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RPM, Inc.

Environmental Health and Safety Plan

Mohawk Finishing
4715 State Highway 30
Amsterdam, New York

June 2009

ARCADIS

Environmental Health and Safety Plan

Mohawk Finishing

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1. Introduction

All work on this project will be carried out in compliance with ARCADIS' Health and Safety policies and procedures, and the Occupational Safety and Health Administration's Hazardous Waste Operations and Emergency Response regulation 29 CFR 1910.120. The design of this health and safety plan (HASP) conforms to the requirements of the ARC HSFS010 (HASP H&S Procedure). Specific health and safety information for the project is contained in this HASP. All personnel working on hazardous operations or in the area of hazardous operations shall read and be familiar with this HASP before doing any work. All project personnel shall sign the certification page acknowledging that they have read and understand this HASP.

Changes in the scope of the project or introduction of new hazards to the project shall require revision of the HASP by the HASP writer and reviewer, and approval by the Project Manager. The HASP Addendum Form and log table are included as Appendix A.

2. Project Site History and Requirements

2.1 Site Location and Background

The former Mohawk Finishing Products is located at 4715 State Highway 30 in the Town of Amsterdam, New York. The Site location is shown on Figure 1.

In 2005, the facility building and property were purchased by Power Pallet, Inc. Power Pallet manufactures and recycles wooden pallets and produces colored mulch products from recycled wood pallets.

The facility is situated on approximately 28 acres in an area of sparse commercial development. Geographically, the Site is located within the Hudson-Mohawk Lowlands physiographic province of New York State, with the local area characterized by undulating upland areas. The site is located at an approximate elevation of 745 feet above mean sea level. The topography of the site slopes slightly to the south and has one main drainage ditch that flows to the south and east. This ditch eventually drains to the south flowing Bunn Creek, a tributary of North Chuctanunda Creek, which ultimately discharges into the Mohawk River.

2.2 Site History and Description

Table 2.1 Site Type: (Check as many as applicable}

X	Active	X	Secure		Industrial		Landfill		Service station
	Inactive		Unsecured	X	Commercial / Industrial		Well field		Water work
		X	Uncontrolled		Residential		Railroad		Undeveloped
Other specify: Active pallet manufacturing and recycling facility									

Prior to 1964, the Site was used as a dairy farm. Mohawk Finishing Products began to build and manufacture wood products at the Site in 1964. By 1968, Buildings 1, 2, and 3 were constructed, and Buildings 4 through 9 were completed during the 1970s and 1980s. Mohawk Finishing Products manufactured a range of chemical-based wood products including; wood finishes, coatings, stains, and repair products. These chemicals were piped from the former tank farm to Building 6 via the former aboveground pipeline. These raw materials were combined by the use of mixing vats to form various wood finishing products. The tank farm consisted of 22 underground storage tanks (USTs) (located southwest of the facility building near Highway 30), used

for storage of various chemicals. The former tank farm and associated aboveground piping were decommissioned and closed out (i.e., demolition, removal, with off-site disposal) in November and December 2000, followed by the submittal of the closure report to the NYSDEC (ARCADIS G&M, 2001). It should be noted that this tank farm replaced the former tank farm located within the footprint and beneath Building 8, which was abandoned in-place. The facility continued to operate until it was closed in 2002. All manufacturing process related equipment and products were decommissioned and removed. As noted, the property was sold to Power Pallet in 2005, which currently utilizes Building 6 to build pallets and leases Building 8 for recycled paper storage (Figure 2).

Access to the site is in accordance with the access easement agreement dated March 30, 2004 between RPM Wood Finishes Group, Inc. (RPM) and Mona Property Enterprises LLC.

2.3 List of Project Tasks and Scope of Work

- Task 1. Groundwater Sampling
- Task 2. Indoor Air Sampling
- Task 3. Well Installation
- Task 4. Remedial System Construction
- Task 5. Remedial System Operation, Maintenance, and Monitoring

2.4 Site Control

2.4.1 General Site Safety Rules

The following general requirements apply to all on-site activities.

2.4.2 Smoking, Eating, Chewing and Drinking

Smoking, eating and drinking will not be permitted within any controlled work area (e.g., exclusion zone or contaminant reduction zone [CRZ]) at any time. These activities shall only be permitted within or outside the support zone. Field workers will first wash hands and face after leaving any controlled work area prior to eating or drinking. Consumption of alcoholic beverages is prohibited at the Site.

2.4.3 Contact with Contaminated Materials

Field personnel should avoid contact with potentially contaminated substances. They should not walk through puddles, pools, mud, etc., and should avoid, whenever possible, kneeling on the ground and leaning or sitting on equipment or the ground. Monitoring equipment should not be placed on a potentially contaminated surface, including the ground surface.

All field crew-members should remain alert for any indications of potentially dangerous situations, (e.g., strong, irritating, or nauseating odors; heavy equipment; excavations; etc.).

2.4.4 Site Awareness

Field crew members will be familiar with the physical characteristics and requirements of the work site, including:

- Site Access;
- Accessibility to equipment and vehicles;
- Communication (i.e., methods, restrictions, or limitations);
- Hot zones (areas of known or suspected contamination - exclusion zones);
- Facility emergency procedures and evacuation assembly points are located in the current facilities health and safety documents located in Appendix B;
- Activities of other contractors and personnel on Site that may affect or be affected by tasks being performed; and
- Location of protective and emergency equipment and relevant first-aid procedures (Appendix E).

The number of personnel and equipment in controlled work areas should be minimized, consistent with Site operations. The Site Safety Officer (SSO) will review this information during the Site orientation and periodically during the daily safety tailgate meetings to be conducted prior to the start of work each day.

2.4.5 Buddy System

All on-site personnel will operate using the buddy system whenever possible. If the buddy system is not possible and ARCADIS personnel must work alone, refer to Module: “Personal Safety” in Appendix C.

2.4.6 Housekeeping

During Site activities, work areas will be continuously inspected for identification of excess trash and unnecessary debris. Excess debris and trash will be collected and stored in an appropriate container (e.g., plastic trash bags, garbage can, roll-off bin,etc.) prior to disposal. At no time will debris or trash be intermingled with waste PPE or contaminated materials. All waste disposal operations should be coordinated with the facility operations, and at no time will the waste streams (e.g., C&D , general trash, or other) from the remedial operation be mixed or comingled with that of the facility's waste streams unless authorized by an approved representative of the facility (e.g., C&D , general trash, etc.) and the project manager.

2.5 Site Access

The SSO will coordinate access and control security at the Site. The SSO will establish work zones at the Site (i.e., support zone, exclusion zone, and CRZ) prior to the commencement of field work. Access to the work zones will be restricted to authorized personnel. .

2.5.1 Safety Signs, Barricades and Postings

Engineering controls (physical barricades, etc), H&S Signage, and other warning devices should be identified and supplied by ARCADIS as appropriate for the projected remedial operations at the project Site. These include, but may not be limited to:

- Caution and warning tape
- Traffic cones and pylons
- Striped traffic barricades and flashing lights (battery supply)
- Emergency phone numbers sign

3. ARCADIS Organization and Responsibilities

3.1 Project Manager/Task Manager

In planning and preparation of this project, the project manager and/or task manager has completed the project-specific H&S Stewardship Checklist & Project Hazard Analysis Worksheet. The project Hazard Analysis Worksheet was completed using the Hazard Analysis Risk Control (HARC) ranking process (ARCADIS H&S Procedure ARC HSMS002) (see Section 4 of this HASP). Additional responsibilities of the project manager and task manager are as follows:

- Review all applicable H&S Procedures, and ensure that project activities conform to all requirements;
- Obtain client-specific health and safety information and communicate with the client on health and safety issues;
- Communicate with the Site Safety Officer (SSO) on health and safety issues;
- Allocate resources for correction of identified unsafe work conditions;
- Ensure ARCADIS site workers have all training necessary for the project; and
- Report all injuries, illnesses and near-misses to the Client H&S Resource or Project H&S Manager (PHSM), lead incident investigations, and ensure that any recommendations made are implemented.

3.2 Other Project Team Responsibilities

Additional personnel designated to carry out H&S job functions for the project, and their responsibilities are listed below. The same person may fill more than one role:

Table 3.2.1 Project Team

ARCADIS Project Team	Responsibility and Tasks
Chris Davern Katie Arnold Gretchen Miles Todd Carignan	**SSO** • Reviews and works in accordance with the components of this HASP. • Ensures that this HASP is available to and reviewed by all site personnel including subcontractors. • Ensures that necessary site-specific training is performed (both initial and "tailgate" safety briefings. • Ensures site visitors have been informed of the hazards related to ARCADIS work, and have signed the Site Visitors Log. • Ensures that work is performed in a safe manner and has authority to

ARCADIS Project Team	Responsibility and Tasks
	stop work when necessary to protect workers and/or the public. • Coordinates activities during emergency situations. • Ensures that all necessary permits and safety information provided by the client is disseminated to other site personnel and is maintained in an organized manner. • Communicates with the PM, Client H&S Resource and/or the PHSM on health and safety issues. • Reports all injuries, illnesses and near-misses to the PM, Client H&S Resource and PHSM. • Ensures that necessary safety equipment is maintained and used at the site. • Contacts a health and safety professional for assistance in establishing the respiratory cartridge change schedule as required.
Chris Davern Katie Arnold Gretchen Miles Todd Carignan	**Site Workers** • Reads and works in accordance with the components of this HASP. • Reports all unsafe working conditions to the SSO. • Reports all injuries, no matter how minor, to the SSO. • Works in a safe manner. • Signs the HASP acceptance log in Appendix E.

ARCADIS Project Team	Responsibility and Tasks
Dave Patterson	**Project Health and Safety Manager (PHSM)** The PHSM oversees all aspects of the site safety program, and prepares site-specific health and safety guidance documents or addenda to this plan. The PHSM does not report to the Project Manager, and is separately accountable to the ARCADIS project team for site health and safety. The PHSM acts as the sole contact to regulatory agencies on matters of safety and health. Other responsibilities include: • Overall authority for health and safety compliance and HASP conformance for the project. • General health and safety program administration. • Conducts project health and safety audits as warranted. • Determines the level of personal protection required. • Updates equipment or procedures based on information obtained during site operations. • Establishes air-monitoring parameters based on expected contaminants. • Assists in injury, illness and near-miss investigations and follow-up.
Dave Patterson	**Client Health and Safety Resource** The designated Client H&S Resource is responsible for : • Assisting the SSO in issues as they arise. • Performing site audits and assessments. • Assisting with near-miss/incident investigations. • Serves as the liaison with corporate during H&S regulatory issues as they may arise.

4. Hazard Control

This section briefly describes ARCADIS's standard policy to be proactive in the identification, assessment, and control of health and safety hazards and associated risks. The hazard assessment and risk control (HARC) matrix provided below is the formal ARCADIS tool (i.e. versus less formal TRACK tool) to be applied to:

- Routine and non-routine activities in ARCADIS at the project site;
- The activities of all people having access to the workplace; and
- The facilities services at the workplace, whether provided or directly controlled by ARCADIS or not (i.e. work completed by contractors, facility activities (client/non-client) that could present hazards to ARCADIS staff and direct subcontractors.

Table 4.1 HARC- Risk Assessment Matrix (H&S Procedure ARC HSMS002)

Risk Assessment Matrix		Likelihood Ratings**				
Consequences Ratings*		A	B	C	D	E
People	Property	Never heard of in the world	Heard of incident in industry	Incident has occurred in ARCADIS Group	Happens several times a year in ARCADIS OpCo	Happens several times a year at ARCADIS Worksite
0 - No health effect	0 - No damage	Low	Low	Low	Low	Low
1 - Slight health effect	1 - Slight damage	Low	Low	Low	Low	Low
2 - Minor health effect	2 - Minor damage	Low	Low	Low	Medium	Medium
3 - Major health effect	3 - Local damage	Low	Low	Medium	Medium	High
4 - PTD or 1 fatality	4 - Major damage	Low	Medium	Medium	High	High
5 - Multiple fatalities	5 - Extensive damage	Medium	Medium	High	High	High

More detailed information is provided in the H&S Procedure ARC HSMS002 provided in Appendix E.

4.1 Job Loss Analyses (JLAs), H&S Procedures and PPE

A JLA has been completed for each safety critical task, and are included in Appendix F. Hazards identified on the Project Hazard Analysis (section 5.1) are addressed in the JLAs as well as control methods to protect employees and property from hazards. The JLA also lists the type of personal protective equipment (PPE) required for the completion of the project. A detailed list of PPE for the project is located in Appendix D; Level D PPE is required for site activities.

ARCADIS H&S Procedures applicable to this project are listed below. These procedures should be reviewed by the project manager, task manager and site personnel.

- ARC HSMS002 – Hazard Identification, Risk Assessment, and Risk Control
- ARC HSFS019 – Utility Location
- ARC HSCS005 – Excavation and Trenching
- ARC HSFS006 – Electrical Safety
- ARC HSGE015 – PPE

4.2 Field Health & Safety Handbook

The Field H&S Handbook is an ARCADIS document containing information about topic-specific health and safety requirements for the field. This handbook contains relevant general topics and is used as part of the overall HASP process. To aid in the consistency of the HASP process the handbook will be used as an informational source in conjunction with this HASP. The following handbook sections are minimally required reading for this project:

- Section III-A. Daily Safety Meetings/Tailgates
- Section III-F. General Housekeeping, Personal Hygiene and Field Sanitation
- Section III-G. Site Security, Work Zone and Decontamination for HAZWOPER Sites
- Section III-H. Personnel Safety and Other Unique Site Conditions
- Section III-I. Severe Weather
- Section III-L. Noise
- Section III-O. Illumination
- Section III-R. Personnel Protective Equipment
- Section III-T. Vehicle Safety Inspection
- Section III-EE. Ergonomics
- Section III-GG. HAZWOPER and HAZMAT Response
- Section III-II. Drums and other Material Handling
- Section III-LL. Traffic Control
- Section III-NN. Backing Safety
- Section IV-G. Forklifts

5. Hazard Communication (HazCom)

All project required chemicals must be handled in accordance with OSHA 29 CFR 1910.1200, ARCADIS-HazCom Procedure (ARC HSGE007), and the requirements outlined in the Field H&S Handbook. Table 1 lists all chemicals that will be brought and stored on the site. Material Safety Data Sheets (MSDS) for chemicals brought on site are included in **Appendix E**.

Table 1. Master Chemical and Storage List

Chemical Name	Estimated Quantity	Chemical Storage Location

5.1 Chemical Hazard

Air monitoring will be conducted as outlined in this HASP to collect exposure data for chemicals of concern (COC) or for chemicals brought onsite for use. Table 2 lists the properties of chemicals CSX most frequently ships that may be encountered at the site.

Table 2. Chemical Hazard Information

Chemical Name	IP (eV) Ionization Energy	Odor Threshold (ppm)	Routes of Entry/ Exposure Symptoms	8-hr TWA[1] (ppm)	IDLH (NIOSH) (ppm)	STEL (ppm)	Source TLV/PEL
1,2,4-Trimethylbenzene	**8.27 eV**	**0.4 ppm**	**Inhalation, Ingestion, Skin/Eye Contact. Irritation to the eyes, skin, nose, throat, respiratory system; bronchitis, hypochromic anemia; headache, drowsiness, fatigue,**	**25 ppm**	**NA**	**NA**	**TLV**

			dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration of liquid).				
1,2-Dichloroethylene	**9.65 eV**	**17 ppm**	**Inhalation, Ingestion, Skin/Eye Contact. Irritation to the eyes, respiratory system; central nervous system depression.**	**200 ppm**	**1000 ppm**	**NA**	**TLV**
1,1-Dichloroethane	**11.06 eV**	**190 ppm**	**Inhalation, Ingestion, Skin/Eye Contact. Irritation, to the skin; central nervous system depression; liver, kidney, lung damage.**	**100 ppm**	**3000 ppm**	**NA**	**TLV**
2-Butanone (MEK)	**9.54 eV**	**5.4 ppm**	**Inhalation, Ingestion, Skin/Eye Contact. Irritation to the eyes, skin, nose; headache; dizziness; vomiting; dermatitis.**	**200 ppm**	**3000 ppm**	**300 ppm**	**TLV**
Hexone (MIBK)	**9.30 eV**	**0.10 ppm**	**Inhalation, Ingestion, Skin/Eye Contact. Irritation to the eyes, skin, mucous membrane; headache, narcosis, coma; dermatitis; in animals: liver, kidney damage.**	**50 ppm**	**500 ppm**	**75 ppm**	**TLV**
Acetone	**9.69 eV**	**13-20 ppm**	**Inhalation, Ingestion, Skin/Eye Contact. Irritation to the eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis.**	**500 ppm**	**2500 ppm**	**NA**	**TLV**
Methylene Chloride	**11.32**	**250 ppm**	**Inhalation, Absorption, Ingestion, Skin/Eye Contact. Irritation to the eyes; lassitude (weakness, exhaustion), drowsiness, dizziness; numbness, tingle limbs; nausea; [potential**	**50 ppm**	**2300 ppm**	**125 ppm**	**TLV**

			occupational carcinogen].				
Tetrachloroethene (PCE)	**9.32 eV**	**1.0 ppm**	**Inhalation, Absorption, Ingestion, Contact with Skin/Eyes. Irritation to the eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoherent; headache, drowsiness; skin erythema (skin redness); liver damage; [carcinogen]**	**25 ppm**	**150 ppm**	**100 ppm**	**TLV**
Trichloroethene (TCE)	**9.45 eV**	**110 ppm**	**Inhalation, Absorption, Ingestion, Contact with Skin/Eyes. Irritation to the eyes, skin; headache, visual disturbance, lassitude, dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmia, paresthesia; liver injury; [carcinogen].**	**10 ppm**	**1000 ppm**	**25 ppm**	**TLV**
Varnish Makers & Painters' Naphtha (VM & P Naphtha)	**NA**	**NA**	**Inhalation, Ingestion, Skin/Eye Contact. Irritation to the eyes, upper respiratory system; dermatitis; central nervous system depression; chemical pneumonitis (aspiration liquid).**	**350 mg/m^3**	**NA**	**Ceiling: 1800 mg/m^3**	**REL**
Carbon Monoxide	**14.01 eV**	**NA**	**Inhalation, Skin/Eye Contact (Liquid). Headache, tachypnea, nausea, lassitude (weakness, exhaustion), dizziness, confusion, hallucinations; cyanosis; depressed S-T segment of electrocardiogram, angina, syncope.**	**25 ppm**	**1200 ppm**	**Ceiling: 200 ppm**	**TLV**

Wood Dust	**NA**	**NA**	**Inhalation, Skin/Eye Contact. Irritation to the eyes; epistaxis (nosebleed); dermatitis; respiratory hypersensitivity; granulomatous pneumonitis; asthma, cough, wheezing, sinusitis; prolonged colds; [potential occupation carcinogen].**	**5 mg/m^3 (resp) 15 mg/m^3 (total)**	**NA**	**NA**	**PEL**

[1]The TLV (Threshold Limit Value) from the American Conference of Governmental Industrial Hygienists (ACGIH) is listed unless the PEL (Permissible Exposure Limit), designated by OSHA, is lower.

See Section 7 for information on air monitoring requirements.

6. Tailgate Meetings

Tailgate safety briefings will be conducted at least daily at the beginning of the work day prior to the start of work activities, or as tasks/hazards change. Each tailgate safety briefing will be documented on the form included in Appendix E.

7. Personal Exposure Monitoring and Respiratory Protection

Personal and area exposure monitoring will document real time exposure monitoring data. This data will be recorded on the Air Monitoring Log provided in Appendix E. All monitoring equipment will be maintained and calibrated in accordance with manufacturer's recommendations. All pertinent monitoring data will be logged on the form and maintained on site for the duration of project activities. Calibration of all monitoring equipment will be conducted daily and logged on the same form.

Table 7.1 lists exposure monitoring requirements and associated action levels for site exposure hazards (e.g. chemical, noise, radiation, etc). Material Safety Data Sheets (MSDSs) for all site related COCs are provided in Appendix H. Additionally the current operating facility maintains MSDS's for their own operations, these MSDS's are posted in the facility break room.

Table 7.1 Exposure Monitoring Requirements

TASK 1 (Groundwater Sampling) – Is exposure monitoring required for the completion of this project task? ☒ YES ☐ NO If yes, complete the following:				
Exposure Hazard	**Monitoring Equipment**	**Monitoring Frequency**	**Action Level**	**Required Action**
TASK 2 (Indoor Air Sampling) – Is exposure monitoring required for the completion of this project task? ☒ YES ☐ NO If yes, complete the following:				
Exposure Hazard	**Monitoring Equipment**	**Monitoring Frequency**	**Action Level**	**Required Action**
Carbon Monoxide	Monitor	Continuous in breathing zone	0 ppm to ≤ 20 ppm > 20 ppm	Normal operations Stop work, evacuate confined spaces/work area, investigate cause of reading, and ventilate area
VOC	Photoionization Detector (PID)	15 Minute	5 ppm above background	Stop Work and mitigate (ventilate work area)

TASK 3 (Well Installation) – Is exposure monitoring required for the completion of this project task?
☒ YES ☐ NO If yes, complete the following:

Exposure Hazard	Monitoring Equipment	Monitoring Frequency	Action Level	Required Action
Dust	Dust Meter/Direct Read Personal Aerosol Monitor	15 Minutes	150 mcg/m^e above upwind concentration	Stop Work and mitigate (suppress dust)
Carbon Monoxide	Monitor	Continuous in breathing zone	0 ppm to ≤ 20 ppm > 20 ppm	Normal operations Stop work, evacuate confined spaces/work area, investigate cause of reading, and ventilate area
VOC	Photoionization Detector (PID)	15 Minute	5 ppm above background	Stop Work and mitigate (ventilate work area)
Flammable Vapors (LEL)	Explosimeter	Continuous in breathing zone	< 10% LEL ≥ 10% LEL	Normal operations Stop work, ventilate area, investigate source of vapors

TASK 4 (Remedial System Construction) – Is exposure monitoring required for the completion of this project task?
☒ YES ☐ NO If yes, complete the following:

Exposure Hazard	Monitoring Equipment	Monitoring Frequency	Action Level	Required Action
Dust	Dust Meter/Direct Read Personal Aerosol Monitor	15 Minutes	150 mcg/m^e above upwind concentration	Stop Work and mitigate (suppress dust)
Carbon Monoxide	Monitor	Continuous in breathing zone	0 ppm to ≤ 20 ppm > 20 ppm	Normal operations Stop work, evacuate confined spaces/work area, investigate cause of reading, and ventilate area
VOC	Photoionization Detector (PID)	15 Minute	5 ppm above background	Stop Work and mitigate (ventilate work area)

Flammable Vapors (LEL)	Explosimeter	Continuous in breathing zone	< 10% LEL ≥ 10% LEL	Normal operations Stop work, ventilate area, investigate source of vapors
TASK 5 (Remedial System Operation, Maintenance, and Monitoring) – Is exposure monitoring required for the completion of this project task? ☒ YES ☐ NO If yes, complete the following:				
Exposure Hazard	**Monitoring Equipment**	**Monitoring Frequency**	**Action Level**	**Required Action**
Flammable Vapors (LEL)	Explosimeter	Continuous in breathing zone	< 10% LEL ≥ 10% LEL	Normal operations Stop work, ventilate area, investigate source

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8. Medical Surveillance

Medical surveillance requirements for the project are provided on the Project Manager/Task Manager H&S Stewardship Checklist & Project Hazard Analysis Worksheet. All medical surveillance requirements as indicated on the worksheet must be completed and site personnel medically cleared before being permitted on the project site.

9. General Site Access and Control

The SSO will coordinate access and control security at the work site. As the work dictates, the SSO will designate and delineate work zones prior to commencement of operations at the Site. The size and location of the work zones will be based on the daily task activities and will be discussed with all project personnel during the daily H&S tailgate meeting prior to the start of work, and documented on the tailgate meeting form.

Access to the work zones is restricted to authorized personnel at the Site. Thus, individual access to work zones by other site workers and visitors to the site will be prohibited. . If visitors need access to the site, the SSO will escort the visitor at all times. All visitors will log in and out with the SSO. The visitor sign-in/sign-out log is provided in Appendix E.

10. Decontamination Control Zones and Procedures

Part of required reading for this HASP includes reviewing the Field H&S Handbook, Section III-G Site Security, Work Zones and Decontamination for HAZWOPER site zones. The decontamination procedures outlined in the Field H&S Handbook are provided for typical Level D ensembles.

10.1 Decontamination Procedures

Personnel and equipment leaving the Exclusion Zone will be decontaminated. Level D Decontamination Steps and the Decontamination Equipment Checklist for the site are listed below.

Level D Decontamination Steps	
1	Equipment Drop
2	Glove and Boot Wash and Rinse
3	Disposable Garment, Outer Boot, and Glove Removal
4	Field Wash

Decontamination Equipment Checklist			
X	Scrub Brushes	X	Garbage Bags
X	Waste Containers	X	Paper Towels
X	Soap		Isopropyl Alcohol
X	Plastic Tubs - Boot Wash		Pump Spray Bottles
X	Plastic Drop Cloths		Pump Spray Bottles (water)

10.2 Air Monitoring, Levels of Protection, and Decontamination Summary by Project Task and/or General Activity

The highest level of protection required for work at the site is Level D. Air Monitoring is required during intrusive activities such as drilling, excavating, and system installation.

Project Task	Level of Protection	Air Monitoring Requirements	Decontamination Procedures	Modifications
Drilling/Excavating	Level D	VOCs, CO, LEL, Dust	Level D	NA
Well Development/Sampling	Level D	NA	Level D	NA
System Installation	Level D	VOCs, CO, LEL, Dust	Level D	NA
System Operation, Maintenance, and Monitoring	Level D	NA	Level D	NA

10.3 Communication Procedures

Effective communication is essential to safe working conditions and the successful completion of field projects. During on-site activities, cellular phones will be used by ARCADIS Site personnel to maximize communications with emergency response units. Active cellular telephone service will be confirmed from the Site prior to the initiation of work activities. In the event of a catastrophic event, any notice to evacuate will be given verbally by the SSO and via air horn or radio as appropriate. Communication details will be provided at the Site safety orientation.

Personnel in the project work zones will attempt to remain in communication or within sight of the ARCADIS SSO or designee. The ARCADIS SSO will indicate the need to evacuate the Site by verbal command or through radio or telephone communication. In addition, the following commands may be used if verbal communication is not possible:

- Grip partner's wrist or place both arms around the waist = Leave area immediately, no debate;
- Hands on top of head = Need assistance;
- Thumbs up = OK, all right, I understand; and
- Thumbs down = No, negative.

11. Emergency Action Plan (EAP)

In the event that an injury, over-exposure or spill has occurred, an EAP will be implemented. Appendix G provides the EAP and notifications for the project. All employees working on this project must be shown the location and proper use of all emergency equipment prior to beginning work on the project. Additionally all personal shall review the existing facility Health and Safety Program and Emergency Procedures in Section 16 of this HASP. Following the initial response/procedures to an emergency field staff are to contact at a minimum the project, site, or H&S manager within 24 hours of the incident. These contacts are provided in Appendix G.

12. Department of Transportation (DOT) Dangerous Goods Shipping Requirements

ARCADIS has policies in place for transporting small quantities of hazardous materials and for offering for shipping via ground or air. These policies are designed to meet the applicable requirements. As such, only ARCADIS project staff trained in the proper methods to prepare and ship hazardous materials are authorized to do so. Tasks associated with the packaging, labeling, marking, and preparation of hazardous materials for shipping or transport must have all appropriate and applicable training.

12.1 Materials of Trade (MOT)

DOT allows for a small amount of hazardous materials that are used in or an inherent part of our work to be transported in company vehicles. This includes things like gasoline, paint, small compressed gas cylinders, calibration gas, etc. To transport these:

- Staff will complete Materials of Trade training; and
- Vehicles used in transportation to and from off-site work locations will be in conformance with ARCADIS vehicle safety procedures.

Hazardous materials will be transported as described above as a result of the activities covered in this HASP. Site personnel who transport materials mentioned above will complete the Hazardous Materials Transportation Form included in Appendix E.

12.2 Department of Transportation

Staff who collect, prepare, package, mark, label, complete shipping declarations, offer shipments to a transporter, directly transport or are engaged in other activities associated with the transportation of Hazardous Materials (referred to as Dangerous Goods in Canada and by the International Air Transport Association [IATA]) will have appropriate and applicable training. DOT requires all individuals who participate in hazmat shipping including activities such as completing the paperwork (but not signing it), filling a container with a hazardous material (including filling a drum with drill cuttings or purge water), marking, labeling, and packaging the hazardous material, etc., have awareness level training on the DOT requirements. DOT requires additional job function training for those who conduct specific activities including:

- Staff who have to sign shipping papers or manifests, are listed as the 24-hour emergency contacts on shipping and have the responsibility for identifying, classifying, packaging, marking, and labeling HazMat packages, and/or are directing or overseeing others who do these tasks will become certified through the completion of additional training.
- The above training allows the offering employee to ship only by ground. If the shipment is to be offered for air transport, additional training is required.

Shipments as described above will be made as a result of the activities covered in this HASP. Site personnel shipping hazardous materials will complete the Hazardous Materials Shipment Form included in Appendix E.

13. Loss Prevention System™ (LPS™) and Loss Prevention Observations (LPOs)

As part of any project, no matter how simple or complex, LPOs should be conducted when practical and when able to integrate into normal business activities. LPOs should be scheduled based on the risk of the tasks being performed, and should be conducted for different tasks and at different times. Completion of LPOs should be documented on the tailgate meeting form.

The following table outlines the LPO plan for the project:

Table 13.1 LPO Schedule

Identified Task for LPO	Schedule Date	Observer Name	Observee Name	Feedback Supervisor Name
Groundwater Sampling	TBD	TBD	TBD	TBD
Remedial System Sampling	TBD	TBD	TBD	TBD
Drilling	TBD	TBD	TBD	TBD
Trenching and Excavation	TBD	TBD	TBD	TBD
Remedial System Construction Activities	TBD	TBD	TBD	TBD

TBD – To be determined

14. Subcontractors

A copy of this HASP is to be provided to all subcontractors prior to the start of work so that the subcontractor is informed of the hazards at the site. While the ARCADIS HASP will be the minimum health and safety requirements for the work completed by ARCADIS and its subcontractors, each subcontractor, in coordination with ARCADIS health and safety personnel, is expected to perform its operations in accordance with its own HASP, policies and procedures unique to the subcontractor's work to ensure that hazards associated with the performance of the work activities are properly controlled. Copies of any required safety documentation for a subcontractor's work activities will be provided to ARCADIS for review prior to the start of on-site activities.

In the event that the subcontractor's procedures/requirements conflict with requirements specified in this HASP, the more stringent guidance will be adopted after discussion and agreement between the subcontractor and ARCADIS project health and safety personnel. Hazards not listed in this HASP, but known to the subcontractor or known to be associated with the subcontractor's services, must be identified and addressed to the ARCADIS project or task manager and SSO prior to beginning work operations.

