear association with other cancers has been shown. An association between environmental exposure to arsenic through drinking water and skin cancer has been observed and confirmed. Epidemiological studies in areas where drinking water contained 0.35-1.14 mg/l arsenic elevated risks for cancers of the bladder, kidney, skin, liver, lung and colon in both men and women. Occupational exposure to inorganic arsenic, especially in mining and copper smelting, has consistently been associated with an increased risk of cancer. An almost tenfold increase in the incidence of lung cancer was found in workers most heavily exposed to arsenic and relatively clear dose-response relationships have been obtained with regard to cumulative exposure. Other smelter worker populations have been shown to have consistent increases in lung cancer incidence, as well as increases of about 20% in the incidence of gastrointestinal cancer and of 30% for renal cancer and hematolymphatic malignancies.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air. Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and wash continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Quickly but gently, wipe material off skin with a dry, clean cloth.

Immediately remove all contaminated clothing, including footwear.

Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

Ingestion: Contact a Poison Control Center.

If swallowed, and if more than 15 minutes from a hospital, induce vomiting, preferably using Ipecac Syrup APF.

Note: DO NOT INDUCE VOMITING in an unconscious person

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short term repeated exposures to arsenic, soluble compounds:

Treat as per arsenic poisoning.

1. Acute skin lesions such as contact dermatitis usually do not require other treatment than removal from exposure.
2. If more severe symptoms of the respiratory system, the skin or the gastrointestinal tract occur, British Anti-Lewisite (BAL, dimercaprol) may be given. Prompt administration in such cases is vital; to obtain maximum benefit such treatment should be administered within 4 hours of poisoning.
3. In addition, general treatment such as prevention of further absorption from the gastrointestinal tract are mandatory.
4. General supportive therapy such as maintenance of respiration and circulation, maintenance of water and electrolyte balance and control of nervous system effects, as well as elimination of absorbed poison through dialysis and exchange transfusion, may be used if feasible.
5. Dimercaprol is given by deep intramuscular injection as a 5% solution in peanut oil (or a 10% solution with benzyl-benzoate in vegetable oil). It is usually given in a dose of 3 mg/kg, 4-hourly, for the first two days, or twice daily for up to seven days.
6. BAL Therapy is effective for hematological manifestations of chronic arsenic poisoning but not for neurological symptoms. Watch for side effects (e.g. urticaria, burning sensation in the lips, mouth and throat, fever, conjunctivitis etc).

7. Some relief results from administration of diphenhydramine (Benadryl) (1.5 mg/kg intramuscularly or by mouth every 6 hour).

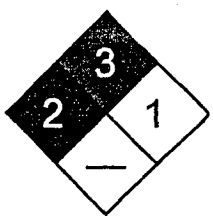
BIOLOGICAL EXPOSURE INDEX - BEI (Notice of Intent to Establish) BEIs represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
Inorganic arsenic metabolites in urine	50 ug/g creatinine	End of workweek	B

B: Background levels occur in specimens collected from subjects NOT exposed
Consult specific documentation.

Section 5 - Fire-Fighting Measures

Flash Point: Noncombustible solid
Extinguishing Media: Use fire fighting procedures suitable for surrounding area.
General Fire Hazards/Hazardous Combustion Products: Solid which exhibits difficult combustion or is difficult to ignite.
Avoid generating dust, particularly clouds of dust in a confined or unventilated space. Dust may form an explosive mixture with air, and any source of ignition, i.e. flame or spark, will cause fire or explosion.



Fire Diamond

Dry dust can be charged electrostatically by turbulence, pneumatic transport, pouring, in exhaust ducts and during transport. Build-up of electrostatic charge may be prevented by bonding and grounding.
Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.
Decomposes on heating and produces toxic fumes of arsenic oxides (AsO_x).
Fire Incompatibility: Avoid contact with acids, oxidizing agents, halogens.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear breathing apparatus plus protective gloves for fire only. Prevent, by any means available, spillage from entering drains or waterways.
Use fire fighting procedures suitable for surrounding area.
Do not approach containers suspected to be hot.
Cool fire exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.
Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: Clean up all spills immediately. Wear protective clothing, impervious gloves and safety glasses. Increase ventilation.
Use a vacuum or a wet method to reduce dust during clean-up. DO NOT dry sweep.
Place in suitable containers for disposal.
Wash area down with large quantity of water and prevent runoff into drains.
Large Spills: POLLUTANT -contain spillage. Clear area of personnel and move upwind.
Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
If contamination of drains or waterways occurs, advise emergency services.
Shut off all possible sources of ignition and increase ventilation.
Stop leak if safe to do so.
Contain spill with sand, earth or vermiculite.
Use dry clean up procedures and avoid generating dust.
Collect recoverable product into labeled containers for recycling. Collect residues and seal in labeled drums for disposal.
Wash area down with large quantity of water and prevent runoff into drains.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Use good occupational work practice.
Avoid contact with skin and eyes.

Avoid generating and breathing dust.
Use in a well-ventilated area.
Wear protective clothing when risk of exposure occurs.
Avoid sources of heat. Avoid contact with incompatible materials. Avoid physical damage to containers.
Keep containers securely sealed when not in use.
When handling, DO NOT eat, drink or smoke.
Wash hands with soap and water after handling.
Work clothes should be laundered separately: NOT at home.

Recommended Storage Methods: Glass container. Plastic drum. Polyethylene or polypropylene container. Steel drum. Metal drum.
Check that containers are clearly labeled.

Storage Requirements: Observe manufacturer's storing and handling recommendations.
Store in a cool, dry place. Store in a well-ventilated area. Store away from sources of heat or ignition/bare lights.
Avoid storage at temperatures higher than 60 °C. Store away from incompatible materials. Store away from foodstuff containers.
Protect containers against physical damage.
Keep containers securely sealed.
Check regularly for spills and leaks.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: General exhaust is adequate under normal operating conditions.
Local exhaust ventilation may be required.
Use ventilated helmet or air-line hood to provide clean air at the breathing zone.
If risk of overexposure exists, wear NIOSH approved respirator. Correct fit is essential to obtain adequate protection.

Personal Protective Clothing/Equipment

Eyes: Safety glasses. Chemical goggles.
Full face shield.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Impervious, gauntlet length gloves; Rubber gloves. Neoprene gloves.
Rubber boots.

Respiratory Protection:
Exposure Range >0.01 to 0.1 mg/m^3: Air Purifying, Negative Pressure, Half Mask
Exposure Range >0.1 to 1 mg/m^3: Air Purifying, Negative Pressure, Full Face
Exposure Range >1 to <5 mg/m^3: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range 5 to unlimited mg/m^3: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: magenta (P100)

Other: Overalls. PVC apron. PVC protective suit may be required if exposure severe.
Eyewash unit. Ensure there is ready access to a safety shower.
* Preplacement and periodic medical examinations are essential for workers exposed to arsenic. Preplacement physical examinations should give particular attention to allergic and chronic skin lesions, eye disease, psoriasis, chronic eczematous dermatitis, hyperpigmentation of the skin, keratosis and warts, baseline weight, baseline blood and hemoglobin counts, baseline urinary arsenic determinations.
Annual physical examinations should give attention to general health, weight, skin condition, and any evidence of excessive exposure or absorption of arsenic.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Grey, shiny, brittle, metallic-looking rhombohedral crystals. Can be heated to burn in air with a bluish flame, giving off an odor of garlic and dense white fumes of arsenic trioxide. Loses its luster on exposure to air. Converted by nitric acid or hot sulfuric acid into arsenous or arsenic acid.
Brinell hardness: 147
Mohs' scale: 3.5

Physical State: Divided solid
Vapor Pressure (kPa): Not applicable
Vapor Density (Air=1): Not applicable
Formula Weight: 74.92
Specific Gravity (H_2O=1, at 4 °C): 5.73
Water Solubility: Insoluble
Evaporation Rate: Not applicable
pH: Not applicable

pH (1% Solution): Not applicable
Boiling Point Range: Sublimes
Freezing/Melting Point Range: 817 °C (1502.6 °F) at 28 atm
Volatile Component (% Vol): Not applicable

Section 10 - Stability and Reactivity

Stability/Polymerization: Contact with acids liberates toxic gases. Presence of heat source and ignition source. Product is considered stable under normal handling conditions. Hazardous polymerization will not occur.
Storage Incompatibilities: Segregate from oxidizing agents, halogens.
Contact with acids produces toxic fumes.

Section 11 - Toxicological Information

Unless otherwise specified data extracted from RTECS - Registry of Toxic Effects of Chemical Substances

TOXICITY
Oral (man) TD_{Lo}: 7857 mg/kg/55 years
Oral (rat) LD_{50}: 763 mg/kg
Tumorigenic - Carcinogenic by RTECS criteria.

IRRITATION
Nil reported

See NIOSH, *RTECS* CG 0525000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: Food chain concentration potential: Bioaccumulated by fresh water and marine aquatic organisms
BCF: bioaccumulated by aquatic organisms
Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Follow all federal, state, and local regulations.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: ARSENIC
Hazard Class: 6.1
ID No.: 1558
Packing Group: II
Label: Poison [6]

Additional Shipping Information:

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 307(a); per CAA Section 112 1 lb (0.454 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Research Date: .....1999-11 **Review Date:** 2000-07

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Material Safety Data Sheet Collection
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Issue Date: 2000-07

Chromium
MSDS 83
CHR4520

Section 1 - Chemical Product and Company Identification 54.1

Material Name: Chromium
CAS Number: 7440-47-3
Chemical Formula: Cr
Structural Chemical Formula: Cr
Synonyms: CHROM; CHROME; CHROMIUM; CHROMIUM METAL
General Use: Used in the manufacture of chrome-steel or chrome-nickel-steel alloys (stainless steel); for greatly increasing resistance and durability of metals; for chrome-plating of other metals.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
chromium	7440-47-3	> 99.5

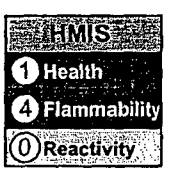
OSHA PEL
TWA: 1 mg/m^3; as Cr. Other Values: 0.1 mg/m^3; Clg Cr-VI as CrO_3.

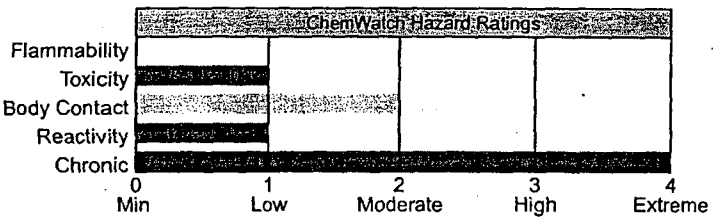
ACGIH TLV
TWA: 0.5 mg/m^3.

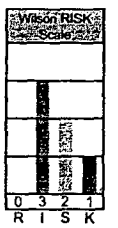
NIOSH REL
TWA: 0.5 mg/m^3; as Cr;Cr-II;Cr-III;Cr(VI)=.001.

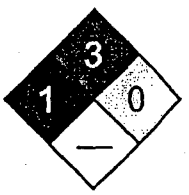
IDLH Level
250 mg/m^3; as Cr.

Section 3 - Hazards Identification









Fire Diamond

ANSI Signal Word
Warning!

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Steel-gray, lustrous metal powder; odorless. Irritating to eyes/skin/respiratory tract. Chronic: exposure to chromium fumes can cause fibrosis of the lungs with decreased function. Flammable. Explosive in air.

Potential Health Effects

Primary Entry Routes: inhalation, skin absorption, ingestion
Target Organs: respiratory system
Acute Effects
Inhalation: The dust may be discomforting to the upper respiratory tract and may be harmful if inhaled.
Chrome fume is irritating to the respiratory tract and lungs.
Toxic effects result from over-exposure.
Asthmatic conditions may result as a consequence of the sensitizing action of chrome VI compounds.
Eye: The dust may produce eye discomfort and abrasive eye inflammation.
Skin: The material may be mildly discomforting to the skin and is capable of causing skin reactions which may lead to dermatitis.
Chrome fume, as the chrome VI oxide, is corrosive to the skin and may aggravate pre-existing skin conditions such as dermatitis and eczema.
As a potential skin sensitizer, the fume may cause dermatoses to appear suddenly and without warning. Absorption of chrome VI compounds through the skin can cause systemic poisoning effecting the kidneys and liver.

Ingestion: The material is moderately discomforting to the gastrointestinal tract and may be harmful if swallowed in large quantity.

Carcinogenicity: NTP - Listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A4, Not classifiable as a human carcinogen; EPA - Not listed; MAK - Not listed.

Chronic Effects: Metallic dusts generated by the industrial process give rise to a number of potential health problems. The larger particles, above 5 micron, are nose and throat irritants. Smaller particles however, may cause lung deterioration. Particles of less than 1.5 micron can be trapped in the lungs and, dependent on the nature of the particle, may give rise to further serious health consequences.

Chromium(III) is considered an essential trace nutrient serving as a component of the "glucose tolerance factor" and a cofactor for insulin action. High concentrations of chromium are also found in RNA. Trivalent chromium is the most common form found in nature.

Chronic inhalation of trivalent chromium compounds produces irritation of the bronchus and lungs, dystrophic changes to the liver and kidney, pulmonary edema, and adverse effects on macrophages. Intratracheal administration of chromium(III) oxide, in rats, increased the incidence of sarcomas, and tumors and reticulum cell sarcomas of the lung. There is inadequate evidence of carcinogenicity of chromium(III) compounds in experimental animals and humans (IARC).

Chronic exposure to hexavalent chromium compounds reportedly produces skin, eye and respiratory tract irritation, yellowing of the eyes and skin, allergic skin and respiratory reactions, diminished sense of smell and taste, blood disorders, liver and kidney damage, digestive disorders and lung damage. There is sufficient evidence of carcinogenicity of chromium(VI) compounds in experimental animals and humans to confirm these as Class 1 carcinogens (IARC).

Exposure to chromium during chrome production and in the chrome pigment industry is associated with cancer of the respiratory tract. A slight increase in gastrointestinal cancer following exposure to chromium compounds has also been reported. The greatest risk is attributed to exposure to acid- soluble, water-insoluble hexavalent chromium which occurs in roasting and refining processes. Animal studies support the idea that the most potent carcinogenic compounds are the slightly soluble hexavalent compounds.

The cells are more active in the uptake of the hexavalent forms compared to trivalent forms and this may explain the difference in occupational effect. It is the trivalent form, however, which is metabolically active and binds with nucleic acid within the cell suggesting that chromium mutagenesis first requires biotransformation of the hexavalent form by reduction.

Hexavalent chromes produce chronic ulceration of skin surfaces (quite independent of other hypersensitivity reactions exhibited by the skin).

Water-soluble chromium(VI) compounds come close to the top of any published "hit list" of contact allergens (eczematogens) producing positive results in 4 to 10% of tested individuals. On the other hand only chromium(III) compounds can bind to high molecular weight carriers such as proteins to form a complete allergen (such as a hapten). Chromium(VI) compounds cannot.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Encourage patient to blow nose to ensure clear breathing passages. Rinse mouth with water. Consider drinking water to remove dust from throat.

Seek medical attention if irritation or discomfort persist.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water). Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.

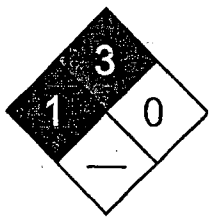
Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Long term exposure to high dust concentrations may cause changes in lung function i.e. pneumoconiosis; caused by particles less than 0.5 micron penetrating and remaining in the lung. Prime symptom is breathlessness; lung shadows show on X-ray.

Section 5 - Fire-Fighting Measures

Flash Point: Noncombustible Solid
Autoignition Temperature: 580 °C (cloud)
LEL: Not applicable
UEL: Not applicable
Extinguishing Media: Sand, dry powder extinguishers or other inerts should be used to smother dust fires.
These are the only suitable means for extinguishing metal dust fires.
Do NOT use water.



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Sand, dry powder extinguishers or other inerts should be used to smother dust fires.
These are the only suitable means for extinguishing metal dust fires.
Do NOT use water.
Fire Incompatibility: Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Clean up all spills immediately. Avoid contact with skin and eyes.
Wear impervious gloves and safety glasses.
Remove all ignition sources.
Use dry clean-up procedures and avoid generating dust.
Vacuum up or sweep up.
Place spilled material in clean, dry, sealable, labeled container.
Large Spills: Clear area of personnel.
Contact fire department and tell them location and nature of hazard.
Control personal contact by using protective equipment.
Prevent, by any means available, spillage from entering drains or water ways.
Moderate hazard.
No smoking, bare lights or ignition sources. Increase ventilation.
Stop leak if safe to do so.
Avoid generating dust.
Collect recoverable product into labeled containers for recycling.
Collect residues and seal in labeled drums for disposal.
Wash area down with large quantity of water and prevent runoff into drains.
After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Limit all unnecessary personal contact.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area. When handling DO NOT eat, drink or smoke.
Always wash hands with soap and water after handling.
Avoid physical damage to containers. Use good occupational work practices.
Observe manufacturer's storing and handling recommendations.
Recommended Storage Methods: Packaging as recommended by manufacturer.
Check that containers are clearly labeled.
Store in metal drums or safety cans.
Plastic container.
Metal can.
Metal drum.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Metal dusts must be collected at the source of generation as they are potentially explosive.
1. Vacuum cleaners, of flame-proof design, should be used to minimize dust accumulation.

2. Metal spraying and blasting should, where possible, be conducted in separate rooms. This minimizes the risk of supplying oxygen, in the form of metal oxides, to potentially reactive finely divided metals such as aluminum, zinc, magnesium or titanium.
3. Work-shops designed for metal spraying should possess smooth walls and a minimum of obstructions, such as ledges, on which dust accumulation is possible.
4. Wet scrubbers are preferable to dry dust collectors.
5. Bag or filter-type collectors should be sited outside the workrooms and be fitted with explosion relief doors.
6. Cyclones should be protected against entry of moisture as reactive metal dusts are capable of spontaneous combustion in humid or partially wetted state.
7. Local exhaust systems must be designed to provide a minimum capture velocity at the fume source, away from the worker, of 0.5 meter/sec.

Special ventilation requirements apply for processes which result in the generation of barium, chromium, lead, or nickel fume and in those processes which generate ozone.

The use of mechanical ventilation by local exhaust systems is required as a minimum in all circumstances (including outdoor work).

(In confined spaces always check that oxygen has not been depleted by excessive rusting of steel or snowflake corrosion of aluminum). Local exhaust systems must be designed to provide a minimum capture velocity at the fume source, away from the worker, of 0.5 meter/sec.

Personal Protective Clothing/Equipment

Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: PVC gloves; Safety footwear.
Rubber gloves.

Respiratory Protection:

Exposure Range >1 to 10 mg/m^3: Air Purifying, Negative Pressure, Half Mask
Exposure Range >10 to 100 mg/m^3: Air Purifying, Negative Pressure, Full Face
Exposure Range >100 to <250 mg/m^3: Supplied Air, Constant Flow/Pressure Demand, Half Mask
Exposure Range 250 to unlimited mg/m^3: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: dust/mist filter (use P100 or consult supervisor for appropriate dust/mist filter)

Other: Overalls. Eyewash unit.

Section 9 - Physical and Chemical Properties

Appearance/General Info: A hard, brittle, lustrous, steel-grey metal which is very resistant to corrosion. Soluble in dilute sulphuric and hydrochloric acids. Welding flux grades typical sieve analysis (cumulative retention %):- 200 um 0, 150 um 10-40, 100 50-80, 75 um 80-95, 63 um 90-96, 43 um 97-100.

Physical State: Divided solid
Vapor Pressure (kPa): 0.13 at 1616 °C
Vapor Density (Air=1): 1.79
Formula Weight: 52.00
Specific Gravity (H_2O=1, at 4 °C): 7.2
Water Solubility: Insoluble in water
Evaporation Rate: Not applicable
pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point Range: 2642 °C (4788 °F)
Freezing/Melting Point Range: 1900 °C (3452 °F)
Volatile Component (% Vol): Nil
Decomposition Temperature (°C): Not applicable

Section 10 - Stability and Reactivity

Stability/Polymerization: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Segregate from strong oxidizers, nitric oxide, potassium chlorate, sulfur dioxide, acids and strong alkalis.

Section 11 - Toxicological Information

No relevant toxicological data found at time of research.

See NIOSH, *RTECS* GB 4200000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: No data found.
BCF: snails 1 x10^6
Biochemical Oxygen Demand (BOD): 62.5 lb/lb, 5 days

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options. Follow applicable federal, state, and local regulations.
Bury residue in an authorized landfill.
Recycle containers if possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: None
Hazard Class: None
ID No.: None
Packing Group: None
Label: No class label assigned

Additional Shipping Information:

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 307(a) 5000 lb (2268 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Research Date:.....1999-11 **Review Date:** 2000-07

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Material Safety Data Sheet Collection

Cadmium **MSDS No. 23**

Issue Date: 1999-10

Section 1 - Chemical Product and Company Identification 53

Product/Chemical Name: Cadmium
Chemical Formula: Cd
CAS Number: 7440-43-9 **EINECS Number:** 231-152-8
Synonyms: colloidal cadmium
Derivation: Cadmium is collected as dust or fume from roasting zinc ores, mixed with coal or coke and sodium or zinc chloride, and sintered. The cadmium fume is collected in an electrostatic precipitator, leached, fractionally precipitated, and distilled; collected as sludge from zinc sulfate purification; prepared from direct distillation of cadmium-bearing zinc; obtained by recovery from electrolytic zinc process; may be prepared from cadmium sulfate in the laboratory.
General Use: Cadmium is used as a constituent of easily fusible alloys; soft solder and solder for aluminum; in electroplating; as a deoxidizer for nickel plating; for process engraving; electrodes for cadmium vapor lamps; photoelectric cells; photometry of ultraviolet sun-rays; in Ni-Cd storage batteries; to charge Jones reductors; as an amalgam in dentistry; power transmission wire; TV phosphors; basis of pigments used in ceramic glazing, machinery enamels, baking enamels; Weston-standard-cell control of atomic fission in nuclear reactors; reactor control rods; fungicide; photography and lithography; selenium rectifiers.
Vendors: Consult the latest *Chemical Week Buyers' Guide.* (73)

Section 2 - Composition / Information on Ingredients

Cadmium, ca 99.5+% wt
Trace Impurities: < 10 ppm

OSHA PELs
8-hr TWA: 0.005 mg/m^3
Fume* TWA: 0.1 mg/m^3; Ceiling 0.3 mg/m^3
Dust* TWA: 0.2 mg/m^3; Ceiling 0.6 mg/m^3

ACGIH TLVs
TWA: 0.01 mg/m^3 (inhalable fraction); 0.002 mg/m^3 (respirable fraction)

NIOSH REL
Reduce to lowest feasible level (LOQ 0.1 mg/m^3)

DFG (Germany) MAK
None established

IDLH Level
9 mg/m^3

AIHA WEEL
8-hr Dust TWA: (0.002 mg/m^3)

*Applies to operations or sectors for which the cadmium standard, 1910.1027, is stayed or otherwise not in effect.

Section 3 - Hazards Identification

ANSI Signal Word: Danger!

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Cadmium is a lustrous metal solid of silver-white to bluish color without odor. It is toxic by inhalation. Cadmium is irritating to the respiratory tract and mildly irritating to the skin. Chronic health effects include kidney damage and obstructive lung disease. Cadmium dust ignites spontaneously in air. It is an experimental carcinogen and teratogen.

Wilson Risk Scale	
R	1
I	4
S	1
K	1

HMIS	
H	3*
F	4**
R	0
PPE†	

*Chronic effects
** Fine dust
†Sec. 8

Potential Health Effects

Primary Entry Routes: Inhalation and ingestion
Target Organs: Respiratory system, kidneys
Acute Effects
Inhalation: Initial signs/symptoms of cadmium poisoning resemble those of the flu. Inhalation of dust or fumes causes throat dryness, cough, headache, vomiting, chest pain, dyspnea (shortness of breath), central nervous system (CNS) effects, extreme restlessness and irritability, pneumonitis, possibly bronchopneumonia, pulmonary edema, and death due to respiratory failure in severe cases. Symptoms may be delayed up to 24 hours. Residual emphysema and fibrosis may result. Note: heating of cadmium may produce cadmium oxide, the inhalation of which can result in metal fume fever, characterized by fever, chills, malaise, headache, myalgias, fatigue, cough, thirst, and abdominal discomfort, with symptom onset about 3 to 10 hours after exposure. Symptoms do not usually last beyond 24 to 48 hours.
Eye: May cause irritation.
Skin: Contact may cause irritation, skin eruptions and pruritus. Significant dermal absorption rarely occurs.
Ingestion: Causes increased salivation, dry mouth, choking, nausea, vomiting, abdominal pain and cramping, blurred vision, anemia, kidney dysfunction, diarrhea, gastroenteritis, and substernal pain.
Carcinogenicity: IARC - Group 1, Carcinogenic to humans; NIOSH - listed as carcinogen; NTP - Class 2A, Reasonably anticipated to be a carcinogen; OSHA - listed as a carcinogen; EPA - Class B1, Probable human carcinogen based on epidemiologic studies; MAK - Class A2, Unmistakably carcinogenic in animal experimentation only; ACGIH - A2, Suspected human carcinogen.

Medical Conditions Aggravated by Long-Term Exposure: Kidney disorders, respiratory disorders.
Chronic Effects: Include chronic obstructive lung disease such as emphysema, kidney damage (renal tubular disorder and proteinuria (low molecular weight)), bone demineralization, microfractures and osteomalacia, respiratory cancer, gastrointestinal symptoms, anosmia (loss of sense of smell), rhinitis and discoloration of the teeth. It is implicated as the causative agent in Itai-Itai disease in Japan.

Section 4 - First Aid Measures

Inhalation: Remove exposed person to fresh air and support breathing as needed.
Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 minutes. Consult a physician or ophthalmologist if pain or irritation persist.
Skin Contact: Quickly remove contaminated clothing. Rinse with flooding amounts of water. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Consider a chest X-ray after acute exposure.

Section 5 - Fire-Fighting Measures

NFPA

Flash Point: Data not found.
Autoignition Temperature: 482 °F (250 °C) (layer cadmium metal dust)
LEL: Data not found.
UEL: Data not found.
OSHA Flammability Classification: Flammable
Extinguishing Media: Extinguish with carbon dioxide, dolomite, dry powder, graphite, soda ash, sodium chloride, dry chemical, or sand.
Unusual Fire or Explosion Hazards: The finely divided material is pyrophoric. The more finely divided the powder the greater the fire/explosion hazard.
Hazardous Combustion Products: When heated to decomposition, toxic fumes of cadmium are emitted.
Fire-Fighting Instructions: *Do not* release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

Section 6 - Accidental Release Measures

Spill /Leak Procedures: Notify safety personnel, evacuate all unnecessary personnel, remove heat and ignition sources. Isolate and ventilate area, deny entry, stay upwind. Cleanup personnel should protect against exposure (Sec. 8). Prevent entry into water, sewers, basements or confined areas.
Small Spills: If in solid form, *do not* sweep! Absorb or cover with dry earth, sand or other noncombustible material. Carefully scoop up or vacuum (with a HEPA filter).
Large Spills: *Do not* release into sewers or waterways.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120 and 1910.1027).

Section 7 - Handling and Storage

Handling Precautions: Wear personal protective clothing and equipment to prevent dust inhalation and any contact with skin or eyes (Sec. 8). Wash thoroughly after handling cadmium.
Storage Requirements: Store in tightly closed containers in a cool, well-ventilated area away from heat, light, ignition sources, incompatibles, and air. Cadmium slowly oxidizes in air to form cadmium oxide.
Regulatory Requirements: Areas where cadmium is used or stored must be labeled according to 29 CFR 1910.1027.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Where feasible, enclose operations to avoid dust dispersion into the work area.
Ventilation: Provide general or local exhaust ventilation systems to maintain airborne concentrations below exposure limits (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.
Administrative Controls: Educate workers about the health and safety hazards associated with this material. Train in work practices which minimize exposure. Consider preplacement and periodic medical exams with emphasis on kidney functions (including urine screening for micro-globulins), lungs and blood. Follow written procedures set forth by OSHA in 29 CFR 1910.1027.
Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. Select respirator based on exposure range as follows. Exposure range >0.005 to 0.05 mg/m^3 use air purifying respirator, negative-pressure, half-mask; >0.05 to 0.5 mg/m^3 use air purifying respirator, negative-pressure, full-face; >0.5 to 5 mg/m^3/use supplied-air respirator, constant flow/pressure-demand, full-face; >5 mg/m^3/use a SCBA, pressure-demand, full-face. Use a magenta cartridge (P100). For emergency or nonroutine

operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, cartridge change schedules, and convenient, sanitary storage areas.

Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent any skin contact. Butyl rubber, chlorinated polyethylene, and polyvinyl chloride are recommended materials. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not protective eye devices. Appropriate eye protection must be worn instead of, or in conjunction with, contact lenses.

Safety Stations: Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment.

Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9 - Physical and Chemical Properties

Physical State: Solid; lustrous metal or granular powder
Color: Silver-white, blue-tinged
Odor: Odorless
Vapor Pressure: 1 mm Hg at 741 °F (394 °C)
Formula Weight: 112.41
Density: 8.642 at 77 °F (25 °C)
Water Solubility: Insoluble
Other Solubilities: Dissolved by acids; ammonium nitrate solution
Boiling Point: 1409 °F (765 °C)
Melting Point: 609.8 °F (321 °C)
Refractive Index: 1.8 at 578 nm and 20 °C/D
Ionization Potential (eV): 8.99367

Section 10 - Stability and Reactivity

Stability: Cadmium is stable at room temperature in closed containers under normal storage and handling conditions. It slowly oxidizes in air to form cadmium oxide. Finely divided material is pyrophoric, i.e., it may ignite or explode spontaneously in air.

Polymerization: Hazardous polymerization cannot occur.

Chemical Incompatibilities: Include acids (reacts readily with dilute nitric acid, slowly with hydrochloric acid); explodes on contact with hydrazoic acid; violent or explosive reaction when heated with ammonium nitrate; tellurium; zinc; ammonia; sulfur; selenium; nitryl fluoride; oxidizing agents; metals.

Conditions to Avoid: Avoid creation of dust clouds, contact with chemical incompatibles, heat, and sources of ignition.

Hazardous Decomposition Products: Thermal oxidative decomposition of cadmium can produce toxic fumes of cadmium and cadmium oxide.

Section 11 - Toxicological Information

Toxicity Data:*

Acute Dermal Effects:
Rabbit, subcutaneous, LD_{Lo}: 6 mg/kg

Acute Inhalation Effects:
Human, inhalation, LC_{Lo}: 39 mg/m^3/20 minutes produced cardiac changes; respiratory depression.
Rat, inhalation, LC_{50}: 25 mg/m^3/30 minutes produced dyspnea.

Acute Oral Effects:
Rat, oral, LD_{50}: 2330 mg/kg
Mouse, oral, LD_{50}: 890 mg/kg

Multiple Dose Toxicity Data:
Human, inhalation, TC_{Lo}: 88 µg/m^3/8.6 years produced proteinuria.
Rat, oral, 546 mg/kg administered for 26 weeks continuously produced toxic effects: changes in serum composition; transminases; weight loss or decreased weight gain.
Rat, oral, 1512 mg/kg administered for 48 weeks continuously produced toxic effects: changes to liver, kidneys, ureter and bladder.

Tumorigenic Effects:
Woman, inhalation, 129 µg/m^3/20 years, continuous produced toxic effects: carcinogenic by RTECS criteria; Lung, thorax or respiration - tumors.
Rat, subcutaneous, 3372 µg/kg produced toxic effects: carcinogenic by RTECS criteria, tumors at site of application.

Genetic Effects:
Mouse, micronucleus test, cell type - embryo: 6 µmol/L induced mutation.
Hamster, cytogenic analysis, cell type - ovary: 1 µmol/L induced mutation.

Reproductive Effects:
Rat, female, oral, 23 mg/kg administered on gestational days 1 - 22 produced specific developmental abnormalities - blood and lymphatic system (including spleen and marrow).
Rat, female, oral, 21.5 mg/kg administered to multigenerations produced toxic effects: Effects on fertility - preimplantation mortality; Effects on newborn - germ cell effects in offspring.
Rat, male, oral, 155 mg/kg administered 13 weeks prior to mating produced toxic effects: Effects on newborn - reduced weight gain and behavioral.

* See NIOSH, *RTECS* (EU9800000), for additional toxicity data.

Section 12 - Ecological Information

Ecotoxicity: *Dreisena polymorpha*, zebra mussels, chronic LC_{50}: 130 mcg/L; *Rivulus marmoratus*, mangrove fish, LC_{50} in fresh water: 2.96 mg/L; Steelhead trout, LC_{50}: 0.0009 ppm for 96 hours; *Daphnia magna*, 0.1 ppm lethal.
Environmental Fate: Data not found.

Section 13 - Disposal Considerations

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable federal, state, and local regulations.
Disposal Regulatory Requirements: Dispose of according to EPA regulations.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: Cadmium compounds
Shipping Symbols: -
Hazard Class: 6.1
ID No.: UN2570
Packing Group: III
Label: Keep away from food
Special Provisions (172.102): -

Packaging Authorizations
a) Exceptions: 173.153
b) Non-bulk Packaging: 173.213
c) Bulk Packaging: 173.240

Quantity Limitations
a) Passenger Aircraft/Rail: 100 kg
b) Cargo Aircraft Only: 200 kg

Vessel Stowage Requirements
a) Vessel Stowage: A
b) Other: -

Section 15 - Regulatory Information

EPA Regulations:
Listed as a RCRA Hazardous Waste (40 CFR 261.33); RCRA Hazardous Waste Number: D006
Listed as a CERCLA Hazardous Substance (40 CFR 302.4) specific per (2) CWA, Sec. 307(a)
CERCLA Final Reportable Quantity (RQ): 10 lb (4.54 kg)
Listed as a SARA Toxic Chemical (40 CFR 372.65)
SARA EHS (Extremely Hazardous Substance) (40 CFR 355): Not listed
Toxic Substances Control Act (TSCA): Listed

OSHA Regulations:
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-1-A)
OSHA Specifically Regulated Substance (29 CFR 1910.1027)

Section 16 - Other Information

References: 1, 99, 124, 136, 149, 161, 176, 164, 198, 209, 216, 222, 225, 226, 227, 230, 233, 234

Prepared By ..... M. Adams, Ph.D/S Fleming, BS
Research Date 1999-3
Review Date 1999-7
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Medical Review ..... T Thoburn, MD, MPH

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Lead
MSDS 713
LEA1000

Section 1 - Chemical Product and Company Identification 54.1

Material Name: Lead **CAS Number:** 7439-92-1
Chemical Formula: Pb
Structural Chemical Formula: Pb
Synonyms: C.I. 77575; C.I. PIGMENT METAL 4; GLOVER; KS-4; LEAD; LEAD FLAKE; LEAD INORGANIC; LEAD METAL; LEAD S2; LEAD SZ; OLOW; OMAHA & GRANT; PB-S 100; PLUMBUM
General Use: Used as a construction material in chemical reaction equipment (tank piping,etc.); manufacture of tetraethyl lead; pigments for paints.
Used in pottery glazes, glass, ceramics, bearing metal and alloys, solder and other lead alloys.
Also used in metallurgy of steel and other metals, cable sheathing, storage batteries, radiation shielding and ammunition.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
lead	7439-92-1	>99

OSHA PEL
STEL: 0.05 mg/m^3; as Pb inorganic.

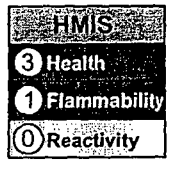
ACGIH TLV
TWA: 0.05 mg/m^3.

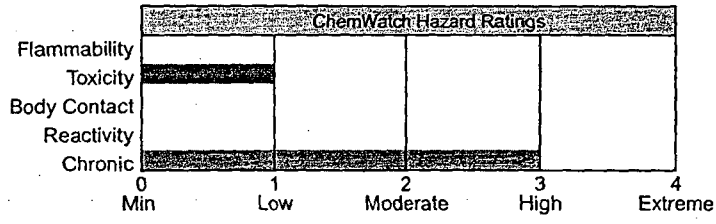
NIOSH REL
TWA: 0.1 mg/m^3.

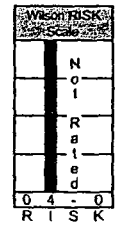
IDLH Level
100 mg/m^3; as Pb.

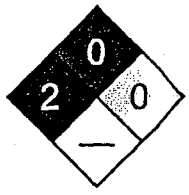
DFG (Germany) MAK
TWA: 0.1 mg/m^3.

Section 3 - Hazards Identification









Fire Diamond

ANSI Signal Word
Danger!


Poison

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Bluish-white, silvery, or gray metal. Cumulative poison. Repeated low exposures causes: severe neurological effects, blood/kidney damage. Possible cancer hazard. Reproductive damage (sterility, decreased fertility) and developmental damage to fetus.