If the subcontractor prefers to adopt this HASP, the **"Subcontractor Acknowledgement Memo" must be signed and dated by the subcontractor's management and placed in the project file.** Once the signed memo is received by the project manager, an electronic version of our HASP can be submitted to the subcontractor to use as their own. Subcontractors working at the site will need to have this plan with them, and will also need to sign the Subcontractor HASP receipt signature page of the ARCADIS HASP (Appendix E). Subcontractors are responsible for the H&S of their employees at all times, and have the authority to halt work if unsafe conditions arise.

The Project/Task Manager and SSO (or authorized representative) has the authority to halt the subcontractor's operations and to remove the subcontractor or subcontractor's employee(s) from the site for failure to comply with established health and safety procedures or for operating in an unsafe manner.

15. Project Personnel HASP Certification

All site project personnel will sign the certification signature page provided in Appendix E of this HASP.

16. Existing Facility Health and Safety Program and Emergency Procedures

The existing facility operator "Power Pallet, Inc." has a written Emergency Action Program including a evacuation map and a PPE Hazard Assessment Form for each facility building area. A copy of these documents is provided in Appendix B. All site project personnel will be required to review these documents prior to commencement of work and utilize the Facility Hazard Assessment form as needed during the performance of remedial operations inside the facility. Additionally, project personnel will be required to review and understand the facility evacuation plan in the event of a facility evacuation.

16.1 Facility Alarms

The following table indicates how Power Pallet Inc. will notify employees/visitors of emergencies:

Table 16.1 Facility Alarms

Emergency	Alarm/Notification
Fire	Train Whistle Alarm
Hazardous Materials Incident	Train Whistle Alarm
Flood or Flash Flood	Radio/Supervisor
Tornado	Radio/Supervisor
Winter Storm/Blizzard	Radio/Supervisor
Workplace Violence	Radio/Supervisor
Explosion	Train Whistle Alarm
Bomb Threat	Train Whistle Alarm
Building Collapse or Failure	Train Whistle Alarm
Transportation Accident	Radio/Supervisor
Terrorism	Radio/Supervisor
Blackout/Utility Outage	Radio/Supervisor

ARCADIS

Appendix A

HASP Addendum Pages and Log Table

ARCADIS

Addendum Page

This form should be completed for new tasks associated with the project. The project manager and/or task manager should revise the Project Hazard Analysis Worksheet with the new task information and attach to this addendum sheet. JSAs should be developed for any new tasks and attached as well.

Review the addendum with all site staff, including subcontractors, during the daily tailgate briefing, and complete the tailgate briefing form as required. Attach a copy of the addendum to all copies of the HASP including the site copy, and log in the Addendum Log Table A-1 on the next page.

Addendum Number: _____ Project Number: AY000273.0007.00001

Date of Changed Conditions: _____ Date of Addendum: 08/03/09

Description of Change that Results in Modifications to HASP:

HASP required updates to address new site activities related to the installation, operation and maintenance of a Vacuum Enhanced Recovery System.

Signed: _____ Project Manager

Signed: _____ Site Safety Officer

Signed: _____ H&S Plan Writer

Signed: _____ H&S Plan Reviewer

ARCADIS

Addendum Log Table

Addendums are to be added to every copy of the HASP, and logged on Table A-1 to verify that all copies of the HASP are current:

Table A-1 Addendum Log Table

Addendum Number	Date of Addendum	Reason for Addendum	Person Completing Addendum
1	08/03/2009	Installation of MPE system	Ed Roberts
2	08/12/2009	Installation of MPE system	Todd Carignan
3			
4			
5			
6			
7			
8			
9			
10			

Make additional copies of this form as necessary.

ARCADIS

Appendix B

Power Pallet Health and Safety Documents

Written November 2008

Environmental, Health & Safety Programs

Emergency Action Program

Purpose

Power Pallet Inc. is dedicated to the protection of its employees from emergencies such as:

Fire
Hazardous Materials Incident
Flood or Flash Flood
Tornado
Winter Storm/Blizzard
Earthquake
Workplace Violence
Explosion
Bomb Threat
Building Collapse or Failure
Transportation/Train derailment Accident
Terrorism
Blackout/Utility Outage

When emergencies do occur, our Emergency Action Plan (EAP) is initiated. This EAP is in place to ensure employee safety from emergencies during regular hours and after hours. It provides a written document detailing and organizing the actions and procedures to be followed by employees in case of a workplace emergency.

OSHA's Emergency Action Plan requirements, found at 29 CFR 1910.38(a), require our company to have a written emergency action plan. This plan applies to all operations in our company where employees may encounter an emergency situation.

The EAP communicates to employees, policies and procedures to follow in emergencies. This written plan is available, upon request, to employees, their designated representatives, and any OSHA officials who ask to see it.

Administrative Duties

Our Safety Coordinator and the members of the Safety Council have the overall responsibility for the plan. This responsibility includes the following:

- *Developing and maintaining a written Emergency Action Plan for regular and after hours work conditions;*
- *Notifying the proper rescue and law enforcement authorities, and the building owner in the event of an emergency affecting the facility;*
- *Taking security measures to protect employees*
- *Integrating the Emergency Action Plan with any existing general emergency plan covering the building or work area occupied;*

- *Distributing procedures for reporting emergencies, the location of safe exits, and evacuation routes to each employee;*
- *Conducting drills to acquaint employees with emergency procedures and to judge the effectiveness of the plan;*
- *Training designated employees in emergency response such as the use of fire extinguishers;*
- *Deciding which emergency response to initiate (evacuate or not);*
- *Ensuring that equipment is placed and locked in storage rooms or desks for protection;*
- *Maintaining records and property as necessary; and*
- *Ensuring that our facility meets all local fire codes, building codes, and regulations.*

The Safety Council is responsible for reviewing and updating the plan as necessary. Copies of this plan may be obtained from the Safety Office.

The Safety Council and Safety Coordinator have full authority to decide to implement the EAP if he/she believes an emergency might threaten human health.

Contact Information

The following personnel can be contacted regarding further information about duties under this written Emergency Action Plan;

John Roach
Ron Coons
Gary Dinadio
All Supervisors

Alarms

Different emergencies call for different alarms to indicate what actions employees should take. Power Pallet Inc. has established an employee alarm system that complies with 29 CFR 1910.65.

We will notify employees of emergencies in the following manner:

Emergency	Alarm/Notification
Fire	Train Whistle Alarm
Hazardous Materials Incident	Train Whistle Alarm
Flood or Flash Flood	Radio/Supervisor
Tornado	Radio/Supervisor
Winter Storm/Blizzard	Radio/Supervisor
Workplace Violence	Radio/Supervisor
Explosion	Train Whistle Alarm
Bomb Threat	Train Whistle Alarm
Building Collapse or Failure	Train Whistle Alarm
Transportation Accident	Radio/Supervisor

Terrorism	Radio/Supervisor
Blackout/Utility Outage	Radio/Supervisor

In all potential emergency situations, 911 must be contacted to summon emergency responders.

Emergency Reporting

When employees detect an emergency that requires an evacuation, such as a fire or hazardous release, should notify their nearest supervisor if possible but at a minimum, should pull the emergency alarm box which is near most common exit doors.

Evacuation Procedures

Some emergencies require evacuation or escape procedures, while some require employees to stay indoors, or in a safe area. Our emergency escape procedures are designed to respond to many potential emergencies, depending on the degree of seriousness. Nothing in these procedures precludes the Plan's Administrator authority in determining whether employees should remain inside or evacuate.

At this company, the following types of emergency evacuations exist:

✓ *Those requiring employees to evacuate to an **"outside location"***
✓ *Those requiring employees to go to an **"inside safe area"***

Our emergency escape procedures and assignments are designed to respond to many potential emergencies that require them, including the ones listed in this program.

Employees need to know what to do if they are alerted to a specific emergency. After an alarm is sounded to evacuate, employees should take the following steps;

"Outside location"
Employees will be trained and instructed on what their primary exit will be as well as a secondary exit should the primary become un-accessible. Once they exit the building, they should proceed to the set "Congregation Point" and await other employees as well as members of the Emergency Response Team so that they may be accounted for and receive further instructions.

"Inside safe area"
Employees will be trained and instructed on what primary routes to take as well as a secondary route to the designated "inside safe area". Once they are there, they should wait quietly and patiently for members of the Emergency Response Team to be accounted for and receive further instructions.

Designated Safe Areas

"Outside location" – is located at the orange flag pole near the mulch area

"Inside safe area" – is in the inside area of the pallet making area

Emergency Response Team

Trained evacuation personnel will make up the Emergency Response Team and will assist in the safe and orderly evacuation for all types of emergencies that require evacuation.

Their names and responsibilities during an evacuation are as follows;

Name	Title	Responsibilities
Mike Pierce	Searcher	Bldgs 5,7,10 and half of Bldg 9
John Orlosky	Searcher	Offices, Bldgs 2,3,6,8
Jarret Yost	Searcher	Bldgs 4,7, half of 9
Kasey Whitman	Searcher	Yard
Merle Yost	Searcher	Dispatch Office
Merle Yost	Guard	East end of building
Steve Seagran	Guard	North end of building
Gary Dinadio/Pete Hand	Guard	West end of building
John Roach (primary) Gary Dinadio (alternate)	Communicator	Wait at front entrance to communicate to emergency responders
Tina Zilinski (Primary) Mike P, John A, Vinny Cospito Alternates	Head Counters	Account for employees at congregation points

Once Emergency Response departments arrive on the scene, all members of the company's Emergency Response Team should report to the congregation point.

For evacuation to "inside safe area"

All members of the ERT will assist in the safe evacuation and entrance into the inside safe area and await further instructions. Searchers must still search their areas to make sure everyone has heard alarm.

All employees will also be instructed to rely on the "buddy system". This system will rely on employees to help account for personnel once they are at the congregation point.

This system requires employees to make sure that the people they were working next to prior to alarm are with them and accounted for.

Once accountability has been completed, the results must be communicated to the Emergency Responders by the Head counter, and/or the Communicator .

Evacuation Drills

Evacuation drills and walk thru's will be done at least once a year or whenever there is a change in the plan.

Training

The safety manager reviews with each of our employees at the following times, those parts of the Emergency Action Plan that employees must know to protect themselves in the event of an emergency:

- *Initially when the plan is developed*
- *Whenever a new employee is hired*
- *Whenever an employees responsibilities or designated actions under the plan change;*
- *Whenever new equipment, materials, or processes are introduced into the workplace;*
- *Whenever the layout or design or the facility changes, and*
- *Whenever the plan is changed*

Appendices

New Hire Acknowledgement of Training sheet

Employee Training Sign off Sheet

Emergency Preparedness 4-Point Evaluation

Copy of Emergency Preparedness Powerpoint

Copies of Training Sign offs

Written November 2008

Environmental, Health & Safety Programs

Emergency Action Plan

New Hire

Sign off and Acknowledgement of Training

I acknowledge that I have been trained on and been informed of how to get access to a copy our Emergency Action Plan. I have understood this training, and I will support and follow this plan and procedures in my daily work at Power Pallet, Inc.

Furthermore, I pledge to do my part with the best of my ability during any crisis which may set in motion this Emergency Action Plan.

I understand my responsibilities and what I must accomplish during an Emergency.

Employee Signature Date

Print Name

Safety Manager Signature Date

Written November 2008

Environmental, Health & Safety Programs

Emergency Action Program
November 24 & 25, 2008

Sign off and Acknowledgement of Training Form

Print Name	**Signature**
Safety Manager Signature	Date

Written November 2008

Environmental, Health & Safety Programs

Emergency Preparedness
Four-Point Evaluation

Date _____

	Yes/NA	No	U	Comments
1. Communications *a. Are alarms working properly?* *b. Can alarms be heard in all areas of the building?* *c. Did alarm company receive proper notice from the alarm?* *d. Are there any areas that need additional alarm notification?*				
2. Emergency Lighting *a. Do the emergency lights in the plant, office, and stairwells work properly?* *b. Is there emergency lighting over every exit door?*				
3. Emergency Paths & Exits *a. Are paths to exits relatively straight and clear of all obstructions?* *b. Are signs properly placed and visible to those exiting?* *c. Are signs needed to direct proper exiting?* *d. Are exit door location signs adequately and reliably illuminated?* e. *Do exit doors open easily and swing in proper direction (open out)?* f. *Are any exit doors kept closed, or are they occasionally propped open for convenience or to allow for ventilation?*				
4. Applied Knowledge of employees *a. Employees were aware of their responsibilities?* *b. Employees take their responsibilities seriously?* *c. Emergency Action Team acted accordingly?* *d. Evacuation was done in a timely manner?*				

Environmental, Health & Safety Programs

PPE
Hazard Assessment

Department Evaluated _____

	Hazards																	Personal Protective Equipment											
Job Function/Operations	Electrical	Falls	Flying Particles	Foot Injry	Hand Injury	Harmful Dust	Head Injury	Impact	Light (radiation)	Chemical Exposure	Noise	Obstructions	Penetration	Rolling/Pinching	Vapor Exposure	Low Visibility	Other	Work Boots	Safety Glasses	Chemical Goggles	Face Shield	Hi-Vis Vest	Gloves	Filtering Facepiece	Respirator	Hard Hat	Hearing Protection	Other
R = Required	P = Required for Posted areas/operations																*See supervisor for recommended type											
	A = As recommended by MSDS																Other (e.g., safety belts, lanyards, or other equip.											

I certify that on the above date(s) I performed a hazard assessment of the above named company. This document constitutes the findings and certification of that hazard assessment. I understand that this document facilitates compliance to the hazard assessment requirements of OSHA 29 CFR 1910.132(d)(2), ONLY. In addition, proper PPE selection, fitting, utilization and communication must be accomplished in accordance with other requirements of 29 CFR 1910 Subpart I.

Signature	Date of Completion

POWER PALLET

Environmental, Health & Safety Programs

Department Evaluated Building #2 - Maintenance
Including Mobile Maintenance

PPE
Hazard Assessment

Hazards | **Personal Protective Equipment**

Job Function/Operations	Electrical	Falls	Flying Particles	Foot Injry	Hand Injury	Harmful Dust	Head Injury	Impact	Light (radiation)	Chemical Exposure	Noise	Obstructions	Penetration	Rolling/Pinching	Vapor Exposure	Low Visibility	Other	Work Boots	Safety Glasses	Chemical Goggles	Face Shield	Hi-Vis Vest	Gloves	Filtering Facepiece	Respirator	Hard Hat	Hearing Protection	Other
Mandatory Daily PPE			X	X			X	X			X							R	R							R	R	
Demo Saw			X		X	X		X			X								R		R		R	A	A		R	
Pneumatic Jack Hammer			X		X						X								R				R	O			R	
Reciprocating Saw			X		X						X								R				R	O			R	
Welding			X		X				X	X											R*		R	O			R	*Use tinted lense/welding helmet
Drill Press			X																R									
Bench Grinder			X		X			X			X								R		R		R				R	
Parts Washer			X							X										A			A					
Cutting & Brazing			X		X																R		R					
Abrasive Wheel Chop Saw			X		X						X								R		R		R				R	
Changing Battery					X					X									R		A		A					
Chemical Usage			X		X	X				X			X		X				A	A	A		A	A	A			
Power Saw operation			X								X								R								R	
Pneumatic Air for cleaning			X																R									

R = Required | **P = Required for Posted areas/operations** | ***See supervisor for recommended type**

A = As recommended by MSDS | **Other (e.g., safety belts, lanyards, or other equip.**

I certify that on the above date(s) I performed a hazard assessment of the above named company. This document constitutes the findings and certification of that hazard assessment. I understand that this document facilitates compliance to the hazard assessment requirements of OSHA 29 CFR 1910.132(d)(2), ONLY. In addition, proper PPE selection, fitting, utilization and communication must be accomplished in accordance with other requirements of 29 CFR 1910 Subpart I.

Signature	Date of Completion

POWER PALLET

Environmental, Health & Safety Programs

Department Evaluated Building #3 - Pallet Making

PPE
Hazard Assessment

Job Function/Operations	Hazards: Electrical	Falls	Flying Particles	Foot Injry	Hand Injury	Harmful Dust	Head Injury	Impact	Light (radiation)	Chemical Exposure	Noise	Obstructions	Penetration	Rolling/Pinching	Vapor Exposure	Low Visibility	Other	Personal Protective Equipment: Work Boots	Safety Glasses	Chemical Goggles	Face Shield	Hi-Vis Vest	Gloves	Filtering Facepiece	Respirator	Hard Hat	Hearing Protection	Other
Pallet Makers			X	X	X		X	X			X			X				R	R		R		R	O		R	R*	
Forklift Operator			X	X	X	X	X	X			X			X		X		R	R			R	R	O		R	R	*Double hearing protection

R = Required	P = Required for Posted areas/operations	*See supervisor for recommended type
	A = As recommended by MSDS	Other (e.g., safety belts, lanyards, or other equip.

I certify that on the above date(s) I performed a hazard assessment of the above named company. This document constitutes the findings and certification of that hazard assessment. I understand that this document facilitates compliance to the hazard assessment requirements of OSHA 29 CFR 1910.132(d)(2), ONLY. In addition, proper PPE selection, fitting, utilization and communication must be accomplished in accordance with other requirements of 29 CFR 1910 Subpart I.

Signature	Date of Completion

POWER PALLET

Environmental, Health & Safety Programs

Department Evaluated Building #4-Mobile Maint.

PPE
Hazard Assessment

	Hazards																Personal Protective Equipment										
Job Function/Operations	Electrical	Falls	Flying Particles	Foot Injry	Hand Injury	Harmful Dust	Head Injury	Impact	Light (radiation)	Chemical Exposure	Noise	Obstructions	Penetration	Rolling/Pinching	Vapor Exposure	Low Visibility	Other	Work Boots	Safety Glasses	Chemical Goggles	Face Shield	Hi-Vis Vest	Gloves	Filtering Facepiece	Respirator	Hard Hat	Hearing Protection	Other

R = Required	P = Required for Posted areas/operations	*See supervisor for recommended type
	A = As recommended by MSDS	Other (e.g., safety belts, lanyards, or other equip.

I certify that on the above date(s) I performed a hazard assessment of the above named company. This document constitutes the findings and certification of that hazard assessment. I understand that this document facilitates compliance to the hazard assessment requirements of OSHA 29 CFR 1910.132(d)(2), ONLY. In addition, proper PPE selection, fitting, utilization and communication must be accomplished in accordance with other requirements of 29 CFR 1910 Subpart I.

Signature	Date of Completion

POWER PALLET

Environmental, Health & Safety Programs

Department Evaluated Building #5 - GMA Bldg

PPE
Hazard Assessment

Hazards | **Personal Protective Equipment**

Job Function/Operations	Electrical	Falls	Flying Particles	Foot Injry	Hand Injury	Harmful Dust	Head Injury	Impact	Light (radiation)	Chemical Exposure	Noise	Obstructions	Penetration	Rolling/Pinching	Vapor Exposure	Low Visibility	Other	Work Boots	Safety Glasses	Chemical Goggles	Face Shield	Hi-Vis Vest	Gloves	Filtering Facepiece	Respirator	Hard Hat	Hearing Protection	Other
Deckmaster Operator				X	X		X	X			X			X				R	R		O		R	O		R	R*	*Double hearing protection
Line Operator			X	X	X		X	X			X			X				R	R		R		R	O		R	R*	*Double hearing protection
Nailer/Stapler			X	X	X		X	X			X		X	X				R	R		R		R	O		R	R*	*Double hearing protection
Set-up man			X	X	X		X	X			X			X				R	R		R		R	O		R	R*	*Double hearing protection
I.R. Stacker Operator			X	X	X		X	X			X			X				R	R		O		R	O		R	R*	*Double hearing protection
De-Stacker Operator			X	X	X		X	X			X			X				R	R		R		R	O		R	R*	*Double hearing protection
Smetco Operator			X	X	X		X	X			X			X				R	R		R		R	O		R	R*	*Double hearing protection
Forklift Operator			X	X	X		X	X			X			X		X		R	R			R	R	O		R	R	

R = Required	P = Required for Posted areas/operations	*See supervisor for recommended type
	A = As recommended by MSDS	Other (e.g., safety belts, lanyards, or other equip.

I certify that on the above date(s) I performed a hazard assessment of the above named company. This document constitutes the findings and certification of that hazard assessment. I understand that this document facilitates compliance to the hazard assessment requirements of OSHA 29 CFR 1910.132(d)(2), ONLY. In addition, proper PPE selection, fitting, utilization and communication must be accomplished in accordance with other requirements of 29 CFR 1910 Subpart I.

Signature	Date of Completion

POWER PALLET

Environmental, Health & Safety Programs

Department Evaluated Building #6 - Trim Shop

PPE
Hazard Assessment

Hazards | **Personal Protective Equipment**

Job Function/Operations	Electrical	Falls	Flying Particles	Foot Injry	Hand Injury	Harmful Dust	Head Injury	Impact	Light (radiation)	Chemical Exposure	Noise	Obstructions	Penetration	Rolling/Pinching	Vapor Exposure	Low Visibility	Other	Work Boots	Safety Glasses	Chemical Goggles	Face Shield	Hi-Vis Vest	Gloves	Filtering Facepiece	Respirator	Hard Hat	Hearing Protection	Other
Trim Saw Operator			X	X	X		X	X			X			X				R	R		R		R	O		R	R*	*Double Hearing Protection
Saw Set-up man			X	X	X		X	X			X			X				R	R		R		R	O		R	R*	*Double Hearing Protection
Double Trim Saw Op.			X	X	X		X	X			X			X				R	R		R		R	O		R	R*	*Double Hearing Protection
Undercut Saw Oper.			X	X	X		X	X			X			X				R	R		R		R	O		R	R*	*Double Hearing Protection
Stringer Saw Oper.			X	X	X		X	X			X			X				R	R		R		R	O		R	R*	*Double Hearing Protection
Material Handler			X	X	X		X	X			X			X				R	R		R		R	O		R	R*	*Double Hearing Protection
Forklift Operator			X	X	X	X	X	X			X			X		X		R	R			R	R	O		R	R	

R = Required	P = Required for Posted areas/operations	*See supervisor for recommended type
	A = As recommended by MSDS	Other (e.g., safety belts, lanyards, or other equip.

I certify that on the above date(s) I performed a hazard assessment of the above named company. This document constitutes the findings and certification of that hazard assessment. I understand that this document facilitates compliance to the hazard assessment requirements of OSHA 29 CFR 1910.132(d)(2), ONLY. In addition, proper PPE selection, fitting, utilization and communication must be accomplished in accordance with other requirements of 29 CFR 1910 Subpart I.

Signature	Date of Completion

POWER PALLET

Environmental, Health & Safety Programs

Department Evaluated Building #7 - Wood Shop

PPE
Hazard Assessment

	Hazards																Personal Protective Equipment										
Job Function/Operations	Electrical	Falls	Flying Particles	Foot Injry	Hand Injury	Harmful Dust	Head Injury	Impact	Light (radiation)	Chemical Exposure	Noise	Obstructions	Penetration	Rolling/Pinching	Vapor Exposure	Low Visibility	Other	Work Boots	Safety Glasses	Chemical Goggles	Face Shield	Hi-Vis Vest	Gloves	Filtering Facepiece	Respirator	Hard Hat	Hearing Protection	Other
Odd Repair Area																												
Stacker			X	X	X		X	X			X			X				R	R		R		R	O		R	R*	*Double hearing protection
Nailers/Staplers			X	X	X		X	X			X			X				R	R		R		R	O		R	R*	*Double hearing protection
Deckmaster Operator			X	X	X		X	X			X			X				R	R		O		R	O		R	R*	*Double hearing protection
Woodshop Area																												
Band Saw Operator			X	X	X		X	X			X			X				R	R		R		R	O		R	R*	*Double hearing protection
Round Table Operator			X	X	X		X				X			X				R	R		R		R	O		R	R*	*Double hearing protection
Sorters			X	X	X		X	X			X			X		X		R	R		R	*	R	O		R*	R*	*Dbl hearing prot. *HiVis glow strips on hat
Forklift Operator			X	X	X		X	X			X			X		X		R	R			R	R	O		R	R	

R = Required	P = Required for Posted areas/operations	*See supervisor for recommended type
	A = As recommended by MSDS	Other (e.g., safety belts, lanyards, or other equip.

I certify that on the above date(s) I performed a hazard assessment of the above named company. This document constitutes the findings and certification of that hazard assessment. I understand that this document facilitates compliance to the hazard assessment requirements of OSHA 29 CFR 1910.132(d)(2), ONLY. In addition, proper PPE selection, fitting, utilization and communication must be accomplished in accordance with other requirements of 29 CFR 1910 Subpart I.

Signature	Date of Completion

Environmental, Health & Safety Programs

Department Evaluated: Building #8 - Green Fiber Bldg

PPE
Hazard Assessment

	Hazards																Personal Protective Equipment										
Job Function/Operations	Electrical	Falls	Flying Particles	Foot Injry	Hand Injury	Harmful Dust	Head Injury	Impact	Light (radiation)	Chemical Exposure	Noise	Obstructions	Penetration	Rolling/Pinching	Vapor Exposure	Low Visibility	Other	Work Boots	Safety Glasses	Chemical Goggles	Face Shield	Hi-Vis Vest	Gloves	Filtering Facepiece	Respirator	Hard Hat	Hearing Protection	Other
Contractor			X	X	X		X	X			X			X				R	R				R	O		R	R	
Forklift Operator			X	X	X		X	X			X			X		X		R	R			R	R	O		R	R	
R = Required	P = Required for Posted areas/operations																*See supervisor for recommended type											
	A = As recommended by MSDS																Other (e.g., safety belts, lanyards, or other equip.											

I certify that on the above date(s) I performed a hazard assessment of the above named company. This document constitutes the findings and certification of that hazard assessment. I understand that this document facilitates compliance to the hazard assessment requirements of OSHA 29 CFR 1910.132(d)(2), ONLY. In addition, proper PPE selection, fitting, utilization and communication must be accomplished in accordance with other requirements of 29 CFR 1910 Subpart I.

Signature	Date of Completion

POWER PALLET

Environmental, Health & Safety Programs

Department Evaluated: Building #9

PPE
Hazard Assessment

	Hazards																Personal Protective Equipment										
Job Function/Operations	Electrical	Falls	Flying Particles	Foot Injry	Hand Injury	Harmful Dust	Head Injury	Impact	Light (radiation)	Chemical Exposure	Noise	Obstructions	Penetration	Rolling/Pinching	Vapor Exposure	Low Visibility	Other	Work Boots	Safety Glasses	Chemical Goggles	Face Shield	Hi-Vis Vest	Gloves	Filtering Facepiece	Respirator	Hard Hat	Hearing Protection	Other
Deckmaster Operator			X	X	X		X	X			X			X				R	R		O		R	O		R	R*	*Double hearing protection
Upender Operator			X	X	X		X	X			X			X				R	R		R		R	O		R	R*	*Double hearing protection
Nailers/Staplers			X	X	X		X	X			X			X				R	R		R		R	O		R	R*	*Double hearing protection
Forklift Operator			X	X	X		X	X			X			X		X		R	R			R	R	O		R	R	

R = Required	P = Required for Posted areas/operations	*See supervisor for recommended type
	A = As recommended by MSDS	Other (e.g., safety belts, lanyards, or other equip.

I certify that on the above date(s) I performed a hazard assessment of the above named company. This document constitutes the findings and certification of that hazard assessment. I understand that this document facilitates compliance to the hazard assessment requirements of OSHA 29 CFR 1910.132(d)(2), ONLY. In addition, proper PPE selection, fitting, utilization and communication must be accomplished in accordance with other requirements of 29 CFR 1910 Subpart I.

Signature	Date of Completion

POWER PALLET

Environmental, Health & Safety Programs

Department Evaluated Building #10 - Grinder Bldg

PPE
Hazard Assessment

Hazards | **Personal Protective Equipment**

Job Function/Operations	Electrical	Falls	Flying Particles	Foot Injry	Hand Injury	Harmful Dust	Head Injury	Impact	Light (radiation)	Chemical Exposure	Noise	Obstructions	Penetration	Rolling/Pinching	Vapor Exposure	Low Visibility	Other	Work Boots	Safety Glasses	Chemical Goggles	Face Shield	Hi-Vis Vest	Gloves	Filtering Facepiece	Respirator	Hard Hat	Hearing Protection	Other
Cardboard Bailer Oper.			X	X	X		X	X			X			X				R	R				R	O		R	R	
Plastic Bailer Operator			X	X	X		X	X			X			X				R	R				R	O		R	R	
Pallet Sorter			X	X	X		X	X			X			X				R	R				R	O		R	R	
Forklift Operator			X	X	X		X	X			X			X		X		R	R			R	R	O		R	R	

R = Required	P = Required for Posted areas/operations	*See supervisor for recommended type
	A = As recommended by MSDS	Other (e.g., safety belts, lanyards, or other equip.

I certify that on the above date(s) I performed a hazard assessment of the above named company. This document constitutes the findings and certification of that hazard assessment. I understand that this document facilitates compliance to the hazard assessment requirements of OSHA 29 CFR 1910.132(d)(2), ONLY. In addition, proper PPE selection, fitting, utilization and communication must be accomplished in accordance with other requirements of 29 CFR 1910 Subpart I.

Signature	Date of Completion

POWER PALLET

Environmental, Health & Safety Programs

Department Evaluated Yard

PPE
Hazard Assessment

Hazards | **Personal Protective Equipment**

Job Function/Operations	Electrical	Falls	Flying Particles	Foot Injry	Hand Injury	Harmful Dust	Head Injury	Impact	Light (radiation)	Chemical Exposure	Noise	Obstructions	Penetration	Rolling/Pinching	Vapor Exposure	Low Visibility	Other	Work Boots	Safety Glasses	Chemical Goggles	Face Shield	Hi-Vis Vest	Gloves	Filtering Facepiece	Respirator	Hard Hat	Hearing Protection	Other
Loader Operator			X	X			X	X								X		R	R			R	O	O		R	O	
Excavator Operator			X	X			X	X								X		R	R			R	O	O		R	O	
Pallet Sorters			X	X			X	X						X		X		R	R			O	R	O		R*	O	*HiVis glow strips on hat
Yard Jockey			X	X	X													R	R			O	R	O			O	
Forklift Operator			X	X	X	X	X	X			X			X		X		R	R			R	R	O		R	R	
***Any position working on or around grinders ADD……*											X																R	

R = Required | P = Required for Posted areas/operations | *See supervisor for recommended type

A = As recommended by MSDS | Other (e.g., safety belts, lanyards, or other equip.

I certify that on the above date(s) I performed a hazard assessment of the above named company. This document constitutes the findings and certification of that hazard assessment. I understand that this document facilitates compliance to the hazard assessment requirements of OSHA 29 CFR 1910.132(d)(2), ONLY. In addition, proper PPE selection, fitting, utilization and communication must be accomplished in accordance with other requirements of 29 CFR 1910 Subpart I.

Signature	Date of Completion

KEY

Exits

Doorway or Opening

Fire Extinguisher

Evacuation Route

Alarm Speakers

CONGREGATION POINT

To Lawn Assembly Area

W

N

S

E

Building No. 1

Front Offices

Fire Alarm Panel

Center Offices

Office

Office

Sign Fabrication

Locked Storage

Maintenance

Bathrooms

Building No. 2

Furniture Storage

Fabrication Area

Building No. 8

Lower

Upper

Building No. 6

Pallet Mfg. Area

DC

Building No. 3

Cafeteria / Break Rm.