Potential Health Effects

Primary Entry Routes: inhalation, ingestion
Target Organs: blood, central nervous system (CNS), peripheral nervous system, kidneys, gastrointestinal (GI) tract
Acute Effects
Inhalation: The dust may be discomforting to the upper respiratory tract and may be harmful if inhaled.
Eye: The dust may be discomforting to the eyes.
Skin: The material may be mildly discomforting to the skin.
Prolonged exposure may cause skin reactions.
Skin absorption is not considered a significant route of exposure.
Ingestion: The material is moderately discomforting to the gastrointestinal tract and may be harmful if swallowed.
In rats intestinal lead absorption is bidirectional and does not follow a linear relationship with oral dose.

Acute effects of exposure are generally minor because of its relative insolubility and physical form. Unusual instances of exposure have been reported in inadequately ventilated indoor firing ranges (as fume), in the application of surma, a mascara-like cosmetic agent, to the conjunctival surfaces in Asian countries and in lead-smelting and associated occupations.

In humans lead metabolism fits into a three compartment model. The first compartment in which lead has a half-life of about 35 days includes the blood; it receives blood from the gut and delivers some of it to the urine and communicates with the other two pools. The second compartment in which lead has a similar half-life includes the soft tissues which contain about half the blood level; they share lead with hair, nails, sweat, saliva, bile and other digestive secretions. The skeleton is the third compartment and contains the vast bulk of the total body burden, possesses a very long half-life and demonstrates a difference between the dense and less dense components to bind lead.

Carcinogenicity: NTP - Not listed; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class B2, Probable human carcinogen based on animal studies; MAK - Not listed.

Chronic Effects: Symptoms of exposure include headache, fatigue, sleep disturbances, abdominal pains and decreased appetite. Overexposure to lead in the form of dust has toxic effects on the lungs and kidneys and on the nervous system resulting in mental disturbances and anemia.

Skin absorption is not considered to be a significant route of exposure.

Worker exposure to lead must be kept to a minimum, especially in cases where lead is worked at temperatures whereby lead vapors are evolved e.g. metal refining.

Lead is an accumulative poison and exposure even to small amounts can raise the body's content to toxic levels.

Potential adverse effects on the offspring of pregnant workers have been cited in the literature.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If available, administer medical oxygen by trained personnel.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water.

Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

Ingestion: Rinse mouth out with plenty of water.

Seek medical attention if irritation or discomfort persist.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: 1.Gastric acids solubilize lead and its salts and lead absorption occurs in the small bowel.

2.Particles of less than 1um diameter are substantially absorbed by the alveoli following inhalation.

3.Lead is distributed to the red blood cells and has a half-life of 35 days.

It is subsequently redistributed to soft tissue & bone-stores or eliminated.The kidney accounts for 75% of daily lead loss; integumentary and alimentary losses account for the remainder.

4.Neurasthenic symptoms are the most common symptoms of intoxication.

Lead toxicity produces a classic motor neuropathy.

Acute encephalopathy appears infrequently in adults.

Diazepam is the best drug for seizures.

5.Whole-blood lead is the best measure of recent exposure; free erythrocyte protoporphyrin (FEP) provides the best screening for chronic exposure. Obvious clinical symptoms occur in adults when whole-blood lead exceeds 80 ug/dL.

6.British Anti-Lewisite is an effective antidote and enhances fecal and urinary excretion of lead. The onset of action of BAL is about 30 minutes and most of the chelated metal complex is excreted in 4-6 hours, primarily in the bile.

Adverse reaction appears in up to 50% of patients given BAL in doses exceeding 5 mg/kg. CaNa2EDTA has also been used alone or in concert with BAL as an antidote.

D-penacillamine is the usual oral agent for mobilization of bone lead; its use in the treatment of lead poisoning remains investigational.

2-3-dimercapto-1-propanesulfonic acid (DMPS) and dimercaptosuccinic acid (DMSA) are water soluble analogues of BAL and their effectiveness is undergoing review.

As a rule, stop BAL if lead decreases below 50 ug/dL; stop CaNa2EDTA if blood lead decreases below 40 ug/dL or urinary lead drops below 2 mg/24 hrs.

BIOLOGICAL EXPOSURE INDEX - BEI

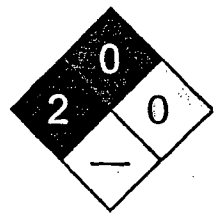
These represent the determinants observed in specimens collected from a healthy worker who has been exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
Lead in blood	50 ug/100 mL	Not Critical	B
Lead in urine	150 ug/gm creatinine	Not critical	B
Zinc Protoporphyrin in blood	250 ug/100 mL erythrocytes OR 100 ug/100 mL blood	After 1 month exposure	B

B: Background levels occur in specimens collected from subjects NOT exposed.

Section 5 - Fire-Fighting Measures

Flash Point: Not available; probably noncombustible
Autoignition Temperature: Not applicable
LEL: Not applicable
UEL: Not applicable
Extinguishing Media: There is no restriction on the type of extinguisher which may be used.
General Fire Hazards/Hazardous Combustion Products: Noncombustible.
Not considered to be a significant fire risk; however, containers may burn.
Moderate fire hazard, in the form of dust, when exposed to heat or flames.
Decomposition products may include toxic lead dust and lead oxide fumes.



Fire Diamond

Fire Incompatibility: Incompatible with strong acids, oxidants, ammonium nitrate, chlorine trifluoride and sodium azide.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Use fire fighting procedures suitable for surrounding area.
Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.
If safe to do so, remove containers from path of fire.
Cool fire-exposed containers with water spray from a protected location.
Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: Clean up all spills immediately. Avoid contact with skin and eyes.
Wear protective clothing, gloves, safety glasses and dust respirator.
Use dry clean-up procedures and avoid generating dust.
Vacuum up.
Place spilled material in clean, dry, sealable, labeled container.
Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
Control personal contact by using protective equipment and dust respirator.
Prevent spillage from entering drains, sewers or waterways.
Recover product wherever possible. Avoid generating dust. Sweep / shovel up.
If required, wet with water to prevent dusting.
Put residues in labeled plastic bags or other containers for disposal.
Wash area down with large quantity of water and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Limit all unnecessary personal contact.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area.
Avoid contact with incompatible materials.
When handling, DO NOT eat, drink or smoke.
Keep containers securely sealed when not in use. Avoid physical damage to containers. Always wash hands with soap and water after handling.
Work clothes should be laundered separately.

Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Recommended Storage Methods: Check that containers are clearly labeled.
Packaging as recommended by manufacturer.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: General exhaust is adequate under normal operating conditions.
If risk of overexposure exists, wear NIOSH-approved dust respirator.
Correct fit is essential to obtain adequate protection.
Personal Protective Clothing/Equipment
Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Impervious gloves; rubber gloves.
Rubber boots.
Protective footwear.
Respiratory Protection:
Exposure Range >0.05 to 0.5 mg/m^3: Air Purifying, Negative Pressure, Half Mask
Exposure Range >0.5 to 2.5 mg/m^3: Air Purifying, Negative Pressure, Full Face
Exposure Range >2.5 to 50 mg/m^3: Powered Air Purifying Respirator, Half or Full Facepiece or Hood
Exposure Range >50 to 100 mg/m^3: Supplied Air Respirator with Full Facepiece, Hood, Helmet, or Suit, operated in a Positive Pressure Mode
Exposure Range >100 to unlimited mg/m^3: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: magenta (P100)
Note: (29CFR 1910.1025) for general industry
Other: Overalls. Eyewash unit. Skin cleansing cream.
Provide adequate ventilation in warehouse or closed storage areas.
General and local exhaust ventilation usually required to maintain airborne dust levels to safety levels.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Bluish-white, silvery-gray metal. Malleable, lustrous when freshly cut and tarnishes when exposed to air. Reacts with strong acids like nitric acid, sulphuric or hydrochloric acid. Attacked by water in presence of oxygen. Poor electrical conductor. Lead fumes are formed at temperatures above 500-700 °C.

Physical State: Divided solid
Vapor Pressure (kPa): 0.24 at 1000 °C
Vapor Density (Air=1): Not applicable
Formula Weight: 207.19
Specific Gravity (H_2O=1, at 4 °C): 11.34
Water Solubility: Insoluble in water
Evaporation Rate: Not applicable
pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point Range: 1740 °C (3164 °F)
Freezing/Melting Point Range: 327.4 °C (621.32 °F)
Volatile Component (% Vol): Not applicable

Section 10 - Stability and Reactivity

Stability/Polymerization: Hazardous polymerization will not occur. Stable under normal storage conditions.
Storage Incompatibilities: Avoid storage with strong acids, oxidants, ammonium nitrate, chlorine trifluoride and sodium azide.

Section 11 - Toxicological Information

TOXICITY
Oral (woman) TD_{Lo}: 450 mg/kg/6 years
Inhalation (human) TC_{Lo}: 0.01 mg/m^3

IRRITATION
Nil Reported

WARNING: Lead is a cumulative poison and has the potential to cause abortion and intellectual impairment to unborn children of pregnant workers.

See NIOSH, *RTECS* OF 7525000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released or deposited on soil, it will be retained in the upper 2-5 cm of soil, especially soils with at least 5% organic matter or a pH 5 or above. Leaching is not important under normal conditions although there is some evidence to suggest that it is taken up by some plants. Generally, the uptake from soil into plants is not significant. It is expected to slowly undergo speciation to the more insoluble sulfate, sulfide, oxide, and phosphate salts. It enters water from atmospheric fallout, runoff or wastewater; little is transferred from natural ores. It is a stable metal and adherent films of protective insoluble salts form that protect the metal from further corrosion. That which dissolves tends to form ligands. It is effectively removed from the water column to the sediment by adsorption to organic matter and clay minerals, precipitation as insoluble salt (the carbonate or sulfate, sulfide), and reaction with hydrous iron and manganese oxide. Under most circumstances, adsorption predominates. It does not appear to bioconcentrate significantly in fish but does in some shellfish such as mussels. When released to the atmosphere, it will generally be in dust or adsorbed to particulate matter and subject to gravitational settling and be transformed to the oxide and carbonate.

Ecotoxicity: LC_{50} Japanese quail (Coturnix japonica), males or females, 14 days old, oral (5-day ad libitum in diet) >5,000 ppm; at 1000, 2236 & 5000 onset of toxic signs began at 7, 7 & 7 days and remissed at 11, 11 & 12 days, respectively, no mortality was observed; control references were dieldrin & dicrotophos; corn oil diluent was added to diet at ratio of 2:98 by wt; (extreme concentrations: 1,000-5,000 ppm)

BCF: freshwater fish 1.38 to 1.65

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: NONE

Additional Shipping Information:

Hazard Class: None

ID No.: None

Packing Group: None

Label: No class label assigned

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed

CERCLA 40 CFR 302.4: Listed per CWA Section 307(a) 10 lb (4.535 kg)

SARA 40 CFR 372.65: Listed

SARA EHS 40 CFR 355: Not listed

TSCA: Listed

Section 16 - Other Information

Research Date:.....1999-11 **Review Date:** 2000-07

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Material Safety Data Sheet Collection

Mercury **MSDS No. 26**

Date of Preparation: 1/77 Revision: D, 6/94

Section 1 - Chemical Product and Company Identification 44

Product/Chemical Name: Mercury
Chemical Formula: Hg
CAS No.: 7439-97-6
Synonyms: colloidal mercury, hydrargyrum, liquid silver, Quicksilver
Derivation: Obtained by roasting cinnabar (mercury sulfide) and purified by distillation, or as a by-product of gold mining.
General Use: Used in agricultural poisons, anti-fouling paint, dental amalgams, mining amalgamation (to remove gold and other metals from ore), thermometers, barometers, dry cell batteries, chlorine and caustic soda production, electrical apparatus, and as a neutron absorber in nuclear power plants.
Vendors: Consult the latest *Chemical Week Buyers' Guide.* (73)

Section 2 - Composition / Information on Ingredients

Mercury, ca 100 %wt

OSHA PEL
Ceiling: 0.1mg/m^3 (vapor and inorganic Hg)
8-hr TWA: 0.05 mg/m^3 (vapor), skin; (Vacated 1989 Final Rule Limit)

ACGIH TLVs
TWA: 0.025 mg/m^3 (inorganic compounds), skin

NIOSH REL
10-hr TWA: 0.05 mg/m^3 (vapor), skin

DFG (Germany) MAK
TWA: 0.01 ppm (0.1 mg/m^3)
Category III: Substances with systemic effects
Onset of Effect: > 2 hr
Half-life: > shift length (strongly cumulative)

Peak Exposure Limit:
0.1 ppm (1 mg/m^3), 30 min. average value, 1/shift

IDLH Level
28 mg/m^3

Section 3 - Hazards Identification

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Mercury exists as a heavy, odorless, silver-white liquid metal. It is highly toxic by both acute and chronic exposure. Exposure can cause corrosion of the eyes, skin, and respiratory tract and may result in irreversible nervous system damage. It readily forms amalgamations with most metals except iron.

Wilson Risk Scale
R 1
I 4
S 2*
K 1
*Skin absorption

HMIS
H 4*
F 0
R 0
*Chronic effects
PPE†
†Sec. 8

Potential Health Effects

Primary Entry Routes: Inhalation, eye and skin contact/absorption.
Target Organs: Central nervous system, eyes, skin, respiratory system, liver, kidneys.
Acute Effects
Inhalation: Exposure to high vapor concentrations can cause severe respiratory damage. Other symptoms include wakefulness, muscle weakness, anorexia, headache, ringing in the ear, headache, diarrhea, liver changes, fever, gingivitis, chest pain, difficulty breathing, cough, inflammation of the mouth (stomatitis), salivation, bronchitis, and pneumonitis. Acrodynia (pink or Swifts disease), characterized by redness and peeling of the skin on the toes and fingers, was commonly seen in children in the 1950s and is still *infrequently* seen in workers.
Eye: Irritation and corrosion.
Skin: Skin can become severely irritated if allowed to remain in contact with mercury. Skin absorption will occur at 2.2% of the rate of absorption through the lungs.
Ingestion: Mercury generally passes through the digestive tract uneventfully. However, large amounts may get caught up in the intestine and require surgical removal. If an abscess or other perforation is present along the digestive tract, absorption into the blood stream with subsequent mercury poisoning is possible.
Carcinogenicity: IARC, NTP, and OSHA do not list mercury as a carcinogen.
Medical Conditions Aggravated by Long-Term Exposure: Central nervous system disorders.
Chronic Effects: Chronic exposure appears more common than acute and is primarily associated with central nervous system damage which can be permanent (ex. paresthesia of the hands, lips, feet). Early signs of toxicity include weakness, fatigue, anorexia, weight loss, and gastrointestinal disturbances. If exposure levels are high, characteristic tremors of the fingers, eyelids, and lips occur with progression to generalized tremors of the entire body. Psychic disorders are noticeable and characterized by behavior and personality changes, increased excitability, memory loss, insomnia, and depression. In severe cases, delirium and hallucinations may occur. Kidney damage is observed with oliguria (decreased urine output) progressing to anuria (urine cessation) and may require dialysis. The cornea and lens of the eyes may take on a brownish discoloration and the extraocular muscles may be damaged. This syndrome has been termed *Asthenic-Vegetative Syndrome* or *Micromercurialism.* Chronic symptoms occur increasingly with exposures to 0.1 mg/m^3 or higher. *Mutation:* Aneuploidy and other chromosomal aberrations

have been observed in the lymphocytes from whole blood cultures in workers exposed to mercury. *Reproductive:* Mercury has been detected in stillborn babies of women treated with mercury for syphilis. In a study of six men acutely exposed (occupationally) to mercury levels as high as 44 mg/m^3, all suffered impaired sexual function. Repeated skin contact may cause allergic dermatitis in some individuals.

NOTE: Spilled mercury will release sufficient vapor over time to produce chronic poisoning.

Section 4 - First Aid Measures

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

Skin Contact: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water and then wash exposed area with soap. For reddened or blistered skin, consult a physician.

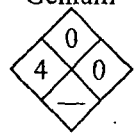
Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. In general, mercury will pass through the digestive tract uneventfully.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: BEI: *blood* (15 µg/L), *urine*: (35 µg/g creatinine). Extremely high urine levels of 0.5 to 0.85 mg Hg/L are indicative of polyneuropathy. 0.4 to 22 µg/L is reported to be the human lethal blood level. Obtain urinalysis including at a minimum: albumin, glucose, and a microscopic examination of centrifuged sediment. Use BAL or 2, 3-dimercaptosuccinic acid as chelators. *Do not* use calcium sodium EDTA because of nephrotoxicity. An electromyograph may determine extent of nerve dysfunction. It has been noted that exposure to mercury may predispose persons to development of carpal tunnel syndrome.

Section 5 - Fire-Fighting Measures

Genium



Flash Point: Nonflammable

Autoignition Temperature: Nonflammable

LEL: None reported.

UEL: None reported.

Extinguishing Media: Use agents suitable for surrounding fire.

Unusual Fire or Explosion Hazards: None reported.

Hazardous Combustion Products: Toxic mercury vapor and mercuric oxide.

Fire-Fighting Instructions: Do not release runoff from fire control methods to sewers or waterways.

Fire-Fighting Equipment: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

Section 6 - Accidental Release Measures

Spill /Leak Procedures: Keep a mercury spill kit readily available in areas where mercury is used. Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind.

Small and Large Spills: Follow instructions on mercury spill kit. Most kits come with an aspiration-driven vacuum trap with a mercury "sweeper" (copper or copper-plated brush). Wash spill area with a dilute calcium sulfide or nitric acid solution. If spill cannot be taken up readily, dust the top of the spill with flowers of sulfur or preferably, calcium polysulfide. This will produce a surface coating of mercury sulfide which will reduce mercury vapor dispersion into the air.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Use appropriate PPE when working with mercury. *Do not* use on porous work surfaces (wood, unsealed concrete, etc.) to prevent spills from lodging in cracks.

Storage Requirements: Store in a cool, dry, well-ventilated area away from heat and incompatibles (Sec. 10). Store on non-porous floors and wash them regularly with a dilute calcium sulfide solution. Because mercury will form amalgamations with most metals except iron, metal shelves should be painted with a sufficiently thick coating to prevent this from happening.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Wherever possible, enclose processes to prevent mercury vapor dispersion into work area.

Ventilation: Provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.(103)

Administrative Controls: Consider pre-placement and periodic medical exams of exposed workers with emphasis on the skin, eyes, central nervous system, liver, and kidneys.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For ≤ 0.5 mg/m^3, use any chemical cartridge respirator with cartridges providing protection against mercury and equipped with an ESLI (end of service life indicator), any SCBA, or any SAR (supplied-air respirator). For ≤ 1.25 mg/m^3, use any SAR operated in continuous-flow mode, any PAPR (powered, air-purifying respirator) with an ESLI. For ≤ 2.5 mg/m^3, use any SCBA or SAR with a full facepiece, any SAR with a tight-fitting facepiece and operated in continuous-flow mode, or any chemical cartridge respirator with a full facepiece, chemical

cartridges providing protection against mercury, and equipped with an ESLI. For ≤28 mg/m^3, use any SAR operated in pressure-demand or other positive-pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA with full facepiece and operated in pressure-demand or other positive pressure mode. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets made of butyl rubber, nitrile rubber, fluorocarbon rubber, neoprene rubber, polyvinyl chloride, chlorinated polyethylene, or polycarbonate to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

Safety Stations: Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment.

Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9 - Physical and Chemical Properties

Physical State: Liquid metal
Appearance and Odor: Silvery-white, odorless
Vapor Pressure: 0.0018 mm Hg at 77 °F (25 °C)
Formula Weight: 200.59
Density (H_2O=1): 13.534 g/cm^3 at 77 °F (25 °C)
Boiling Point: 674.09 °F (356.72 °C)
Freezing Point: -37.97 °F (-38.87 °C)
Viscosity: 15.5 mP at 77 °F (25 °C)
Electrical Resistivity: 95.76 µohm at 68 °F (20 °C)

Water Solubility: 0.28 µmol/L at 77 °F (25 °C)
Other Solubilities: Soluble in boiling sulfuric acid, nitric acid (reacts); slightly in lipids, and 2.7 mg/L in pentane. Insoluble in alcohol, ether, cold sulfuric acid, hydrogen bromide, and hydrogen iodide.
Surface Tension: 484 dyne/cm at 77 °F (25 °C)
Critical Temperature: 2664 °F (1462 °C)
Critical Pressure: 1587 atm

Section 10 - Stability and Reactivity

Stability: Mercury does not tarnish at ordinary temperatures but when heated to near its boiling point, it slowly oxidizes to mercuric oxide.

Polymerization: Hazardous polymerization does not occur.

Chemical Incompatibilities: Mercury forms alloys (amalgamates) with most metals except iron. It is incompatible with oxidizers such as bromine, 3-bromopropyne, methylsilane + oxygen, chlorine, chlorine dioxide, nitric acid, or peroxyformic acid; tetracarbonyl nickel + oxygen, alkynes + silver perchlorate, ethylene oxide, acetylenic compounds (explosive), ammonia (explosive), boron phosphodiiodide, methyl azide, nitromethane, and ground sodium carbide.

Conditions to Avoid: Exposure to high temperatures, metal surfaces or incompatibles.

Hazardous Decomposition Products: Thermal oxidative decomposition of mercury can produce mercuric oxide.

Section 11- Toxicological Information

Toxicity Data:*

Reproductive:
Rat, inhalation: 890 ng/m^3/24 hr for 16 weeks prior to mating had an effect on spermatogenesis.

Acute Dermal Toxicity:
Man, skin, TD_{Lo}: 129 mg/kg for 5 continuous hours caused ringing in the ears, headache, and allergic dermatitis.

Acute Oral Toxicity:
Man, oral, TD_{Lo}: 43 mg/kg caused tremor and jaundice or other liver changes.

Acute Inhalation Effects:
Woman, inhalation, TC_{Lo}: 150 µg/m^3/46 days caused anorexia, diarrhea, and wakefulness.
Man, inhalation, TC_{Lo}: 44300 µg/m^3/8 hr caused muscle weakness, liver changes, and increased body temperature.

Chronic Effects:
Rat, inhalation: 1 mg/m^3/ 24 hr for 5 continuous weeks caused proteinuria.

* See NIOSH, *RTECS* (OV4550000), for additional toxicity data.

Section 12 - Ecological Information

Ecotoxicity: Catfish, LC_{50} = 0.35 mg/L/96 hr; mollusk (*Modiolus carvalhoi*), LC_{50} = 0.19 ppm/96 hr: tadpole (*Rana hexadactyla*), LC_{50} = 0.051 ppm/96 hr. Mercury is transformed to methyl mercury by bacteria in the environment and undergoes bioaccumulation readily. BCF for freshwater fish = 63,000; for saltwater fish = 10,000; and for marine and freshwater invertebrates = 100,000.

Environmental Degradation: Mercury is expected to volatilize rapidly when deposited on soil surfaces. Once in the air, it can be transported long distances before being redeposited on soil or in water. In water, mercury appears to bind to particulates where it eventually becomes deposited on the bed sediment. In general, mercury entering the environment can be deposited and revolatilized several times.

Section 13 - Disposal Considerations

Disposal: Incineration is *not* an appropriate disposal method. Wastewater may be treated by addition of chlorine to oxidize the mercury to its ionic state. The water can then be passed through an absorbent (an activated charcoal concentrate with a sulfur coating or peanut shell charcoal) to collect the ionic mercury, followed by distillation to recover the mercury. Sodium borohydride, a reducing agent, can be used to precipitate mercury from waste solutions. Bioremediation, using *Pseudomonas putida*, has also been suggested. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: Mercury
Shipping Symbols: A, W
Hazard Class: 8
ID No.: UN2809
Packing Group: III
Label: Corrosive
Special Provisions (172.102): –

Packaging Authorizations
a) Exceptions: 173.164
b) Non-bulk Packaging: 173.164
c) Bulk Packaging: 173.240

Quantity Limitations
a) Passenger, Aircraft, or Railcar: 35 kg
b) Cargo Aircraft Only: 35 kg

Vessel Stowage Requirements
a) Vessel Stowage: B
b) Other: 40, 97

Section 15 - Regulatory Information

EPA Regulations:
Listed as a RCRA Hazardous Waste (40 CFR 261.33): U151
Listed as a CERCLA Hazardous Substance (40 CFR 302.4) per RCRA, Sec. 3001; CWA, Sec. 307(a), CAA, Sec. 112
CERCLA Reportable Quantity (RQ), 1 lb (0.454 kg)
SARA 311/312 Codes: 1, 2
Listed as a SARA Toxic Chemical (40 CFR 372.65)
SARA EHS (Extremely Hazardous Substance) (40 CFR 355): Not listed
OSHA Regulations:
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-1-A)

Section 16 - Other Information

References: 73, 103, 124, 132, 136, 148, 149, 159, 167, 176, 187, 189

Prepared By ..... M Gannon, BA
Industrial Hygiene Review ..... RE Langford, PhD, CIH
Medical Review ..... T Thoburn, MD, MPH

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Phenol
MSDS 355
PHE3200

Section 1 - Chemical Product and Company Identification 54.1

Material Name: Phenol **CAS Number:** 108-95-2
Chemical Formula: C_6H_6O
Structural Chemical Formula: C_6H_5OH
Synonyms: ACIDE CARBOLIQUE; BAKER'S P AND S LIQUID AND OINTMENT; BENZENOL; CARBOLIC ACID; CARBOLSAURE; FENOL; FENOLO; HYDROXYBENZENE; IZAL; MONOHYDROXYBENZENE; MONOPHENOL; OXYBENZENE; PHENIC ACID; PHENOL; PHENOL ALCOHOL; PHENOLE; PHENOL,MOLTEN; PHENYL ALCOHOL; PHENYL HYDRATE; PHENYL HYDROXIDE; PHENYLIC ACID; PHENYLIC ALCOHOL
General Use: Used as a general disinfectant, either in solution or mixed with slaked lime, etc., for toilets, stables, cesspools, floors, drains, etc.; for the manufacture of colorless or light-colored artificial resins.
Also used in many medicinal and industrial compounds and dyes; as a reagent in chemical analysis.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
phenol	108-95-2	>99

OSHA PEL
TWA: 5 ppm; 19 mg/m^3; skin.

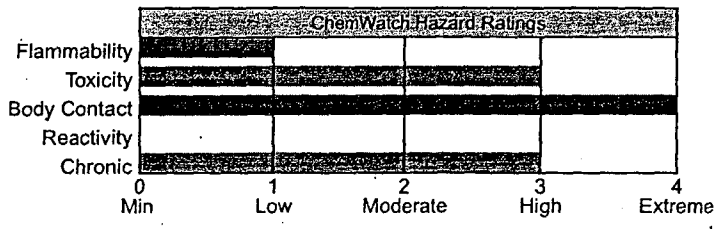
ACGIH TLV
TWA: 5 ppm; 19 mg/m^3.

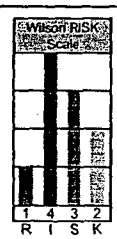
NIOSH REL
TWA: 5 ppm; 19 mg/m^3. STEL: 15.6 ppm; 60 mg/m^3; 15-minute, skin.

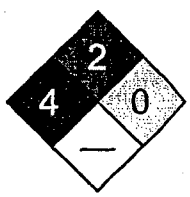
IDLH Level
250 ppm.

DFG (Germany) MAK
TWA: 5 ppm; 19 mg/m^3.

Section 3 - Hazards Identification







Fire Diamond

ANSI Signal Word
Danger!

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

White, crystalline solid; medicinal odor. Poison! Corrosive, causes severe burns to the eyes (blindness)/skin/respiratory tract. Also causes: severe neurological effects (shock and coma), liver and kidney damage. Absorbed through the skin. Combustible.

Potential Health Effects

Primary Entry Routes: skin absorption, eye contact, ingestion, inhalation
Target Organs: liver, kidneys, nervous system, skin
Acute Effects
Inhalation: The vapor is extremely discomforting to the upper respiratory tract, may cause severe mucous membrane damage and may be harmful if inhaled.

Pulmonary absorption may lead to systemic toxicity affecting the cardiovascular and central nervous system.
Inhalation of phenol and some of its derivatives may produce profuse perspiration, intense thirst, nausea, vomiting, diarrhea, cyanosis, hyperactivity, stupor, falling blood pressure, hypernea, abdominal pain, hemolysis, convulsions, coma and pulmonary edema with pneumonia. Respiratory failure and kidney damage may follow.
Inhalation of the vapor causes a sore throat, coughing, shortness of breath and labored breathing.
Systemic effects include paleness, weakness, headache, sweating, ringing of the ears, shock, cyanosis, excitement, dark colored urine, frothing of the nose and mouth.
Pulmonary inflammation and pneumonia, inflammation and necrosis of the myocardium, hepatic centro-lobular necrosis, renal proximal tube swelling and edema and globular degeneration and hind-limb paralysis was observed in guinea-pigs exposed 29 times for 7 hours/day, five days/week to concentrations ranging from 26 to 52 ppm.

Eye: The material is highly corrosive to the eyes and is capable of causing severe burns and capable of causing severe damage with loss of sight.
The vapor from heated material is highly discomforting to the eyes.
The vapor when concentrated has pronounced eye irritation; this gives some warning of high vapor concentrations. If eye irritation occurs seek to reduce exposure with available control measures, or evacuate area.
The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
Some phenol derivatives may produce mild to severe eye irritation with redness, pain and blurred vision. Permanent eye injury may occur; recovery may also be complete or partial.

Skin: The solid/dust is corrosive to the skin, may cause blisters or burns or severe burns and is it is rapidly absorbed by the skin.
Toxic effects may result from skin absorption.
Phenol and some of its derivatives may produce mild to severe skin irritation on repeated or prolonged contact, producing second and third degree chemical burns. Rapid cutaneous absorption may lead to systemic toxicity affecting the cardiovascular and central nervous system.
Absorption through the skin may result in profuse perspiration, intense thirst, nausea, vomiting, diarrhea, cyanosis (following the formation of methemoglobin), hyperactivity, stupor, falling blood pressure, hypernea, abdominal pain, hemolysis, convulsions, coma and pulmonary edema followed by pneumonia. Respiratory failure and kidney damage may follow.
The material may produce severe skin irritation after prolonged or repeated exposure, and may produce a contact dermatitis (nonallergic).
This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis.
Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.
Prolonged contact is unlikely, given the severity of response, but repeated exposures may produce severe ulceration.
Contact with the skin causes a white, wrinkled discoloration followed by a severe burn or systemic poisoning if not promptly and properly removed.
Intense burning and pain from skin contact may be delayed. Extreme dangers are posed by percutaneous absorption.
In one case a 32 year old male who spilled a solution of phenol over his scalp, face, neck, shoulders and back, died 10 minutes later.
There was coagulation necrosis of the skin, left eye and acute dermatitis veneta with acute passive congestion of the lungs, liver, spleen, kidneys.
Skin absorption occurs at low vapor pressure, without apparent discomfort and proceeds with the same efficiency as absorption by inhalation.
Damage to the lungs has been described following percutaneous absorption.
Methemoglobinemia and hemolytic anemia are frequently documented.

Ingestion: The material is corrosive to the gastrointestinal tract, may cause severe mucous membrane damage and may be fatal if swallowed.
Ingestion may result in nausea, abdominal irritation, pain and diarrhea.
Ingestion of phenol causes blotches on the lips and in the mouth.
Some phenol derivatives may produce mild to severe damage within the gastrointestinal tract. Phenolic groups with ortho and para positions free from substitution are reactive; this is because the ortho and para positions on the aromatic ring are highly activated by the phenolic hydroxyl group and are therefore readily substituted.
Severe phenol ingestions cause hypotension, coma, ventricular dysrhythmias, seizures and white coagulative chemical burns.
Absorption may result in profuse perspiration, intense thirst, nausea, vomiting, diarrhea, cyanosis (following the formation of methemoglobin), hyperactivity, stupor, falling blood pressure, hypernea, abdominal pain, hemolysis, convulsions, coma and pulmonary edema followed by pneumonia.
Respiratory failure and kidney damage may follow. Phenol does not uncouple oxidative phosphorylation like dinitrophenol and pentachlorophenol and thus does not cause a heat exhaustion-like syndrome.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A4, Not classifiable as a human carcinogen; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Prolonged exposure to some derivatives of phenol may produce dermatitis, anorexia, weight loss, weakness, muscle aches and pain, liver damage, dark urine, ochronosis, skin eruptions, diarrhea, nervous disorders with headache, salivation, fainting, increased skin and scleral pigmentation, vertigo and mental disorders. Liver and kidney damage may also ensue. Chronic phenol toxicity was first noted in medical personnel in the late 1800s when 5 and 10% phenol was used as a skin disinfectant. The term carbolic (phenol) marasmus was given to this syndrome. Chronic phenol poisoning is very rarely reported, but symptoms include vomiting, difficulty in swallowing, diarrhea, lack of appetite, headache, fainting, dizziness, dark urine, mental disturbances, and possibly skin rash. Death due to liver and kidney damage may occur.

Repeated exposure of animals to phenol vapor at concentrations ranging from 26 to 52 ppm has produced respiratory, cardiovascular, hepatic, renal and neurologic toxicity.

Administration of phenol in the drinking water of mice (2500 ppm for 103 weeks) produced an increased incidence of leukemia and lymphomas.

Phenol has been studied in initiation/promotion protocols with a number of polycyclic hydrocarbons and has been shown to have promoting activity in the two-stage skin model.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: If spilled on skin remove contaminated clothing, swab repeatedly with glycerin, PEG (polyethylene glycol), or PEG/ methylated spirit mixture or if necessary with methylated spirit alone.

Contamination of skin with phenol and some of its derivatives may produce rapid collapse and death. After skin contamination, keep patient under observation for at least 24-48 hours. Phenol-decontaminating fluid is more effective than water in removing phenol from the skin and retarding absorption; olive oil or vegetable oil may also be used; do not use mineral oil. Alcohols (methylated spirit, for example) may enhance absorption and their use alone may be ill-advised; some authorities, however, continue to advise the use of such treatment. Rapid water dilution of phenol burns may increase systemic absorption by decreasing the extent of the coagulum and thus allowing greater absorption.

Transport to hospital (or doctor).

Ingestion: Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: * Provide preplacement and annual medical examinations for employees exposed to phenol.

Persons with a history of convulsive disorders or abnormalities of the skin, respiratory tract, liver or kidneys would be expected to be at increased risk from exposure. Examination of the liver, kidneys and respiratory tract should be stressed. A urinalysis should be performed including at a minimum, specific gravity, albumin, glucose, and a microscopic on centrifuged sediment.

For acute or short-term repeated exposures to phenols/ cresols:

1.Phenol is absorbed rapidly through lungs and skin. Massive skin contact may result in collapse and death.

2.Ingestion may result in ulceration of upper respiratory tract; perforation of esophagus and/or stomach, with attendant complications, may occur. Esophageal stricture may occur.

3.An initial excitory phase may present. Convulsions may appear as long as 18 hours after ingestion. Hypotension and ventricular tachycardia that require vasopressor and antiarrhythmic therapy, respectively, can occur.

4.Respiratory arrest, ventricular dysrhythmias, seizures and metabolic acidosis may complicate severe phenol exposures so the initial attention should be directed towards stabilization of breathing and circulation with ventilation, intubation, intravenous lines, fluids and cardiac monitoring as indicated.

5.Vegetable oils retard absorption; do NOT use paraffin oils or alcohols. Gastric lavage, with endotracheal intubation, should be repeated until phenol odor is no longer detectable; follow with vegetable oil. A saline cathartic should then be given. ALTERNATELY: Activated charcoal (1g/kg) may be given. A cathartic should be given after oral activated charcoal.

6.Severe poisoning may require slow intravenous injection of methylene blue to treat methemoglobinemia.

7.Renal failure may require hemodialysis.

8.Most absorbed phenol is biotransformed by the liver to ethereal and glucoronide sulfates and is eliminated almost completely after 24 hours

BIOLOGICAL EXPOSURE INDEX - BEI

These represent the determinants observed in specimens collected from a healthy worker who has been exposed to the Exposure Standard (ES or TLV):

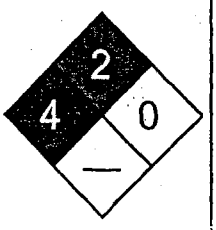
Determinant	Index	Sampling Time	Comments
Total phenol	250 mg/gm	End of shift	B, NS

in blood	creatinine

B: Background levels occur in specimens collected from subjects NOT exposed
NS: Non-specific determinant; also seen after exposure to other materials.

Section 5 - Fire-Fighting Measures

Flash Point: 79 °C Closed Cup
Autoignition Temperature: 715 °C
LEL: 1.7% v/v
UEL: 8.6% v/v
Extinguishing Media: Carbon dioxide; dry chemical powder.
Alcohol stable foam.
General Fire Hazards/Hazardous Combustion Products: Combustible. Moderate fire hazard when exposed to heat, flame or oxidizers.
Vapor may readily form an explosive mixture with air.
Decomposes on heating and produces toxic fumes of carbon monoxide (CO), carbon dioxide (CO_2).