Mobile Maintenance

Building No. 4

Scrap Conveyor

Building No. 10

Grind Area

Building No. 7

Wood Reclaim and odd sort

Building No. 9

Building No. 5

GMA Area

Production Offices

To Access Road Assembly Area

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Appendix C

Personal Safety

Personal Safety

If there are issues of personal safety at a project site, resources such as the client, local law enforcement officials, Park or Wildlife Service, and Animal Control will be utilized as necessary to ensure the safest possible work environment. Some general guidelines are provided here, but each situation is different and actions must be taken based on the specifics of each.

Personal Safety

If it is deemed that a work site is in an area where an employee's personal safety may be at risk from potential criminal acts, the PM or SSO will work with the client and local law enforcement officials to evaluate the risk and determine what steps can be taken to minimize the risk. For example, can local law enforcement be present or make frequent drive-bys while the work is being done, should outside security be hired, should work only occur during certain times of the day, or should work not proceed at all.

In areas of risk such as this and if work proceeds, employees will not work alone and will have the ability to communicate with local law enforcement and the PM through cell phones or 2-way radios. Employees will check-in with the PM (or other specific individual) at predetermined times throughout each work day, and if employees do not call in, the PM will attempt to contact the team. If unsuccessful, the PM will notify local law enforcement.

If while on the project site and despite the other precautions set forth, an employee feels that their personal safety is at risk from potential criminal acts, the employee should leave the site immediately if possible and report their concerns to the PM or SSO so that appropriate steps can be taken as described above

Project Site In Isolated Area and Employees Working Alone

Whenever possible, employees will not work alone in isolated areas.

If the isolated area involves hiking/walking into areas that are unmarked or if there is potential to become directionally disoriented (e.g., no trails, unmarked trails, forested or highly vegetated areas), employees will be trained on the use of a compass and trail/topography maps and, if necessary, will take wilderness safety training. The PM or SSO will work with the Park/Wildlife service on what emergency planning is necessary (e.g., unexpected weather, animal attack, and search/rescue).

Communication through cell phones or 2-Way Radios will be utilized whenever possible. In addition, if employees are unable to check in on a daily basis because of the project location and cell phones or 2-Way Radios do not work, consider the use of some type of transponder or GPS locator device that can be used to locate the team if necessary.

Employees will check-in with the PM (or other specific individual) at predetermined times throughout each work day and if employees do not call in, the PM will attempt to contact the team. If unsuccessful, the PM will notify the appropriate authorities. In addition, and especially if communication is not possible during the day, the PM will know the planned start and estimated finish times and employees will check in with the PM at the end of the work day.

If employees will be moving from isolated area to isolated area, for each day that this will occur:

- There will be established beginning and ending locations;
- Planned start and estimated finish times; and

- Planned routes that will be followed throughout the day.

Employees will not deviate from this schedule without first contacting the PM. It may also be appropriate and necessary to notify the client, law enforcement or Park/Wildlife officials of these schedules.

The PM should also check with local authorities in regard to any hunting season that may be in session and if it is possible that hunters may be present in the area in which ARCADIS personnel will be working. If so, employees will wear brightly colored hardhats/hats and reflective vests, will not work before dusk and work will end 30 minutes before dusk, and employees will be advised to make lots of noise by talking loudly at regular intervals or carrying a radio to help ensure that they aren't mistaken for an animal/bird.

Employees Working Late/Early Hours

Whenever possible, employees will not work before dusk and work will be completed before dark. If this is not possible, employees will wear appropriate reflective apparel and have appropriate lighting, such as portable lighting, flashlights, or headlamps as appropriate for the activity being conducted. Personal security will be assessed and measures taken as discussed above if appropriate.

No or Limited Cell Phone Service

The PM will assess if any other type of communication such as 2-Way Radios is appropriate for the area. If not, the PM will know the planned start and estimated finish times and employees will check in with the PM at the end of the work day. In addition, if employees are unable to check in on a daily basis because of the project location and 2-Way Radios do not work, consider the use of some type of transponder or GPS locator device that can be used to locate the team if necessary.

If employees will be moving from area to area within a day or over several days, each time the crew moves, the team will:

- Establish beginning and ending locations;
- Plan start and estimated finish times; and
- Plan routes that will be followed throughout the period.

Employees will not deviate from the schedule or planned route without first contacting the PM. It may also be appropriate and necessary to notify the client, law enforcement or Park/Wildlife officials of these schedules and routes.

Potentially Dangerous Wildlife

The local Park or Wildlife Service should be contacted to verify what type of potentially dangerous wildlife may be in or around the work site, to provide their recommendations on avoiding contact and, if contact is made, how to react appropriately. If the chance for contact with potentially dangerous wildlife is high, it may be necessary to work with the Park/Wildlife Service to have a member of their staff on site while work is being performed, and/or to have personnel receive additional training on avoiding and reacting to the particular animal/animals. Protection from wildlife may require specific protection devices like pepper spray, bear-proof canisters, or other devices as recommended by wildlife experts.

Guard or Stray Dogs

If the client utilizes guard dogs at the site, the PM or SSO will work with the client each day to ensure that the dogs are unable to gain access to any area in which ARCADIS personnel will or could be working. ARCADIS personnel will also carry Pepper Spray or similar product that can be used to protect themselves in case a guard dog does come into the work area.

If stray dogs are known to be in an area in which ARCADIS personnel will be working, the PM or SSO will work with local animal control to have the dogs removed from the area. ARCADIS personnel will carry Pepper spray or similar product as recommended Animal Control that can be used to protect themselves from a dog that may become aggressive.

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Appendix D

PPE Checklist

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PPE CHECKLIST

R = Equipment required to be present on the site. **O** = Optional equipment. Subcontractors must have the same equipment listed here as a minimum.

Description (Put Specific Material or Type in Box)	Level Of Protection
	D
Body	
Coveralls	O
Chemical Protective Suit	O
Splash Apron	O
Rain Suit	O
Orange Safety Shirt	R
Traffic Safety Vest (reflective)	O
Head	
Hard Hat (if it does not create other hazard)	R
Head Warmer (depends on temperature and weather conditions)	O
Eyes & Face	
Safety Glasses (incorporate sun protection as necessary)	R
Goggles (based on hazard)	O
Splash Guard (based on hazard)	O
Ears	
Ear Plugs (required in building 6 and 6C)	R
Ear Muffs	O
Hands and Arms	
Outer Chemical Resistant Gloves	R
Inner Chemical Resistant Gloves	O
Insulated Gloves	O
Work Gloves*	R
Foot	
Safety Boots (steel toe and shank)	R
Rubber, Chemical Resistant Boots	O
Rubber Boots	O
Disposable Boot Covers	O
Respiratory Protection	
1/2 Mask APR	NA
Full Face APR	NA
Dust Protection	O

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Appendix E

H&S Forms

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SITE ACTIVITIES TAILGATE HEALTH & SAFETY BRIEFING FORM

This briefing form documents the tailgate briefing conducted in accordance with the HASP. Personnel who perform work operations on site are required to attend each briefing and to acknowledge receipt of each briefing, at least daily.

Project Number:		**Project Name:**
Date:	**Time:**	**Briefing Conducted by:**
Company:		**Signature/Title:**

TRACKing the Tailgate Briefing

Think through the Tasks (list the tasks for the day):

1 _____ 3 _____ 5 _____

2 _____ 4 _____ 6 _____

Recognize the hazards (check all those that are discussed) and **A**ssess the Risks (Low, Medium, High-circle risk level)

☐	Confined Space (L M H)	☐	Buried/Overhead Utilities (L M H)	☐	Excavation (L M H)
☐	Walking/Working surfaces (L M H)	☐	Chemical Exposure (L M H)	☐	Noise (L M H)
☐	Thermal Stress (Hot/Cold) (L M H)	☐	Overhead Hazards (L M H)	☐	Traffic/Roadway/Railway (L M H)
☐	Severe Weather (L M H)	☐	Chemical Usage (L M H)	☐	Elevated work (L M H)
☐	Hazardous Energy (L M H)	☐	Heavy Machinery (L M H)	☐	Biological/Animals (L M H)
☐	Ergonomic (L M H)	☐	Personal Safety/Security (L M H)	☐	Mining (L M H)
☐	Client/Other Site Activities ***List***	☐	Chemical Exposure ***List***	☐	Other ***Specify***
	_____ (L M H)		_____ (L M H)		_____ (L M H)
	_____ (L M H)		_____ (L M H)		_____ (L M H)
	_____ (L M H)		_____ (L M H)		_____ (L M H)

Control the hazards (Check all those methods to control the hazards that apply):

☒ **STOP WORK AUTHORITY** (Must be addressed in every Tailgate meeting-*See H&S Handbook for definition*)

☐ General PPE Usage	☐ Hearing Conservation	☐ Respiratory Protection
☐ Personal Hygiene	☐ Exposure Guidelines	☐ Decon Procedures
☐ Emergency Action Plan	☐ Fall Protection	☐ Work Zones/Site Control
☐ JSA to be developed/used ***(specify)***	☐ LPO conducted ***(specify job/JSA)***	☐ Other ***(specify)***
_____	_____	_____
_____	_____	_____
_____	_____	_____

Personnel Sign-in List

Printed Name	Signature

Keep H&S 1st in all things

Use the back to add comments such as recent near misses, injuries or property damage, visitors to the site, etc

SITE ACTIVITIES TAILGATE HEALTH & SAFETY BRIEFING FORM

Additional Comments:

Discussion of recent results of LPOs conducted on the project:

Discussion of recent Near-miss, injuries, and/or property damage on the project:

List Visitors to Site Today:

Real Time Exposure Monitoring Data Collection Form

Document all air monitoring conducted on the Site below. Keep this form with the project file.

Site Name: _____ Date: _____

Instrument: _____ Model: _____ Serial #: _____

Calibration Method: (Material used settings, etc.)	
Calibration Results:	
Calibrated By:	

Activity Being Monitored	Compounds/Hazards Monitored	Time	Reading	Action Required? Y/N

Describe Any Actions Taken as a Result of this Air Monitoring and Why (does it match Table 5-1):

_____

_____

Employee Signature Form

I certify that I have read, understand, and will abide by the safety requirements outlined in this HASP.

Printed Name	Signature	Date

Subcontractor Acknowledgement: Receipt of HASP Signature Form

ARCADIS claims no responsibility for the use of this HASP by others although subcontractors working at the site may use this HASP as a guidance document. In any event, ARCADIS does not guarantee the health and/or safety of any person entering this site. Strict adherence to the health and safety guidelines provided herein will reduce, but not eliminate, the potential for injury at this site. To this end, health and safety becomes the inherent responsibility of personnel working at the site.

Printed Name	Company	Signature	Date

Visitor Acknowledgement and Acceptance of HASP Signature Form

By signing below, I waive, release and discharge the owner of the site and ARCADIS and their employees from any future claims for bodily and personal injuries which may result from my presence at, entering, or leaving the site and in any way arising from or related to any and all known and unknown conditions on the site.

Name	Company	Reason for Visit	Date/Time On Site	Date/Time Off Site

Hazardous Materials Transportation Form

	Vehicle (place X in box)	Type (pick-up, car, box truck, etc.)
Personal		
Rental		
ARCADIS owned/leased		
Government owned		
Trailer		

Materials Transported	Quantity	Storage/Transport Container

List Trained Drivers:

_____

_____

Hazardous Materials Shipment Form

Material Description and Proper Shipping Name (per DOT or IATA)	Shipment Quantity	DOT Hazard Classification	Shipment Method (air/ground)

List Shipper (i.e., who we are offering the shipment to):

_____

_____

List Trained Employee(s):

_____

_____

1. POLICY

Minimizing the risk of incidents is the fundamental criterion to be satisfied when working on, performing maintenance activities on, and/or installing electrical equipment. The core criteria to this policy are as follows:

- Anything that has been, could be, or is charged with electricity is considered to be energized until the employee knows with certainty that it is no longer energized and cannot be energized during the time ARCADIS staff is in contact with or in the vicinity of that item.

- Appropriate safe work practices and controls, as required by this policy and associated ARCADIS procedures, are employed to prevent electric shock, arc flash burns or other injuries resulting from either direct or indirect electrical contacts. Specific work practices and controls are to be consistent with the nature and extent of the associated electrical hazards.

- All servicing of electrical equipment shall be performed by qualified persons who operate in strict compliance with ARCADIS electrical safety requirements, including Lockout/Tagout (LOTO), arc-flash, and shock hazard safety requirements. Qualified individuals shall possess working knowledge of the various systems upon which work is being performed.

- Routine work is planned carefully, following the ARCADIS TRACK process, and scheduled well in advance. Work assignments are planned to include the competently qualified personnel to perform the work. All electrical work will only be performed once all appropriate equipment has been procured, including all required PPE and analytical equipment (appropriately-rated digital voltmeter, etc.) and LOTO equipment, as appropriate.

- When emergency work is required (including trouble-shooting), electrical safety is not compromised in favor of maintaining the project schedule or budget. Equipment outages (including de-energization and LOTO) are scheduled in lieu of working on energized equipment, whenever possible. When power shutdown is not possible a signed live work permit from an authority in responsible charge must be provided (Exhibit 2).

- No ARCADIS employee works on or installs electrical equipment that requires electrical power source of equal to or greater than 480 volts unless appropriately qualified and approved by ARCADIS Corporate H&S.

This Electrical Safety Policy does not include design requirements for electrical equipment and/or work on or directly associated with electrical generation, transmission, or distribution installations. The PLC panels that ARCADIS designs/builds are excluded from this policy/procedure as this work is covered by other standard requirements established by the ARCADIS Technical Knowledge and Innovation group.

2. PURPOSE AND SCOPE

2.1 Purpose

2.1.1 Prevention

The basic purpose of the ARCADIS electrical safety HSP is to prevent accidents, injuries and equipment damage. Electrical accidents are caused by a combination of the following controllable factors:

- Insufficient training or knowledge of the hazards and hazard controls
- At-risk behaviors or work practices
- Inappropriate equipment and/or installation
- Workplaces made unsafe by the environment
- Insufficient preparation for the expected task

There are various physical controls protecting personnel from the hazards related to electricity including: insulation, guarding, grounding, de-energizing equipment and electrical protective devices. In addition, administrative procedures such as safe work-practices, employee training, routine maintenance, inspections and program audits also provide administrative controls to appropriately and adequately protect ARCADIS personnel. This HSP sets forth minimum requirements for ARCADIS personnel to conduct work involving electricity.

2.1.2 Defining Hazards

This HSP addresses electrical work as the hazardous energy source. The HSP make reference to the control of hazardous energy LO/TO program and employees covered by this standard must also follow the ARCADIS LO/TO HSP ARC HSFS004.

2.1.3 Providing Guidance

The policy and procedures also provide guidance and minimum training and competency requirements for ARCADIS employees, who potentially face a risk of electrical shock, arc flash, or related injuries, when they are working with or are in/and around electrical equipment.

2.2 Scope

2.2.1 HSP Application

The HSP for conducting electrical work apply to every project and all operations conducted at ARCADIS offices, project sites, client facilities, and any other work-related location where ARCADIS employees carry-out activities that directly or indirectly expose these employees to hazards of electricity.

2.2.2 Exposure

This HSP applies to all ARCADIS US work operations conducted involving electrical systems where employees may be exposed to energized parts and/or those parts that have been de-energized.

3. DEFINITIONS

There are several definitions associated with this policy and associated procedures. These definitions are presented in Exhibit 1 of this document.

4. RESPONSIBILITY

4.1 PICs, Project Managers, Task Managers and Corporate Service Managers

Are responsible for implementing this HSP on any project that poses electrical hazards to ARCADIS employees or employees of its subcontractors, clients, and other organizations present in the vicinity of work controlled by ARCADIS. These individuals are responsible for communicating and appropriately managing subcontractors, ensuring that employees have appropriate training and qualifications, and for reviewing all opportunities of electrical work performed by or supervised by ARCADIS as specified in this policy and procedure. These individuals are responsible for involving the appropriate ARCADIS H&S Staff and for ensuring that all subcontractors have been communicated with concerning the minimum H&S requirements for the activity involving electricity.

4.2 Division HS Directors

Are responsible for communicating with all PICs, PMs, APMs, Location Leaders, and Corporate Services Managers within ARCADIS and ensuring they are aware of this HSP and for ensuring it is being implemented effectively**.**

4.3 Operations Managers and Supervisors

Operations managers and supervisors that have oversight management for the health and safety of employees in their respective operations assures that appropriate time is provided to facilitate the development of electrical control procedures and for personnel training.

Note: OSHA requires that any work being done on live voltage systems greater than 50 volts be accompanied by a completed live work permit, signed by a person of authority in responsible charge, and with reason as to why the equipment must be worked on live and

energized. The permit used by ARCADIS is presented in Exhibit 2 of this document. NFPA 70E specifically stipulates that troubleshooting activity by "qualified persons" is exempt from this requirement; however, the ARCADIS HSP requirements exceed those of NFPA 70E and OSHA.

4.4 ARCADIS Employees

ARCADIS employees are responsible for implementing the TRACK (**T**hink through the task, **R**ecognize the hazard, **A**ssess the risk, **C**ontrol the risk, **K**eep H&S first in all things) process before any and all work related to electricity and adhere to this electrical policy and associated electrical procedures set forth by ARCADIS Corporate H&S and communicate H&S concerns, issues and questions to their supervisor or their respective Health and Safety contact prior to initiating work.

5. PROCEDURE

5.1 Procedure

The following elements support this ARCADIS Electric Safety HSP. Each element, briefly described below, has its own detailed procedure and is associated with this policy.

5.1.1 Electrical Energy Control Program

An Electrical Energy Control Program is established for each project or activity where ARCADIS personnel (including subs) perform work on devices with electrical energy sources. This program consists of energy control procedures (including the identification of the hazardous energy sources as required by the Control of Hazardous Energy Standard - ARC HSFS004), employee training requirements, and periodic inspections to ensure that before any employee performs any servicing (trouble-shooting, and includes the testing of this equipment during the build-out) or maintenance on a machine or equipment where the unexpected energizing, startup or release of stored energy could occur and cause injury, the machine or equipment shall be isolated from the energy source and rendered inoperative. The Electrical Energy Control Program also includes a general section on installation requirements and safeguards.

This Electrical Energy Control Program can be part of the project's health and safety plan.

5.1.2 Electrical Energy Control Procedure

An Electrical Energy Control Procedure is developed, documented and utilized for the control of potentially hazardous electrical energy when ARCADIS personnel are engaged in the installation testing, servicing (trouble-shooting) and/or maintenance of equipment. The Electrical Energy Control Procedure includes specific requirements for the installation of electrical equipment. This procedure serves as the Electrical Energy Control Procedure.

5.1.3 Protective Devices

Protective Devices (e.g. locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware) and **Personal Protective Equipment (PPE)** is provided, specified in each Electrical Energy Control Procedure, and used by ARCADIS personnel. These devices and PPE are used for isolating, securing or blocking of machines or equipment from electrical energy sources, and during servicing (trouble-shooting) equipment, and installation of this equipment.

5.1.4 Assessment Procedure

An Assessment Procedure is developed to cover the specifications required for periodic assessments. These assessments, to be conducted (at least annually) of each project employing Electrical Energy Control Procedure(s), ensures that the Electrical Energy Control Procedure(s) and the requirements of Electrical Energy Control Program are being followed.

5.1.5 Electrical Safety Training

ARCADIS provides Electrical Safety Training to include the arc flash safety training to appropriate personnel to ensure that the purpose and function of the Electrical Energy Control Program and Procedures are understood and that the knowledge and skills required for the safe operation (including, servicing, maintenance, and installation) are acquired.

5.1.6 Outside Personnel

Whenever outside servicing personnel (Contractors/Subcontractors) are to be engaged in activities covered by the control of hazardous energy sources (re: Control of Hazardous Energy Standard- ARC HSFS004) and this HSP, ARCADIS and the outside servicing employer shall inform each other of their respective energy control procedures

Per NFPA 70E, when ARCADIS contracts with a subcontractor to perform electrical work, it serves as the Host Employer and has certain responsibilities and will inform the subcontractor of:

- Known electrical hazards that are related to the subcontractor's work, and that might not be recognized by the subcontractor or its employees

- Information about ARCADIS' installation that the subcontractor needs to make the appropriate electrical hazard assessments and analyses

In addition, ARCADIS will report observed subcontractor-related issues related to electrical safety as appropriate.

The ARCADIS subcontractor will:

- Ensure that each of its employees is instructed in the hazards communicated to it by ARCADIS in addition to ensuring that its employees meet all training and qualification requirements of NFPA 70E and OSHA.

- Ensure that each of its employees follow the work practices required by this HSP, the NFPA 70E standard, and the project HASP.

- Advise ARCADIS of:

  - Any unique hazards presented by the subcontractor's work.

  - Any unanticipated hazards found during the subcontractor's work that ARCADIS did not mention.

  - The measures the subcontractor took to correct any issues identified or raised by ARCADIS to the subcontractor and to prevent them from occurring again.

5.2 Electrical Energy Control Program

This Electrical Energy Control Program procedure provides general information and work requirements for ARCADIS employees working on projects. A project-specific Electrical Energy Control Program, which includes an electrical safety analysis to be performed as part of the Health and Safety Plan (HASP) development, is established for each project site where ARCADIS' personnel perform work on hazardous energy sources. The following elements are required in a project-specific Electrical Energy Control Program:

5.2.1 General Requirements

- All electrical equipment used on the project or activity is listed by a national testing laboratory for the specific application for which it is used.

- All electrical equipment is inventoried and listed in the project Health and Safety Plan (HASP).

- All electrical equipment (e.g. switchboards, panel boards, industrial control panels, motor control centers, etc.) in areas that are likely to require examination, adjustment, servicing (trouble-shooting), or maintenance while energized, are labeled to warn qualified persons and others of the potential electrical shock and arc flash hazards. The marking label will be located on the equipment so that the label is clearly visible to those qualified person(s) performing work or those who are not qualified. Examples of marking labels are provided in Exhibit 1.

  – *Note:* Exempted from arc and shock labeling requirements are equipment or appliances which are equipped with a cord and disconnectable plug or which operate on 120V alternating current (AC) or less. Such equipment is to be serviced in the totally de-energized state by unplugging the AC cord.

  - Safety-related work practices are employed by qualified persons to prevent electric shock or other injuries resulting from either direct or indirect electrical contacts, when work is performed near or on equipment or circuits that are or may be energized (consistent with their training and with specific energy control procedures).

- The specific safety-related work practices are consistent with the nature and extent of the associated electrical hazards.

- System enclosures containing multiple energy sources are required to be appropriately labeled with a label warning of multiple energy sources, and directing operation personnel to the procedure for eliminating all alternate sources of energy.

- Live parts to which an employee may be exposed are de-energized before the employee works on or near them, unless it is demonstrated that de-energizing introduces additional or increased hazards or is infeasible due to the work requiring the equipment to be energized, equipment design or operational limitations.

- Live parts that operate at less than 50 volts to ground need not be de-energized if there is no increased exposure to electrical burns or to explosion due to electric arcs.

- Visual inspection of portable cord and plug connected equipment and flexible cord sets (extension cords) is conducted before use on any shift for external defects (such as loose parts, deformed and missing pins, or damage to outer jacket or insulation) and for evidence of possible internal damage (such as pinched or crushed outer jacket). Cord and plug connected equipment and flexible cord sets (extension cords) that remain connected once they are put in place and are not exposed to damage need not be visually inspected until they are relocated.

- If there is a defect or evidence of damage that might expose an employee to injury, the defective or damaged item are removed from service, and no employee may use it until repairs and tests necessary to render the equipment safe have been made.

- When an attachment plug is to be connected to a receptacle (including on a cord set), the relationship of the plug and receptacle contacts shall first be checked to ensure that they are of proper mating configurations.

- If the exposed live parts are not de-energized (e.g., for reasons of increased or additional hazards or infeasibility), other safety-related work practices are used to protect employees who may be exposed to the electrical hazards involved.

- Such work practices serve to protect employees against contact with energized circuit parts directly with any part of their body or indirectly through some other conductive object.

- When working in damp or wet environments, only Ground Fault Circuit Interrupters (GFCI) or GFCI protected receptacles shall be used.

- Employees may not enter spaces containing exposed energized parts, unless illumination is provided that enables the employees to perform the work safely. Where lack of illumination or an obstruction precludes observation of the work to be performed, employees may not perform tasks near exposed energized parts. Employees may not reach blindly into areas which may contain energized parts.

- Conductive articles of jewelry and clothing (such a watch bands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, or metal headgear) may not be worn if they might contact exposed energized parts. *Note: However, such articles may be worn if they are rendered nonconductive by covering, wrapping, or other insulating means.*

- For conductive materials and equipment that are in contact with any part of an employee's body, employees are instructed (through daily tailgate meetings, job briefings, review of the health and safety plan, etc.) to handle these materials/equipment in a manner that will prevent them from contacting exposed energized conductors or circuit parts. If an employee must handle long dimensional conductive objects (such as ducts and pipes) in areas with exposed live parts, the work practices will be instituted (such as the use of insulation, guarding, and material handling techniques) to minimize the hazard.

5.2.2 Working on or Near Exposed De-energized Electrical Equipment Requirements

See ARCADIS Standard Operating Procedure ARC HSFS004 - Control of Hazardous Energy for LO/TO requirements.

5.2.3 Disconnecting and Over-current Protection Requirements

- All circuits are protected from over-current conditions based upon the current-carrying capacity of the conductors being used. *Note:* The only grounded conductor that can be opened without opening all other phase conductors is the control circuit neutral of a starter via an auxiliary contact of the overload but only if the overload relay and motor contactor are in the same enclosure.

- No overcurrent devices are incorporated into any permanently grounded conductor unless the device opens all conductors simultaneously.

- Overcurrent protection devices, circuit breakers, and disconnect switches are placed so that they are readily accessible for maintenance and use, reasonably protected from physical damage, and located, shielded, or enclosed to prevent personal injury from arcing, moving parts, or accidental operation. No easily ignitable materials are placed in the vicinity of any overcurrent protection devices.

- Circuit breakers and disconnect switches are clearly labeled to indicate the energized and de-energized positions, as well as the equipment or circuit it supplies. All circuit breaker panels fuse boxes, and control panels are securely mounted and constructed with close fitting doors or panels to prevent unauthorized access or injury.

- All circuit breaker fused switches and non-fused switches used as a disconnect means shall be capable of being locked in the off position.

- All electrical panels, devices, and boxes located out of doors or in wet locations are placed in a weatherproof enclosure or cabinet.

5.2.4 Grounding Requirements

- All electrical circuits are grounded in accordance with NEC and National Electric Safety Code (NESC) regulations. Any conductor used as a ground is clearly identifiable and distinguishable from all other conductors.

- Any grounded conductor or grounding terminal on a receptacle, cord, or device is not utilized for any purpose other than grounding.

- All grounding rods are tested after installation with a suitable earth/ground resistance tester to ensure minimal resistance (25 ohms or less). If the resistance measurement is greater than 25 ohms, an additional grounding rod must be installed at least 6 feet from the original grounding rod, and bonded together (with the correct size bonding jumper according the sizing table of Article 250) to create one grounding electrode.

- Equipment grounding conductors shall be sized not less than the minimum conductor size listed in the equipment grounding conductor sizing table of Article 250 of the latest edition of the NEC. *Equipment grounding conductors are sized based on the overcurrent protective device and not the ungrounded conductor size.*

- When temporarily bonding and grounding equipment, the leads are attached to the grounding point first. When disconnecting temporary bonding or grounding leads, disconnect the grounding point last. Appropriate PPE must be worn according to NFPA 70E safe work practices.

- The equipment end is attached and removed using insulated tools or similar means.

- Prior to use, all equipment, receptacles, electrical power tools, portable light strings, cord-sets, etc., are inspected and instrument tested by a qualified person to ensure ground circuit continuity.

- Additional tests are performed prior to returning equipment to service following repairs, or an incident that may have caused damage, or at intervals not to exceed three months. All tests are recorded, including equipment type and number, repairs made, and date of test. No equipment, tool, or devices are put into service if damaged.

- All portable tools, lights, or devices utilize three-conductor, grounded cord-sets unless protected by an approved system of double insulation. All temporary 120-volt, single phase, 15- and 20-ampere receptacles are installed with GFCI for personal protection. GFCI receptacles shall be tested to ensure proper operation. If the test button does not trip the receptacle, a portable *in-line* GFCI protective device shall be used.

- Where permanent receptacles are installed without GFCI protection, in-line GFCI receptacles are utilized between the permanent receptacle and the portable powered device.

5.2.5 Temporary Wiring Requirements

- General
  - A certified, licensed electrician installs temporary wiring.
  - Any portable lighting units will have a protective guard surrounding the light bulb.
  - Spent light bulbs are replaced promptly and disposed of according to federal, state, provincial, local jurisdiction, or client requirements.
  - No exposed or empty sockets are permitted.
  - If any receptacles are required for use in wet locations, they are contained in a weatherproof enclosure. The integrity of the weatherproof enclosure is not affected when a plug is inserted.
  - Extension cords are not fastened with staples, hung from nails, or suspended by wire.
  - Temporary light strings are not suspended by their cords unless specifically designed for that purpose. Each lamp is equipped with a suitable guard.
  - All temporary lighting exposed to wet or hazardous conditions in confined spaces are operated at a maximum of 12 volts and protected by an approved switch near the entrance to interrupt the power in the event of an emergency.
  - Extension cords are placed so as not to be damaged by sharp objects, moving equipment, or excessive heat. *Note:* Multiple extension cords should not be used to extend the overall length. An extension cord current rating is based on

the cord's length. A short cord will have smaller conductors for a given current rating than a longer cord of the same current rating. This is due to the impedance of the conductor. A shorter cord has less impedance. The manufacturer picks a conductor size at the cord length that when the rated current is applied to the cord, the voltage drop is insignificant. If the cord is extended by plugging in another cord, the impedance goes up and in order to have no appreciable voltage drop, the current, must be less. If the same current were applied to the extended cord, it could overheat. Therefore, a cord should be selected with the length needed for the current rating needed. Longer cords for a given current rating have larger conductors than shorter cords for the same current rating.

- Connectors are placed above ground and protected from water, and cords are either suspended above walkways or covered to eliminate tripping hazards and protect the cord from damage.
- Cords are not suspended by conductive material.
- All cord sets used in wet locations will have approved plugs molded to the cord insulation, and all receptacles used in wet locations are contained in a weatherproof enclosure that is not affected when a cord-set is inserted.

5.2.6 Working Space about Electric Equipment

- Sufficient access in the vicinity of and working space is provided and maintained about all electric equipment to permit ready and safe operation and maintenance of such equipment. See the most current NEC for working clearance requirements.
- The dimension of the working space in the direction of access to live parts operating at 600 volts or less and likely to require examination, adjustment, servicing (trouble-shooting), or maintenance while alive may not be less than indicated in Table A. In addition to the distances shown in Table A, workspace may not be less than 30 inches wide in front of the electric equipment. Working space is not required in back of assemblies such as dead-front switchboards or motor control centers where there are no renewable or adjustable parts such as fuses or switches on the back and where all connections are accessible from locations other than the back.