Fire Diamond

Fire Incompatibility: Avoid reaction with strong oxidizing agents and halogens.
Reaction with calcium hypochlorite is exothermic and produces toxic fumes which may ignite. Hot phenol is corrosive to many metals, including aluminum, lead, magnesium and zinc.
Do not heat phenol above 60 °C.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Use water delivered as a fine spray to control the fire and cool adjacent area.
Avoid spraying water onto liquid pools.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: POLLUTANT -contain spillageEnvironmental hazard - contain spillage.
Wear protective clothing, impervious gloves and safety glasses.
Avoid breathing vapors and contact with skin and eyes.
Use dry clean-up procedures and avoid generating dust.
Place spilled material in clean, dry, sealable, labeled container.
Wash area down with large quantity of water and prevent runoff into drains.
Large Spills: POLLUTANT -contain spillageEnvironmental hazard - contain spillage.
Clear area of personnel and move upwind.
Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.
If contamination of drains or waterways occurs, advise emergency services.
Shut off all possible sources of ignition and increase ventilation.
Stop leak if safe to do so.
Use dry clean-up procedures and avoid generating dust.
Collect recoverable product into labeled containers for recycling.
Collect residues and seal in labeled drums for disposal.
Wash area down with large quantity of water and prevent runoff into drains.
After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Use good occupational work practices.
Avoid breathing vapors and contact with skin and eyes.
Use in a well-ventilated area.
Wear personal protective equipment when handling.
Avoid contact with incompatible materials.
Avoid smoking, bare lights or ignition sources.
Vapor may travel a considerable distance to source of ignition.
Avoid thermal shock.
Avoid physical damage to containers.

Handle and open container with care.
When handling, DO NOT eat, drink or smoke.
Wash hands with soap and water after handling.
Work clothes should be laundered separately: NOT at home.
Recommended Storage Methods: Polylined drum. Stainless steel.
Steel drum.
Check that containers are clearly labeled.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: General exhaust is adequate under normal operating conditions.
Local exhaust ventilation may be required in specific circumstances.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection.
Provide adequate ventilation in warehouse or closed storage areas.
Personal Protective Clothing/Equipment
Eyes: Chemical goggles. Full face shield.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Neoprene gloves; PVC gloves.
Rubber boots.
Respiratory Protection:
Exposure Range >5 to 50 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range >50 to <250 ppm: Air Purifying, Negative Pressure, Full Face
Exposure Range 250 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: black with dust/mist prefilter (use P100 or consult supervisor for appropriate dust/mist prefilter)
Other: Acid-resistant overalls.
PVC apron.
Hard hat with brim.
Ensure there is ready access to a safety shower.
Eyewash unit.
Glove Selection Index:

BUTYL	A
BUTYL/NEOPRENE	A
NATURAL+NEOPRENE	A
NEOPRENE/NATURAL	A
PE/EVAL/PE	A
VITON	A
VITON/NEOPRENE	A
NEOPRENE	A
TEFLON	A
NATURAL RUBBER	B
NITRILE	C
NAT+NEOPR+NITRILE	C
PVA	C
PVC	C

A: Best selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: White, crystalline solid with a characteristic sharp medicinal, sweet, tangy odor, which is detectable above 0.05 ppm. Phenol turns pink or red if it contains impurities, or if it is exposed to heat or light. Soluble in benzene. Very soluble in alcohol, chloroform, ether, glycerol, carbon disulfide, petrolatum, volatile and fixed oils, aqueous alkali hydroxides.

Physical State: Divided solid
Vapor Pressure (kPa): 101.33 at 181 °C
Vapor Density (Air=1): 3.24
Formula Weight: 94.11
Specific Gravity (H_2O=1, at 4 °C): 1.06 at 20 °C
Water Solubility: 1 g/15 ml water
Boiling Point Range: 181.8 °C (359 °F) at 760 mm Hg
Freezing/Melting Point Range: 40.9 °C (105.62 °F)
Volatile Component (% Vol): 100

Section 10 - Stability and Reactivity

Stability/Polymerization: Product is considered stable under normal handling conditions.
Hazardous polymerization will not occur.

Storage Incompatibilities: Segregate from strong oxidizers, halogens, calcium hypochlorite, and metals such as aluminum, lead, zinc, magnesium.

Section 11 - Toxicological Information

Unless otherwise specified data extracted from RTECS - Registry of Toxic Effects of Chemical Substances

TOXICITY
Oral (rat) LD_{50}: 317 mg/kg
Oral (human) LD_{Lo}: 140 mg/kg
Inhalation (rat) LC_{50}: 316 mg/m^3
Dermal (rabbit) LD_{50}: 850 mg/kg

IRRITATION
Skin (rabbit): 500 mg/24hr - SEVERE
Skin (rabbit): 500 mg open -SEVERE
Eye (rabbit): 5 mg - SEVERE
Eye (rabbit): 100 mg rinse - mild

See NIOSH, *RTECS* SJ 3325000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to the environment, the primary removal mechanism is biodegradation which is generally rapid (days). Since it is a benchmark chemical for biodegradability studies, there is a large body of information on its degradation which concludes that it rapidly degrades in sewage, soil, fresh water and seawater. Acclimation of resident populations of microorganisms is rapid. Under anaerobic conditions degradation is slower and microbial adaptation periods longer. If released to soil, it will readily leach and biodegrade. The biodegradation in soil is generally rapid with half-lives of under 5 days even in subsurface soils. Biodegradation is sufficiently rapid that most groundwater is generally free of this pollutant. The exception would be in the cases of spills where high concentrations destroy degrading microbial populations. Biodegradation is also the primary removal process when released into water (half-lives are of the order of hours to days) although sensitized photolysis may also be important. In one study using estuarine water, the combination of biodegradation and photolysis resulted in a half-life in summer and winter of 39 and 94 hr, respectively. Since the pKa is 9.994, it will be partially dissociated at higher pHs in water and moist soils and its transport and reactivity may be pH-dependent. It does not bioconcentrate in aquatic organisms. In the atmosphere, it occurs as a vapor and reacts with photochemically-produced hydroxyl radicals resulting in a half-life of approximately 15 hours. During the nighttime, it reacts with nitrate radicals with a resulting half-life of 12 minutes. It has also been shown to be readily removed from the atmosphere by rain.

Ecotoxicity: LC_{50} Crangon crangon 5600 mg/l 3 min, 20 mg/l 1 hr, 80 mg/l 3 hr, 40 mg/l 6-24 hr, 30 mg/l 48-72 hr, 25 mg/l 96 hr in sea water at 15 °C /Conditions of bioassay not specified; LC_{50} Rainbow trout 5.6-11.3 mg/l/24 hr in a static bioassay; LC_{50} Ophicephalus punctatus 46.0 mg/l/48 hr in a static bioassay; TLm Mercenaria mercenaria (hard clam) egg 5.263 x10^4 ppb/48 hr in a static bioassay; Algae: Microcystis aeruginosa inhibition of cell multiplication noted at 4.6 mg/l /Conditions of bioassay not specified; Protozoa: Vorticella campanula perturbation level 3 mg/l /Conditions of bioassay not specified ; Arthropoda: LD_0 Daphnia magna 16 mg/l /Conditions of bioassay not specified; Arthropoda: TLm Daphnia magna (young) 17/7 mg/l 25-50 hr /Conditions of bioassay not specified ; TLm Roach 15 mg/l/24 hr /Conditions of bioassay not specified

Henry's Law Constant: 3.33 x10^{-7}

BCF: goldfish 1.9

Biochemical Oxygen Demand (BOD): 200%, 5 days

Octanol/Water Partition Coefficient: log K_{ow} = 1.46

Soil Sorption Partition Coefficient: K_{oc} = 1 to 3

Section 13 - Disposal Considerations

Disposal: Follow applicable federal, state, and local regulations.
Incinerate contaminated waste at an approved site.
Phenol may be recovered by charcoal absorption, solvent extraction or steam stripping. A concentration of 1% by weight is required for economical recovery.
Recycle containers wherever possible, otherwise dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: PHENOL, SOLID
Additional Shipping Information: CARBOLIC ACID, SOLID
Hazard Class: 6.1(a)
ID No.: 1671
Packing Group: II
Label: Poison[6]

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Listed U188 Toxic Waste
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4); per RCRA Section 3001; per CWA Section 307(a) 1000 lb (453.5 kg)
SARA 40 CFR 372.65: Listed 500/10000 lb
SARA EHS 40 CFR 355: Listed 1,000 lb
TSCA: Listed

Section 16 - Other Information

Research Date: .....1999-11 **Review Date:** 2000-07

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Material Safety Data Sheet Collection
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Issue Date: 2001-06

Section 1 - Chemical Product and Company Identification 55

Material Name: Benz[a]anthracene **CAS Number:** 56-55-3
Chemical Formula: $C_{18}H_{12}$
Synonyms: B(A)A; BA; BAA; 1,2-BENZ(A)ANTHRACENE; 1,2-BENZANTHRACENE; BENZ(A)ANTHRACENE; BENZANTHRACENE; BENZ[A]ANTHRACENE; 1,2-BENZANTHRAZEN; 1,2-BENZANTHRENE; BENZANTHRENE; 1,2-BENZOANTHRACENE; BENZO(A)ANTHRACENE; BENZOANTHRACENE; 2,3-BENZOPHENANTHRENE; BENZO(A)PHENANTHRENE; BENZO(B)PHENANTHRENE; 2,3-BENZPHENANTHRENE; NAPHTHANTHRACENE; TETRAPHENE
General Use: research chemistry

Section 2 - Composition / Information on Ingredients

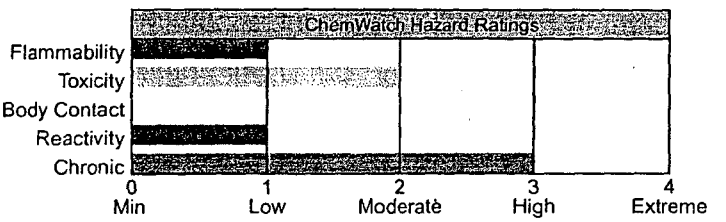
Name	CAS	%
benz[a]anthracene	56-55-3	>98

OSHA PEL
No data found.

NIOSH REL
No data found.

ACGIH TLV
No data found.

Section 3 - Hazards Identification



ANSI Signal Word

Danger!


Poison

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless plates. May cause irritation. Poison. Other Acute Effects: may be fatal if inhaled, swallowed, or absorbed through skin. Chronic Effects: may cause heritable genetic damage; may alter genetic material. Carcinogen. Will burn.

Potential Health Effects

Target Organs: No data found.
Primary Entry Routes: accidental skin and eye contact, inhalation of generated dusts
Acute Effects

Inhalation: The dust is harmful and discomforting to the upper respiratory tract. Persons with impaired respiratory function, airway diseases, or conditions such as emphysema or chronic bronchitis may incur further disability if excessive concentrations of particulate are inhaled.

Eye: The dust may be discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/ or other transient eye damage/ ulceration.

Skin: The material may be mildly discomforting to the skin. Open cuts and abraded or irritated skin should not be exposed to this material. Toxic effects may result from skin absorption.

Ingestion: The solid/dust is discomforting to the gastrointestinal tract and harmful if swallowed. Considered an unlikely route of entry in commercial/industrial environments.

Carcinogenicity: NTP - Class 2B, Reasonably anticipated to be a carcinogen, sufficient evidence of carcinogenicity from studies in experimental animals; IARC - Group 2A, Probably carcinogenic to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A2, Suspected human carcinogen; EPA - Class B2, Probable human carcinogen based on animal studies; MAK - Class A2, Unmistakably carcinogenic in animal experimentation only.

Chronic Effects: Cited in many publications and by a number of regulatory authorities as a suspected human carcinogen. Subcutaneous injection produces sarcomas (soft tissue growths) in rats and mice. When administered by gavage benz[a]anthracene induced papillomas to the forestomach in mice and hamsters and mammary tumors in female rats.

Section 4 - First Aid Measures

Inhalation: • If dust is inhaled, remove to fresh air.
• Encourage patient to blow nose to ensure clear breathing passages.
• Rinse mouth with water. Consider drinking water to remove dust from throat.
• Seek medical attention if irritation or discomfort persist.
• If fumes or combustion products are inhaled, remove to fresh air.
• Lay patient down. Keep warm and rested.
• Other measures are usually unnecessary.

Eye Contact: • Immediately hold the eyes open and flush with fresh running water.
• Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
• Seek medical attention if pain persists or recurs.
• Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: • Immediately remove all contaminated clothing, including footwear (after rinsing with water).
• Wash affected areas thoroughly with water (and soap if available).
• Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center. If more than 15 minutes from a hospital:
• INDUCE vomiting with IPECAC SYRUP, or fingers down the back of the throat, ONLY IF CONSCIOUS. Lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. NOTE: Wear a protective glove when inducing vomiting by mechanical means.
• SEEK MEDICAL ATTENTION WITHOUT DELAY.
• In the meantime, qualified first-aid personnel should treat the patient following observation and employing supportive measures as indicated by the patient's condition.
• If the services of a medical officer or medical doctor are readily available, the patient should be placed in his/her care and a copy of the MSDS should be provided.
• If medical attention is not available on the worksite or surroundings send the patient to a hospital together with a copy of the MSDS.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treat symptomatically.

Section 5 - Fire-Fighting Measures

Flash Point: Not available; probably combustible

Extinguishing Media: Foam. Dry chemical powder. BCF (where regulations permit). Carbon dioxide. Water spray or fog - Large fires only.

General Fire Hazards/Hazardous Combustion Products: • Solid which exhibits difficult combustion or is difficult to ignite.
• Avoid generating dust, particularly clouds of dust in a confined or unventilated space, as dust may form an explosive mixture with air and any source of ignition, e.g., flame or spark, will cause fire or explosion.
• Dry dust can also be charged electrostatically by turbulence, pneumatic transport, pouring, in exhaust ducts and during transport.
• Build-up of electrostatic charge may be prevented by bonding and grounding.
• Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.

Fire Incompatibility: Avoid contamination with oxidizing agents i.e., nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

Fire-Fighting Instructions: • Contact fire department and tell them location and nature of hazard.
• Wear breathing apparatus plus protective gloves for fire only.
• Prevent, by any means available, spillage from entering drains or waterways.
• Use fire fighting procedures suitable for surrounding fire.
• Do not approach containers suspected to be hot.
• Cool fire-exposed containers with water spray from a protected location.
• If safe to do so, remove containers from path of fire.
• Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: • Clean up all spills immediately.
• Avoid contact with skin and eyes.

- Wear protective clothing, gloves, safety glasses and dust respirator.
- Use dry clean up procedures and avoid generating dust.
- Vacuum up or sweep up.
- Place in clean drum then flush area with water.

Large Spills: • Clear area of personnel and move upwind.
- Contact fire department and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or waterways.
- No smoking, bare lights or ignition sources.
- Increase ventilation.
- Stop leak if safe to do so.
- Water spray or fog may be used to disperse/absorb vapor.
- Contain or absorb spill with sand, earth or vermiculite.
- Collect recoverable product into labeled containers for recycling.
- Collect solid residues and seal in labeled drums for disposal.
- Wash area and prevent runoff into drains.
- After clean up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.
- If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: • Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of overexposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- DO NOT enter confined spaces until atmosphere has been checked.
- Do not allow material to contact humans, exposed food or food utensils.
- Avoid smoking, bare lights or ignition sources.
- When handling, DO NOT eat, drink or smoke.
- Avoid contact with incompatible materials.
- Keep containers securely sealed when not in used.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Working clothes should be laundered separately. Launder contaminated clothing before reuse.
- Follow good occupational work practices.
- Observe manufacturer's storage/handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Recommended Storage Methods: Glass container. Plastic container. Metal can. Metal drum. Check that all containers are clearly labeled and free from leaks.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Local exhaust ventilation usually required. If risk of overexposure exists, wear NIOSH-approved respirator. Provide adequate ventilation in warehouse or closed storage area.

Personal Protective Clothing/Equipment

Eyes: Safety glasses with side shields or chemical goggles. Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Wear chemical protective gloves, e.g. PVC. Wear safety footwear.

Other: • Overalls.
- PVC Apron.
- PVC protective suit may be required if exposure severe.
- Eyewash unit.
- Ensure there is ready access to a safety shower.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Light yellow to tan crystalline powder.

Physical State: colorless plates

Vapor Pressure (kPa): 5 x10^{-9} torr at 20 °C

Formula Weight: 228.29

Water Solubility: 0.014 mg/L in Water at 25 °C

Evaporation Rate: Half life 89 hours

Boiling Point Range: Sublimes at 435 °C (815 °F)

Freezing/Melting Point Range: 162 °C (323.6 °F)

Volatile Component (% Vol): Negligible

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid reaction with oxidizing agents.

Section 11 - Toxicological Information

Toxicity
Intravenous (rat) LD_{50}: > 200 mg/kg

Irritation
Nil reported

See NIOSH, *RTECS* CV9275000, for additional data.

Section 12 - Ecological Information

Environmental Fate: When released into water it will rapidly become adsorbed to sediment or particulate matter in the water column, and bioconcentrate into aquatic organisms. In the unadsorbed state, it will degrade by photolysis in a matter of hours to days. Its slow desorption from sediment and particulate matter will maintain a low concentration in the water. Because it is strongly adsorbed to soil it will remain in the upper few centimeters of soil and not leach into groundwater. It will very slowly biodegrade when colonies of microorganisms are acclimated but this is too slow a process (half-life ca 1 year to be significant). In the atmosphere it will be transported long distances and will probably be subject to photolysis and photooxidation although there is little documentation about the rate of these processes in the literature.
Ecotoxicity: Algae: Anabaena flos-aquae 2w EC_{50} growth +0.014 mg/l NOEC growth +0.003 mg/l
BCF: daphnia 4.0
Octanol/Water Partition Coefficient: log K_{ow} = 5.61
Soil Sorption Partition Coefficient: K_{OC} = sediments 55 to 1.87 x10^6

Section 13 - Disposal Considerations

Disposal: • Recycle wherever possible or consult manufacturer for recycling options.
• Follow applicable local, state, and federal regulations.
• Bury residue in an authorized landfill.
• Recycle containers if possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: TOXIC SOLID, ORGANIC, N.O.S.
Additional Shipping Information:
Hazard Class: 6.1
ID No.: 2811
Packing Group: III
Label: Harmful[6]

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Listed U018 Toxic Waste
CERCLA 40 CFR 302.4: Listed per RCRA Section 3001, and per CWA Section 307(a) 10 lb (4.535 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Research Date:.....2000-11 **Review Date:** 2001-05

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Issue Date: 2001-06

Benzo[k]fluoranthene
MSDS: BEN4680

Section 1 - Chemical Product and Company Identification 55

Material Name: Benzo[k]fluoranthene **CAS Number:** 207-08-9
Chemical Formula: $C_{20}H_{12}$
Synonyms: B; B (K) F; B K F; 8,9-BENZFLUORANTHENE; BENZO(K) FLUORANTHENE; 11,12-BENZO(K)FLUORANTHENE; 11,12-BENZOFLUORANTHENE; 8,9-BENZOFLUORANTHENE; BENZO(K)FLUORANTHENE; BENZO[K]FLUORANTHENE; 11,12-BENZOFLURANTHENE; 2,3,1',8'-BINAPHTHYLENE; 2,3,1',8'-BINAPTHYLENE; BKF; DIBENZO(B,JK)FLUORENE
General Use: there is no commerical use of this compound

Section 2 - Composition / Information on Ingredients

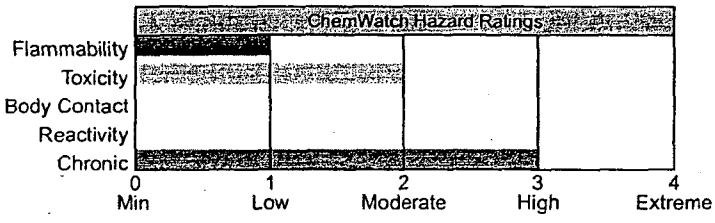
Name	CAS	%
benzo[k]fluoranthene	207-08-9	>98

OSHA PEL
No data found.