Table A - Working Clearances

	Minimum Clear Distance for Condition (ft)		
Nominal voltage to ground	a	b	c
0-150	3	3	3
151-600	3	3 ½	4

Conditions a, b, and c, are as follows:

Exposed live parts on one side and no live or grounded parts on the other side of the working space, or exposed live parts on both sides effectively guarded by suitable wood or other insulating material. Insulated wire or insulated bus-bars operating at not over 300 volts are not considered live parts.

Exposed live parts on one side and grounded parts on the other side.

Exposed live parts on both sides of the workspace *[not guarded as provided in Condition a]* with the operator between.

5.2.7 Guarding of Live Parts

Except as required or permitted elsewhere, live parts of electric equipment operating at 50 volts or more are guarded against accidental contact by approved cabinets or other forms of approved enclosures. This guarding is to be accomplished by suitable permanent, substantial partitions or screens so arranged that only qualified persons will have access to the space within reach of the live parts. Any openings in such partitions or screens are so sized and located that persons are not likely to come into accidental contact with the live parts or to bring conducting objects into contact with them.

5.3 Training, Qualification, and Equipment Requirements

5.3.1 Qualified Persons

"Qualified Person" definitions:

- Level I: Qualified to work on energized 50 - 120 VAC control systems on qualified sites (Qualified sites have been audited for NFPA 70E Hazard Analysis, and have been assigned a value of 0 or 1 in regards to hazard risk categories as determined by NFPA 70E. Other requirements will be discussed). This is the lowest level of qualified individual in the qualification management system. The prerequisites include training and expertise in the use of a digital voltmeter, schematic diagram interpretation and training in all applicable electrical safety programs, including NFPA 70E and LOTO. This assumes that the employee is equipped with all applicable PPE and all appropriate tools and metering equipment.

- Level II: Qualified to work on energized 120 VAC control systems on qualified sites (see above), and to service de-energized switchgear of operating voltages of up to 600 VAC. This Qualification level allows qualified individuals the opportunity to service deenergized 480 VAC equipment, including such tasks as changing fuses, testing components, visual inspections, etc. It will not permit work on any exposed, energized 480 VAC circuits or switchgear.

- Level III: Qualified to work on energized power systems and controls up to 600 VAC. This includes motor controls, switchgear and variable frequency drives of 600 VAC or less.

- Level IV: Qualified to work on electrical systems of greater than 600 VAC.

- In addition, and this applies to Infrastructure and PM/CM staff who provide oversight of System/Electrical Installs: There will be situations where engineers and/or construction oversight personnel will need to be within the arc flash boundary to perform inspections/oversight of work completed by subcontractors or qualified personnel. These staff will need the NFPA 70e training as well and wear all appropriate PPE as described in the training.

5.3.2 Electrical Hazards

Employees who face a risk of electrical hazards by the electrical installation (e.g., systems that meet the National Electrical Code and OSHA requirements) are trained per the requirements described below. Employees in these groups do not require training if their work does not bring them within the Limited Approach Boundary (as determined by NFPA 70E Table 130.2(C)) of electric circuits—operating at 50 volts or more to ground—for a hazard to exist. *Note:* Persons outside the arc flash boundary wearing no arc flash protection may still receive second-degree burns, which are considered “curable” burns. .

5.3.3 Energized Parts

Qualified persons working on or near exposed energized parts receive training in the following:

- The skills and techniques necessary to distinguish exposed energized parts from other parts of electric equipment.

- The skills and techniques necessary to determine the nominal voltage of exposed live parts.

- The clearance distances specified for working on or near exposed energized parts and the corresponding voltages to which the qualified person will be exposed.

- Trained in the latest requirements of NFPA 70E.

5.3.4 Energized Equipment

Qualified persons’ whose work on energized equipment involves either direct contact, or contact by means of tools or materials, are trained on how to work safely on energized circuits. This training includes the precautionary work practices, personal protective equipment, insulating and shielding materials, and the use of insulated tools.

Exposed live work must not be done without an Energized Electrical Work Permit. (Exhibit 2 and NFPA 70 E, Annex J).

5.3.5 Qualified and Unqualified Employee Training

Training for qualified employees will involve classroom and on-the-job training, as appropriate. This training involves some customization to reflect the scope of work performed within project or type of equipment (e.g. PCL cabinets, etc.). The training course will be approved by Corporate H&S.

Unqualified employees (those who do not work on equipment-including trouble shooting) will at a minimum, complete an approved on-line electrical safety awareness course that discusses to some degree NFPA 70E, including [but not limited to] compliance with the Limited Approach Boundaries for shock protection as determined by NFPA 70E Table 130.2(C).

5.3.6 Training Timeframe

Training is performed before the employee is assigned duties involving work around or on electrical systems (including trouble-shooting).

5.3.7 Ongoing Training

Retraining and refresher training is performed whenever inspections indicate that an employee does not have the necessary knowledge or skills to safely work on or around electrical systems. Retraining is also performed when policies or procedures change and/or new equipment or systems are introduced into the work area.

5.4 Personal Protective Equipment Related to Hazard Analysis and Hazard Risk Category Classification

To determine the appropriate PPE necessary to conduct electrical work on energized equipment, it is necessary to complete an electrical hazard analysis of the equipment as discussed in section 5.2. This hazard analysis will be conducted on projects where exposed energized equipment will require maintenance, troubleshooting or be encountered. The hazard analysis will result in determining Hazard Risk Categories of 0 through 4 by applying Tables 130(C)(9) in the current NFPA 70E. Based on the determined category, the appropriate PPE will be specified for the job as specified in the table shown in Exhibit 3:

6. REFERENCE DOCUMENTS AND ASSOCIATED PROCEDURES

6.1 National Electrical Code (NEC) - NFPA 70

The NEC is the accepted standard for protection of persons and property from electrical installations. Familiarization with NFPA 70 is required for any one whose responsibility is designing, installing, verifying and maintaining safe and compliant electrical systems. Information can be found through the NFPA website with a membership or printed and electronic versions of the code can be purchased from NFPA and other suppliers.

6.2 National Electrical Installation Standards

The NEIS gives definition to "neat and workmanlike manner" as required by the National Electrical Code. Each standard is submitted for approval by the American National Standards Institute (ANSI).

6.3 National Electrical Safety Code (NESC)

The NESC is a product of the Institute of Electrical and Electronics Engineers (IEEE). This code provides information on the installation, operation, and maintenance of electrical systems. The intent of the publication is the safeguarding of persons performing the work. Information, like the NEC, is available with IEEE membership or by buying a printed or electronic version of the code.

6.4 National Fire Protection Association (NFPA)

The NFPA is the definitive source for everything related to fire protection. The association has developed numerous standards that have been adopted by federal, state, and local jurisdictions as enforceable standards. The NFPA website has plenty of free information but more specific information is restricted to members only.

6.5 National Institute for Occupational Safety and Health (NIOSH)

NIOSH is similar in mission to OSHA but differs by the singular perspective that NIOSH is the federal agency responsible for the prevention of work related disease and injury, and is part of the Centers for Disease Control and Prevention.

6.6 Occupational Health and Safety Administration (OSHA)

OSHA is the main governmental source for effective safety practices. The OSHA website is a vast, readily accessible information resource with a thorough search engine.

6.7 NFPA 70E: Standard for Electrical Safety in the Workplace

This standard addresses electrical safety requirements for employee workplaces that are necessary for the practical safeguarding of employees during activities such as the installation, operation, maintenance, and demolition of electric conductors, electric equipment, signaling and communications conductors and equipment, and raceways for the following:

1. Public and private premises, including buildings, structures, mobile homes, recreational vehicles, and floating buildings

2. Yards, lots, parking lots, carnivals, and industrial substations FPN

3. Installations of conductors and equipment that connect to the supply of electricity

4. Installations used by the electric utility, such as office buildings, warehouses, garages, machine shops, and recreational buildings, that are not an integral part of a generating plant, substation or control center.

6.8 Other related ARCADIS Documents:

Control of Hazardous Energy Procedure (ARC HSFS004) Exhibit 2 – Energized Electrical Work Permit

7. RECORDS

- Audit Records
- Inspection and testing records
- Complete Energized Electrical Work Permits

8. APPROVALS AND HISTORY OF CHANGE

Approved by: Mija A. Coppola, Director H&S, Infrastructure and PMCM Divisions

History of Change

Revision Date	Revision Number	Reason for change
26 March 2007	01	Original document
28 June 2007	02	Enhanced for regulatory requirement additions
6 September 2007	03	Changing over to new template format
25 February 2008	04	Template change
10 March 2009	05	Modified to address elements of NFPA 70E and based on review of procedure. Process improvements

Exhibit 1 - Definitions

Following are terms and definitions used in the electrical safety policy and associated procedures.

Affected Employee - An employee/worker whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lock-out/tag-out, or whose job requires him/her to work in an area where servicing or maintenance is being performed. An affected employee is not allowed to apply or remove locks or tags.

Arc Flash Hazard – A dangerous condition associated with the possible release of energy caused by an electric arc. An arc flash hazard may exist when energized electrical conductors or circuit parts are exposed or when they are within equipment in a guarded or enclosed condition, provided a person is interacting with the equipment in such a manner that could cause an electric arc.

Arc Flash Hazard Analysis – A study investigating a worker's potential exposure to arc flash energy, conducted for the purpose of injury prevention and the determination of safe work practices and appropriate levels of PPE.

Arc Flash Protection Boundary – An approach limit at a distance from exposed live parts, within which a person could receive greater than a second-degree burn if an electrical arc flash were to occur.

Arc Flash Suit – A complete Fire Resistant (FR) clothing and equipment system that covers the entire body, except for the hands and feet. This includes pants, jacket and beekeeper-type hood fitted with a face shield.

Authorized Employee - An employee/worker who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. Only authorized employees may apply or remove locks or tags.

Bonding - Bonding is the conductive connection of all non-current-carrying metal parts for the purpose of providing a low-resistance, effective fault-current path from the point of a fault back to the source of electricity, which is the closest transformer upstream from the faulted circuit.

Because of the water factor, it is very important to bond ALL non-circuit metal parts together to form a single bonding path back to the source of electricity.

Cabinet - An enclosure designed either for surface or flush mounting, and provided with a frame, mat, or trim in which a swinging door or doors are or may be hung.

Certified - Equipment is "certified" if it (a) has been tested and found by a nationally recognized testing laboratory (e.g. UL certified) to meet nationally recognized standards or to be safe for use in a specified manner, or (b) is of a kind whose production is periodically inspected by a nationally recognized testing laboratory, and (c) it bears a label, tag, or other record of certification.

Circuit breaker

- 600 volts nominal, or less - A device designed to open and close a circuit by non-automatic means and to open the circuit automatically on a predetermined overcurrent without damage to itself when properly applied within its rating.

- Over 600 volts, nominal - A switching device capable of making and opening a circuit current paths under normal and abnormal circuit conditions, including short circuit conditions.

Conductor

- **Bare** - A conductor having no covering or electrical insulation whatsoever.

- **Covered** - A conductor encased within material of composition or thickness that is not recognized as electrical insulation.

- **Insulated** - A conductor encased within material of composition and thickness that is recognized as electrical insulation.

Device - A unit of an electrical system which is intended to carry or control but not utilize electric energy.

Disconnecting Means - A device, or group of devices, or other means by which the conductors of a circuit can be disconnected from their source of supply.

Electric Shock Hazard – A dangerous condition associated with the possible release of energy caused by contact or approach to energized electrical conductors or circuit parts.

Energized - Connected to an energy source or containing residual or stored energy.

Energy Isolating Device - A mechanical device that physically prevents the transmission or release of energy, including but not limited to a manually operated electrical circuit breaker, a disconnect switch, a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors and no pole can be operated independently, a line valve, a block, and any similar device used to block or isolate energy. Push buttons, selector switches, interlocks, and other control circuit-type devices are not energy-isolating devices.

Energy Source - Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy source.

- **Lock-out** - The placement of a lock-out device on an energy isolating device, in accordance with an established procedure, ensures that the energy isolating device and the equipment being controlled cannot be operated until the lock-out device is removed.

- **Lock-out/Tag-out (LOTO)** – The placement of a lock-out device and associated identifying tag on an energy-isolating device, in accordance with an established procedure, to ensure that this device and

the equipment being controlled cannot be operated until the lock-out device and associated tag is removed.

- **Lock-out Device** - A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment. Included are blank flanges and bolted slip blinds.

Enclosed - Surrounded by a case, housing, fence or walls which will prevent persons from accidentally contacting energized parts.

Enclosure - The case or housing of apparatus, or the fence or walls surrounding an installation to prevent personnel from accidentally contacting energized parts, or to protect the equipment from physical damage.

Equipment - A general term including material, fittings, devices, appliances, fixtures, apparatus, and the like, used as a part of, or in connection with, an electrical installation.

Exposed

- (As applied to live parts.) Capable of being inadvertently touched or approached nearer than a safe distance by a person. It is applied to electrical conductors or parts not suitably guarded, isolated, or insulated.

- (As applied to wiring methods.) On or attached to the surface or behind panels designed to allow access.

Ground - A conducting connection, whether intentional or accidental, between an electrical circuit or equipment and the earth, or to some conducting body that serves in place of the earth.

Grounded - Connected to earth or to some conducting body that serves in place of the earth.

Grounded conductor - A system or circuit conductor that is intentionally grounded.

Grounding conductor - A conductor used to connect equipment or the grounded circuit of a wiring system to a grounding electrode or electrodes.

Grounding conductor, **equipment** - The conductive path installed to tconnect normally non-current-carrying metal parts of equipment together and to the system grounded conductor or the grounding electrode conductor.

Grounding electrode conductor - The conductor used to connect the system grounded conductor or the equipment to a point on the grounding electrode system.

Ground-fault circuit-interrupter (GFCI) - A device intended for the protection of personnel that functions to deenergize a circuit or portion thereof within an established period of time when a current to ground exceeds some predetermined value that is less than that required to operate the overcurrent protective device of the supply circuit.

Guarded - Covered, shielded, fenced, enclosed, or otherwise protected by means of suitable covers, casings, barriers, rails, screens, mats, or platforms to remove the likelihood of approach to a point of danger or contact by persons or objects.

Incident Energy – The amount of energy impressed on a surface, a certain distance from the source, generated during an electrical arc event. One of the units used to measure incident energy is calories per centimeter squared (cal/cm^2).

Isolated - Not readily accessible to persons unless special means for access are used.

Labeled - Equipment is "labeled" if there is attached to it a label, symbol, or other identifying mark of a nationally recognized testing laboratory which, (a) makes periodic inspections of the production of such equipment, and (b) whose labeling indicates compliance with nationally recognized standards or tests to determine safe use in a specified manner.

NFPA-70E Example Labels:

Large Warning Label

Small Warning Label

"Behind this Cover Label"

"Within this Unit Label"

Limited Approach Boundary – An approach limit at a distance from an exposed live part, within which a shock hazard exists. Limited Approach Boundaries are based on phase-to-phase nominal voltage levels and may be found in NFPA 70E Table 130.2(C). Unqualified persons must maintain the Limited Approach Boundary from parts, circuits, or conductors that are exposed and energized.

Listed - Equipment is "listed" if it is of a kind mentioned in a list that (a) is published by a nationally recognized laboratory which makes periodic inspection of the production of such equipment, and (b) states such equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner.

Outlet - A point on the wiring system at which current may be taken to supply utilization equipment.

Overcurrent - Any current level that is in excess of the rated current of equipment or the capacity of a conductor. It may result from overload (see definition), short circuit, or ground fault.

Overload - is a situation where an electrical machine or system is subjected to a greater load than it was designed. This can be caused by short-circuiting, incorrect installation, or misuse such as running a high-current rated appliance off a low- current-rated extension cable. Systems should incorporate suitable overload protection devices to prevent damage should such a situation occur. Fuses and circuit breakers are commonly installed for this purpose.

Other Employees - Personnel other than authorized or affected employees whose work is or may be in an area where lock-out and tag-out procedures may be used.

Personal Protective Equipment (PPE) - Rated protective equipment, including personal protective equipment for eyes, face, head, and extremities; protective clothing; respiratory devices; and protective shields and barriers. Such equipment must be provided, used, and maintained in a sanitary and reliable condition wherever necessary by reason of hazards of processes or environment, chemical hazards, electrical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through adsorption, inhalation or physical contact.

Panel board - A single panel or group of panel units designed for assembly in the form of a single panel; including buses, automatic overcurrent devices, and with or without switches for the control of light, heat,

or power circuits; designed to be placed in a cabinet or cutout box placed in or against a wall or partition and accessible only from the front.

Power outlet - An enclosed assembly that may include receptacles, circuit breakers, fuse holders, fused switches, buses and watt-hour meter mounting means; intended to supply and control power to mobile homes, recreational vehicles or boats, or to serve as a means for distributing power required to operate mobile or temporarily installed equipment.

Prohibited Approach Boundary – An approach limit at a distance from an exposed live part within which work is considered the same as making contact with the exposed live part. Prohibited Approach Boundaries may be found in NFPA 70E Table 130.2(C). Only qualified persons utilizing rated PPE may enter a Prohibited Approach Boundary.

Qualified person - One familiar with the construction and operation of the equipment and the hazards involved.

- Whether an employee is considered to be a "qualified person" will depend upon various circumstances in the workplace. It is possible and, in fact, likely for an individual to be considered qualified" with regard to certain equipment in the workplace, but "unqualified" as to other equipment. This includes:
  - The skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment.
  - The skills and techniques necessary to determine the nominal voltage of exposed live parts, and
  - Clearance distances and the corresponding voltages to which the qualified person will be exposed.
- An employee who is undergoing on-the-job training and who, in the course of such training, has demonstrated an ability to perform duties safely at his or her level of training and who is under the direct supervision of a qualified person is considered to be a qualified person for the performance of those duties.

Readily accessible - Capable of being reached quickly for operation, renewal, or inspections, without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, chairs, etc.

Receptacle - A receptacle is a contact device installed at an outlet for the connection of a single attachment plug. A single receptacle is a single contact device with no other contact device on the same yoke. A multiple receptacle is a single device containing two or more receptacles.

Restricted Approach Boundary – An approach limit at a distance from an exposed live part within which there is an increased risk of shock, due to electrical arc over combined with inadvertent movement, for personnel working in close proximity to the live part. Restricted Approach Boundaries may be found in NFPA 70E Table 130.2(C). Only qualified persons may enter into a Restricted Approach Boundary.

Service equipment - The necessary equipment, usually consisting of a circuit breaker or switch and fuses, and their accessories, located near the point of entrance of supply conductors to a building or other structure, or an otherwise defined area, and intended to constitute the main control and means of supply and cutoff of the electrical service to a premise.

Switchboard - A large single panel, frame, or assembly of panels that has switches, buses, instruments, overcurrent and other protective devices mounted on the face, back or both. Switchboards are generally accessible from the rear as well as from the front and are not intended to be installed in cabinets.

Servicing and/or Maintenance - Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, maintaining and/or servicing machines or equipment, including troubleshooting . These activities include but are not limited to lubrication, cleaning or un-jamming of machines/equipment, and making adjustments or tool changes that creates employee exposure to unplanned energizing or startup of equipment, or the release of hazardous energy.

Setting Up - Any work performed to prepare a machine or equipment for its normal production operation.

Tag-out -The placement of a tag-out device on an energy isolating device in accordance with an established procedure to ensure that the energy isolating device and the equipment being controlled cannot be operated.

Tag-out Device - A prominent warning device, including a tag and a means of attachment that can be securely fastened to an energy isolating device in accordance with an established procedure to indicate that the energy isolating device and the equipment being controlled may not be operated.

Testing – Determining that machinery, equipment, or equipment parts are de-energized through the proper application of approved test equipment designed to test for the presence or absence of voltage.

Verify - Operating equipment controls for the purpose of determining that equipment cannot be restarted after an energy-isolating procedure has been performed and before maintenance or repair work is initiated.

Voltage, nominal - A value assigned to a circuit or system for the purpose of conveniently designating its voltage class (as 120/240, 480Y/277, 600, etc.). The actual voltage at which a circuit operates can vary from the nominal within a range that permits satisfactory operation of equipment.

Voltage to ground - For grounded circuits, the voltage between an ungrounded conductor and that point or conductor of the circuit that is connected to earth ground.

Exhibit 2 – Energized Electrical Work Permit

Energized Electrical Work Permit

Part 1. To be completed by the requester: Job/Work Order Number_____

1. Description of circuit/equipment/job location:_____
2. Description of work to be done:_____
3. Justification of why the circuit/equipment cannot be de-energized or the work deferred until the next schedule outage:

_____

_____

_____ _____

Requester/Title Date

Part 2. To be completed by the electrically qualified persons doing the work: **Check when complete**

1. Detailed Job Description procedure to be used in performing the above detailed work:

_____

_____

2. Description of the Safe Work Practices to be employed:_____

_____

3. Results of the Shock Hazard Analysis:_____

_____

4. Determination of Shock Protection Boundaries:_____

_____

5. Results of the Flash Hazard Analysis:_____

_____

6. Determination of the Flash Protection Boundaries:_____

_____

7. Necessary personal protective equipment to safely perform the assign task:_____

_____

8. Means employed to restrict the access of unqualified persons from the work area:_____

_____

9. Evidence of completion of a Job Briefing including discussion of any job-related hazards:_____

_____

10. Do you agree the above described work can be done safely? Yes No (if *no*, return to the requester)

Electrically Qualified Person(s) Date

Electrically Qualified Person(s) Date

Part 3: Approval(s) to perform the work while electrically energized:

Manufacturing Manager Maintenance/Engineering Manager

Safety Manager Electrically Knowledgeable Person

General Manager Date

Note: Once the work is complete, forward this form to the site Safety Department for review and retention.

Personal Protective Equipment Requirements for Work Being Done On Energized Electrical Equipment and/or In Arc Flash Boundary

	Hazard / Risk Category				
PPE	**0**	**1**	**2**	**3**	**4**
Leather gloves	X❶	X❶	X❶	X❶	X❶
Insulated rubber gloves	Depends on activity	Depends on activity	Depends on activity	Depends on activity	Depends on activity
Long sleeve shirt ❷	X	X	X	X	X
Long pants❷	X	X	X❸	X	X
Nomex coveralls		X (min arc rating of 4) **OR**	X (min arc rating of 8) **OR**	X (min arc rating of 8) **AND**	X (min arc rating of 40) **OR**
Fire Retardant - Long sleeve shirt /long pants		X (min arc rating of 4)	X (min arc rating of 8)	X (min arc rating of 8) ❻	X (min arc rating of 40)
Flash suit jacket and pants					X (min arc rating of 40)
Arc rated face shield		X (min arc rating of 4) **OR**	X (min arc rating of 8)❹ **OR**		
Arc rated arc flash suit hood		X	X	X	X (min arc rating of 40)
Safety glasses or Goggles	X	X	X	X ❺	X ❺
Sock hood	Depends on activity	Depends on activity	Depends on activity	Depends on activity	Depends on activity
Hearing protection	X (inserts)	X (inserts)	X (inserts)	X (inserts)	X (inserts)
Hardhat (rated for electrical)		X	X	X	X
Hardhat Liner				X❼	X ❼
Leather boots		X	X	X	X
Meter – Fluke Brand	X	X	X	X	X
Insulated/insulating tools	X	X	X	X	X

If work is being done outdoors, may need arc-rated coats, rainwear, etc.; *Cotton undergarments shall be worn for all hazard/risk categories*

❶Combination insulated rubber gloves with leather protectors is acceptable

❷ Non-melting (per ASTM F 1506-00) or untreated natural fiber

❸ If using FR pants as noted, long pants of non-melting or natural fiber fabric do not need to be worn; However, if using coveralls as noted, long pants of non-melting or natural fiber **must be** worn

❹Must have wrap around guarding to protect face, forehead, ears and neck

❺Selection required based on activity. See NFPA 70E

❻Other options:

1. Two sets of Nomex coveralls (inner coverall with minimum arc rating of 4 and other one with minimum arc rating of 5) over non-melting or untreated natural fiber long sleeve shirt and pants
2. Total FR clothing system and hood with a minimum arc rating of 25

❼ As required based on activity. See NFPA 70E

1. POLICY

It is ARCADIS US policy to be proactive in the identification, assessment and control of health and safety hazards and associated risks. To those means, any work involving trenching and excavation that is under the control or direction of ARCADIS or an ARCADIS subcontractor will be accomplished following, at a minimum, this procedure.

It is ARCADIS' policy that ARCADIS staff will not enter excavations and trenches unless it is absolutely necessary. If there are no suitable alternatives and it becomes necessary to enter excavations or trenches, this procedure, at a minimum will be strictly followed.

It is also the policy of ARCADIS to ensure an OSHA-defined Excavation Competent Person is on-site for all excavation work under ARCADIS contractual control. The competent person will be provided by the entity on site responsible for performing the excavation work unless otherwise required by the client. Thus, if an ARCADIS subcontractor is conducting the excavation work, that subcontractor will provide the competent person. If ARCADIS is self-performing the excavation services, then ARCADIS will provide a competent person whether a specialized subcontractor or authorized employee.

2. PURPOSE AND SCOPE

2.1 Purpose

To effectively control or eliminate the hazards presented by working near or entry into excavations or trenches, this procedure sets forth the accepted practice for and establishes the requirements for workplace safety near excavations and trenches and employee and subcontractor entry into such.

2.2 Scope

This procedure along with associated checklists and the Utility Location procedure (ARC HSFS019) apply to all employees of ARCADIS-US. Only trained and authorized personnel are permitted to work near or enter excavations and trenches, perform rescue services, or act as the excavation competent person.

3. DEFINITIONS

Exhibit 1 includes relevant definitions to this procedure including that for competent person qualifications.

4. RESPONSIBILITIES

4.1 Corporate H&S with Division and Practice Experts

On an annual basis, review and update, as necessary, this procedure. In addition, review cancelled checklists periodically to ensure conformance to this procedure. Provide the excavation competent person and qualified person training and retraining, or recommend qualified training provider. Provide technical assistance regarding excavation and trench

protocol, atmospheric testing equipment, PPE, hazard assessment and research information on unusual hazards. Audit project-specific excavation sites for compliance with this procedure.

4.2 Principal in Charge (PIC), Project Manager (PM), and Task Manager (TM)

PIC, PM and TMs are responsible to:

- Verify that all excavation and trench protocols are properly identified and addressed within the project work plan, project health & safety plan, and/or other project-related documents.
- Verify that their divisional or project team employees have received the proper training provided by Corporate Health & Safety or qualified training source prior to conducting excavation/trenching entry activities.
- Verify that any ARCADIS employee acting as the Excavation Competent person has been authorized and trained to do so as noted in Exhibit 1
- Verify that the proper entry equipment, including personal protective equipment (PPE), atmospheric testing equipment and safety equipment, is available for use by their divisional employees.
- Verify that copies of the completed checklists are available for Corporate Health and Safety review and retained with the project files

4.3 Health and Safety Plan Writers and Reviewers

Utilize this procedure as guidance to ensure the appropriate identification, assessment and control of excavation and trenching hazards for documentation in project HASPs

4.4 Entry/Work Supervisors (also see Training and Duties of Entry Supervisor)

- Work in direct coordination with and under the direction of the project excavation competent person
- Interface with the client representative to identify hazards associated with the client's excavation and trenching and/or work permit programs.
- Review existing soil sampling (if any) data or other pertinent hazard characterization information recorded by the client.
- Investigate the client's excavation/trenching protocol, to verify that any identified hazards and previous experience with earthwork at the site is properly communicated.
- Coordinate entry operations with the client's employees when both client and ARCADIS employees will be working in or near an excavation/trench.

- Coordinate necessary rescue assistance with either the client's in-house rescue team and/or the offsite rescue assistance specified by the client. The offsite rescue assistance specified by the client must have applicable rescue experience and be within a reasonable response distance.

- Verify that the client takes the necessary precautions in notifying their employees that our employees will be installing an excavation or trench.

- Review the lockout/tagout and isolation measures implemented by the client as necessary based on proximity of utilities or other energy sources in the area of the excavation/trench

- Immediately report any unusual or unforeseen excavation or trenching hazards to Corporate Health and Safety prior to authorizing entry

- Verify that all tests and precautionary measures identified on the Daily/Periodic Inspection Checklist located in Exhibit 1 and the ARCADIS Utility Location Policy and Procedure ARC HSFS019 has been performed prior to authorizing subsurface work or entry into an excavation or trench

- Offer all entrants an opportunity to review the applicable control measures and testing results and an opportunity to request a reevaluation as necessary

- Issue, authorize, and have the Utility Clearance and Daily/Periodic Inspection forms readily available for review

- Verify that copies of the completed clearance forms and checklists are properly disseminated to Corporate Health and Safety and retained with the project files, as specified in Section 8.0 – Records.

4.5 Entrants

- Qualified Employee Entrants must have training and instruction in their duties and responsibilities regarding the following:

- Recognize the hazards which may be faced during entry, as well as the signs and symptoms of exposure to the hazard(s).

- Maintain visual contact and/or verbal communications with the attendant at all times.

- Use the PPE, air monitoring and testing equipment that has been provided or have access to the information.

- Maintain an awareness of all required hazard controls and consult with the Competent Person as necessary

- Obey evacuation orders given by the Attendant, automatic alarm activation, or when self-perceived.

4.6 Competent Person

Meet all of the requirements specified for the Qualified Employee Entrants plus adequate training and experience for their duties and responsibilities to complete the following tasks:

- Anticipation, identification and control of excavation and trenching hazards, as well as the signs and symptoms of exposure to the hazard(s), and the Authority to implement all corrective actions including Stopping Work.
- Implement the ARCADIS Utility Clearance Policy and Procedure and complete the Daily/Periodic Excavation Inspection Checklist
- Verify adequate training and experience of all Entrants prior to entry

4.7 Attendants

- An attendant must be stationed outside the excavation and be available to monitor operations above and below ground. The attendant may have no other duties besides those listed in this section.
- All attendants must have training and instruction in their duties and responsibilities regarding excavation/trenching entry. The following are assigned duties.
- Maintain an accurate count of all entrants in the excavation
- Monitor activities both inside and outside the excavation/trench to verify the continued safety of entrants
- Maintain visual contact or verbal communication with all entrants
- Order evacuation of the excavation/trench if an uncontrolled hazard develops, either within or outside the space, or upon observing a behavioral effect of hazard exposure among entrants
- Keep unauthorized persons away from the excavation area
- Participate in non-entry rescue as appropriate
- Summon rescue and other emergency services
- Attendants must maintain current certification in basic first aid and cardiopulmonary resuscitation (CPR).

4.8 All ARCADIS Employees

Use the TRACK process described below regularly and frequently. In addition, employees read and understand all documented hazard identification and risk

assessments conducted using the HARC process and documented in HASPs, JSAs, and other written plans that are associated with their work. ARCADIS employees will:

- Recognize the hazards of trenches and excavations
- Understand and follow the methods for working near trenches and excavations
- Notify the PIC, PM, TM or entry/work supervisor if they have not received appropriate training
- Participate in entry operations only if trained and authorized to do so
- Never enter an excavation/trench without completion of the required Utility Location Procedure, Daily/Periodic Inspection Checklist and have an authorized attendant
- Never attempt entry rescue within a excavation unless trained in entry rescue with appropriate equipment available
- If unexpected conditions arise during entry, immediately notify other entrants, evacuate the space and inform the designated Competent Person

5. PROCEDURE

5.1 General Safety Requirements for all Excavations

- All surface obstructions must be moved or supported so as to protect employees and equipment.
- Prior to excavation, all underground installations (water, electric, telephone, gas, etc.) must be located and documented in accordance with ARCADIS Utility Clearance Policy and Procedure ARC HSFS019.
- When excavating in areas near underground installations, proper precautions must be taken to determine the exact location of the installations and to adequately protect and support them. While an excavation is open, underground installations shall be protected, supported or removed as necessary to protect employees.
- Structural ramps that are used solely by employees as a means of access or egress from excavations shall be designed by a competent person.
- Structural ramps used for access or egress of equipment shall be designed by a competent person qualified in structural design, and shall be constructed in accordance with the design.
- Ladders used for access and egress from the excavation must extend at least 36” (3 feet) above the landing surface.

- If personnel are working in a location exposed to vehicular traffic they must be provided with and be required to wear reflective safety vests. Adequate, signs, barriers or other equivalent traffic controls must be used to protect employees.

- Personnel are not permitted to be beneath elevated loads handled by equipment or be in excavations when heavy equipment is digging in or near the excavation.

- Mobile equipment located near open excavations must be adequately protected from falling or rolling into excavations by the use of barricades or warning devices.

- All excavations over 4 feet in depth must be tested for hazardous atmospheres whenever personnel are required to enter and a potential exists for the existence of hazardous contaminants or oxygen deficiency. Excavations less than 4 feet in depth must be evaluated by the competent person and at the competent person's discretion be tested for hazardous atmospheres whenever personnel are required to enter and a potential exists for the existence of hazardous contaminants or oxygen deficiency.

- Means of rescue including a lifeline and body harness must be used by personnel entering excavations with a potential for air hazards. A standby person must be stationed outside the excavation to tend the lifeline(s).

- Water must not be allowed to accumulate in open excavations where employees are working. When necessary, means such as diverting natural drainage around the excavation or actively pumping water must be used to prevent or control water accumulation.

- All structures adjacent to an open excavation must be supported, or a registered professional engineer (PE) must determine that the structure will not be affected by the excavation activities.

- Excavated materials (spoil) must be placed no closer than 2 feet from the edge of an open excavation, and otherwise retained to prevent loose material from falling into the excavation.

- Protection such as guardrails, barricades or covers must be in place to protect personnel from possible falls into open excavations, pits, wells and shafts.

- Work tasks will be designed to limit the number of personnel required to enter any excavation. All tasks that can be completed remotely from outside the excavation (such as soil sampling) will be conducted in such a manner.

- Personnel will not be allowed to enter any excavation unless adequate protective systems and procedures are utilized to prevent accidents and injury.

- All excavations over four feet in depth shall be provided with a stairway, ladder, ramp, or other safe means of egress so as to require no more than 25 feet of lateral travel. As deemed necessary by the competent person, excavations less than 4 feet in depth will be provided with a stairway, ladder, ramp, or other safe means of egress so as to require no more than 25 feet of lateral travel.

5.2 Excavations Requiring Protective Systems

This section defines excavations that require protective systems.

- All excavations into which employees will enter, regardless of depth, where the potential for cave-in exists.

- Any excavation over 4 feet in depth into which employees will enter that is not entirely in stable rock as defined in this procedure.

- Any excavation near a structure, (e.g. foundations, piers, footers, walls, sidewalks, tanks, roadways, etc.), as required by the registered professional engineer reviewing the stability of the excavation and the structure.

- All excavations over 20 feet in depth must be designed by a registered professional engineer regardless of whether personnel will enter it or not.

- All excavations with adjacent structures which are located a distance less than 6 times the depth of the excavation away shall be reviewed by a registered professional engineer to determine if the stability of the structure will be affected by the excavation.

- Support systems for an adjacent structure must be designed by a registered professional engineer.

5.3 Selection and Use of Protective Systems

5.3.1 Shoring or Shielding

- If shoring or shielding is selected as the protective system for an excavation, soil classification in accordance with 1926 Subpart P Appendix A (see Section 9 of this procedure) is required.

- One of the following options must be utilized for all excavations which will be shored or shielded.

  - Timber shoring as specified in 1926 Subpart P Appendix C must be utilized

  - Hydraulic shoring, trench jacks, air shores, or shields as required in 1926.652 (c)(2) must be utilized following the system manufacturer's data

- A system which follows other tabulated data (approved by a registered professional engineer) must be utilized
- The excavation must be designed by a registered professional engineer

5.3.2 Sloping

- If sloping is selected as the protective system for an excavation, the excavation sides must be sloped at a maximum of 34 degrees (1.5 Horizontal: 1 Vertical), unless the procedure listed above is followed.
- Soil classification in accordance with Section 10 of this procedure) is required for all excavations with sides which will be sloped greater than 34^{o} (1.5 Horizontal: 1 Vertical). If it will be sloped greater than 34^{o}, the one of the following options must be utilized:
  - Option 1 - assume Type C and slope 1.5/1 - probably the most common and preferred method for us
  - Option 2 - classify soil according to the standard and use Type A/B sloping requirements
  - Option 3 – use other tabulated data with PE approval
  - Option 4 – PE approval of sloping/benching design

5.4 Atmospheric Testing for Entry

Any excavation over 4 feet in depth with a potential for hazardous contaminants or oxygen deficiency must be tested for hazardous atmospheres prior to and during activities involving entry. After atmospheric testing, if the area is found to be oxygen deficient or a hazardous atmosphere exists or could exist a confined space permit must be obtained if the area will be entered.

The site designated "competent person" will document initial and periodic air monitoring results for all activities requiring entry into the excavation. All atmospheric testing of excavations must be conducted in the following sequence and meet the following air quality criteria.

- Oxygen content must be 19.5 to 23.5%
- Combustible gas or vapor must not exceed 10% of its lower explosive limit (LEL)
- Toxic air contaminant levels must not exceed 50% of the PEL or TLV for the specific contaminant whichever is lower
- Carbon monoxide must not exceed 10 ppm for a 5 minute average or ceiling value of 25 ppm

- Hydrogen sulfide must not exceed 0.5 ppm

5.5 Location of Underground/Overhead Utilities

- The competent person and the project manager shall both verify that local underground facilities location/protection agencies are notified within the required time frame prior to the initiation of excavation activities and meet all requirements in the ARCADIS Utility Location Policy and Procedure ARC HSFS019.

- Prior to initiation of excavation or trenching operations the competent person shall verify that all utilities have been located.

5.6 Daily/Periodic Inspections

- Prior to initiation of daily excavation or trenching operations the competent person shall complete a daily inspection of the excavation.

- During excavation or trenching operations the competent person shall complete a periodic inspection after any event (e.g., thunderstorm, vibration, excessive drying) that may affect excavation stability.

- The competent person shall complete the daily/periodic inspection checklist (A copy of the checklist is attached to this Policy as Exhibit A– Subcontractors must complete an equivalent inspection form) is completed for each inspection of excavation and trenching activities.

5.7 Soil Classification for Selection of Protective Systems

5.7.1 Soil Classification

This section describes a method of classifying soil and rock deposits based on site and environmental conditions, and on the structure and composition of the earth deposits. This section contains definitions, sets forth requirements, and describes acceptable visual and manual tests for use in classifying soils.

This section applies when a sloping, benching or shoring system is utilized as a method of protection for employees from cave-ins.

5.7.2 Soil Classification Definitions

5.7.2.1 Types/Classes of Soil

Type/Class A Soils are cohesive soils with an unconfined, compressive strength of 1.5 ton per square foot (tsf) (144kPa) or greater. Examples of cohesive soils are: Clay, silty clay, sandy clay, clay loam and in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, no soil is Type A if the following apply.

- The soil is fissured
- The soil is subject to vibration from heavy traffic, pile driving, or similar effects
- The soil has been previously disturbed
- The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4 Horizontal:1 Vertical) or greater
- The material is subject to other factors that would require it to be classified as a less stable material

5.7.2.1.1 Type Class B Soils

- Cohesive soils with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa)
- Granular cohesionless soils including angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam
- Previously disturbed soils except those which would otherwise be classed as Type C soil
- Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration
- Dry rock that is not stable
- Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4 Horizontal:1 Vertical), but only if the material would otherwise be classified as Type B

5.7.2.1.2 T ype/Class C Soils

- Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less
- Granular soils including gravel, sand, and loamy sand
- Submerged soil or soil from which water is freely seeping

- Submerged rock that is not stable
- Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4 Horizontal:1 Vertical) or steeper

5.7.2.2 Methods for Classifying Soils

Each soil and rock deposit shall be classified by a competent person as Stable Rock, Type A, Type B, or Type C in accordance with the definitions set forth in this section. The classification of the deposits shall be made based on the results of at least one visual and at least one manual analysis conducted by a competent person using tests described below, or in other recognized methods of soil classification and testing such as those adopted by the American Society for Testing Materials, or the U.S. Department of Agriculture textural classification system.

The visual and manual analyses, such as those noted as being acceptable in this section, shall be designed and conducted to provide sufficient quantitative and qualitative information as may be necessary to identify properly the properties, factors, and conditions affecting the classification of the deposits. Visual analysis is conducted to determine qualitative information regarding the excavation site in general, the soil adjacent to the excavation, the soil forming the sides of the open excavation, and the soil taken as samples from excavated material.

Observe the following:

- Samples of soil that are excavated and soil in the sides of the excavation. Estimate the range of particle sizes and the relative amounts of the particle sizes. Soil that is primarily composed of fine grained material is cohesive material. Soil composed primarily of coarse grained sand or gravel is granular material.
- Soil as it is excavated. Soil that remains in clumps when excavated is cohesive. Soil that breaks up easily and does not stay in clumps is granular.
- The side of the open excavation and the surface area adjacent to the excavation. Crack like openings such as tension cracks could indicate fissured material. If chunks of soil spall off a vertical side, the soil could be fissured. Small spalls are evidence of moving ground and are indications of potentially hazardous situations.
- The area adjacent to the excavation and the excavation itself for evidence of existing utility and other underground structures, and to identify previously disturbed soil.

- The open side of the excavation to identify layered systems. Examine layered systems to identify if the layers slope toward the excavation. Estimate the degree of slope of the layers.

- The area adjacent to the excavation and the sides of the opened excavation for evidence of surface water, water seeping from the sides of the excavation, or the location of the level of the water table.

- The area adjacent to the excavation and the area within the excavation for sources of vibration that may affect the stability of the excavation face.

Manual analysis of soil samples is conducted to determine quantitative as well as qualitative properties of soil and to provide more information in order to classify soil properly.

5.7.2.3 Classifications

A. Plasticity. Mold a moist or wet sample of soil into a ball and attempt to roll it into threads as thin as 1/8 inch in diameter. Cohesive material can be successfully rolled into threads without crumbling. For example, if at least a two inch (50 mm) length of 1/8 inch thread can be held on one end without tearing, the soil is cohesive.

B. Dry strength. If the soil is dry and crumbles on its own or with moderate pressure into individual grains or fine powder, it is granular (any combination of gravel, sand, or silt). If the soil is dry and falls into clumps which break up into smaller clumps, but the smaller clumps can only be broken up with difficulty, it may be clay in any combination with gravel, sand or silt. If the dry soil breaks into clumps which do not break up into small clumps and which can only be broken with difficulty, and there is no visual indication the soil is fissured, the soil may be considered unfissured.

C. Thumb penetration. The thumb penetration test can be used to estimate the unconfined compressive strength of cohesive soils. Type A soils with an unconfined compressive strength of 1.5 tsf can be readily indented by the thumb; however, they can be penetrated by the thumb only with very great effort. Type C soils with an unconfined compressive strength of 0.5 tsf can be easily penetrated several inches by the thumb, and can be molded by light finger pressure. This test should be conducted on an undisturbed soil sample, such as a large clump of spoil, as soon as practicable after excavation to keep to a minimum the effects of exposure to drying influences. If the excavation is later exposed to wetting influences (rain, flooding), the classification of the soil must be changed accordingly.

D. Other strength tests. Estimates of unconfined compressive strength of soils can also be obtained by use of a pocket penetrometer or by using a hand operated shearvane.

E. Drying test. The basic purpose of the drying test is to differentiate between cohesive material with fissures, unfissured cohesive material, and granular material. The procedure for the drying test involves drying a sample of soil that is approximately one inch thick (2.54 cm) and six inches (15.24 cm) in diameter until it is thoroughly dry:

1. If the sample develops cracks as it dries, significant fissures are indicated.

2. Samples that dry without cracking are to be broken by hand. If considerable force is necessary to break a sample, the soil has significant cohesive material content. The soil can be classified as an unfissured cohesive material and the unconfined compressive strength should be determined by using the thumb penetration or other test.

5.7.2.4 If a sample breaks easily by hand, it is either a fissured cohesive material or a granular material. To distinguish between the two, pulverize the dried clumps of the sample by hand or by stepping on them. If the clumps do not pulverize easily, the material is cohesive with fissures. If they pulverize easily into very small fragments, the material is granular.

5.7.2.5 Layered system

A layered system shall be classified in accordance with its weakest layer. Each layer may be classified individually where a more stable layer lies under a less stable layer.

5.7.2.6 Reclassifying Soils

A layered system shall be classified in accordance with its weakest layer. Each layer may be classified individually where a more stable layer lies under a less stable layer.

In most instances the ARCADIS designated Excavation/Trenching Competent person will assume Type C soil, unless they have conclusive data to validate Type A or B.

5.7.2.7 Excavation Construction Based on Soil Type

The Maximum allowable slope means the steepest incline of an excavation face that is acceptable for the most favorable site conditions as protection against cave-ins, and is expressed as the ratio of horizontal distance to vertical rise (H:V). Short-term exposure means a period of time less than or equal to 24 hours that an excavation is open. Soil and rock deposits must be

classified in accordance with Appendix A to Subpart P of Part 1926. The maximum allowable slope for a soil or rock deposit must be determined from the table provided below. The actual slope must not be steeper than the maximum allowable slope. The actual slope must be less steep than the maximum allowable slope, when there are signs of distress. If that situation occurs, the slope must be cut back to an actual slope which is at least horizontal to one vertical (1/2H:1V) less steep than the maximum allowable slope. When surcharge loads from stored material or equipment, operating equipment, or traffic are present, a competent person must determine the degree to which the actual slope must be reduced below the maximum allowable slope, and must assure that such reduction is achieved. Surcharge loads from adjacent structures must be evaluated in accordance with 1926.651(I). Configurations of sloping and benching systems must be in accordance with 29 CFR 1926 Subpart P, Appendix B.

EXCAVATION SLOPE TABLE 2 29 CFR 1926 SUBPART P APPENDIX B MAXIMUM ALLOWABLE SLOPES	
Soil or Rock Type	**Maximum Allowable Slopes (H:V)[1] for Excavations Less Than 20 Feet Deep[2]**
Stable Rock	Vertical (90 degrees)
Type A[3]	¾:1 (53 degrees)
Type B	1:1 (45 degrees)
Type C	1:½ (34 degrees)

1. Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.
2. Sloping or benching for excavations greater than 20 feet deep must be designed by a registered professional engineer.
3. A short-term maximum allowable slope of 1/2H:1V (63 degrees) is allowed in excavations in Type A soil that are 12 feet (3.67 m) or less in depth. Short-term maximum allowable slopes for excavations greater than 12 feet (3.67 m) in depth must be 3/4H:1V (53 degrees).

6. TRAINING

6.1 Project - Specific Training

All staff working on a site where trenching and excavation activities are being conducted by ARCADIS or its subcontractors will be provided with site orientation on excavation projects shall include a discussion of the following:

- Site excavation hazards and procedures
- Requirements for conducting activities remotely whenever possible
- Client requirements and procedures for excavation activities

- This Procedure

Daily Safety Meetings on projects involving excavation activities shall include a discussion of:

- Site excavation hazards and procedures
- Requirements for conducting activities remotely whenever possible
- Client requirements and procedures for excavation activities
- This Excavation and Trenching Procedure, as appropriate

6.2 Additional Training

Besides site orientation training, additional training will be provided as follows based on the employee's activities:

- All employees who work in the area of potential excavation/trenching sites will receive awareness level training as provided and/or approved by ARCADIS Corporate H&S in order to recognize and to understand the hazards.
- Entrants, Attendants, and Entrant Supervisors will receive additional training as approved by Corporate H&S. This training will be classroom in nature and cover the details of trenching and excavation hazards and controls
- Qualified Competent Persons will be provided training as follows:

  In order to be assigned duties as a competent person with respect to excavation and trenching, in addition to the criteria noted in Exhibit 1, personnel must complete an ARCADIS approved training course or an equivalent course approved by Corporate Health and Safety including but not limited to the following topics:

  - Introduction to trenches and excavations
    - Definition of trenches and excavations
    - General requirements of OSHA 29 CFR 1926 Subpart P
  - Responsibilities and requirements of a competent person
    - Ne cessary authority
    - When other/outside resources may be necessary
  - Hazard Identification and Assessment
    - Cave-In Hazards including nearby structures
    - Und erground utilities

- Confin ed Space
- Ha zardous atmospheres
- Wate r accumulation
- Vehicular traffic and falling loads

• Ha zard controls

- Soil analysis and testing (visual and manual
- Protective systems
  - Shorin g
  - Sloping
  - Shielding
  - Benchi ng
- Personal protective equipment
- Utility location
- A tmospheric testing
- Water drainage and pumping
- Site housekeeping and management
  - Spoils
  - Traffic control
  - Overhead hazard protection
- Comm unications
  - Verbal
  - Signaling
- Access and egress

• Emerge ncy Procedures

- Warning signs of cave-in
- Evacuation procedures

- Re scue

- Ins pections
  - Checklist s
  - Potential deficiencies

All training provided must be reviewed and approved by Corporate Health & Safety and will be managed through ARCHIMEDES.

Documentation of training certification received by attendance at any training course including externally provided training courses will be kept by the employee with copies provided to ARCHIMEDES.

7. REFERENCES

7.1 ARCADIS Health and Safety Procedure ARC HSFS010– Health and Safety Planning

7.2 ARCADIS Health and Safety Procedure ARC HSFS004 – Control of Hazardous Energy (Lockout/Tagout)

7.3 ARCADIS Utility Clearance Policy and Procedure ARC HSF019

7.4 ARCADIS Confined Space Policy and Procedure ARC HSF003

7.5 OSHA 29 CFR Part 1926 Subpart P - Excavations

8. RECORDS

8.1 Training records will be kept by the individual employee with copies of such certificates kept by ARCHIMEDES. Training dates and times will be kept by ARCHIMEDES.

8.2 Completed clearance forms and checklists will be kept in the project files with copies available for Corporate H&S review.

8.3 Copies of all HASPs that document excavation trenching procedures will be kept in the project files.

9. APPROVALS AND HISTORY OF CHANGE

Approved By: Michael Thomas, CIH, CPEA

History of Change

Revision Date	Revision Number	Reason for change
12 May 2008	01	Original document
13 June 2008	02	Modified Section 5.1 – 4th bullet related to structural ramps. Modified Section 5.2 to designate a 6x factor for structural integrity of structures near the excavation. Revised Exhibit 1 to modify the definition of a Competent person
9 January 2009	03	Cleaned up definitions, deleted training requirements from Section 5.0 and moved them to Section 6.0, modified purpose statement

Exhibit 1 – Definitions

Attendant is a trained qualified individual stationed outside the excavation whose duty is to monitor authorized entrants inside the excavation or trench and have a means of communication with the designated rescue services.

Benching/Benching system means a method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.

Cave-in means the separation of a mass of soil or rock material from the side of an excavation, or the loss of soil from under a trench shield or support system, and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury or otherwise injure and immobilize a person.

Competent person means one who, through education, training, and/or experience, is capable of identifying existing and predictable hazards or working conditions which are unsanitary, hazardous, or dangerous to employees and who has authorization to take prompt corrective measures to eliminate them. All ARCADIS employee's, must meet the following minimum requirements to be considered a Competent Person:

- Be nominated to the appropriate Division H&S Director by their supervisor or project manager to be considered as a competent person. The nomination will include the submittal of various documentation that describes why the person should be nominated and to provide evidence that they have met the criteria listed below.
- Be jointly approved by the appropriate Division H&S Director and the appropriate Practice/Client H&S Manager or resource.
- Attend ARCADIS Competent Person training or an equivalent course approved by Corporate Health and Safety
- Have a minimum of 1 year of supervised field experience and approval from their supervisor to fill the role of competent person
- If on an Environmental project where HAZWOPER training is required by ARCADIS, completed a 40 Hour HAZWOPER and HAZWOPER Supervisor training course and be current on their annual 8 Hour refresher
- Attended a 10 or 30 Hour OSHA Construction Safety Course or have equivalent training to that provided by the 10 or 30 hour course
- If a hazardous atmosphere is present, or there is limited entry or exit and the excavation or trench must be entered as a confined space, the person must also be Confined Space trained and authorized as per the ARCADIS Confined Space procedure ARC HSFS003

Excavation means any man-made cut, cavity, trench, or depression in an earth surface formed by earth removal into which a person can bodily enter. **Entry** constitutes the act by which an employee proceeds into an excavation or trench. Consideration of hazards, especially cave-ins and fall protection must still be considered and accounted for when equipment or personnel are near an excavation or trench, even if personnel will not be entering.

Entrants are employee's who are trained and authorized to enter a trench or excavation. Entrants must have attended a Qualified Excavation Training course offered or approved by Corporate Health and Safety.

Failure means the breakage, displacement, or permanent deformation of a structural member or connection so as to reduce its structural integrity and its supportive capabilities.

Hazardous Atmosphere is an atmosphere which exposes employees to a risk of death, incapacitation, injury, or acute illness from one or more of the following:

- An atmospheric concentration of any substance in excess of 50% of its established permissible exposure limit (PEL); or its assigned threshold limit value (TLV) or other value listed on the Material Safety Data Sheet (MSDS) for the chemical constituent, whichever is lower.
- A flammable gas, vapor, or mist in excess of 10% of its lower explosive limit (LEL).
- An airborne combustible dust at a concentration that obscures vision at a distance of 5 feet or less.
- An atmospheric oxygen concentration below 19.5% (oxygen-deficient atmosphere) or above 23.5% (oxygen-enriched atmosphere).
- An atmosphere which is immediately dangerous to life and health.

Immediately Danger to Life and Health (IDLH) means any condition which poses an immediate threat to loss of life; may result in irreversible or immediate-severe health effects; may result in eye damage, irritation, or other conditions which could impair escape from the space.

Protective system means a method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems and other systems that provide protection.

Ramp means an inclined walking or working surface that is used to gain access to one point from another, and is constructed from earth or from structural materials such as steel or wood.

Registered Professional Engineer means a person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer, registered in any state is deemed to be a "registered professional engineer" within the meaning of this standard when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce. To oversee an excavation/trench activity the PE must have experience with and expertise in excavation, soil and stability considerations.

Sheeting means the members of a shoring system that retain the earth in position and in turn are supported by other members of the shoring system.

Shield (Shield system) means a structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shield can be either pre-manufactured or job-built in accordance with 1926.652 (c)(3) or (c)(4). Shields used in trenches are usually referred to as "trench boxes" or "trench shields".

Shoring (Shoring system) means a structure such as a metal hydraulic, mechanical or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.

Sloping (Sloping system) means a method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

Stable rock means natural solid mineral material that can be excavated with vertical sides and will remain intact while exposed. Unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against caving-in or movement by rock bolts or by another protective system that has been designed by a registered professional engineer.

Support system means a structure such as underpinning, bracing, or shoring, which provides support to an adjacent structure, underground installation, or the sides of an excavation.

Trench means a narrow excavation (in relation to its length) made below the surface of the ground to which a person can bodily enter. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet (4.6 meters). If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet (4.6 meters) or less (measured at the bottom of the excavation), the excavation is considered to be a trench.

Cemented soil means a soil in which the particles are held together by a chemical agent, such as calcium carbonate, such that a hand size sample cannot be crushed into powder or individual soil particles by finger pressure.

Cohesive soil means clay (fine grained soil), or soil with a high clay content, which has cohesive strength. Cohesive soil does not crumble, can be excavated with vertical sides, and is plastic when moist. Cohesive soil is hard to break up when dry, and exhibits significant cohesion when submerged. Cohesive soils include clayey silt, sandy clay, silty clay, clay and organic clay.

Dry soil means soil that does not exhibit visible signs of moisture content.

Fissured means a soil material that has a tendency to break along definite planes of fracture with little resistance, or a material that exhibits open cracks, such as tension cracks, in an exposed surface.

Granular soil means gravel, sand, or silt (coarse grained soil) with little or no clay content. Granular soil has no cohesive strength. Some moist granular soils exhibit apparent cohesion. Granular soil cannot be molded when moist and crumbles easily when dry.

Layered system means two or more distinctly different soil or rock types arranged in layers. Micaceous seams or weakened planes in rock or shale are considered layered.

Moist soil means a condition in which a soil looks and feels damp. Moist cohesive soil can easily be shaped into a ball and rolled into small diameter threads before crumbling. Moist granular soil that contains some cohesive material will exhibit signs of cohesion between particles.

Plastic means a property of a soil which allows the soil to be deformed or molded without cracking, or appreciable volume change.

Saturated soil means a soil in which the voids are filled with water. Saturation does not require flow. Saturation, or near saturation, is necessary for the proper use of instruments such as a pocket penetrometer or sheer vane.

Soil classification system means, for the purpose of this procedure, a method of categorizing soil and rock deposits in a hierarchy of Stable Rock, Type A, Type B and Type C, in decreasing order of stability. The categories are determined based on an analysis of the properties and performance characteristics of the deposits and the characteristics of the deposits and the environmental conditions of exposure.

Submerged soil means soil which is underwater or is free seeping.

Unconfined compressive strength means the load per unit area at which a soil will fail in compression. It can be determined by laboratory testing, or estimated in the field using a pocket penetrometer, by thumb penetration tests, and other methods.

Wet soil means soil that contains significantly more moisture than moist soil, but in such a range of values that cohesive material will slump or begin to flow when vibrated. Granular material that would exhibit cohesive properties when moist will lose those cohesive properties when wet.

Exhibit 2 – Daily / Periodic Excavation Inspection Checklist

ARCADIS		**Daily / Periodic Excavation Inspection Checklist**
Project Name:		**Date / Time:**
Project Number:		**Location:**
Prepared By:		**Project Manager:**

This checklist must be completed for all excavations. It documents that daily and post-event / periodic inspections are conducted.

Soil Classified As: Stable Rock Type A Type B Type C

Soil Classified On: By:

Type of Protective System in Use: Sloping Shoring Other _____

Description:

Inspection Item	YES	NO	Comments
Has the ARCADIS Utility Clearance Procedure been completed?			
Are underground installations protected from damage?			
Are adequate means of entry / exit available in the excavation – at least every 25 feet?			
If exposed to traffic, are personnel wearing reflective vests and adequate barriers/traffic controls installed?			
Do barriers exist to prevent equipment from rolling into the excavation?			
Was air monitoring conducted prior to and during excavation entry?			
Was the stability of adjacent structures reviewed by a registered P.E.?			
Are spoil piles at least 2 feet from the excavation edge?			
Is fall protection in use near excavations deeper than 6 feet?			
Are work tasks completed remotely if feasible?			
Is a protective system in place and in good repair?			
Is emergency rescue (lifeline / body harness) equipment used due to potential atmospheric hazard?			
Is excavation exposed to vibration?			
Are employees protected from falling / elevated material?			
Is soil classification adequate for current environmental / weather conditions?			
Do portable ladders extend at least 4 feet above the excavation?			
Are portable ladders or ramps secured in place?			
Have all personnel attended safety meeting on excavation hazards?			
Are support systems for adjacent structures in place?			
Is the excavation free from standing water?			
Is water control and diversion of surface runoff adequate?			
Are employees wearing required protective equipment?			
ARCADIS Excavation Competent Person:			**Date/Time:**

FIRE EXTINGUISHERS – MONTHLY VISUAL INSPECTION
OSHA 1910.157 (e)(2)

The **[office location]** has **[total number and type, e.g. four ABC]** class fire extinguishers**.**

All extinguishers are checked monthly for:

1. Gauge reading in the green area?
2. Any leakage from the injection port and is port free from obstruction?
3. Current for annual visual inspection and 5 year hydrostatic testing?
4. Extinguisher secure (e.g., in brackets, cabinet, etc)?
5. Extinguisher is accessible and not blocked.
6. Extinguisher is mounted or available at a height accessible by all
7. All extinguishers are present
8. Location is marked with a sign

If there is any problem (e.g., the tag is missing) or potential problem (leakage from the port) responsible party will be notified immediately. Follow up to ensure corrective action is completed.

Document date checked and by whom in the below table or on the extinguisher tag

Date Checked/Initials	Date Checked/Initials	Date Checked/Initials	Date Checked/Initials	Date Checked/Initials

Checked by:

1. [name & initials] **3.**

2. **4.**

CORRECTIVE ACTION Note date deficiency found, which extinguisher (if more than one in the office), person responsible for corrective action, and completion date.

_____

_____

_____

_____

_____

Definitions of Control Measures Shown on the HARC Process Spreadsheet

1 – **TRACK**

This is a self-assessment tool that allows the individual to **T**hink through the task, **R**ecognize the hazards, **A**ssess the risks, **C**ontrol the hazards, and **K**eep Safety First in all things.

2 – **JSAs**

Job Safety Analysis – a documented analysis of a job which includes breaking down the job into individual steps, identifying the hazards of each step, and determining the appropriate level and methods of control for the identified hazards. It is written by the experts or the individuals carrying out the job.

3 - **H&S plans**

A document written at the beginning of a project, and reviewed and modified during the project as conditions or activities change that guides the H&S activities of the project. It outlines the responsibilities for H&S on the project, identifies the hazards to be encountered, defines the controls for those hazards, documents emergency response procedures, defines personal protective equipment and air monitoring requirements, identifies training requirements, and other important H&S information for the project.

4 – **H&S Procedures**

A document that sets a standard way of controlling a particular type of hazard written and maintained by ARCADIS. It provides minimum requirements for dealing with a particular hazard. Procedures state a policy, purpose/scope, definitions, responsibilities, procedures for how to address the particular hazard, training requirements, records to be kept, reference documents, and provide the forms and other information.

5 - **Hazard Control Sheets**

A document that sets hazard control for a very distinct hazard. These are typically used for medium or high hazards. This can be used to supplement JSAs, H&S plans, and other more broadly based documents.