NIOSH REL
No data found.

ACGIH TLV
No data found.

Section 3 - Hazards Identification



ANSI Signal Word

Warning!

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Pale yellow needles. Irritating to eyes/skin/respiratory tract. Toxic. Probable human carcinogen. Will burn.

Potential Health Effects

Target Organs: eyes, skin, respiratory system
Primary Entry Routes: skin contact/absorption, inhalation of generated dust
Acute Effects

Inhalation: The dust may be discomforting to the upper respiratory tract. Persons with impaired respiratory function, airway diseases, or conditions such as emphysema or chronic bronchitis may incur further disability if excessive concentrations of particulate are inhaled.

Eye: The material is moderately discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/ or other transient eye damage/ ulceration.

Skin: The material may be mildly discomforting to the skin. Open cuts and abraded or irritated skin should not be exposed to this material. The material may accentuate any pre-existing skin condition.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments. The material is moderately discomforting and harmful if swallowed in large quantity.

Carcinogenicity: NTP - Listed; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class B2, Probable human carcinogen based on animal studies; MAK - Not listed.

Chronic Effects: When injected into pulmonary tissue of female rats benzo[k]fluoranthene induced squamous cell carcinomas. Topical administration initiated skin tumors in female mice whilst subcutaneous injection induced local sarcomas in mice of both sexes. Although there is no adequate data available to evaluate carcinogenicity of PAHs in humans, there are a number of epidemiologic and mortality studies to show increased incidences of cancer in humans exposed to mixtures of PAHs. Lung and genitourinary cancer mortality amongst coke oven workers and skin tumors in workers exposed to creosote are examples.

Section 4 - First Aid Measures

Inhalation: • If dust is inhaled, remove to fresh air.
• Encourage patient to blow nose to ensure clear breathing passages.
• Rinse mouth with water. Consider drinking water to remove dust from throat.
• Seek medical attention if irritation or discomfort persist.
Eye Contact: • Immediately hold the eyes open and flush with fresh running water.
• Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
• Seek medical attention if pain persists or recurs.
• Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact: • Immediately remove all contaminated clothing, including footwear (after rinsing with water).
• Wash affected areas thoroughly with water (and soap if available).
• Seek medical attention in event of irritation.
Ingestion: Contact a Poison Control Center. If more than 15 minutes from a hospital:
• INDUCE vomiting with IPECAC SYRUP, or fingers down the back of the throat, ONLY IF CONSCIOUS. Lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. NOTE: Wear a protective glove when inducing vomiting by mechanical means.
• SEEK MEDICAL ATTENTION WITHOUT DELAY.
• In the meantime, qualified first-aid personnel should treat the patient following observation and employing supportive measures as indicated by the patient's condition.
• If the services of a medical officer or medical doctor are readily available, the patient should be placed in his/her care and a copy of the MSDS should be provided.
• If medical attention is not available on the worksite or surroundings send the patient to a hospital together with a copy of the MSDS.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Treat symptomatically.

Section 5 - Fire-Fighting Measures

Flash Point: Not available; probably combustible
Extinguishing Media: Foam. Dry chemical powder. BCF (where regulations permit). Carbon dioxide. Water spray or fog - Large fires only.
General Fire Hazards/Hazardous Combustion Products: • Solid which exhibits difficult combustion or is difficult to ignite.
• Avoid generating dust, particularly clouds of dust in a confined or unventilated space, as dust may form an explosive mixture with air and any source of ignition, e.g., flame or spark, will cause fire or explosion.
• Dry dust can also be charged electrostatically by turbulence, pneumatic transport, pouring, in exhaust ducts and during transport.
• Build-up of electrostatic charge may be prevented by bonding and grounding.
• Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting. Combustion products include carbon dioxide (CO_2).
Fire Incompatibility: Avoid contamination with strong oxidizing agents as ignition may result.
Fire-Fighting Instructions: • Use water delivered as a fine spray to control fire and cool adjacent area.
• Do not approach containers suspected to be hot.
• Cool fire-exposed containers with water spray from a protected location.
• If safe to do so, remove containers from path of fire.
• Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: • Clean up all spills immediately.
• Avoid contact with skin and eyes.
• Wear impervious gloves and safety glasses.
• Use dry clean up procedures and avoid generating dust.
• Vacuum up or sweep up.
• Place spilled material in clean, dry, sealable, labeled container.
Large Spills: • Clear area of personnel and move upwind.
• Contact fire department and tell them location and nature of hazard.
• Wear breathing apparatus plus protective gloves.
• Prevent, by any means available, spillage from entering drains or waterways.
• Stop leak if safe to do so.
• Contain spill with sand, earth or vermiculite.
• Collect recoverable product into labeled containers for recycling.

- Neutralize/decontaminate residue.
- Collect solid residues and seal in labeled drums for disposal.
- Wash area and prevent runoff into drains.
- After clean up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.
- If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions:
- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- DO NOT enter confined spaces until atmosphere has been checked.
- Avoid smoking, bare lights or ignition sources.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately.
- Follow good occupational work practices.
- Observe manufacturer's storage and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

Recommended Storage Methods: Metal can. Metal drum. Check that all containers are clearly labeled and free from leaks.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: General exhaust is adequate under normal operating conditions. If risk of overexposure exists, wear NIOSH-approved respirator. Provide adequate ventilation in warehouse or closed storage areas.

Personal Protective Clothing/Equipment

Eyes: Safety glasses, safety glasses with side shields, or chemical goggles. Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Wear general protective gloves, e.g. light weight rubber gloves.

Other: Overalls; impervious protective clothing. Eyewash unit.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Yellow powder.

Physical State: pale yellow needles

Vapor Pressure (kPa): 0.0000000000959 mm Hg at 25 °C

Vapor Density (Air=1): > 1

Formula Weight: 252.32

Water Solubility: Insoluble in Water

Boiling Point Range: 480 °C (896 °F) at 760 mm Hg

Freezing/Melting Point Range: 217 °C (422.6 °F)

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.

Storage Incompatibilities: Avoid storage with oxidizers.

Section 11 - Toxicological Information

Tumors at site of application.

NOTE: Substance has been shown to be mutagenic in various assays, or belongs to a family of chemicals producing damage or change to cellular DNA.

See NIOSH, *RTECS* DF6350000, for additional data.

Section 12 - Ecological Information

Environmental Fate: Its presence in distant places indicates that it is reasonably stable in the atmosphere and capable of long distant transport. Atmospheric losses are caused by gravitational settling and rainout. On land it is strongly adsorbed to soil and remains in the upper soil layers and should not leach into groundwater. Biodegradation may occur but will be very slow (half-life ca 2 years with acclimated microorganisms). It will get into surface water from dust and precipitation in addition to runoff and effluents. In the water it will sorb to sediment and particulate matter in the water column. It would be expected to bioconcentrate in fish and seafood.
Ecotoxicity: No data found.
Henry's Law Constant: estimated at 4.2×10^{8}
BCF: fish 4.97
Octanol/Water Partition Coefficient: log $K_{ow} = 6.84$
Soil Sorption Partition Coefficient: K_{oc} = nearly 1×10^{6}

Section 13 - Disposal Considerations

Disposal: • Consult manufacturer for recycling options and recycle where possible.
• Follow applicable local, state, and federal regulations.
• Incinerate residue at an approved site.
• Recycle containers if possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: TOXIC SOLID, ORGANIC, N.O.S. **Additional Shipping Information:**
Hazard Class: 6.1
ID No.: 2811
Packing Group: III
Label: Harmful[6]

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 307(a) 5,000 lb (2268 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Not listed

Section 16 - Other Information

Research Date:.....2000-11 **Review Date:** 2001-05

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Material Safety Data Sheet Collection

Benzo[*b*]fluoranthene **MSDS No. 1091**

Date of Preparation: 3/98

Section 1 - Chemical Product and Company Identification 51

Product/Chemical Name: Benzo[*b*]fluoranthene
Chemical Formula: $C_{20}H_{12}$
CAS Number: 205-99-2
Synonyms: B[*b*]B; B[*b*]F; BBF; BEF; B[*e*]F; 3,4-benz[*e*]acephenanthrylene; benz[*e*]acephenanthrylene; 2,3-benzfluoranthene; 3,4-benzfluoranthene; 3,4-benzofluoranthene; benzo[*e*]fluoranthene; 2,3-benzofluoranthrene
Derivation: No manufacturing information available; found in coal tar, coke oven emissions, cigarette smoke and automobile exhaust.
General Use: Used as a research chemical.
Vendors: There is no commercial production of this compound in the U.S.

Section 2 - Composition / Information on Ingredients

Benzo[*b*]fluoranthene, ca 100% wt (Note that, except when in the form of a laboratory research chemical, benzo[*b*]fluoranthene is typically found in mixtures with other PAHs (polycyclic aromatic hydrocarbons), such as coal tar pitch).

OSHA PEL	ACGIH TLV	NIOSH REL
As oil mist, mineral	As oil mist, mineral*	As oil mist, mineral
8-hr TWA: 5 mg/m^3	TWA: 5 mg/m^3	10-hr TWA: 5 mg/m^3
	STEL†: 10 mg/m^3	STEL: 10 mg/m^3

*Sampled by method that does not collect vapor.
†Notice of Impending Change: delete STEL

DFG (Germany) MAK
None established

Section 3 - Hazards Identification

ANSI Signal Word: Caution

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Benzo[*b*]fluoranthene is a solid in the form of colorless needles. It can be irritating to the respiratory tract, skin and eyes. Like some other PAHs (polycyclic aromatic hydrocarbons), benzo[b]fluoranthene is a possible human carcinogen and mutagen. Handle with care! When heated to decomposition, benzo[*b*]fluoranthene will emit carbon monoxide (CO) and carbon dioxide (CO_2).

Wilson Risk Scale	
R	1
I	2
S	1*
K	1

*Skin absorption

HMIS	
H	2*
F	1
R	0
PPE†	

*Chronic effects
†Sec. 8

Potential Health Effects

Primary Entry Routes: Inhalation, ingestion, skin and/or eye contact/absorption
Target Organs: Eyes, skin, respiratory system, gastrointestinal (GI) system, blood, liver, kidneys
Acute Effects
Inhalation: Irritation may result from inhalation of benzo[*b*]fluoranthene dust or fumes.
Eye: Contact may result in irritation.
Skin: Contact may cause irritation.
Ingestion: None reported.
Carcinogenicity: IARC lists benzo[*b*]fluoranthene as Group 2B (Possibly Carcinogenic to Humans); EPA, B2 (Probable Human Carcinogen, with sufficient evidence from animal studies); MAK, A2 (Unmistakably carcinogenic in animal experimentation only); NTP, 2B (Reasonably anticipated to be a carcinogen, with sufficient evidence of carcinogenicity from studies in experimental animals); and ACGIH, TLV A2 (Suspected human carcinogen). OSHA does not list benzo[*b*]fluoranthene as a carcinogen.
Medical Conditions Aggravated by Long-Term Exposure: None reported.
Chronic Effects: Although there is no direct epidemiological evidence linking benzo[*b*]fluoranthene with cancer, it is frequently a component of mixtures associated with human cancer. Epidemiological studies demonstrate increased incidence of cancer (skin, lung, urinary tract, GI system) with exposure to mixed PAHs and substances that contain them. Coal tar pitch volatiles are reported to cause an excess of bronchitis. In animal studies, benzo[*b*]fluoranthene has been found to be tumorigenic and mutagenic.
Other: Animal testing suggests a synergism (combined effect greater than sum of parts) of mutagenicity between benzo[*b*]fluoranthene and other PAHs.

Section 4 - First Aid Measures

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 minutes. Consult a physician or ophthalmologist if pain and/or irritation develop.

Skin Contact: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treat overexposure symptomatically and supportively. Medical surveillance may be necessary for high exposures (skin, mouth, GI, respiratory system).

Section 5 - Fire-Fighting Measures

Flash Point: Not applicable; probable combustible solid **Autoignition Temperature:** None reported.

LEL: None reported. **UEL:** None reported.

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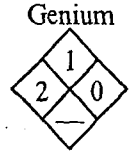

Flammability Classification: Probable combustible solid

Extinguishing Media: Use water spray; carbon dioxide, dry chemical powder or appropriate foam.

Unusual Fire or Explosion Hazards: None reported.

Hazardous Combustion Products: Heating benzo[*b*]fluoranthene to decomposition can produce carbon monoxide (CO) and carbon dioxide (CO_2).

Fire-Fighting Instructions: *Do not* release runoff from fire control methods to sewers or waterways.

Fire-Fighting Equipment: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

Section 6 - Accidental Release Measures

Spill /Leak Procedures: Notify safety personnel, isolate area and deny entry. Remove sources of ignition, and provide maximum ventilation.

Small Spills: Vacuum or carefully scoop up material and deposit in sealed containers. Absorb liquid containing benzo[*b*]fluoranthene with vermiculite, earth, sand or similar material.

Large Spills

Containment: Dike far ahead of liquid spill for later disposal. *Do not* release into sewers or waterways.

Cleanup: Stay upwind and have cleanup personnel protect against inhalation and contact.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid dust inhalation, and skin and eye contact. Avoid sunlight exposure of contaminated skin. Use only with ventilation sufficient to reduce airborne concentrations as low as possible. Wear protective gloves, goggles, and clothing (see Sec. 8). Keep away from heat and ignition sources.

Storage Requirements: Store in tightly closed container in cool, well-ventilated area, away from heat, ignition sources and incompatibles (see Sec. 10). Periodically inspect stored materials.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Work with benzo[*b*]fluoranthene only under an exhaust hood.

Ventilation: Provide general or local exhaust ventilation systems to maintain airborne concentrations as low as possible. Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

Administrative Controls: Have employees with potential for exposure submit to preplacement and periodic medical examinations with emphasis on oral cavity (including sputum cytology), respiratory tract, skin (chronic disorders, lesions), blood (complete count), bladder and kidneys (urinalysis: specific gravity, albumin, glucose, microscopic examination of sediment; urinary cytology). Repeat medical exam on an annual basis, or on a semi-annual basis for employees 45 years or older or with 10 or more years of exposure to pitch volatiles. Periodically inspect lab atmospheres, and surfaces such as walls, floors, and benches and interior of fume hoods and air ducts for contamination. Post appropriate signs and labels on doors leading to areas where benzo[*b*]fluoranthene is used.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For any detectable concentration (of coal tar pitch volatiles) use SCBA with full facepiece operated in pressure-demand

or other positive pressure mode, or supplied-air respirator with full facepiece operated in pressure-demand or other positive pressure mode in combination with auxiliary SCBA operated in pressure-demand or other positive pressure mode; escape, air purifying full face respirator (gas mask) with a chin-style or a front- or back-mounted organic vapor canister and with a full facepiece and a fume or high-efficiency filter, or escape-type SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent skin contact. Wear splash-proof chemical safety goggles, and face shield (8-inch minimum), per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

Safety Stations: Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment.

Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9 - Physical and Chemical Properties

Physical State: Solid

Appearance and Odor: Colorless needles

Vapor Pressure: 5×10^{-7} mm Hg at 68 °F (20 °C)

Formula Weight: 252.32

Other Solubilities: 95% ethanol: <1 mg/mL at 66 °F (19 °C); acetone: 10-50 mg/mL at 66 °F (19 °C); benzene: slightly soluble; DMSO: 10-50 mg/mL at 66 °F (19 °C).

Water Solubility: 0.0012 mg/L

Melting Point: 334.4 °F (168 °C)

Henry's Law Constant (H): 1.38×10^{-4} atm-m^3/mole, estimated

Octanol/Water Partition Coefficient: log K_{ow} = 6.124

Soil Sorption Coefficient (log K_{oc}): 5.88, estimated

Section 10 - Stability and Reactivity

Stability: Benzo[*b*]fluoranthene is stable at room temperature in closed containers under normal storage and handling conditions.

Polymerization: Hazardous polymerization cannot occur.

Chemical Incompatibilities: Include strong oxidizing agents.

Conditions to Avoid: Heat, sunlight.

Hazardous Decomposition Products: Thermal oxidative decomposition of benzo[*b*]fluoranthene will produce carbon monoxide (CO) and carbon dioxide (CO_2).

Section 11- Toxicological Information

Toxicity Data:*

Tumorigenicity:

Rat, implant: 5 mg/kg produced toxic effects: tumorigenic - equivocal tumorigenic agent by RTECS criteria; lungs, thorax, or respiration - tumors; tumorigenic - tumors at site of application.

Mouse, skin: 88 ng/kg/120 weeks intermittently produced toxic effects: tumorigenic - carcinogenic by RTECS criteria; skin and appendages - tumors; tumorigenic - tumors at site of application.

Mouse, skin: 72 mg/kg/60 weeks intermittently produced toxic effects: tumorigenic - equivocal tumorigenic agent by RTECS criteria; skin and appendages - tumors; tumorigenic - tumors at site of application.

Mouse, skin: 4037 µg/kg/20 days intermittently produced toxic effects: tumorigenic - equivocal tumorigenic agent by RTECS criteria; skin and appendages - tumors.

Genetic Effects:

Human, lymphocyte cells: 55 µg/L produced mutation.

Rat, intraperitoneal: 100 mg/kg resulted in DNA adducts.

Rat, intraperitoneal: 100 mg/kg induced sister chromatid exchange.

Hamster, lung cells: 100 µg/L produced morphological transformation.

*See NIOSH, *RTECS* (CU1400000), for additional toxicity data.

Section 12 - Ecological Information

Ecotoxicity: Evidence suggests that PAHs in lake bottom sediments may cause tumors in fish.

Environmental Fate: Benzo[*b*]fluoranthene has a low vapor pressure and Henry's Law Constant, and will not readily evaporate from water or soil. In surface water, it will partition from the water column to suspended sediments. Limited bioconcentration

in aquatic organisms may occur (polychaete worms, BCF = 9.1); however, fish have an enzyme (microsomal oxidase) capable of rapidly metabolizing PAHs.