6 - **Tailgate safety meetings**

A meeting held at the beginning of each day (and in the middle of each day as well at some sites) during project field work. The meeting is led by the ranking on-site ARCADIS employee and discusses the tasks for the day, the hazards to be encountered, site conditions, environmental and weather conditions, activities of others on the site, etc. All site members are in attendance at one project-wide tailgate meeting, or at a sub-project group tailgate meeting. This will vary by project based on number of staff, number of activities, and the complexities of the project.

7 - **Awareness training**

Training given to employees that explain the basic information about a hazard and how to recognize said hazard. This is not intended for staff who will directly encounter the hazard, but those who may work in the vicinity of a hazard, or for those who need to be able to recognize that it is a hazard so they avoid it. For example, individuals will take awareness training to be able to recognize a confined space, so they don't inadvertently enter one.

8 - **Specialized training**

Training provided to an employee who will directly encounter a hazard. It provides detail in the risks and consequences of the hazard, and specific measures in how to control it. Often times, this training includes practical training in learning how to use equipment, etc. For example, if a person has to enter a confined space, they will take specialized training to know the permitting requirements, monitoring requirements, entry and exit requirements, what equipment is required and how to use such equipment, and emergency procedures.

9 - **Client training**

Specific training as required by a client. This may include specific training to enter a client site, or special training that is necessary to work in a particular industry. It is defined by the client.

10 - **Contingency/Emergency planning**

A detailed plan on what to do in the event of any type of emergency including injury, spill, fire, explosion, etc. It identifies what emergencies are possible, the pre-planning and rehearsal requirements, the methods used to prevent emergencies, what to do in the event of an emergency, what equipment is necessary to respond to an emergency, how to responds, telephone numbers and contact information for emergency personnel, and how to follow-up the emergency.

11 - **Engineering controls**

A method of control that utilizes the principle of separating personnel for the hazard source including ventilation, trench boxes, sloping of trench or excavation sides, Lockout/Tagout devices, material handling-assist equipment, noise barriers, vibration dampeners, etc. The selection of engineering controls requires specific expertise to ensure the control minimizes or eliminates the hazard and does not create new hazards.

12 - **Administrative controls**

A method of control to manage personal exposure to hazards to include training, job rotation, rest breaks, shift reduction, time management, medical exams, etc.

13 - **Personal Protective Equipment**

A method of control that includes objects worn by personal to include such things as gloves, hearing protection, hard hats, steel-toed boots, respirators, chemical resistant suits, eye protection; etc. These are always the last method considered when determining controls.

14 - **Specialized equipment**

Includes air monitoring devices, volt meters, ventilation systems, fall protection equipment such as lanyards and harnesses, heat stress and cold stress monitors, etc.

15 – **Housekeeping**

An administrative process to keep a site or workplace neat, clean, and orderly. This reduces such hazards as fire, slips, trips, falls, blocked emergency exits and routes, etc.

16 – **Inspections**

A physical examination of equipment, workplaces, etc. to proactively identify potential failure areas.

17 – **Other**

There may be other control measures that can be followed to eliminate or minimize a hazard. Consult with a H&S or other expert.

1. POLICY

It is ARCADIS US policy to be proactive in the identification, assessment and control of health and safety hazards and associated risks. To those means, ARCADIS US utilizes systematic approaches to identify and assess hazards and risks for the purposes of determining appropriate and effective controls to protect its staff, subcontractors, clients and the public who may be impacted by ARCADIS activities.

2. PURPOSE AND SCOPE

2.1 Purpose

This procedure serves as the foundation for identifying hazards and assessing the associated H&S risks in the ARCADIS US working environment, and assisting in the identification of the means and methods of controlling those risks. The processes and tools described herein are the recommended tools for use to ensure standard and consistent approaches throughout the organization. These hazard identification and risk assessment tools are to be used to supplement such activities as but not limited to:

- Health and Safety Plan development
- Job Safety Analysis development
- Using the TRACK process
- Determining the level of training staff or subcontractors need to complete

2.2 Scope

This procedure and the associated tools are to be applied for the identification of hazards, the assessment of the associated risks, and the identification of control methods applicable to the entire ARCADIS US operation. It is also to be applied when assessing the risks of hazards identified on individual projects as described herein.

The Hazard Assessment and Risk Control (HARC) process is the formal ARCADIS tool to be applied to:

- The routine and non-routine activities in ARCADIS offices and project sites
- The activities of all people having access to the workplace
- The facilities and services at the workplace, whether provided or directly controlled by ARCADIS or not (i.e. office renovation work completed by contractors, client activities on an active client site where ARCADIS is providing services, etc.) that could present hazards to our staff.

The TRACK process is a less formal tool to be used prior to any activity conducted by an ARCADIS employee. It is an undocumented process that follows similar steps as the HARC process but is less formal and is done frequently throughout the activity.

3. DEFINITIONS

Key Definitions for terms used within this procedure are found in the ARCADIS US H&S Management System document: ARC HSMS000

In general, the definition of hazards is as follows:

Health hazards including physical, chemical, biological, ergonomic and psychological hazards associated with work. Typically, they involve long-term exposure, although short-term exposure can also result in a health hazard. Typical examples include:

- Workplace exposure (e.g. to chemicals, noise, heat) that can lead to illness
- Infections (e.g. insects, snakes, parasites, poisonous plants)
- Ergonomic conditions (e.g. RSI, VDU screen)
- Psychological conditions (e.g. aspects of work related stress)

Safety hazards that may result in sudden, unwanted, incidents leading to injury (incl. e.g. back strain, contusion, permanent or temporary disability, a broken arm, skin laceration, fatality, burn, fires and explosions; spills on land or water) that are immediate in nature.

4. RESPONSIBILITIES

4.1 Corporate H&S with Division and Practice Experts

On an annual basis, review and update the corporate HARC listing which provides a listing of the more likely hazards that ARCADIS staff will encounter in the course of their work.

4.2 Principal in Charge (PIC), Project Manager (PM), and Task Manager (TM)

Ensures that the HARC process is used to assess hazards on projects during the planning and implementation stages of the projects.

4.3 Health and Safety Plan Writers and Reviewers

Utilize the HARC process when assessing hazards for the development of Health and Safety Plans (HASP). The writers and reviewers can use the corporate-wide HARC listing or use the HARC process as appropriate for specific project hazards.

4.4 All ARCADIS Employees

Use the TRACK process described below regularly and frequently. In addition, employees read and understand all documented hazard identification and risk assessments conducted using the HARC process and documented in HASPs, JSAs, and other written plans that are associated with their work.

5. PROCEDURE

5.1 Hazard Assessment and Risk Control (HARC)

Applying the HARC process assists in third step of the ARCADIS TRACK process. Once the tasks of the project or activity are thought through, and the hazards are identified or recognized, HARC assists assessing the risk of those hazards. The process provides a standardized means for ensuring that hazards and risk are assessed consistently from one activity to another. The HARC assists in assessing the risk based on the following two questions:

- What is/are the (potential) severity of the consequence(s) when the hazard (that what has the potential to cause harm) occurs:, and
- How likely is it that the, unwanted, consequence after the release of the hazard occurs

The HARC risk assessment process starts with listing, for each individual hazard, what the consequences could be if the controls for that particular hazard fail. During this step it is important to consider that particular **credible** worst case scenario's for one hazard can lead to more than one consequence depending on the scenario.

Subsequently for each consequence the risk is assessed using the "Risk Assessment Matrix" (RAM). Risk is defined as: a combination of the chance or likelihood that a consequence will occur and the severity of that consequence.

The RAM is a tool that standardizes qualitative risk assessment to classify H&S risks into three categories: Low (blue area), Medium (yellow area) and High (red area). It facilitates this classification process and does not require specific competencies to perform a sound risk assessment. The matrix axes, consistent with the definition of risk, are consequence and likelihood. This classification results in different levels of risk control commensurate with the risk.

The RAM is shown below.

Risk Assessment Matrix

Consequences Ratings*		Likelihood Ratings**				
		A	B	C	D	E
People	**Property**	Never heard of in the world	Heard of incident in industry	Incident has occurred in ARCADIS Group	Happens several times a year in ARCADIS OpCo	Happens several times a year at ARCADIS Worksite
0 - No health effect	0 - No damage	**Low**	**Low**	**Low**	**Low**	**Low**
1 - Slight health effect	1 - Slight damage	**Low**	**Low**	**Low**	**Low**	**Low**
2 - Minor health effect	2 - Minor damage	**Low**	**Low**	**Low**	**Medium**	**Medium**
3 - Major health effect	3 - Local damage	**Low**	**Low**	**Medium**	**Medium**	**High**
4 - PTD or 1 fatality	4 - Major damage	**Low**	**Medium**	**Medium**	**High**	**High**
5 - Multiple fatalities	5 - Extensive damage	**Medium**	**Medium**	**High**	**High**	**High**

5.1.1 Using the RAM:

The scale of consequences from “0” to “5” is used to indicate increasing severity. The consequences are those of credible – worst case- scenarios (taking the prevailing circumstances into account) that can develop from the release of a hazard. The potential consequences, rather than the actual ones, are used. These can be thought of as the consequences that could have resulted from the released hazard if circumstances are less favorable: e.g. the risk controls failed and developed into a consequence.

After estimating the potential consequence(s), the likelihood on the horizontal axis is estimated on the basis of historic evidence or experience that such consequences have materialized within the industry, the company or a smaller unit (Division, Practice or Project). Note that it is the likelihood of the consequence occurring and not the likelihood of the hazard released.

Estimation of the likelihood and the severity of consequences is not an exact science. The consequences are based on foreseen scenarios of what “might happen” and likelihood estimates are based on historical information that such a scenario has happened under similar conditions, knowing very well that circumstances are never exactly the same.

When assessing the risk of a particular scenario, first estimate the severity of the potential consequence starting at the bottom (for people, severity rating 5): “multiple fatalities”. Ask the question: “in this particular situation” can multiple (more than one) fatalities occur when all the risk control measures fail? If this is not possible, move one box up (severity rating 4) and ask the question: “can a PTD or 1 fatality” occur? If not, again move up one box (severity rating 3) and ask the question: “can major health effect or injury” occur? Suppose the answer is yes, than the next step is the estimation of the likelihood that “major health effect or injury” occurs. In the RAM go first to the likelihood “E”: “happens several times per year at ARCADIS work site”. If this is not the case, move to the next box: likelihood “D”: “happens several times per year at ARCADIS U.S.”. If the likelihood is less, move to likelihood box “C”: “has happened in the ARCADIS group”. Suppose this likelihood is correct, then the estimated risk is “People 3C”. This is a “medium risk”.

If consequences can occur to people and property from the same hazard, the risk will be assessed for both with the higher risk level being used for the overall risk ranking.

Likelihoods “E” – “C” are generally well known by staff. The likelihoods “A” and “B” are often not known by staff. Corporate H&S will maintain a record of likelihoods with a low to very low chance.

Estimating the risk is should be done with a small group of experienced and realistic employees. Their focus should be on what is **probable** (this is more realistic) in a certain situation, rather than on what is **possible** (this is often theoretical). When seriously in doubt whether the risk is in the blue (low risk) or yellow area (medium risk), it is advised to accept the more serious situation so as to remain at the safe or conservative level.

5.1.2 Guidance for the Consequence ratings is provided below:

- **Slight Health Effect** - Slight injury of health effects: injuries or health effects NOT affecting work performance or causing disability and not affecting Daily Life Activities.
    - Examples:
        - First aid cases
        - Exposure to health hazards that give rise to noticeable discomfort, minor irritation or transient effects reversible after exposure stops.

- **Minor Health Effect -** Minor injury or health effects: Injuries or health effects affecting work performance, such as restriction to work activities or need to take up to 1 week to fully recover. Or affecting Daily Life Activities for up to 1 week. Or reversible health effects.
    - Examples:
        - Medical treatment cases Restricted work day cases or lost work day cases resulting in up to 1 week away from work
        - Illnesses such as skin irritation, food poisoning or temporary hearing loss

- **Major Health Effect** - Major injury or health effects: Injuries or health effects affecting work performance in the longer term, such as absence from work for more than 1 week and less than 3 months. Or irreversible damage to health.
    - Examples:
        - Long term disabilities (also called Permanent Partial Disability)
        - Illnesses such as sensitization, noise induced hearing loss, chronic back injury, repetitive strain injury or stress.

- **PTD or 1 Fatality -** Long-term (more than 3 months) or Permanent Total Disability or one fatality: - resulting from injury or occupational illness.
    - Examples:
        - Illnesses such as asbestosis, cancer and serious work related depression
        - Car accident resulting in long-term or permanent total disability or fatality

- **Multiple Fatalities** - Multiple fatalities: - resulting from injury or occupational illness.
    - Examples:
        - Multiple asbestosis cases traced to a single exposure situation
        - Cancer to a large exposed population
        - Fire or explosion resulting in one or more fatalities

- **Slight Damage** - Costs less than $1,000
    - Example:
        - No disruption of operation or activities

- **Minor Damage** - Costs between $1,000 and $10,000
  - Example:
    - Brief disruption of operation or activity

- **Local Damage -** Costs between $10,000 and $100,000
  - Example:
    - Partial shutdown of installation or cessation of part of the activity for a while

- **Major Damage** - Costs between $100,000 and $1,000,000
  - Example:
    - Shutdown of installation for up to 2 weeks or cessation of the whole activity for up to 2 weeks

- **Extensive Damage** - Costs greater than $1,000,000
  - Example:
    - Substantial or total loss of installation or permanent cessation of activity

5.1.3 Using the HARC and RAM for Determining Hazard Controls

Once the risk levels are known, the assessors, plan writers, etc, can prioritize the hazards to determine the appropriate controls. Below is guidance on the controls for each level of hazard.

5.1.3.1 Control of Low Risks

There is a variety of possibilities how these Low H&S risks can be controlled. The list of general control measures for Low H&S risks is not exhaustive and can be expanded where practical.

Examples of General H&S control procedures or measures for Low H&S risks:

- Newly recruited staff receives basic training in safety aspects in their area of work as part of their education for the job.
- All (newly appointed) staff should attend a general H&S education program. This is also applicable for office staff. The TRACK process is very suited for this purpose.
- Training on the job by experienced supervisor or peer
- Health and Safety Procedures (HSPs)
- Good housekeeping practices as laid down in an OpCo guideline
- Tool box meetings before a new activity is being carried out
- Reading/understanding of and training in company safety procedures
- Understanding of vendor specification for use of equipment

For each of these requirements, procedures or measures it must be indicated who is responsible for keeping them up to date and who is responsible for their application.

The H&S documents the minimum training requirements and procedures and measures applied to control H&S risks.

5.1.3.2 Control of Medium Risks

Medium risks can be controlled through the development and use of other tools such as a Job Safety Analysis (JSA) and/or Project H&S Plans. In addition, controls can include such things as:

- Specialized training
- Client training
- Contingency/Emergency planning
- Engineering controls
- Administrative controls
- Personal Protective Equipment
- Specialized equipment (i.e., air monitoring, fall protection, ventilation)
- Housekeeping
- Inspections

In many cases it may be appropriate to utilize a combination of these tools to control Medium risks.

5.1.3.3 Control of High Risks

Managing High H&S risks requires very detailed hazard analysis and risk control. Because High H&S risks are rare in ARCADIS these risks will be assessed and put under control by specialists trained in managing these high risks. High risks require the assistance of qualified H&S staff and other experts to ensure adequate controls are developed.

5.2 TRACK

The TRACK process is the second tool that ARCADIS staff use to identify hazards, assess risk, and determine the best ways to control those identified risks. TRACK is the following:

Think through the task

Recognize the hazard

Assess the risk

Control the hazard

Keep H&S first in all things

Every person will perform an SPSA using **TRACK**:

- At the beginning of the day and when changing tasks during the work period;
- Before undertaking new activities for the first time and for non-routine activities;
- When changes in working conditions occur (e.g., weather, traffic); and
- Immediately following an incident, including near misses.

"Think through the task!"

First, think about the task in relation to how an incident could occur:

- What are the steps in the task?
- How is the job going to be done?
- What tools will be used; what environment are we in; what techniques will be used?
- Who is involved and who needs to be involved?

"Recognize the hazards!"

Next, recognize the hazards associated with the task and its individual steps:

- Is the work area safe?
- What hazards might I encounter while performing these tasks?
- What is the worst that could happen?
- Are tools and equipment in good repair and working properly?
- Are chemicals or biological hazards present?
- Which physical hazards are present (e.g., heat, noise, vibration, awkward positions, lifting)?

"Assess the risks!"

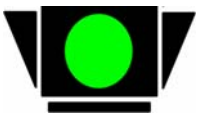
Then, be sure you understand the risks associated with the identified hazards.

- If this hazard was likely to occur, how badly could I or anybody else be hurt?
- How often might I or anybody else be exposed to that hazard as I am doing this task?
- How might I be exposed to identified chemicals and what are the safe levels of those chemicals?
- What is the likelihood of an injury or damage?

"Control the hazards!"

Now, take the necessary steps to eliminate or control the hazards.

- Is there a safer way to do the job?
- Can the hazard be eliminated?
- Can the hazard be engineered out of the task or work area (e.g., guardrails, a fan, ventilation, material substitution to a less hazardous chemical or piece of equipment)?
- Can administrative controls be implemented to eliminate or minimize the hazard (e.g., rest periods, signage, job rotation, training)?
- If engineering or administrative controls are not practical, will the use of Personal Protective Equipment (PPE) minimize the hazard and risk?



"Keep health and safety first in all things!"

Lastly, always put health and safety first in all things.

- Correct or report safety concerns.
- Suggest ways to improve health and safety and/or eliminate unsafe conditions.
- Monitor health and safety controls for effectiveness.

- Look out for yourself and others.
- Continually be aware of your surroundings and when things change or you have a concern, stop and redo TRACK.
- **Stop work if it's not safe**.

6. TRAINING

All employees are trained on the TRACK process during their initial Loss Prevention System™ training. No formal training is required for the HARC process.

7. REFERENCES

7.1 HARC Spreadsheet kept on the H&S page of the Company Intranet under H&S Planning

7.2 ARCADIS Health and Safety Procedure ARC HSFS002 – Health and Safety Planning

8. RECORDS

Upon completion of the HARC process on projects, the documentation will be kept with project files. The most current version of the overall company HARC document will be kept on the H&S section of the company intranet.

9. APPROVALS AND HISTORY OF CHANGE

History of Change

Revision Date	Revision Number	Reason for change
28 March 2008	01	Original document

1. POLICY

It is the policy of ARCADIS to assess noise hazards resulting from or encountered by our staff during job activities and to control such noise hazards to minimize and eliminate hearing loss among our staff, subcontractors, clients, and the public. Any employee who will be exposed to noise at or over 85 decibels (excluding brief intermittent ambient noise) for any amount of time will be required to wear appropriate hearing protection. When in doubt, ARCADIS will provide hearing protection.

2. PURPOSE AND SCOPE

2.1 Purpose

ARCADIS is committed to providing a healthy and safe work environment for our employees, subcontractors, clients and visitors. To this end, ARCADIS embraces this Hearing Conservation Health & Safety (HS) Policy. The purpose of the ARCADIS Hearing Conservation HS Policy is to provide a standard policy on the health and safety requirements and processes for all employees with potential exposure to excessive noise (levels in excess of 85dBA for any amount of time) and to comply with 29CFR1910.95. ARCADIS defines excessive noise as any noise environment that requires speech levels above those used for normal conversation.

2.2 Scope

This policy and associated procedures apply to every project and all operations conducted by ARCADIS. Hearing Protection is supplied and/or approved by ARCADIS for use by employees in carrying out their assignments. All employees conducting work where the potential for excessive noise is present, are required to have their assigned hearing protection available and used as required by the project Health and Safety Plan (HASP), Job Safety Analysis (JSA), or client requirements.

3. DEFINITIONS

NRR – Noise Reduction Rating is the measure, in decibels, of how well a hearing protector reduces noise, as specified by the Environmental Protection Agency. The higher the number, the greater the noise reduction. When dual protectors are used, the combined NRR provides approximately 5 decibels more than the higher rated of the two products. For example, using ear plugs (NRR of 29 decibels) with ear muffs (NRR 27) would provide a Noise Reduction Rating of 34 decibels. For practical purposes, users should assume they will actually receive protection that is 5 decibels less than the published value.

HSP – Health and Safety Procedure

TWA – Time Weighted Average; The average exposure to a contaminant or condition (such as noise) to which workers may be exposed without adverse effect over a period of 8 hours a day or a 40 hour work week.

Decibels – A Weighted – the unit of measure to be used when measuring noise levels on ARCADIS work sites and when comparing to occupational exposure standards and limits.

4. RESPONSIBILITIES

Employees – are required to wear prescribed hearing protection during activities with identified excessive noise levels. In addition, employees are required to have their provided hearing protection available where the potential for excessive noise exists and to use as required by HASPs, JSAs, or client requirements.

In addition, employees have the responsibilities to adhere to this HSP and to communicate HS concerns, issues and questions to their supervisor or their respective Health and Safety resource. In addition, all employees have the responsibility to:

- Use the TRACK process prior to any activity;
- Follow all ARCADIS and client requirements;
- Participate in the medical monitoring program, including annual audiogram and hearing conservation training as applicable based on their job duties;
- Notify the Corporate Health and Safety if they were exposed to high noise levels and required to wear hearing protection during the previous year and are not already in the medical monitoring program;
- To understand and appropriately utilize the “Stop Work Authority” concept.

Managers – Have the responsibility to steward the HS program to ensure that staff in their practice are appropriately equipped with the necessary hearing protection and have been provided the appropriate training. To accomplish this, Business Practice Managers (BPMs) have the responsibility to know and understand our HS program, policy, vision, and this HSP in detail enough so as to be prepared to explain it to a client when required. In addition, Managers have the responsibility to provide oversight management for the HS of employees in their respective operations. Each will assure that appropriate time and resources are provided to facilitate the implementation of this HSP. In addition, the Managers will involve themselves in any “Stop Work” issued by an employee as requested by an ARCADIS employee, project manager, or Principal-in-Charge (PIC). Managers will assist in resolving the issue associated with the “Stop Work Authority” issued by an employee.

Project Managers and Principals in Charge (PICs) – Have the responsibility to know and follow all applicable ARCADIS and client HS requirements, for ensuring work is conducted under the policy stated in this HSP, and for implementing the procedure requirements provided for in this HSP on any project and/or in offices that pose hazards to ARCADIS employees or employees of its subcontractors, clients, and other organizations present in the vicinity of work controlled by ARCADIS

For project related work, Project Managers and PICs responsibilities also include determining and communicating any specific client requirements that are applicable, including:

- Communicating with and appropriately managing subcontractors, ensuring that employees have appropriate training and qualifications, and for ensuring all client HS requirements are met;

- Involving the appropriate ARCADIS HS Staff and project client staff, as necessary;
- Ensuring that all subcontractors have been communicated with concerning the minimum HS requirements for the project
- Providing adequate resources and budget for personal protective equipment (PPE), including hearing protection; PPE will be provided at not cost to the employee

In addition, as project and client agents and on behalf of ARCADIS, the Project Managers and Client Managers for client-related work shall be responsible for:

- Understanding and compliance by employees with HS rules and the requirements;
- Guaranteeing each employee the absolute right to exercise “Stop Work Authority” in good faith without fear of retribution or disciplinary action
- Using the ARCADIS Incident Investigation process for formally resolving a “Stop Work” condition.

Using this “Stop Work Authority” process, the manager and the employee will:

- Discuss and document the condition;
- Identify and document the root cause for the condition;
- Determine and document the solutions;
- Implement the solutions;
- Sign and acknowledge the solutions are in place to the satisfaction of the employee.

Corporate HS Staff – Have the responsibility for:

- Communicating the policy and procedure requirements in this HSP with all offices within ARCADIS – US;
- Ensuring that offices are aware of this HSP;
- Ensuring this HSP is being implemented effectively;
- Provide required training or guidance on approved training options;
- Providing the necessary suppliers and criteria for selection of H&S equipment.

Health and Safety Managers and Specialists – Are responsible for facilitating the policy and procedure requirements in this HSP in their area of responsibility and for providing “hands-on” assistance to ARCADIS staff to ensure this procedure is appropriately implemented.

5. PROCEDURE

5.1 Noise Monitoring and Exposure Assessments

Noise monitoring should be conducted on any or all activities where excessive noise may be present. The monitoring will be prescribed by H&S professionals during the development of HASP and/or JSA. Noise monitoring may also be conducted at the discretion of the health and safety supervisor (HSS) or any staff members that have questions or concerns about potential noise exposure. ARCADIS defines excessive noise as any noise environment that requires speech levels above those used for normal conversation. If noise monitoring is not feasible, the staff will assume that exposures that require elevated speech are above 85 db and will use appropriate hearing protection. Monitoring results will be collected in accordance with guidance provided in 29CFR1910.95 Appendix G - Monitoring noise levels non-mandatory informational appendix. Monitoring results will be communicated to staff and used to determine adequate types and effectiveness (NRR) of hearing protection.

Community based noise monitoring may also be required based on the scope of the project. Community based noise monitoring will be conducted in accordance with the Project specifications and applicable Environmental Protection Agency (EPA), State or Local ordinances.

5.2 Audiometric Testing

Audiometric tests will be scheduled in conjunction with pre-placement, periodic, and termination medical examinations as required by the Medical Surveillance Program. All employees that are not already part of the medical monitoring program must inform their supervisor and Corporate Health and Safety if they were exposed to high noise levels as part of their job duties. Employees that were exposed to high noise levels must receive an audiogram as specified by the Medical Surveillance Program. Employees will be informed of the requirement that they avoid both non-occupational and occupational noise exposure for 14 hours prior to audiometric testing.

Audiograms will be compared to baseline and prior tests to determine if a standard threshold shift has occurred. If a shift is detected, retesting may be done within 30 days. If a shift is confirmed, the employee will be informed in writing and may need to be refitted and retrained in hearing protection use. If subsequent testing shows that a standard threshold shift is not present, the employee will be informed. Additional audiometric testing may be conducted at the discretion of Health and Safety.

The Physician or audiologist will determine if further evaluation is needed and, if so, will provide to the specialist all the information that is required by 29 CFR 1910.95 (g)(7)(iii). If the physician determines that the medical pathology is unrelated to work exposure or wearing hearing protectors, the employee will be informed by the physician.

5.3 Hearing Protection Devices

Employees must use hearing protection selected, supplies, and/or approved by the firm. Requests for hearing protective devices must be directed to the Regional Health and Safety Managers and Specialists. Hearing protective devices are required to be selected by the Project Manager, or their designee, based on consultation with Corporate HS staff.

6. TRAINING

Employees required to wear hearing protection will receive training as provided by Corporate H&S. The training will be provided at least annually with refresher training as necessary and will include information regarding: effects of noise on hearing, the purpose of hearing protectors, their advantages/disadvantages and attenuation of various types, the proper selection, fit, use and care of protectors, and the purpose of audiometric testing. Employees will be trained concerning site specific noises hazards and hearing protection by H&S or project H&S staff as applicable.

7. REFERENCES

- OSHA Standard 29 CFR 1910.95

8. RECORDS

Record Maintenance – All records regarding noise exposure measurements will be maintained by the offices for two years. All audiometric test records will be maintained for the duration of the affected employee's employment. Original copies of shipping declarations and related shipping documents for hazardous materials will be kept in central file in each office location with copies kept in project files, as appropriate. These documents will be kept for a minimum of 2 years (3 years for manifests) or with the project files as long as the project files are kept.

9. APPROVALS AND HISTORY OF CHANGE

Approved By:

Mija A. Coppola, Director, H&S Compliance Assurance, LPS, Communications

Revision Date	Revision Number	Reason for change
1 December 2007	01	Original document
30 January 2008	02	Change to new template

1. POLICY

ARCADIS considers motor vehicle operation a risk that demands strict management to lead to accident prevention and the resultant decrease in employee injuries, lost productivity and insurance costs to be a vital key in accomplishing our company's vision. Motor vehicle accident prevention involves the safety and well-being of our employees as well as the general public.

To that end, it is the policy of ARCADIS that defensive driving skills and techniques along with good administrative management and controls be implemented by all of its employees at all times during the operation of ARCADIS vehicles, rental vehicles or personal vehicles used for company business.

2. PURPOSE AND SCOPE

2.1 Purpose

2.1.1 ***Purpose Statement*** **-** ARCADIS is committed to providing a healthy and safe work environment for our employees, subcontractors, clients and visitors. To this end, ARCADIS embraces this Health and Safety (H&S) Motor Vehicle Safety Program (MVSP) Policy and Procedure.

2.1.2 ***Providing Standard Practices*** - This policy and the accompanying procedures provide standard practices with regards to defensive driving and vehicle administration as required by employees as it relates to motor vehicle operation during the conduct of ARCADIS business.

2.2 Scope

2.2.1 ***Business Driving*** - This MVSP policy and associated procedures apply to the operation of any motor vehicle during the conduct of ARCADIS business. It applies to every ARCADIS Driver operating an ARCADIS, rental or personal vehicle used for company business.

2.2.2 ***Area Involved*** - This policy applies to the operation of motor vehicles for company business in any country in which ARCADIS employees or temporary agency employees are working.

2.2.3 ***Exceptions*** - Additional requirements apply to operation of commercial motor vehicles (CMVs). Refer to the ARCADIS DOT Program for Commercial Motor Vehicles (CMV Program) for additional information..

3. DEFINITIONS

ARCADIS Vehicle: Any vehicle owned or leased by ARCADIS US.

ARCADIS Driver: Any ARCADIS US employee or temporary agency employee who drives an ARCADIS vehicle, rental vehicle, or personal vehicle for business reasons whether the use of the vehicle includes operation from the local office or for travel while away from the local office.

ARCADIS Employee: Any full-time, part-time, temporary or as needed employee, and interns employed by ARCADIS US.

Business Use of ARCADIS, Rental, or Personal Vehicle: For the purposes of this policy, examples of business use of an ARCADIS, rental, or personal vehicle includes but is not limited to: attending meetings; driving to and from a client location; driving to dinner while out of town on business; and driving to an office supply store to pick up office supplies. Use of the vehicle for business would not include personal use as described below.

HSP: Health & Safety Procedure.

Manager: The employee's project supervisor or an Operations Manager

MVR: Motor Vehicle Report.

MVSP: Motor Vehicle Safety Program

Personal Use of ARCADIS Vehicle or Rental Vehicle: For the purposes of this policy, examples of personal use of an ARCADIS Vehicle or Rental Vehicle include but are not limited to: driving to dinner with a non-business-related person(s) in the vehicle; driving for the purposes of personal entertainment; using an ARCADIS Vehicle or Rental Vehicle for staying over period of time not required for business (e.g., staying over a weekend to visit friends, etc.).

Rental Vehicle: For the purposes of this policy, any motor vehicle rented from an established rental car company for ARCADIS business whether the use of the vehicle is operated from the local office or for travel while away from the local office.

Supervisor: The employee's administrative supervisor.

Temporary Agency Employee: A temporary agency employee utilized by ARCADIS for temporary work. A temporary agency employee may become an ARCADIS employee after completing the ARCADIS employment process. Temporary Employee Agency agreements shall provide for standard automobile insurance and other terms consistent with this policy.

4. RESPONSIBILITIES

4.1 *Corporate H&S Department* – Have the responsibility for: Communicating the policy and procedure requirements in this MVSP with all offices within ARCADIS – US. They are also responsible for ensuring that offices are aware of this MVSP. They also ensure this MVSP is being implemented effectively.

4.2 *Corporate HR Department* – Have the responsibility to review applicable portions o this policy and procedure for the purposes of ensuring consistency with HR policies and procedures regarding motor vehicle operation. They also have the responsibility to perform required Motor Vehicle Report acquisitions and review in conjunction with Corporate H&S.

4.3 *Health and Safety Managers and Specialists* – Are responsible for facilitating the policy and procedure requirements in this MVSP for providing "hands-on" assistance to ARCADIS staff to ensure this procedure is implemented appropriately.

4.4 *ARCADIS Managers and Supervisors (including project and task managers)* – Provide oversight management for the H&S of employees in their respective operations, and ensure that the MVSP is being implemented. In addition, they assure that appropriate time is provided to facilitate the implementation of this MVSP

4.5 *ARCADIS Employees* – Have the responsibilities to adhere to this MVSP and to communicate H&S concerns, issues and questions to their supervisor or to Health and Safety staff. In addition, all employees have the responsibly to use the TRACK process prior to any activity and follow all ARCADIS; federal, state, provincial, and local jurisdiction regulatory; and client requirements

5. PROCEDURE

5.1 General Procedure and Requirements

Only ARCADIS Drivers as defined above are permitted to drive ARCADIS vehicles. Exceptions to this requirement are permitted only upon approval of the Division President and General Counsel.

ARCADIS Drivers who drive an ARCADIS vehicle, rental vehicle or personal vehicle for business will maintain a valid driver's license, appropriate for the vehicle they are operating, that is free from any driving restrictions or suspension. An ARCADIS Driver who is asked to drive for business purposes in any type of vehicle, shall notify their supervisor or ARCADIS contact by the next business day if:

- Their license is suspended, revoked, or restricted ; and
- They receive a moving violation while driving for ARCADIS-related business.

In the case that one of these two issues occurs, the employee's supervisor or ARCADIS contacts ARCADIS Human Resources. Human Resources, in cooperation with Corporate H&S and legal, as deemed necessary, evaluates the employee's driving status (especially in instances of license suspension, revocation or restriction) and, as appropriate, corrective action recommendations are made.

All ARCADIS Drivers driving on ARCADIS business will:

- Wear seat belts at all times in any vehicle with seat belts (this includes taxis and shuttle buses equipped with seat belts);
- Operate and license the vehicle in accordance with applicable laws;
- Operate the vehicle consistent with client driving rules, speed limits, and requirements when operating the vehicle on project sites;

- Drive defensively as learned through training, education, and experience;
- Exercise caution when taking any prescription or over-the-counter medication that may cause drowsiness or an altered mental state;
- Have headlights on at all times, even during daylight hours;
- Not use controlled substances, illegal drugs, or alcohol while driving on ARCADIS business;
- Not drive in a manner that could be deemed reckless or aggressive by other drivers;
- Not use radar/laser-type detectors; and
- Not pick up hitchhikers.

5.2 Comments on My Driving? Program

Along with continuing to reinforce the Smith System defensive driving techniques and the use of the LPO process, ARCADIS will be soliciting comments on our driving so that we can provide both positive feedback and develop solutions to help eliminate at-risk driving behaviors before an incident occurs using a “Comments on My Driving?” program.

The program entails the placement of a “Comments on My Driving?” bumper sticker to ARCADIS-owned and leased vehicles. The sticker contains an 866 toll-free number that the public can call to comment on our driving. The number will be checked on a daily basis by H&S. Callers will be asked to provide the ARCADIS license plate number and a description of the positive or at-risk driving behavior observed.

When a call is received, the driver’s supervisor will be notified and required to discuss the call with the employee, regardless of the nature of the comment. An investigation will be initiated as follows:

- If the employee denies the actions described in the call and the investigation is inconclusive or if it is determined that the call is not legitimate, the matter will be closed. The call will be logged showing the outcome and any action taken.
- If the employee agrees or confirms the actions described, the call will be logged and:

The employee will be recognized commensurate with the event if it is a positive comment.

If the issue reported is related to at-risk behaviors, the event will be investigated per the Loss / Near Loss Investigation HSP (ARC HSMS010) as any other near loss would be investigated with the identification of a root cause(s) and appropriate solutions.

- The situation will also be investigated per the Loss / Near Loss Investigation HSP (ARC HSMS010) if an employee is the subject of multiple calls related to at-risk behaviors, even if denied.

- In addition, similar to other H&S or company policy violations, the supervisor will consult with Human Resources about other actions that may be appropriate including possible disciplinary action.

5.3 Defensive Driving Training and Education Requirements for All Employees

On a frequency defined on an annual basis by Corporate H&S in cooperation with Operations, employees with an active driver's license shall complete the on-line defensive driving training course as designated by Corporate H&S or an equivalent course as approved by Corporate H&S.

If a client requires classroom or hands-on drivers' training, Corporate H&S will arrange for this to be provided. The on-line training will not be required for those employees, who attend the classroom session.

All active drivers are expected to review and be familiar with the contents of the Operator's Manual(s) for the vehicles they will be operating.

Additional training may be provided or required per the request of an employee's supervisor or Corporate H&S, and as required by a client

5.3.1 Defensive Driving Training and Education Requirements For New Hires

Human Resources reviews the motor vehicle records (MVRs) (see section 5.16) of all new hires. If the MVR is acceptable, the new hire process proceeds as indicated below. If it is determined that the MVR is poor or borderline, the hiring manager works with Corporate H&S, Human Resources and legal, as necessary, to determine their employment and driving status with the company. The criteria for assessing new hire driving records are presented in Exhibit 1.

New hires with an active driver's license shall complete the on-line defensive driving training course as designated by Corporate H&S or an equivalent course as approved by Corporate H&S within 30 days of hire. If the new hire is approved to drive for the company based on the MVR and the new hire will drive on average 5 or more days per month for the company business, the following process is implemented to determine additional driving requirements.

If the new hire will only drive sedan-type vehicles including sport utility vehicles (SUV) under normal on-road driving conditions, the new hire is required to:

- Complete the online training described in Section 5.3 and before they are permitted to drive on company business unless approved for limited driving by their supervisor;

- Within 60 days of employment complete a Loss Prevention Observation (LPO) with their supervisor, manager or designated "expert"; (refer to the LPS database for a driving LPO form)

- If questionable behaviors are observed during the LPO per the outcome of the feedback session, it is the supervisor's discretion to require the successful completion of a one-day, hands-on defensive driving training course within 90 days of the LPO. It is also the supervisor's decision in consultation with applicable managers to allow the driver to continue to drive on company business until completion of the hands-on course. If approved, the person may drive on company business until the hands-on course can be scheduled and completed. If not approved, the person is not permitted to drive on company business before the hands-on course is scheduled and completed;

- Subsequent LPOs may be completed following the hands-on training at the discretion of the supervisor or manager; and

- If the new hire continues to exhibits repeated questionable driving behaviors that in the opinion of the supervisor affects the safe operation of the motor vehicle during subsequent LPOs, the supervisor reviews the situation and determines the next steps working with Human Resources as appropriate.

If the new hire will be driving vehicles that include, but not limited to, SUVs that are used in off-road field conditions, pick-up trucks, delivery trucks, utility trucks, or non-family type vans, the new hire will be required to:

- Complete the online training described in Section 5.3 and before they are permitted to drive on company business unless approved for limited driving by their supervisor;

- Within the first 30 days of employment complete: An LPO with their supervisor or designated "expert." (the LPS database for a driving LPO form.) **Note: Employees operating vehicles that must comply with the CMV Program must complete the "CMV Road Test" prior to operating the vehicle.**

- If a person successfully completes the LPO per the feedback session, the operations manager will make the decision as to whether the person is permitted to drive a pick-up, van, or other large vehicle prior to the completion of the hands-on training. If approved by the manager, the person may drive on company business until the hands-on course can be scheduled and completed. If not approved, the person will be permitted to drive only sedan-type vehicles and SUVs used under normal driving conditions on company business before the hands-on course is scheduled and completed. If the person does not successfully complete the LPO, it is the supervisor's decision to allow the driver to continue to drive on company business until completion of the hands-on course;

- Successfully complete a one-day, hands-on training course within the first 90 days of employment with additional steps as noted below:

- If the employee has had their license for less than one year, the supervisor or manager plans and schedules a LPO within one week after the hands-on course. The supervisor may require additional LPOs;
- Additional LPOs on all drivers may be completed following the hands-on training at the discretion of the supervisor or manager; and
- If the person does not successfully complete subsequent LPO, the supervisor will review the situation and determine the next steps working with Human Resources as appropriate.
- If the new hire has a foreign license or has had their foreign license converted to a U.S. license, the new hire will be required to:
  - Complete the online training described in Section 5.3 and before they are permitted to drive on company business unless approved for limited driving by their supervisor;
  - Successfully complete a one-day, hands-on training course within the first 90 days of employment with additional steps as noted below;
    - If the employee has had their license for less than one year, the supervisor or manager plans and schedules a LPO within one week after the hands-on course. Supervisor may require additional LPOs;
    - Additional LPOs on all drivers may be completed following the hands-on training at the discretion of the supervisor; and
    - If the person does not successfully complete subsequent LPOs, the supervisor will review the situation and determine the next steps working with Human Resources as appropriate.

Refer to the flowchart in Exhibit 2 for the decision-making process for new hires.

5.3.2 Additional Defensive Driving Training and Education Requirements for Existing Employees

In addition to the training as required in Section 5.3, existing employees complete hands-on defensive driving training at the discretion of their supervisor or manager based on one of the following conditions.

- If a manager or supervisor determines that the driving hazards faced by the employee require hands-on training to assist in the prevention of motor vehicle accidents;

- If the results of an LPO conducted by a supervisor or manager indicate that the employee requires additional training or

- As a result of a MVR evaluation, Corporate HR and Corporate H&S determine that the employee's driving record is borderline or poor as defined by this policy for existing employees (Exhibit 3).

5.3.3 Additional Defensive Driving Training and Education Requirements for Employees Involved in a Motor Vehicle Accident

Any ARCADIS employee involved in a motor vehicle accident while driving on company business, may be required to complete hands-on defensive training. The determination to require hands-on defensive driving training will be based on solutions derived from the IINLI process using the Factors and Solutions Flowchart or as required by the employee's supervisor. This training may be repeated as often as necessary based on the supervisor's discretion in cooperation with Corporate H&S and Human Resources.

Additional training may not be provided if it is determined by the supervisor in cooperation, as necessary from HR, legal, and/or Corporate H&S, that the employee will no longer be permitted to drive on company business.

5.4 Sources for On-Line and Hands-On Defensive Driving Training

The on-line defensive driving training or equivalent training is provided by, or based on, a nationally recognized defensive driving training company such as the Smith System, National Safety Council, or other recognized provider as approved by Corporate H&S. The current provider through ARCHIMEDES is Smith System.

Hands-on defensive driving training is provided by, or based on, a nationally recognized defensive driving training provided such as the Smith System, National Safety Council or provider approved by Corporate H&S. The trainer must be certified in the program upon which they are instructing and can be either internal or external to ARCADIS. The current provider of hands-on defensive driving training is Smith System. If not provided by an internal trainer, arrangements for hands-on defensive driving courses are handled directly through Smith System. Contact the Corporate Health and Safety Administrator in the Denver office for assistance.

5.5 Additional Training and Education for Other Driving Conditions

Supervisors, managers, or H&S staff determines additional training for employees driving under special conditions such as commercial motor vehicles, towing trailers, riding and operating all-terrain vehicles (ATVs) or other non-routine driving conditions. Training is coordinated and approved by Corporate H&S and the ARCADIS training department.

5.6 Driving Distractions and Cell Phone Use While Operating a Motor Vehicle

ARCADIS drivers avoid distractions while they operate motor vehicles and the vehicle is moving. These distractions include such things as eating, drinking, reading maps or

other information, operating the radio, and using cell phones. Specific requirements regarding cell phones are as follows:

- The safest driving occurs when drivers can focus their full attention on operating the vehicle and the surrounding conditions. To minimize driving distractions, any use of cell phones by ARCADIS employees while operating a motor vehicle is not recommended and highly discouraged. It is expected that all ARCADIS drivers will use the TRACK process to assist in assessing the safety of using a cell phone while driving.

- Using a cell phone or Blackberry for sending/reading text messages, or reading, preparing or sending emails is strictly prohibited while driving.

- The ARCADIS Vehicle Use Policy provides the ARCADIS policy on the use of cell phones while operating a motor vehicle. The policy should be reviewed for employees' guidance and the minimum precautions to use to advance the safe use of cell phones while driving. In summary, this policy allows cell phone use only where it is not banned by a client or regulatory requirement, and only if it is hands free. This policy can be reviewed in the Employee Handbook on the Human Resources intranet page.

- Supervisors and managers are permitted to apply more stringent requirements regarding cell phone use (i.e., no cell phone use at all while driving) based on client, business, or regulatory requirements.

5.7 Additional Required Defensive Driving Procedures

ARCADIS requires additional defensive driving techniques to assist in the elimination or minimization of motor vehicle accidents. These required techniques include:

- When a second ARCADIS employee is available, and where it is safe to do so, all vehicle backing operations will require the use of a spotter to assist with the backing operation.
- To assist drivers in their potential lack of familiarity with the location in which they are driving, one of the following will be utilized by drivers traveling to unfamiliar locations:
    - The use of GPS systems in rental cars such as Hertz Never Lost
    - Pre-Trip Route Planning through the use of Google Maps or MapQuest
    - Development and use of a Journey Management Plan (this is required by some clients).

5.8 Cone Placement and Retrieval to Encourage Visual Inspection Around Vehicle

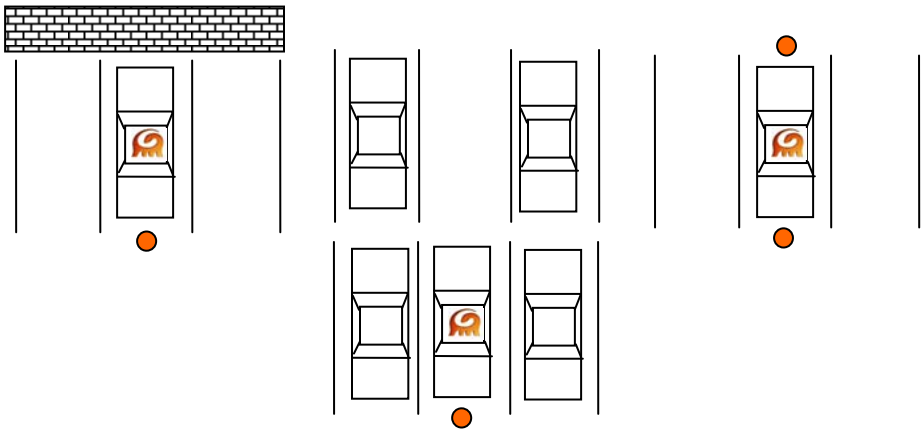
To ensure that the area around a parked vehicle is clear of obstacles, all company owned or leased trucks (also includes rental vehicles if required by the manager or supervisor) will be equipped with two to four traffic cones that will be placed around the vehicle

whenever the driver leaves the vehicle unattended (when the vehicle is parked and the occupants are outside of the vehicle regardless of distance or visual site); the cones will be placed in the configurations shown on the following page. Upon departing in the vehicle, the driver will pick up the cones and look around the vehicle before moving.

Employees will use TRACK and place cones around vehicles in a manner that promotes driver awareness of vehicle surroundings and is appropriate to conditions encountered. The following general guidelines will help facilitate adherence to this program.

Parking Lots:

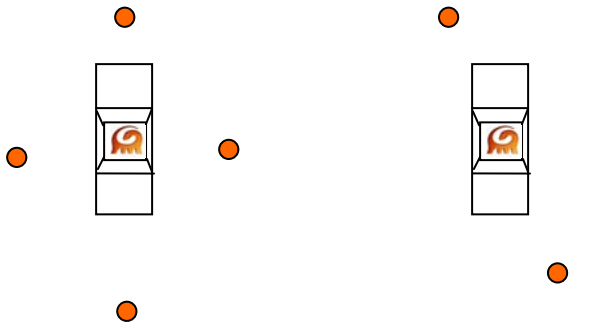
- At a minimum, one cone will be placed at the end of the vehicle in the direction of movement from the parking place when only one direction can be driven (Example 1).
- Parking lots with facing parking spaces, only deploy cone on the roadway end of vehicle (Example 2).
- Two cones will be required (one at each end of the vehicle) if potential movement can be from a forward or backing direction (Example 3)



Example 1 Example 2 Example 3

Project Sites:

- It is recommended that one cone be placed on all four sides of the parked vehicle at a distance sufficient to prevent trip hazards during the course of normal work around the vehicle (Example 4). If only two cones are available, the placement of the cones should be as shown in Example 5.



Example 4

Example 5

- Cone placement is not required for vehicles used for non- field work purposes.
- Use TRACK for all cone placement activities:
    - DO NOT place cones in parking lots in a manner that could cause a trip hazard to employees or the public.
    - DO NOT place cones in a manner that would affect or impede the flow of traffic, unless part of a traffic control program.

Offices and/or Projects should consider the purchase of exterior cone stands (mount on the vehicle bumper) for easy cone access when complying with this program. Cones should be orange color and have a minimum height of 18 inches. These cones may be procured from existing office stock or are available for purchase on the ARCADIS Section of the Wise Safety and Environmental website.

5.9 Vehicle Inspections and Maintenance

All company owned or leased vehicles will be maintained in safe operating condition. To ensure vehicles are properly maintained. A weekly inspection (daily if required by the manager or supervisor or if vehicle is operated in harsh environments) is required. Rental vehicles operated by ARCADIS for more than one week also must be inspected weekly. Inspections are required to be documented. An example inspection checklist is presented in Exhibit 4.

Deficiencies identified in inspections or at any other time will be managed through LeasePlan. Routine maintenance (gasoline, oil, etc) will also be managed through LeasePlan. All fuel purchases in company owned or leased vehicles must be made using the fuel purchase card issued for each vehicle. Each employee is issued a PIN

number to use the fuel card at participating retailers. Contact your supervisor if you need a PIN number.

Use of the fuel card assigned to the vehicle is critical to help ensure maintenance schedules are maintained for the vehicle. Records of vehicle inspections should be maintained at the office or project location where the vehicle is assigned.

Employees operating company owned or leased vehicles (including qualifying rental vehicles) required to be maintained under the CMV program will follow inspection and maintenance requirements specified in the CMV program. Use of Exhibit 4 for CMV inspection is not permitted.

5.10 Fatique Management

Employees operating vehicles on behalf of ARCADIS must be rested and mentally alert. The following table provides to reduce the hazards of fatigue:

Fatigue Management Requirements (Non-CMV Drivers)

Maximum Time Driving before taking a break, and break duration	Maximum Hours of Driving in a 24 hour period	Maximum Time on Duty in a 24 hour period	Maximum Hours of Driving Per Week
Required: 3 hours, followed by a 15 minute break **Recommend: 2 hours, followed by a 10 minute break**	**10**	**16**	**40 over 4 consecutive days, followed by a break of 24 hours**

Notes:
1) CMV drivers have alternate requirements; refer to ARC DOT-009, “Hours of Service” for more information
2) Client requirements may vary.

5.11 Vehicle Use and Insurance

Only ARCADIS employees and authorized temporary agency employee shall drive ARCADIS Vehicles or Rental Vehicles.

Non-business use during business hours and/or having non-business related passengers in an ARCADIS Vehicle or Rental Vehicle during such business use is prohibited. In the event of an accident in one of these situations, the employee could be personally liable for injuries and damages associated with such an accident. Operating an ARCADIS Vehicle for strictly personal use on weekends, evenings and holidays is prohibited. If the employees uses a passenger vehicle that is a Rented Vehicle during these periods, such use will be considered personal use. The employee, and not ARCADIS, will be responsible for all rental charges and will be responsible for any damages or injuries occurring during such periods.

Use of an ARCADIS Vehicle or Rental Vehicle to commute to and from work should be limited to those situations where there is a sound business reason to do so and must be authorized by the Operations Manager.

Temporary agency employees are only permitted to drive ARCADIS Vehicles or Rental Vehicles under the following requirements:

- The temporary agency employee's MVR is clear of any violation for the prior three (3) years and lists no prior critical violations. Critical violations include such issues as:
    - Alcohol-related offenses
    - Driving while impaired or under the influence of alcohol or drugs
    - Homicide, negligent homicide, or manslaughter by vehicle
    - Fleeing or attempting to elude police officer
    - Hit and run
    - Failure to stop after an accident
    - Leaving the scene of an accident
- Completion of drivers training consistent with that required of ARCADIS employees (see section 5.3).

If a temporary agency employee receives a violation or has an accident while driving, regardless of fault or preventability, on ARCADIS business, they are immediately prohibited from driving ARCADIS Vehicles, Rental Vehicles or a personal vehicle for ARCADIS business.

5.12 Insurance

ARCADIS has vehicle insurance coverage for ARCADIS Vehicles and Rental Vehicles. If an accident occurs or damage is sustained, there is a $2,000 deductible for damage to the ARCADIS Vehicle or Rental Vehicle ("collision") and a $10,000 deductible for damage to another vehicle, property damage or injury to another party ("liability"). These deductibles are paid by the relevant ARCADIS office.

If an accident should occur during non-business hours while an employee is driving an ARCADIS Vehicle or Rental Vehicle, in accordance with state law, the ARCADIS employee could be personally liable for injuries and damages associated with such an accident.

5.12.1 Insurance – Rental Vehicles

5.12.1.1 Vehicle Rental in United States

As stated above, ARCADIS has insurance for all ARCADIS Vehicles and Rental Vehicles. Therefore, when renting for business in the United States, there is no need to accept the insurance coverage offered by the rental company.

In addition, the national accounts and agreements the company has with Enterprise Rent-A-Car and Hertz includes insurance coverage. There are no deductibles associated with the Enterprise and Hertz insurance coverage. Insurance arrangements with these rental car companies are as follows:

- Enterprise: Collision and liability. The company's ID number (NA12ARC) must appear on the rental agreement. Employees should waive insurance coverage offered when picking up the vehicle.
- Hertz: Collision and liability. The company's CDP number (26931) must appear on the rental agreement. Employees should waive insurance coverage offered when picking up the vehicle.

5.12.1.2 Vehicle Rental Outside United States

If an ARCADIS employee is renting a vehicle for business **outside of the United States, the employee must accept the insurance offered by the local rental car company in order to be fully covered under the company's Foreign Package policy.** In addition, check with Corporate H&S about any additional coverage that may be needed for the country in which you are renting.

5.12.2 Insurance – Personal Vehicles Being Driven for Business

Employees who drive their own vehicle for company business, as a condition for performance of his or her duties, shall comply with all minimum state requirements for auto insurance as required by their state. This requirement includes auto liability insurance with the minimum amounts of coverage meeting or exceeding that state's requirements. If requested, employees shall provide a current insurance card which indicates the amount of coverage as adequate proof of insurance coverage.

If a personal vehicle is damaged or involved in an accident while being driven for company business, the insurance covering that personal vehicle is primary. ARCADIS does not reimburse employees for personal auto insurance deductibles.

5.13 Drivers License Verification

As requested by ARCADIS' insurance carrier or as deemed necessary by ARCADIS, ARCADIS reserves the right to review any employee's or temporary agency employee's MVR, or request driver's license verification. This review can be done at anytime during the course of employment with ARCADIS.

5.14 Internal Accident Review

ARCADIS' Incident Investigation/Near Loss reporting and investigation process is applicable to all employees or temporary agency employees driving for ARCADIS following an accident in an ARCADIS Vehicle, Rental Vehicle, or personal vehicle while driving for business. All motor vehicle accidents will be reported and investigated in accordance with the ARCADIS IINLI Factors and Solutions Analysis procedure.

5.15 Accident Review Committee

The Accident Review Committee (ARC) is comprised of representatives from ARCADIS' Human Resources, Health and Safety, and Legal departments. The ARC is used on a case by case basis at the discretion of Corporate H&S, Corporate HR or Corpoorate Legal. The ARC function of the ARC is to make recommendations in regard to:

- Corrective action following motor vehicle accidents in ARCADIS, Rental, and personal vehicles being driven by ARCADIS employees for company business. Motor vehicle accidents that involve a temporary agency employee will not be reviewed by the ARC.

- MVRs categorized as "borderline" or "poor" for current ARCADIS employees and new hire candidates once an offer of employment has been made.

- Incidents in which an ARCADIS employee receives a ticket while driving an ARCADIS , Rental, or personal vehicle for company business.

- An ARCADIS employee who drive on ARCADIS business whose driver's license has been suspended, revoked or is under a restricted status.

In situations where the ARC is used, the ARC recommends corrective action that may include internal or external defensive drivers training, LPOs, and/or MVR checks at specified time intervals. The ARC may also recommend:

- A verbal or written warning;

- Restriction or suspension of driving privileges;

- Termination of employment; or

- That the candidate/prospective employee be notified that the offer of employment is withdrawn since the candidate's MVR failed to meet the conditions of the offer.

All offers of employment that require a candidate to operate a vehicle as a part of his or her duties will contain an express condition to the offer that the offer is contingent upon the candidate's MVR meeting the requirements of this policy. If a new hire's MVR is categorized as borderline or poor, the ARC may recommend restrictions on driving or corrective actions, or they can recommend the candidate/prospective employee be notified that the offer of employment is withdrawn since the candidate's MVR failed to

meet the conditions of the offer. If withdrawn, the office may appeal to the ARC. If any corrective action is required or job offer withdrawn, the new hire/potential new hire are notified in accordance with the Fair Credit Reporting Act and/or applicable state statute.

5.16 Motor Vehicle Reports

An MVR lists violations that have been issued to an individual which could, according to the insurance industry, indicate an established pattern of "at risk" driving behavior. Therefore, it is important to review MVRs of current applicable employees, all temporary agency employees who will be driving ARCADIS, Rental or personal vehicle driven for business, and applicable new hires to proactively address those reports that are of concern.

When reviewing an MVR for ARCADIS employees and applicable new hires, all critical violations in the person's MVR history are considered. Minor, major, and serious violations are considered for the current and prior three years. Upon review, reports are categorized as clear, acceptable, borderline or poor in accordance with the Driver Evaluation Criteria seen in Exhibit 1 (New Hire) and Exhibit 3 (Current Employee).

As stated above, any temporary agency employee with an MVR that indicates any violation for the prior three (3) years and any prior critical violations is prohibited from driving an ARCADIS Vehicle, Rental Vehicle, or any personal vehicle for business.

MVRs are requested as follows:

- HR may ensure that an MVR is obtained on all new hires who are expected to drive an ARCADIS, Rental, or personal vehicle for business.

- Routine MVR requests and reviews may be done on all drivers of ARCADIS Vehicles, Rental Vehicles, or personal vehicles used for business. ARCADIS can review MVRs at any time as deemed necessary by Human Resources, Corporate H&S or the ARC.

- ARCADIS may request MVRs on current employees following a motor vehicle accident or receipt of a moving violation in an ARCADIS, Rental, or personal vehicle being driven for business, or at other times as deemed necessary.

MVRs are reviewed by Human Resources and/or Corporate Health & Safety.

If a new hire's MVR is categorized as borderline or poor, the ARC may recommend restrictions on driving or corrective actions, or they can recommend that the job offer be rescinded. If rescinded, the office may appeal to the ARC. If any corrective action is required or job offer withdrawn, the new hire/potential new hire are notified in accordance with the Fair Credit Reporting Act and/or applicable state statute.

If a current employee's MVR is categorized as borderline or poor, corrective action may be required as determined by the ARC. If any corrective action is required, the employee will be notified in accordance with the Fair Credit Reporting Act and/or applicable state statute.

6. REFERENCES

- ARCADIS HSP - ARC HSMS011 – Incident Reporting and Investigation
- ARCADIS HSP - ARC HSMS015 – Root Cause Analysis and Solutions Development
- ARCADIS HSP - ARC HSMS006 – Health and Safety Training and Competence
- ARCADIS DOT Program for Commercial Motor Vehicles.
- ARCADIS Employee Handbook

7. RECORDS

MVRs and related correspondence, employee authorizations, defensive driving training certificates, loss prevention observations under the Loss Prevention System, and ARC findings regarding a preventable accident are maintained in the appropriate files per ARCADIS record keeping requirements.

8. APPROVALS AND HISTORY OF CHANGE

Approved By: Mija A. Coppola, Director H&S, Infrastructure and PMCM Divisions

History of Change

Revision Date	Revision Number	Reason for change
26 March 2007	01	Original document
18 August 2007	02	Change in required on-line defensive drivers training
22 October 2007	03	Changing over to new template format and addition of the “Comments on My Driving?” program
21 January 2008	04	Change to new template; change to 2008 organization job titles; change to prohibit texting/emailing while driving
13 June 2008	05	Addition of Sections 5.10 and 5.11 on other defensive driving techniques and cone placement.

Revision Date	Revision Number	Reason for change
6 October 2008	06	Clarified who is required to complete online training in Section 5.3 and modified section on when hands-on defensive driving is required after an accident.
8 April 2009	07	Incorporated references to the CMV program and vehicle inspection requirements. Incorporated Vehicle Use Policy. Added fatigue management requirements. Deleted references to the Check Ride which is obsolete.