Environmental Degradation: Photolysis, photo-oxidation, and volatilization of dissolved benzo[*b*]fluoranthene may occur, but adsorption to suspended sediments is expected to inhibit these processes. Release to the soil may result in some biodegradation. Photolysis is not expected to be significant after release to soil. In the atmosphere it is likely to be adsorbed to particulate matter, and will be subject to wet and dry deposition. In the atmosphere, benzo[*b*]fluoranthene will rapidly degrade by reaction with photochemically produced hydroxyl radicals (half life 1.00 day).

Soil Adsorption/Mobility: A high Koc indicates significant sorption and low mobility in the soil column.

Section 13 - Disposal Considerations

Disposal: Benzo[*b*]fluoranthene is a good candidate for rotary kiln incineration. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: Environmentally hazardous substances, solid, n.o.s.*
Shipping Symbols: –
Hazard Class: 9
ID No.: UN3077
Packing Group: III
Label: Class 9
Special Provisions (172.102): 8, B54

Packaging Authorizations
a) Exceptions: 173.155
b) Non-bulk Packaging: 173.213
c) Bulk Packaging: 173.240

Quantity Limitations
a) Passenger, Aircraft, or Railcar: No limit
b) Cargo Aircraft Only: No limit

Vessel Stowage Requirements
a) Vessel Stowage: A
b) Other: –

*If in a quantity in one package which equals or exceeds the final reportable quantity of 1 lb (0.454 kg).

Section 15 - Regulatory Information

EPA Regulations:
Listed as a RCRA Hazardous Waste (40 CFR 261.33)
RCRA Hazardous Waste Number: F039
Listed as a CERCLA Hazardous Substance (40 CFR 302.4) specific per (2) CWA Section 307(a)
CERCLA Final Reportable Quantity (RQ): 1 lb (0.454 kg)
Listed as a SARA Toxic Chemical (40 CFR 372.65)
SARA EHS (Extremely Hazardous Substance) (40 CFR 355): Not listed

OSHA Regulations:
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1 as oil mist, mineral)

Section 16 - Other Information

References: 1, 73, 103, 136, 209, 216, 217, 223, 230, 232

Prepared By..... HM Spliethoff, MS
Industrial Hygiene Review..... S Gilson, CIH
Medical Review..... G Kelafant, MD

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Material Safety Data Sheet Collection

Chrysene **MSDS No. 1092**

Date of Preparation: 3/98

Section 1 - Chemical Product and Company Identification 51

Product/Chemical Name: Chrysene
Chemical Formula: $C_{18}H_{12}$
CAS Number: 218-01-9
Synonyms: 1,2-benzophenanthrene; benzo(*a*)phenanthrene; benz(*a*)phenanthrene; 1,2-benzphenanthrene; 1,2,5,6-dibenzonaphthalene
Derivation: Distilled from coal tar, coal tar pitch. A small amount is produced from the distillation or pyrolysis of many fats and oils. By heating hydrogen and acetylene. Chrysene is not produced commercially in the U.S. (except as a laboratory research chemical).
General Use: Used in organic synthesis; as a research chemical. Occurs in cigarette smoke.
Vendors: Consult the latest *Chemical Week Buyers' Guide.* (73)

Section 2 - Composition / Information on Ingredients

OSHA PEL*
8-hr TWA: 0.2 mg/m^3

ACGIH TLV
Coal tar pitch volatiles, as benzene solubles: 8-hr TWA: 0.2 mg/m^3

NIOSH REL*
Cyclohexane-extractable fraction
10-hr TWA: 0.1 mg/m^3
Carcinogen: lowest feasible concentration

IDLH Level
As coal tar pitch volatiles: 80 mg/m^3

DFG (Germany) MAK
None established

*These specific exposure limits may also be applied to the total concentration of benzene soluble coal tar pitch volatiles.

Section 3 - Hazards Identification

ANSI Signal Word: Caution

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Chrysene exists as colorless to white crystals with reddish-blue fluorescence. This poycyclic aromatic hydrocarbon (PAH) is often present in mixtures of PAHs. May be irritating to skin, eyes, and respiratory system. It may be absorbed through the skin. Animal data indicate that chrysene may be cancer-causing in humans. Handle with care. Chrysene is combustible.

Wilson Risk Scale	
R	1
I	3
S	2
K	1

HMIS	
H	2*
F	1
R	0
PPE†	

*Chronic Effects
†Sec. 8

Potential Health Effects

Primary Entry Routes: Skin absorption
Target Organs: Eyes, skin, respiratory system
Note: *There is no human evidence available for the acute health effects of chrysene alone. There is, however, considerable data indicating that it is carcinogenic in humans. Based on the chemical properties of chrysene, as a polynuclear aromatic hydrocarbon, the following acute effects may occur.*
Acute Effects
Inhalation: May cause irritation.
Eye:. May cause irritation.
Skin: May cause irritation or be absorbed.
Ingestion: None reported.
Carcinogenicity: IARC lists chrysene as Group 3 (Not classifiable as to carcinogenicity to humans); OSHA, X (Carcinogen defined with no further categorization); EPA, B2 (Probable human carcinogen; sufficient evidence from animal studies; inadequate evidence or no data from epidemiologic studies); TLV, A3 (Animal carcinogen); MAK, A2 (Unmistakably carcinogenic in animal experimentation only); NTP, 1 (Known to be a carcinogen); and NIOSH, X (Carcinogen defined with no further categorization).
Medical Conditions Aggravated by Long-Term Exposure: None reported.
Chronic Effects: Animal data indicate that chronic exposure to chrysene and other coal tar pitch volatiles probably causes cancer. May also cause respiratory, skin, or eye irritation; cough, bronchitis, photosensitivity, "coal tar warts" (precancerous lesions enhanced by UV light exposure), erythema (skin inflammation), dermal burns, acneiform lesions, hematuria (blood in urine). May alter genetic material. Exposure to PAH's is believed to cause leukoplakia (precancerous patches on the tongue), lip and oral cavity cancers, and bladder cancer.

Section 4 - First Aid Measures

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 min. Consult a physician or ophthalmologist if pain, irritation, swelling, or photophobia persist.

Skin Contact: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For high exposures, medical surveillance (skin, mouth, GI tract, respiratory system) may be necessary.

Section 5 - Fire-Fighting Measures

Flash Point: Not applicable; combustible solid

Autoignition Temperature: None reported.

LEL: None reported.

UEL: None reported.

Flammability Classification: Combustible solid

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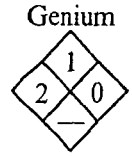


Extinguishing Media: Use water spray, carbon dioxide, dry chemical powder or appropriate foam.

Unusual Fire or Explosion Hazards: None reported.

Hazardous Combustion Products: Acrid smoke and fumes, including carbon monoxide and carbon dioxide.

Fire-Fighting Instructions: *Do not* release runoff from fire control methods to sewers or waterways.

Fire-Fighting Equipment: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

Section 6 - Accidental Release Measures

Spill /Leak Procedures: Notify safety personnel, evacuate all unnecessary personnel, remove heat and ignition sources. Isolate and ventilate area, deny entry, stay upwind. Tag container as defective and return to supplier. Use spark-proof tools and explosion-proof equipment.

Small Spills: *Do not* sweep! Carefully scoop up or vacuum (with a HEPA filter). Absorb liquid spill with an inert, noncombustible absorbent such as sand or vermiculite.

Large Spills

Containment: Large spills of chrysene are unlikely. *Do not* release into sewers or waterways.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid dust inhalation and skin and eye contact. Use only with adequate ventilation to maintain concentrations at nonhazardous levels (see Sec. 2). Wear personal protective clothing and equipment to prevent contact with skin and eyes (see Sec. 8). Practice good personal hygiene procedures to prevent inadvertently ingesting this material.

Storage Requirements: Store in tightly closed containers in a cool, well-ventilated area away from heat, ignition sources, and incompatibles.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Where feasible, enclose operations to avoid dust dispersion into the work area. Ventilate at the site of chemical release. To prevent static sparks, electrically ground and bond all containers and equipment.

Ventilation: Provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA PEL (see Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

Administrative Controls: Educate workers about the health and safety hazards associated with this material. Train in work practices which minimize exposure. Consider preplacement and periodic medical exams with emphasis on the skin and lungs.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Air purifying respirators may be adequate for handling small amounts of chrysene in a laboratory setting. For unlimited exposure ranges, wear a pressure-demand, full-face SCBA. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

Safety Stations: Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder clothing separately before reuse. Remove this material from your shoes and clean personal protective equipment.

Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9 - Physical and Chemical Properties

Physical State: Solid

Appearance and Odor: Colorless to white rhombic plates with reddish-blue fluorescence.

Vapor Pressure: 6.3 x10^{-7} mm Hg; 6.3 x10^{-9} mm Hg at 68 °F (20 °C)

Formula Weight: 228.28

Specific Gravity (H_2O=1, at 4 °C): 1.274 at 20 °C/4 °C

Refractive Index: 2610

Water Solubility: Insoluble (0.0018 mg/kg)

Other Solubilities: Slightly soluble in 95% ethanol, acetone, carbon disulfide, ether, glacial acetic acid. Soluble in hot benzene, toluene.

Boiling Point: 838 °F (448 °C); sublimes easily in a vacuum

Melting Point Range: 489 °F (254 °C) to 496 °F (258 °C)

Henry's Law Constant (H): 9.4 x10^{-8}

Octanol/Water Partition Coefficient: log K_{ow} = 5.61 to 5.91

Ionization Potential (eV): 7.59 ± 0.2

Section 10 - Stability and Reactivity

Stability: Chrysene is stable at room temperature in closed containers under normal storage and handling conditions.

Polymerization: Hazardous polymerization cannot occur.

Chemical Incompatibilities: Include strong oxidizers.

Conditions to Avoid: Avoid contact with chemical incompatibles, heat and ignition sources.

Hazardous Decomposition Products: Thermal oxidative decomposition of chrysene can produce acrid smoke and fumes, including carbon monoxide and carbon dioxide.

Section 11- Toxicological Information

Toxicity Data:*

Acute Effects:

Mouse, intraperitoneal, LD_{50}: >320 mg/kg

Mouse, skin, TD_{Lo}: 3600 µg/kg

Mutagenicity:

Human, lymphocyte: 6 µmol/L produced mutation.

Bacteria, *S typhimurium*: 5 mg/plate (-S9) produced mutation.

Tumorigenic Effects:

Mouse, skin, 3600 mg/kg for 30 weeks, intermittent; toxic effects: tumorigenic - equivocal tumorigenic agent by RTECS criteria; skin and appendages - tumors.

Mouse, skin: 23 mg/kg; toxic effects: tumorigenic - neoplastic by RTECS criteria; skin and appendages - tumors.

Genetic Effects:

Hamster, intraperitoneal: 900 mg/24 hr induced sister chromatid exchange.

Mouse, skin: 192 µmol/kg produced DNA adducts.

* See NIOSH, *RTECS* (GC0700000), for additional toxicity data.

Section 12 - Ecological Information

Ecotoxicity: *Anabaena flos-aquae* (algae), 2 weeks, EC_{35} growth: ± 0.002 mg/L. *Daphnia magna* (crustaceans), 2 hr, LC_{50}: 1.9 mg/L. *Rana pipiens* (amphibians), 24 hr, LC_{50}: >6.7 mg/L. *Neanthes arenaceodentata* (fishes), 96 hr, LC_{50}: >1 mg/L.

Environmental Fate: If released to water, it will adsorb very strongly to sediments and particulate matter, but will not hydrolyze or appreciably evaporate. It will bioconcentrate in species which lack microsomal oxidase. Calculated BCF: 4,230. K_{ow} indicates bioaccumulation, which could cause food-chain contamination. It will not hydrolyze or appreciably evaporate from soils or surfaces. The estimated biodegradation half-life in soil is 7 years.

Environmental Degradation: The estimated half-life of any gas phase in the atmosphere is 1.25 hours as a result of reaction with photochemically produced hydroxyl radicals. It will be subject to near-surface, direct photolysis with a half-life of 4.4 hours computed for exposure to sunlight at mid-day in midsummer at latitude 40° N. If released to air, it will be subject to direct photolysis, although adsorption to particulates may affect the rate of this process.

Soil Adsorption/Mobility: If released to soil it will be expected to adsorb very strongly to the soil and will not be expected to leach appreciably to groundwater.

Section 13 - Disposal Considerations

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations. One method is to dissolve or mix the material with a combustible solvent and burn in an incinerator equipped with an afterburner and scrubber.

Container Cleaning and Disposal: Handle empty containers carefully as hazardous residues may still remain. Triple rinse containers and dispose of wash wastewater appropriately.

Section 14 - Transport Information

Shipping Name: Environmentally hazardous substances, solid, n.o.s.*
Shipping Symbols: –
Hazard Class: 9
ID No.: UN3077
Packing Group: III
Label: CLASS 9
Special Provisions (172.102): 8, B54

Packaging Authorizations
a) Exceptions: 173.155
b) Non-bulk Packaging: 173.213
c) Bulk Packaging: 173.240

Quantity Limitations
a) Passenger, Aircraft, or Railcar: No limit
b) Cargo Aircraft Only: No limit

Vessel Stowage Requirements
a) Vessel Stowage: A
b) Other: –

*If in a quantity in one package which equals or exceeds the final reportable quantity (RQ) of 100 lb (45.4 kg)

Section 15 - Regulatory Information

EPA Regulations:
Listed as a RCRA Hazardous Waste (40 CFR 261.33)
RCRA Hazardous Waste Number: U050
Listed as a CERCLA Hazardous Substance (40 CFR 302.4) specific per (2) CWA, Sec. 307(a); (4) RCRA, Sec. 3001
CERCLA Final Reportable Quantity (RQ), 100 lb (45.4 kg)
SARA Toxic Chemical (40 CFR 372.65): Not Listed
SARA EHS (Extremely Hazardous Substance) (40 CFR 355): Not listed

OSHA Regulations:
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1)

Section 16 - Other Information

References: 1, 73, 103, 124, 136, 176, 190, 208, 209, 216, 217, 222, 223, 230, 232

Prepared By..... S Fleming, BS/ HM Spliethoff, MS
Industrial Hygiene Review..... S Gilson, CIH
Medical Review ..... G Kelafant, MD

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Publishing Corporation extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

IND3480 CAS #: 193-39-5

INDENO(1,2,3-CD)PYRENE

RTECS: NK9300000
EINECS Number: 205-893-2
Molecular Formula: $C_{22}H_{12}$
Formula Weight: 276.34
Synonyms: IDENO(1,2,3-CD)PYRENE; INDENO(1,2,3-C,D) PYRENE; INDENO(1,2,3-C,D)PYRENE; INDENOPYRENE; IP; 1,10-(1,2-PHENYLENE)PYRENE; 1,10-(O-PHENYLENE)PYRENE; 1,10-(ORTHO-PHENYLENE)PYRENE; 2,3-O-PHENYLENEPYRENE; 2,3-ORTHO-PHENYLENEPYRENE; 2,3-PHENYLENEPYRENE; O-PHENYLENEPYRENE; ORTHO-PHENYLENEPYRENE
Description: yellow plates or needles
Use: research chemical

Physical Properties

Boiling Point: 530 °C (986 °F)
Freezing Point: 162.5 °C (324.5 °F) to 164 °C (327.2 °F)
Vapor Pressure: 1.0×10^{-1} mm Hg
Water Solubility: 0.062 mg/L Water

RTECS Toxicity Data

Mutagenic: Hamster Morphological Transformation; Cell Type: lung; Dose: 100 ug/L. Bacteria - S Typhimurium Mutations in Microorganisms; Dose: 3 ug/plate/48H (-S9).
Tumorigenic: Rat Route: Implant; Dose: 4150 ug/kg; Toxic Effects: Tumorigenic - Carcinogenic by RTECS criteria; Lungs, Thorax, or Respiration - Tumors; Tumorigenic - Tumors at site of application. Rat Route: Implant; Dose: 20750 ug/kg; Toxic Effects: Tumorigenic - Carcinogenic by RTECS criteria; Lungs, Thorax, or Respiration - Tumors; Tumorigenic - Tumors at site of application. Rat Route: Implant; Dose: 5 mg/kg; Toxic Effects: Tumorigenic - Equivocal tumorigenic agent by RTECS criteria; Lungs, Thorax, or Respiration - Tumors; Tumorigenic - Tumors at site of application.

Hazard Overviews

Carcinogenicity: IARC - Group 2B, Possibly carcinogenic to humans; NIOSH - Not listed; NTP - Listed; ACGIH - Not listed; OSHA - Not listed; EPA - Class B2, Probable human carcinogen based on animal studies; MAK - Not listed

Environmental

Environmental Fate: If released to soil it will sorb strongly (estimated $K_{oc} = 20,146$) and hence is not expected to leach. No information was found about volatilization from, hydrolysis in, or biodegradation in soil. Released to water it will sorb strongly to suspended particulate matter, biota and sediments. Although there is a high potential to bioconcentrate in most aquatic organisms, it may not in fish since fish contain microsomal oxidase, which allows polyaromatic hydrocarbons to be metabolized. No information was found about volatilization, photolysis, hydrolysis, or biodegradation in water. It will probably be persistent in the aquatic environment and concentrate in sediments. Almost all released to the atmosphere will be sorbed to particulate matter; thus its atmospheric fate will primarily depend on physical processes such as dry and wet deposition. However, a computer-estimated half-life in the vapor phase is about 20 hours due to reaction with photochemically produced hydroxyl radicals.

Environmental Physical Data

Henry's Law Constant: 5.89×10^{-10}
Octanol/Water Partition Coefficient: log $K_{ow} = 6.584$
Sorption Partition Coefficient: 2.0146×10^{4}
BCF: estimated at 5.9407×10^{4}

Regulations

RCRA 40CFR: Listed Hazardous Waste No. U137 Toxic Waste

CERCLA: 40CFR 302.4: Listed per RCRA Section 3001 per CWA Section 307(a) RQ: 100 lb (45.35 kg)
SARA 40CFR 372.65: Listed
SARA EHS 40CFR 355: Not listed
TSCA: Listed

Analytical Methods

Air: EPA TO-13; California 429
Soil: CLP LC_SV, MC_SVOA, OHC; EPA 16, 1625, PAH-005, PAH-007, PAH-011, PAH-012; SW846 3630B, 3640A, 8100, 8250A, 8270B, 8270C, 8275A, 8310; DOE OS050
Water / Groundwater: EPA PAH-002, PAH-006, 1625, 610, 625, 625-S, 6; APHA 6410-B, 6440-B, 6440-C; ASTM D4657; USGS O3118
Drinking Water: EPA 525.1, 525.2, 550, 550.1
Indoor / Expired Air: NIOSH 5506, 5515; EPA IP-7-A, IP-7-B
Plasma: EPA 29
Other: EPA PAH-009

Material Safety Data Sheet Collection
Genium Publishing Corp.
1171 RiverFront Center
Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2001-06

Section 1 - Chemical Product and Company Identification 55

Material Name: Benz[e]pyrene **CAS Number:** 192-97-2
Chemical Formula: $C_{20}H_{12}$
Synonyms: B(E)P; 1,2-BENZOPYRENE; 4,5-BENZOPYRENE; BENZO(E)PYRENE; 1,2-BENZPYRENE; 4,5-BENZPYRENE; BENZ[E]PYRENE
General Use: constituent of coal tars and cigarette smoke and is in the atmosphere as a product of incomplete combustion

Section 2 - Composition / Information on Ingredients

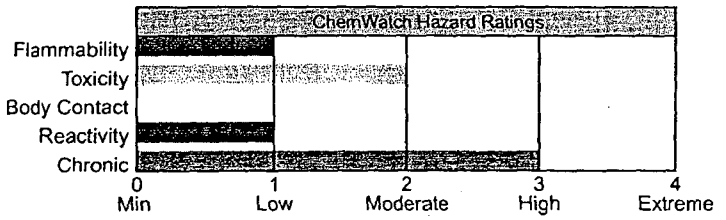
Name	CAS	%
benz[e]pyrene	192-97-2	>98

OSHA PEL
No data found.

NIOSH REL
No data found.

ACGIH TLV
No data found.

Section 3 - Hazards Identification



ANSI Signal Word

Warning!

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Prisms or plates. Irritating to eyes/skin/respiratory tract. Toxic. Chronic Effects: laboratory experiments have shown mutagenic effects; teratogen; may cause harm to the unborn child. Possible human carcinogen. Will burn.

Potential Health Effects

Target Organs: eyes, skin, respiratory system
Primary Entry Routes: accidental skin and eye contact, inhalation of generated dusts
Acute Effects

Inhalation: The dust is harmful and discomforting to the upper respiratory tract. Persons with impaired respiratory function, airway diseases, or conditions such as emphysema or chronic bronchitis may incur further disability if excessive concentrations of particulate are inhaled.

Eye: The dust may be discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/ or other transient eye damage/ ulceration.

Skin: The material may be mildly discomforting to the skin. Open cuts and abraded or irritated skin should not be exposed to this material. Toxic effects may result from skin absorption.

Ingestion: The solid/dust is discomforting to the gastrointestinal tract and harmful if swallowed. Considered an unlikely route of entry in commercial/industrial environments.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: The so-called polycyclic aromatic hydrocarbons (PAHs) comprise a large family; some members occur in coal tar, tobacco smoke, petroleum and air pollution. Some substituted derivatives have been identified, in animal studies, as amongst the most highly active carcinogens. Rodent species are sensitive to some PAHs with skin application producing cancerous growths. Injection produces soft tissue tumors (sarcomas) in rats and mice. Administration of PAHs to Rhesus monkey on the other hand has not yet proved successful in yielding tumors and there is inadequate date to support the proposition that individual PAHs produce cancer in humans. There are however

a number of epidemiology and mortality studies that show increased incidence of cancer in humans exposed to mixtures of PAHs. Evidence exists of lung and genito-urinary cancer mortality amongst coke-oven workers and skin tumors in workers exposed to creosote. Exposures to other chemical mixtures containing PAHs such as cigarette smoke, coal tar, coal tar pitch and bitumens, have been associated with increased incidences of lung cancer in humans.

Section 4 - First Aid Measures

Inhalation: • If dust is inhaled, remove to fresh air.
• Encourage patient to blow nose to ensure clear breathing passages.
• Rinse mouth with water. Consider drinking water to remove dust from throat.
• Seek medical attention if irritation or discomfort persist.
• If fumes or combustion products are inhaled, remove to fresh air.
• Lay patient down. Keep warm and rested.
• Other measures are usually unnecessary.
Eye Contact: • Immediately hold the eyes open and flush with fresh running water.
• Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
• Seek medical attention if pain persists or recurs.
• Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact: • Immediately remove all contaminated clothing, including footwear (after rinsing with water).
• Wash affected areas thoroughly with water (and soap if available).
• Seek medical attention in event of irritation.
Ingestion: Contact a Poison Control Center. If more than 15 minutes from a hospital:
• INDUCE vomiting with IPECAC SYRUP, or fingers down the back of the throat, ONLY IF CONSCIOUS. Lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. NOTE: Wear a protective glove when inducing vomiting by mechanical means.
• SEEK MEDICAL ATTENTION WITHOUT DELAY.
• In the meantime, qualified first-aid personnel should treat the patient following observation and employing supportive measures as indicated by the patient's condition.
• If the services of a medical officer or medical doctor are readily available, the patient should be placed in his/her care and a copy of the MSDS should be provided.
• If medical attention is not available on the worksite or surroundings send the patient to a hospital together with a copy of the MSDS.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Treat symptomatically.

Section 5 - Fire-Fighting Measures

Flash Point: Not available; probably combustible
Extinguishing Media: Foam. Dry chemical powder. BCF (where regulations permit). Carbon dioxide. Water spray or fog - Large fires only.
General Fire Hazards/Hazardous Combustion Products: • Solid which exhibits difficult combustion or is difficult to ignite.
• Avoid generating dust, particularly clouds of dust in a confined or unventilated space, as dust may form an explosive mixture with air and any source of ignition, e.g., flame or spark, will cause fire or explosion.
• Dry dust can also be charged electrostatically by turbulence, pneumatic transport, pouring, in exhaust ducts and during transport.
• Build-up of electrostatic charge may be prevented by bonding and grounding.
• Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.
Fire Incompatibility: Avoid contamination with oxidizing agents i.e., nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.
Fire-Fighting Instructions: • Contact fire department and tell them location and nature of hazard.
• Wear breathing apparatus plus protective gloves for fire only.
• Prevent, by any means available, spillage from entering drains or waterways.
• Use fire fighting procedures suitable for surrounding fire.
• Do not approach containers suspected to be hot.
• Cool fire-exposed containers with water spray from a protected location.
• If safe to do so, remove containers from path of fire.
• Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: • Clean up all spills immediately.
• Avoid contact with skin and eyes.

- Wear protective clothing, gloves, safety glasses and dust respirator.
- Use dry clean up procedures and avoid generating dust.
- Vacuum up or sweep up.
- Place in clean drum then flush area with water.

Large Spills: • Clear area of personnel and move upwind.
- Contact fire department and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or waterways.
- No smoking, bare lights or ignition sources.
- Increase ventilation.
- Stop leak if safe to do so.
- Water spray or fog may be used to disperse/absorb vapor.
- Contain or absorb spill with sand, earth or vermiculite.
- Collect recoverable product into labeled containers for recycling.
- Collect solid residues and seal in labeled drums for disposal.
- Wash area and prevent runoff into drains.
- After clean up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.
- If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: • Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of overexposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- DO NOT enter confined spaces until atmosphere has been checked.
- Do not allow material to contact humans, exposed food or food utensils.
- Avoid smoking, bare lights or ignition sources.
- When handling, DO NOT eat, drink or smoke.
- Avoid contact with incompatible materials.
- Keep containers securely sealed when not in used.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Working clothes should be laundered separately. Launder contaminated clothing before reuse.
- Follow good occupational work practices.
- Observe manufacturer's storage/handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Recommended Storage Methods: Glass container. Plastic container. Metal can. Metal drum. Check that all containers are clearly labeled and free from leaks.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Local exhaust ventilation usually required. If risk of overexposure exists, wear NIOSH-approved respirator. Provide adequate ventilation in warehouse or closed storage area.

Personal Protective Clothing/Equipment

Eyes: Safety glasses with side shields or chemical goggles. Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Wear chemical protective gloves, e.g. PVC. Wear safety footwear.

Other: • Overalls.
- PVC Apron.
- PVC protective suit may be required if exposure severe.
- Eyewash unit.
- Ensure there is ready access to a safety shower.

Section 9 - Physical and Chemical Properties

Appearance/General Info: White to yellow green crystalline powder.

Physical State: prisms or plates

Vapor Pressure (kPa): Negligible

Formula Weight: 252.30

Water Solubility: 2.9 x10^{-8} mol/L dissolve in Water at 25 °C

Boiling Point Range: 3at 10 °C (590 °F) to 312 °C (594 °F) at 10 mm Hg

Freezing/Melting Point Range: 178 °C (352.4 °F) to 179 °C (354.2 °F)

Volatile Component (% Vol): Negligible

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid reaction with oxidizing agents.

Section 11 - Toxicological Information

Gastrointestinal and skin tumors, fetotoxicity, specific developmental abnormalities, an ability to facilitate action of known carcinogens recorded. Exposure to the material for prolonged periods may cause physical defects in the developing embryo (teratogenesis).
NOTE: Substance has been shown to be mutagenic in various assays, or belongs to a family of chemicals producing damage or change to cellular DNA.

See NIOSH, *RTECS* DJ4200000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to the atmosphere, it will exist in both the vapor and particulate-phases, although the particulate-phase will usually be dominant. Vapor-phase is rapidly degraded by photochemically produced hydroxyl radicals (estimated half-life of 2.5 hr). Particulate-phase can also be degraded readily by hydroxyl radicals and direct photolysis; however, the rate of degradation depends upon the adsorbing substrate. Substrates containing carbon (>5%) stabilize it and permit long-range atmospheric transport. Physical removal from air by wet and dry deposition is important. If released to soil, it will adsorb strongly and will not leach. If released to water, it will adsorb strongly to sediment and suspended matter and will partition from the water column to sediment. It will bioconcentrate in aquatic organisms that can not metabolize it. Volatilization from water is slow. Limited data suggests that biodegradation are slow.
Ecotoxicity: Worms: apparent bioconcentration factors in polychaete worms (dry wt/sediment dry wt). Prionospio cirrifera and Spiochaetpoterus costarum BCF: 11.6
Henry's Law Constant: estimated at 1.07×10^{-6}
BCF: polychaete worms 1.5 to 11.6
Soil Sorption Partition Coefficient: $K_{OC} = 7.2$

Section 13 - Disposal Considerations

Disposal: • Recycle wherever possible or consult manufacturer for recycling options.
• Follow applicable local, state, and federal regulations.
• Bury residue in an authorized landfill.
• Recycle containers if possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: TOXIC SOLID, ORGANIC, N.O.S.
Additional Shipping Information:
Hazard Class: 6.1
ID No.: 2811
Packing Group: III
Label: Harmful[6]

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Not listed

Section 16 - Other Information

Research Date:.....2000-11 **Review Date:** 2001-05

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ATTACHMENT 3
SAFETY AND HEALTH FORMS

Tool-Box Safety Briefing Sheet

Date:	Project:

Topics of Toolbox Safety Meeting

- ☐ Hardhats and Safety Shoes
- ☐ Eye & Ear Protection
- ☐ Work Zones and Site Control
- ☐ Heat and Cold Stress
- ☐ Designated Smoking Zone
- ☐ Review Previous Accidents
- ☐ Accident Reporting/Investigation
- ☐ Activity Hazard Analysis _____
- ☐ Activity Hazard Analysis _____
- ☐ Ladder for Excavation
- ☐ Entering Excavation
- ☐ Confined Space Entry
- ☐ Ground Fault Interrupters
- ☐ First Aid and Fire Protection
- ☐ Hazardous Communication
- ☐ Fall Protection (6 Foot Rule)
- ☐ Activity Hazard Analysis _____
- ☐ Other_____

Site Specific Hazards

Attendees

Conti Employees	Subcontractors & Visitors

Daily Operations

Site Safety and Health Officer:

Conti Environmental, Inc
Site Entry and Exit Log

Project Number:	Project Name:	Project Supervisor:

Employee Name	Company	Task	Time In	Time Out

Conti Environmental, Inc
Qualitative Fit Test Report

Employee Information

Employee Name:	Date:
Employee Position/Department:	SSAN:
Test Performed By:	Title:

Respirator/Fit Test Information

☐ Self Contained Breathing Apparatus	☐ Supplied Air Respirator
☐ Powered Air Purifying Respirator	☐ Air Purifying Respirator

☐ Clean Shaven	☐ Beard	☐ Glasses	☐ Other

	Respirator 1	Respirator 2	Respirator 3
Brand:			
Model:			
Size:			
Positive Pressure Test: (Pass/Fail)			
Negative Pressure Test: (Pass/Fail)			
Irritant Smoke Test: (Pass/Fail)			
Banana Oil Test: (Pass/Fail)			
Fit Test Result: (Pass/Fail)			

Employee Statement: I understand that my use of this respirator must be in accordance with the Tyree Health and Safety Program, Manufactures Instruction and applicable OSHA Regulations and Standards

Employee's Signature:

Tester's Signature:

Conti Environmental, Inc
Equipment Decontamination Log

Project Number:	Project Name:	Project Supervisor:

Equipment Description	Equipment Number	Date Decontaminate	Date Demob

Comments:

Site Safety and Health Officer	Signature

Conti Environmental, Inc.
Equipment Inspection Form

Date:	Project Name.:	Project No.:
Equipment Make & Model:	Equipment No:	Equipment Hours:

This form is to be used for the initial equipment inspection upon arrival at the project and Daily inspection during use. Corrective actions are required for all deficiencies noted during the inspections.

EQUIPMENT CHECKLIST

Inspection Item	*Yes*	*No*	*Comment/Corrective Action*
Fluid Level?			
Horn Operable?			
Emergency/Parking Brake System?			
Hydraulic System Operable w/No leaks?			
Engine and Transmission			
Parking Brake System?			
Headlights Operable?			
Taillights Operable?			
Brake Lights Operable?			
Audible (Reverse) Alarm System?			
Unobstructed rear View?			
Windshields?			
Windshield Wipers and Washer Fluid?			
Defroster/Defogger?			
Cab Shield or Canopy?			
Seatbelts Available and Used?			
Fire Extinguishers?			
Rear View Mirror?			
Fender/Mud Flaps?			

Comments

Inspection Performed By:	Date:	Time:

Conti Environmental, Inc.
Air Sampling Report

PROJECT NUMBER:	PROJECT NAME:	Date:
WORK LOCATION AND TASK:		

AIR SAMPLING INFORMATION

Sample I.D.	Name / SSAN Area	Air Sampling Compound	Analysis Method	Start Time	Stop Time	Total Time	Start Flow	Stop Flow	Average Flow Rate	Total Volume

Comments:

Signature:	Date:

Conti Environmental, Inc.
Daily Air Monitoring Report

Project Number:	Project Name:	Project Supervisor:
Date:	**Duration of Monitoring**	

Work Location and Task:

Instrument:		**Instrument:**		**Instrument:**	
Reading	**Time**	**Reading**	**Time**	**Reading**	**Time**
Calibration:		**Calibration:**		**Calibration:**	

Perimeter Samples Collected:

Personnel Samples Collected:

Perimeter and Personnel Sample Results From Previous Day (Provide Data when Received):

Comments:

Name:	**Title:**
Signature:	Date:

Daily Air Monitoring Report (Cont.)

Project Number:	Project Name:	Project Supervisor:

Instrument:		**Instrument:**		**Instrument:**	
Reading	**Time**	**Reading**	**Time**	**Reading**	**Time**
Calibration:		**Calibration:**		**Calibration:**	

Signature:	Date:

OSHA's Form 300A

Summary of Work-Related Injuries and Illnesses

Year 20__ __

U.S. Department of Labor
Occupational Safety and Health Administration
Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete this Summary page, even if no work-related injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete and accurate before completing this summary.

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the Log. If you had no cases, write "0."

Employees, former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR Part 1904.35, in OSHA's recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
_____	_____	_____	_____
(G)	(H)	(I)	(J)

Number of Days

Total number of days of job transfer or restriction	Total number of days away from work
_____	_____
(K)	(L)

Injury and Illness Types

Total number of . . .

	(M)		
(1) Injuries	_____	(4) Respiratory conditions	_____
		(5) Poisonings	_____
(2) Musculoskeletal disorders	_____	(6) Hearing loss cases	_____
(3) Skin disorders	_____	(7) All other illnesses	_____

Establishment information

Your establishment name _____

Street _____

City _____ State _____ ZIP _____

Industry description (*e.g., Manufacture of motor truck trailers*)

_____

Standard Industrial Classification (SIC), if known (*e.g., SIC 3715*)

__ __ __ __

Employment Information *(If you don't have these figures, see the Worksheet on the back of this page to estimate.)*

Annual average number of employees _____

Total hours worked by all employees last year _____

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

_____ _____
Company executive Title

( ) _____ / /
Phone Date

Post this Summary page from February 1 to April 30 of the year following the year covered by the form.

OSHA's Form 300

Log of Work-Related Injuries and Illnesses

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

Year 20__ __

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

You must record information about every work-related death and about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid. You must also record significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional. You must also record work-related injuries and illnesses that meet any of the specific recording criteria listed in 29 CFR Part 1904.8 through 1904.12. Feel free to use two lines for a single case if you need to. You must complete an Injury and Illness Incident Report (OSHA Form 301) or equivalent form for each injury or illness recorded on this form. If you're not sure whether a case is recordable, call your local OSHA office for help.

Establishment name ______________________

City ______________ State ______________

Identify the person			Describe the case			Classify the case											
(A) Case no.	(B) Employee's name	(C) Job title (e.g., *Welder*)	(D) Date of injury or onset of illness	(E) Where the event occurred (e.g., *Loading dock north end*)	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (e.g., *Second degree burns on right forearm from acetylene torch*)	Using these four categories, check ONLY the most serious result for each case: Death (G)	Days away from work (H)	Remained at work: Job transfer or restriction (I)	Remained at work: Other record-able cases (J)	Enter the number of days the injured or ill worker was: On job transfer or restriction (K)	Away from work (L)	Check the "injury" column or choose one type of illness: (M) Injury (1)	Musculoskeletal disorder (2)	Skin disorder (3)	Respiratory condition (4)	Poisoning (5)	Hearing loss (6)	All other illnesses (7)
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___	___	___	__/__ month/day	___	___	☐	☐	☐	☐	___ days	___ days	☐	☐	☐	☐	☐	☐	☐
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					Page totals ➤	___	___	___	___	___	___	Injury (1)	Musculoskeletal disorder (2)	Skin disorder (3)	Respiratory condition (4)	Poisoning (5)	Hearing loss (6)	All other illnesses (7)

Be sure to transfer these totals to the Summary page (Form 300A) before you post it.

Public reporting burden for this collection of information is estimated to average 14 minutes per response, including time to review the instructions, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any other aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistics, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed forms to this office.