Exhibit 1 – New Hire/Potential New Hire Driver Qualification Criteria

CRITERIA CATEGORIES *(Contact the Health & Safety Manager if a violation does not fall into one of these categories*):

CRITICAL VIOLATIONS

- Driving while impaired or under the influence of alcohol or drugs
- Homicide by vehicle, negligent homicide, or involuntary manslaughter
- Fleeing or attempting to elude police officer
- Hit & Run, failure to stop after an accident, and/or leaving the scene of an accident

SERIOUS VIOLATIONS

- Reckless driving/Careless driving
- Passing a stopped school bus loading or unloading children
- Driving while license is suspended or revoked
- Evading responsibility after an accident
- Speeding (20 or more mph over limit)

MAJOR VIOLATIONS

- Speeding (less than 20 mph over limit)
- Speed greater than reasonable or prudent or too fast for conditions
- Careless driving
- Failure to yield
- Failure to obey traffic sign or signal
- Improper backing, turning, or passing
- Following too closely
- Other moving violation
- Driving without a license
- Accident in which a ticket is issued

MINOR VIOLATIONS

- Defective equipment or other equipment violation
- Oversize or overweight load
- Operating without required equipment or warnings
- Accident in which no ticket is issued

TYPE OF VIOLATION

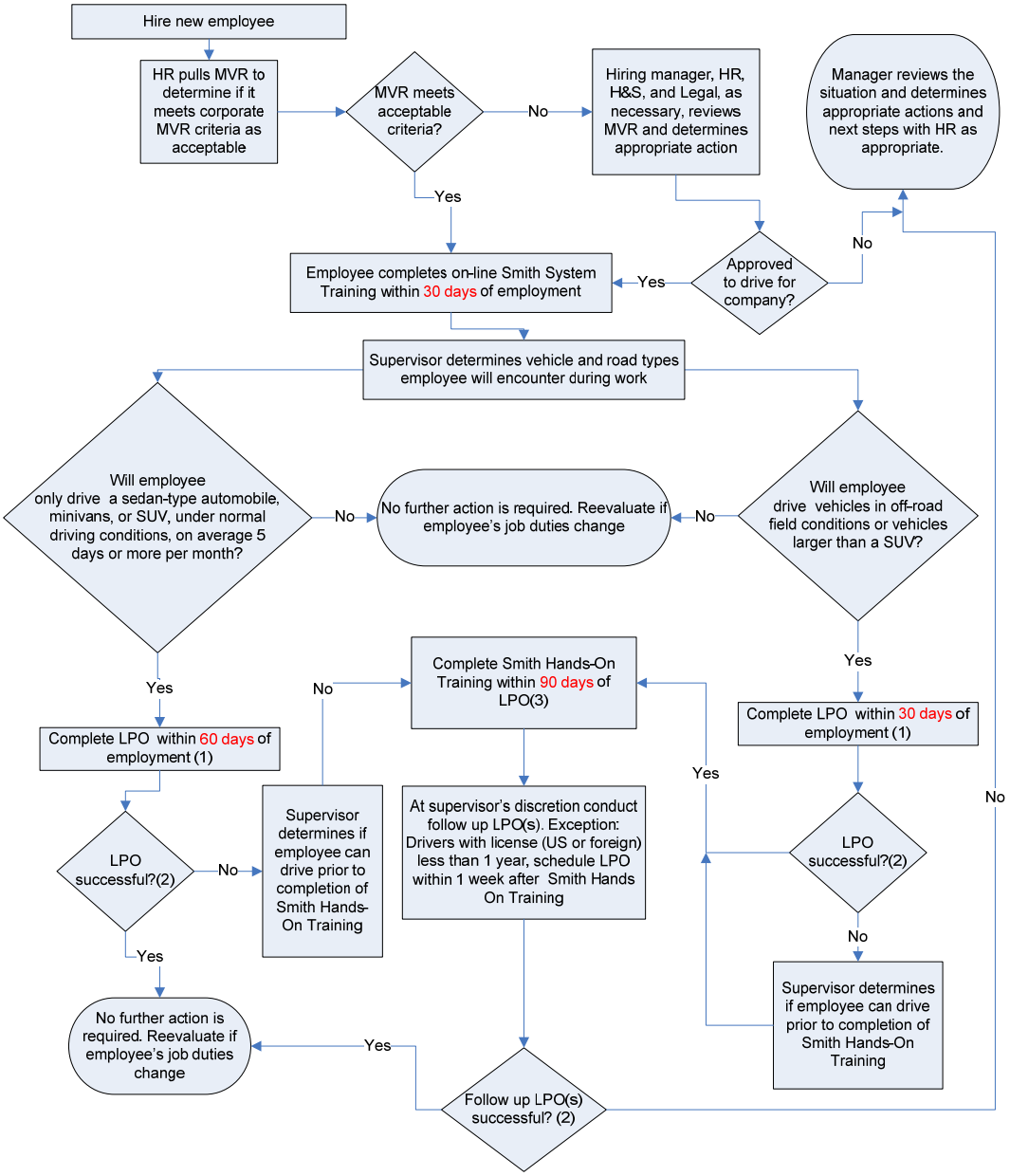
NUMBER OF VIOLATIONS	CRITICAL	SERIOUS	MAJOR	MINOR
0	Clear	Clear	Clear	Clear
1	Poor	Borderline	Acceptable	Acceptable
2	Poor	Poor	Borderline	Acceptable
3	Poor	Poor	Poor	Borderline
4	Poor	Poor	Poor	Poor

DECISION MAKING GUIDE:

- **Clear**: Job offer can be made.
- **Acceptable**: Job offer can be made.
- **Borderline**: Rescind the job offer or appeal to the ARC.
- **Poor**: Rescind the job offer or appeal to the ARC.

Exhibit 2. Defensive Driving Training and Education for New Hires

Defensive Driving Training and Education for New Hires



Notes:
SUV – Vehicles having the similar size of a Ford Explorer or smaller.
(1) Drivers of CMVs may not operate a CMV until completion of a Road Test in accordance with the ARCADIS DOT Program for CMVs.
(2) The feedback supervisor, in consultation with the employee's supervisor (if different), will make this determination based on LPO findings.
(3) The requirement for Smith Hands-On Training is at supervisor's discretion for all driving scenarios. Employee's holding a foreign driver's license or recently converted a foreign driver's license to US license should enroll in Smith Hands-On Training within 90 days of employment.

Exhibit 3 – Existing Employee Driver Qualification Criteria

CRITERIA CATEGORIES *(Contact the Health & Safety Manager if a violation does not fall into one of these categories*):

CRITICAL VIOLATIONS

- Driving while impaired or under the influence of alcohol or drugs
- Homicide by vehicle, negligent homicide, or involuntary manslaughter
- Fleeing or attempting to elude police officer
- Hit & Run, failure to stop after an accident, and/or leaving the scene of an accident

SERIOUS VIOLATIONS

- Reckless driving/Careless driving
- Passing a stopped school bus loading or unloading children
- Driving while license is suspended or revoked
- Evading responsibility after an accident
- Speeding (20 or more mph over limit)

MAJOR VIOLATIONS

- Speeding (less than 20 mph over limit)
- Speed greater than reasonable or prudent or too fast for conditions
- Careless driving
- Failure to yield
- Failure to obey traffic sign or signal
- Improper backing, turning, or passing
- Following too closely
- Other moving violation
- Driving without a license
- Accident in which a ticket is issued

MINOR VIOLATIONS

- Defective equipment or other equipment violation
- Oversize or overweight load
- Operating without required equipment or warnings
- Accident in which no ticket is issued

TYPE OF VIOLATION

NUMBER OF VIOLATIONS	CRITICAL	SERIOUS	MAJOR	MINOR
0	Clear	Clear	Clear	Clear
1	Poor	Borderline	Acceptable	Acceptable
2	Poor	Poor	Borderline	Acceptable
3	Poor	Poor	Poor	Borderline
4	Poor	Poor	Poor	Poor

DECISION MAKING GUIDE:

- **Clear:** No action.
- **Acceptable:** No action.
- **Borderline:** Contact Human Resources to discuss action to be taken.
- **Poor:** Contact Human Resources to discuss action to be taken.

Exhibit 4. Example Vehicle Inspection Checklist.

ARCADIS

WEEKLY INSPECTION CHECKLIST

Office Location: _____ Vehicle/Plate Number:_____

1. Check under the hood; 2. Examine exterior; 3. Check for leaks under hood and exterior; 4. Test brakes, steering, transmission; and, 5. Examine interior.
"S" = satisfactory or "NS"= not satisfactory. If "NS" is noted, please explain below and include what corrective action was taken and the date it was taken.

	Date/Initials	S or NS	Date/Initials	S or NS	Date/Initials	S or NS	Date/Initials	S or NS	Date/Initials	S or NS	Date/Initials	S or NS	Date/Initials	S or NS
Odometer Reading														
Inside:														
Side & Rear-View Mirrors														
Horn and Door Locks														
Windshield wipers														
Heater, Defroster, AC														
Interior Lights & Panel/Gages														
Flashers & Turn Signals														
Parking & Emergency Brake														
Steering Wheel (excessive play?)														
Clutch (if applicable)														
Engine:														
Engine (start without problem?)														
Fluid Levels & Belts														
Noticeable Leaks														
Exterior:														
Lights, Flashers, Signals, Reflectors														
Tires (condition, inflation)														
Cargo Area/Tie-Downs Secure														
License Tags – Check Status (Date)														

Checked by – Name and initials

1. 3. 5. 7.
2. 4. 6. 8.

Explanation:_____

_____

_____

1. POLICY

At any time, when a compliance officer from a regulatory agency arrives at a location where ARCADIS employees are present, the senior person of those employees will, as soon as possible, contact the Corporate Legal and H&S departments for guidance and advice following this procedure. At all times, ARCADIS staff will treat the compliance officer with respect.

2. PURPOSE AND SCOPE

2.1 Purpose

This HSP provides guidance on the process for appropriately managing a H&S inspection from a regulatory agency (i.e., OSHA, DOT, FAA or similar agency) of ARCADIS or at a site on which ARCADIS is working.

2.2 Scope

This procedure applies to all locations where ARCADIS works, is present, or provides services and to all staff present at these locations.

3. DEFINITIONS

HSP—Health & Safety Procedure

4. RESPONSIBILITIES

All ARCADIS employees have the responsibility to follow this HSP as detailed in Section 5.0.

5. POLICY AND PROCEDURE

U.S. OSHA, DOT, FAA, Canada Federal Occupational Health and Safety regulatory agencies, and several state and provincial regulatory agencies are authorized to conduct workplace inspections to determine whether employers are complying with standards for safe and healthful workplaces. OSHA also enforces Section 5 (a)(1) of the Act, known as the “general duty clause”, which requires that each worker be provided with safe and healthful working conditions. Workplace inspections are performed by OSHA compliance safety and health officers. Similarly, U.S. states, and Canadian provinces with their own occupational safety and health programs conduct inspections using qualified safety and health officers.

5.1 Legal Requirements

If ARCADIS refuses to admit a regulatory H&S compliance officer or if an employer attempts to interfere with the inspection, law permits appropriate legal action by the compliance officer.

Various laws and regulators give a H&S compliance officer the right of entry and set the rules for administrating and enforcing the regulations respectively.

5.2 What to Do If a H&S Compliance Officer Visits a Site Where ARCADIS is Working But Not The Subject of the Visit

Should a H&S compliance officer visit a project site where ARCADIS is working, ARCADIS employees politely direct them to the party/parties responsible for safety at the site. This will typically include the contractor(s) and Owner.

The Senior ARCADIS employee on-site, if approached by a regulatory H&S compliance officer will:

1) Determine the purpose for the visit.

2) Identify (for the benefit of the compliance officer) the party/parties responsible for site safety.

3) Get the compliance officer together with that party.

5.3 What to Do if ARCADIS is the Subject of the H&S Regulatory Inspection

If ARCADIS is the subject of an inspection the following is suggested:

- Request permission to notify appropriate ARCADIS staff, client, other contractors, sub-contractors that the OSHA compliance officer is on the project site.

- Immediately call the Project Manager who will notify Corporate Legal and Corporate H&S for direction.

- The Senior ARCADIS employee on the site asks for credentials.

- Insist on an opening conference. The senior ARCADIS employee on site at the time should serve as the ARCADIS representative during the conference and inspection.

    - At the opening conference the compliance officer indicates the purpose of the visit, the scope of the inspection, and standards that apply. The ARCADIS representative documents the proceedings including those in attendance. ARCADIS will be given a copy of applicable safety and health standards as well as a copy of any employee complaint that might be involved. An authorized employee representative and other representatives of employees (e.g. attorney) may be given the opportunity to attend the opening conference and accompany the compliance officer on his inspection.

    - During the opening conference explain to the agency that any requests for documents that are not located on site or could be privileged to be in writing, numbered and given to the ARCADIS representative. The documents will be provided after review by the Corporate Legal and H&S for privileged or business confidential information. Corporate Legal and H&S will attempt to provide this review before the compliance officer leaves the site so that the documents can be provided that day.

- The ARCADIS representative accompanies the compliance officer during his inspection and takes notes of the proceedings. A compliance officer is generally limited to inspect only that which is identified in the scope of the inspection, which is defined during the opening conference. Therefore, ARCADIS will not interfere with the inspection, but will escort the compliance officer to only those areas related to the scope of inspection.

    - The ARCADIS representative obtains a camera and/or video camera and takes pictures and/or video at the locations where the compliance officer takes pictures and/or video.

    - In addition, the ARCADIS representative takes any measurements that the compliance officer takes.

- If the compliance officer wants to speak with any ARCADIS employees, the ARCADIS representative will ensure that employees know their rights related to talking to the officer. The ARCADIS representative will ensure the compliance officer explains to each employee he/she speaks with, their rights. Employees have the right to decline to be interviewed. If an employee chooses to do so, the ARCADIS representative should note the date, time and person/persons present when the employee declined.

    - The ARCADIS representative will instruct employees/team members to answer truthfully, any question from the compliance officer, and to answer with only facts, not opinions, speculation, or guesses.

- During the inspection the compliance officer may point out any unsafe or unhealthy working conditions observed. For each condition, the ARCADIS representative should note what the compliance officer points out and ask the compliance officer to discuss possible corrective action. **Do not argue with the compliance officer.** If possible, violations detected by the compliance officer should be corrected immediately.

- The ARCADIS representative asks the compliance officer for a receipt acknowledging any documents provided to the compliance officer.

- After the inspection, a closing conference is held with the compliance officer. This is the time for free discussion of problems, needs, and a time for frank questions and answers. Take comprehensive notes or use a tape recorder, if one is available. The ARCADIS Project Manager, Legal representative and Corporate H&S representative are involved in the closing conference, even if by speaker phone.

At closing conference the compliance officer discusses violations observed, if any, and indicates for which violations a citation and proposed penalty may be issued and how they will be characterized.

Upon completion of his/her inspection, obtain his/her business card and a copy of the inspection report or complaint.

If the employees are willing, the ARCADIS representative does follow-up interviews immediately after the closing conference to determine what was asked of them by the compliance officer.

After the OSHA compliance officer leaves the project site, telephone the area office and report the results of the inspection to the Corporate Health & Safety Manager. Send along copies of the officer's findings, your notes and pictures to the Corporate Health & Safety Manager.

In the event that a citation is issued, ARCADIS procedures for addressing the citation are implemented, including corrective and preventive action as discussed in HSP ARC HSMS011.

6. REFERENCES

See country and state or provincial specific regulations for more detail about regulatory inspections.

7. RECORDS

Records will be kept and provided to the legal department related to any regulatory agency H&S inspection.

8. APPROVALS AND HISTORY OF CHANGE

Approved by: Mija A. Coppola, Director H&S Compliance Assurance, LPS

History of Change

Revision Date	Revision Number	Reason for change
16 July 2007	01	Original document
18 July 2007	02	Section 5.3, fifth bullet, third subparagraph was modified to provide more explanation on document requests from a compliance officer.
22 February 2008	03	Template change

1. POLICY

It is the policy of ARCADIS to assess the workplace to identify and assess hazards in order to appropriately implement controls for those hazards. In addition, it is ARCADIS policy to supply personal protective equipment (PPE) for employees in a working environment where engineering and administrative controls are not feasible or effective in the control of hazards. ARCADIS will train and supply this PPE at no cost to the employee.

2. PURPOSE AND SCOPE

2.1 Purpose

The purpose of PPE is to shield or isolate individuals from the chemical, physical, and biologic hazards that may be encountered in their work environment. A hazard analysis or assessment will be performed before a job task is begun to evaluate the if PPE is necessary to protect an employee from identified hazards and determine the type of PPE required. This analysis will include the identification of hazards/suspected hazards and their routes of exposure.

Combinations of protection may be needed to provide the appropriate level of protection for any given work environment. The level of PPE may change during a job, so periodic evaluation will be done to ensure that the most appropriate PPE is being used. Over-protection, as well as under-protection, can be hazardous and should be avoided where possible.

Subcontractors and other non-ARCADIS employees must supply their own PPE. ARCADIS will not supply PPE to any non-ARCADIS employees unless specific arrangements and agreements are made with the other party.

This Health and Safety Procedure (HSP) provides guidance on the proper selection, use, care and maintenance of PPE.

2.2 Scope

Whenever possible, engineering, substitution, and administrative controls will be used to reduce or eliminate hazards, but when they are not feasible, practical or adequate, PPE will be used to protect employees from exposure to hazards during ARCADIS-related work tasks.

3. DEFINITIONS

Eye/Face Protection - Equipment designed to provide eye or face protection when exposed to hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation.

Foot Protection - Footwear designed to provide foot and toe protection when working in areas where there is a danger of foot injuries due to falling or rolling objects, or objects piercing the sole, and/or where an employee's feet are exposed to electrical hazards. These include such measures as steel toe, metatarcal, and boot warmers

Hand and Body Protection - Equipment designed to provide protection to the hands and body during exposures to potential hazards such as potential for skin absorption of harmful substances, sharp objects, abrasive surfaces, punctures, temperature extremes and chemical contact.

Hazard Assessment - The process utilized to identify hazards in the workplace and to select the appropriate PPE to guard people against potential hazards (see attachment Hazard Assessment for Personal Protective Equipment (PPE)).

Head Protection - Equipment designed to provide protection to the head during exposure to potential hazards such as falling objects, striking against objects, or electrical hazards.

Hearing Protection - Equipment designed to provide protection to an individual's hearing during exposure to excessive noise levels and any 8hr work day with noise levels consistently 85dB or above.

Personal Protective Equipment (PPE) - Equipment designed to provide protection to the wearer from potential hazards to the eyes, face, hands, head, feet, ears, extremities, and respiratory system.

Respiratory Protection - Equipment designed to provide protection to the wearer from potential inhalation hazards such as vapors, mists, particulates, and gases.

4. RESPONSIBILITIES

4.1 ARCADIS Management

Is responsible for providing resources for the acquisition of PPE and for the conduct of hazard assessments.

4.2 Project Managers

Project Managers are responsible, as part of the project hazard assessment, for determining PPE necessary to complete the project. In addition, the project manager is responsible for determining client requirements with respect to PPE. Project Managers notify health and safety staff of biological, chemical, and physical hazards present or potentially present on the site.. Project Managers are also responsible for ensuring that project staff has the appropriate and applicable training for PPE use prior to those staff beginning work.

4.2 Corporate Health and Safety

Corporate Health and Safety is responsible for keeping this policy and procedure up-to-datewith current regulatory requirements and best practices and for assisting in determining the appropriate PPE for a particular task and work environment and for assisting in the identification of appropriate vendors of such PPE.

4.3 Health and Safety Staff

Project Health and Safety Staff including designated Writers and Reviewers of Project Health and Safety Plans (HASPs) are responsible for developing control processes andtechniques on specific projects based on the physical, chemical, and biological hazards expected to be encountered on project facilities.

4.4 ARCADIS Staff

ARCADIS staff are responsible for completing PPE training as required by this policy and procedure, and for following all hazard control processes designated by the Project Manager, Project Health and Safety Staff, and the project HASP. If project personnel believe that a hazard is present that was not previously identified or is at levels that are higher than expected, they should stop work and notify project health and safety staff or the project manager immediately and not proceed until authorized.

5. PROCEDURE

5.1 Minimum PPE Requirements

All staff who regularly conduct field work or visit project sites outside of office environments will be issued a field bag that contains, at a minimum, the following PPE:

- An ARCADIS logo'd hardhat
- Two pair of safety glasses, one clear pair and one tinted pair, or one pair of prescription safety glasses with transitional lenses
- Hearing protection
- A minimum, Type 2 reflective vest in either orange, lime green or yellow
- Steel toe safety boots

Office locations will stock extra bags with the equipment listed above for use by other staff who do not regularly go to field locations. Additional PPE and H&S equipment will be issued to staff based on the hazards they face on specific projects (i.e. respirators, goggles, chaps, etc.).

No ARCADIS staff should arrive at a field or project site without this minimum PPE.

5.2 The PPE Program

The basic objectives of a PPE program are to protect the wearer from safety and health hazards; and to prevent injury to the wearer from incorrect use and/or malfunction of the PPE. This document serves as the overall ARCADIS PPE program and is used as guidance for the development of a project-specific PPE program which becomes part of a project-specific health and safety plan. A project-specific PPE program in combination with this HSP will address the following:

- PPE selection based upon site hazards (Hazard Identification/Assessment).

- Identify the hazards/suspected hazards and their potential routes of exposure (e.g., skin, inhalation, ingestion or eye contact).

- The use and limitations of the equipment including limitations during temperature extremes and under certain medical conditions;

- The work mission duration;

- Maintenance, storage, decontamination and disposal of PPE;

- Training including proper fit and how to properly put on and take off PPE;

- PPE inspection procedures prior to, during, and after use; and

- Periodic evaluation of the effectiveness of the PPE program.

5.3 PPE Selection

The use of PPE can itself create significant worker hazards, such as heat stress, physical and psychological stress and impaired vision, mobility and communication. Over-protection, as well as under-protection, can be hazardous and should be avoided where possible. Site or project-specific health and safety plans take into consideration engineering, substitution, and administrative controls first as a means to eliminate/reduce the need for PPE. When it is not feasible or practical to eliminate the use of PPE, PPE selection will be based on an evaluation of the performance characteristics of the PPE relative to the following:

- The requirements and limitations of the tasks or work environment;

- The task-specific conditions and duration; and

- The hazards and potential hazards identified at the site.

The level of protection will be increased whenever it is shown that increased protection is necessary to reduce employee exposures to the hazards. It may be decreased when it is shown that this will not result in hazardous exposure to employees.

5.4 Levels of PPE Protection

For work on hazardous sites, a combination of PPE may be categorized into levels A, B, C, or D with level A offering the highest level of protection and D the lowest. Monitoring the effectiveness of PPE will be done throughout a project to ensure that the appropriate level of protection is being worn. These levels of protection are described below.

Level A Protection

Level A PPE offers the highest level of respiratory and skin protection and should be worn when:

- The hazardous substance has been identified and requires the highest level of protection of the skin, eyes, and respiratory system based on either:
  - The measured (or potential) high concentrations of atmospheric gases, vapors, or particulates; or
  - If site operations and work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates which are harmful to skin eyes, or the respiratory system.
- There is a known or suspected high degree of hazard to the skin and skin contact is possible.
- Conducting work in a confined, poorly ventilated area and the other criteria requiring Level A PPE have not been determined.

Level A equipment includes:

- NIOSH approved positive pressure, full-face piece self contained breathing apparatus (SCBA), or positive pressure supplied airline respirator with escape SCBA;
- Totally encapsulating chemical-protective suit (material based on the hazard);
- Chemical resistant outer **and** inner gloves (type and material based on the hazard);
- Chemical resistant boots with steel toe and shank;
- Disposable protective suit, gloves and boots (depending on suit construction, may be worn over the totally encapsulating suit);
- Coveralls (optional, as applicable);
- Long underwear (optional, as applicable); and
- Hard-hat - under suit (optional, as applicable).

Level B Protection

Level B PPE offers a high degree of respiratory protection with lesser levels of skin protection. Level B PPE should be worn when:

- The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection but less skin protection;
- The atmosphere contains less than 19.5 percent oxygen; or
- The presence of incompletely identified vapors or gases is indicated by direct reading organic vapor detection instruments, but the vapors and gases are not suspected of

containing high levels of chemical harmful to the skin or capable of being absorbed through the skin. Level B is the minimum level of protection that should be worn when there is insufficient information to determine the hazards or potential hazards of the substance.

Level B PPE equipment includes:

- NIOSH approved positive pressure, full face piece self contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA;
- Hooded chemical resistant clothing (overalls and long sleeve jacket; coveralls; one or two piece chemical splash suit; disposable chemical resistant overalls) (materials based on the hazards);
- Chemical resistant outer **and** inner gloves (material based on the hazards);
- Chemical resistant boots with steel toe and shank;
- Coveralls (optional, as applicable);
- Outer chemical resistant boot covers (optional, as applicable);
- Hard hat (optional, as applicable); and
- Face shield (optional as applicable).

Level C Protection

Level C PPE is used when the concentration and type of airborne substance is known, and the criteria for using an air purifying respirator are met. It should be worn when:

- Atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin;
- The types of air contaminants have been identified, concentrations measured, and an air purifying respirator is available that can remove the contaminants; and
- All criteria for the use of an air purifying respirator are met.

Level C PPE equipment includes:

- NIOSH approved full face or half mask air purifying respirator (with appropriate cartridges based on the hazards);
- Hooded chemical resistant clothing (overalls and long sleeve jacket; coveralls; one or two piece chemical splash suit; disposable chemical resistant overalls) (materials based on the hazards);

- Chemical resistant outer **and** inner gloves (materials based on the hazards);
- Chemical resistant boots with steel toe and shank;
- Coveralls (optional, as applicable);
- Outer chemical resistant boot covers (optional, as applicable);
- Hard hat (optional, as applicable);
- Escape mask (optional, as applicable); and
- Face shield (optional, as applicable).

Level D Protection

Level D PPE offers the least skin and respiratory protection and should be worn when the atmosphere contains no known hazards, and work functions preclude splashes, immersions or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

Level D PPE equipment may include any or all of the following depending on the hazards of the site:

- Chemical resistant boots with steel toe and shank (optional, as applicable);
- Coveralls (optional, as applicable);
- Gloves (optional, as applicable);
- Outer chemical resistant boots (disposable) (optional, as applicable);
- Safety glasses or chemical splash goggles (optional, as applicable);
- Hard hat (optional, as applicable);
- Escape mask (optional as applicable); and
- Face shield (optional as applicable).

5.5 Combinations of Protection

Combinations of protection are acceptable if the task hazard analysis and the site conditions warrant modification of PPE levels.

5.6 Equipment List

Eye/Face Protection

All employees engaged in or working in or adjacent to areas with eye-hazardous activities or operations, such as but not limited to flying objects and hazardous chemicals shall wear appropriate eye protection.

- Safety glasses with side shields are required for impact protection and shall meet ANSI Standard Z87.1 requirements.
- Chemical goggles (for protection against chemical splash).
- Face shields (for face protection from chemical splash and are not a substitute for primary eye protection).
- Full-face respirators can provide eye and face protection in lieu of safety glasses, goggles, or face shields.
- Shaded eye protection meeting the minimum shade requirements established in 29 CFR 1910.133 (for employees exposed to sources of injurious light radiation [e.g., welding, cutting, lasers]).
- For prescription eye protection contact your supervisor to fill out an AOSafety order form available on APEX.

Respiratory Protection

Respirators will be provided and used in accordance with the ARCADIS Respiratory Protection Policy/Procedure ARC HSGE017 and 29CFR 1910.134.

Hearing Protection

Hearing protection will be provided and used in accordance with the ARCADIS Hearing Conservation Policy/Procedure ARC HSIH008 and 29CFR 1910.95.

Foot Protection

- Basic foot protection is required for all ARCADIS job sites and industrial locations. Specialized footwear will be provided as required by the nature of the work. Special foot protection may include, but is not limited to, chemically resistant, thermally shielded, metatarsal guards, etc.
- Leather Safety Boots will be provided for employees employees; one pair of leather safety boots will be provided as necessary by ARCADIS. The employee purchasing the footwear is required to ensure that it meets ANSI Standard Z41.
- For most work done by ARCADIS, safety boots will be equipped with steel toes and shanks. It is also required that puncture resistant soles or in-soles are equipped in the safety boots. Some clients require puncture resistant soles or in-soles.

- The maximum expenditure or reimbursement for approved safety shoe purchases will be $150. Reimbursement requests must be approved by the employee's supervisor.

- Athletic-style safety shoes ("safety sneakers") are prohibited (due to the difficulties created by these styles in supervising proper use of protective footwear).

Head Protection

Hard hats meeting ANSI Z89.1 will be provided to protect employees from impact, penetration, falling objects, and/or limited electrical shock and burn, as appropriate for work site hazards. A hard hat must be replaced when it becomes damaged, contaminated (and contamination cannot be removed) or it has been struck by an object of sufficient size to potentially compromise its integrity.

Hardhats must resist penetration by objects, be water resistant and slow burning, and have a chin strap if it is worn while working at elevation. It must be worn square on the head and not be pushed back, to the side or forward.

There are two types and three classes of head protection described in ANSI standard

Z89.1-1997. The types and classes are divided by the protection they provide from impact and electricity. It is important that the level of protection necessary be evaluated when during preparation of the site specifc HASP.

Other hazard situations to consider are:

- In areas of heavy vegetation or in any area where hunters may be present, it is recommended that some type of brightly colored head protection be worn. For example, a bright orange or yellow baseball cap or stocking cap.

- If cold exposure is an issue, hardhat liners are available (made specifically for the particular hardhat) or if a hardhat is not required, some type of insulated head protection such as a stocking cap should be worn.

Hand Protection

Appropriate hand protection will be provided if employee's hands are exposed to hazards while on the job.

such as:

- pinch points
- sharp/pointed tools or objects
- incorrect or inadequate tool use
- improper use
- rotating/energized/automated parts
- abrasive materials

- inadequate job planning
- lack of/inadequate protection
- changing weather conditions and extreme temperatures
- hazardous material
- jewelry and loose clothing.

Once these hazards are identified, the appropriate glove or hand protection must be selected. When choosing gloves, keep in mind:

- Hazardous Chemicals/Substances to be Contacted
- Nature of Contact (total immersion, splash, etc.)
- Duration of Contact
- Area of Protection (hand only, forearm, arm)
- Equipment (rotating, sharp edges, etc.)
- Grip (dry, wet, oily)
- Thermal Protection
- Abrasion/Cut/Puncture Resistance
- Tear/Tensile Strength
- Ergonomics (size, heat stress, dexterity)
- Decontamination/Disposal

In selecting chemically protective gloves, the toxic properties of the chemical(s) will be determined. Information provided on the manufacturer's label or by chemical compatibility charts regarding breakthrough time, permeation rate, and degradation should be considered during selection.

Body Protection

Protective clothing, gloves, boots, and other protective equipment will be provided as appropriate for the hazards associated with the tasks being performed.

Long pants are required for all field work unless approval is granted by corporate H&S. . Additional protection such as cooling vests may be required. In environments with potential biological hazards such as ticks, plantsor snakes, gloves and long sleeves should be worn along with head protection of somekind to protect the scalp. In areas of roadway work or other vehicle traffic high visibility Class II safety vests will be worn.

Chemically Protective Clothing (CPC) will be selected by evaluating the performance characteristics of the CPC against the requirements and limitations of the site and task-

specific conditions. This selection should be performed by an employee with training and experience taking into consideration:

- Permeation, degradation, penetration of the CPC by the chemical and;
- Durability, flexibility, fit, temperature effects, ease of decontamination, compatibility with other necessary equipment (e.g., hardhats, SCBA, etc.); and duration of use that could effect the employees ability perform the task.

Specialized Equipment

All other specialized safety equipment required for an assignment (e.g., work gloves, specialized protective clothing, hip boots, field rain gear, personal floatation devices) will be provided by the Firm as specified in the HASP.

Extreme Cold Environments

Supervisors will provide as necessary any of the following to protect from extreme cold environments:

- Hats/hat liners and gloves
- Thermal clothing
- Hi-Visibility clothing
- Winter footwear

Use of specialized equipment will be charged to projects in accordance with established policy and rental rates.

5.7 Maintenance/Storage/Disposal

PPE Maintenance and Disposal

PPE must be inspected by the user before and after each use for defects, rips, tears, and/or damaged parts. Damaged or compromised PPE will not be used and must be repaired before re-use or disposed. PPE must be disposed of according to the HASP and other project plans for the site. If non-disposable, PPE must be decontaminated and sanitized before being reused according to the HASP Contaminated PPE which cannot be properly decontaminated by normal procedures must be disposed of accordingly.

PPE Storage

All PPE must be stored to protect against dust, sunlight, extreme heat and cold, excessive moisture, and damaging chemicals. Storage must be in accordance with the manufacturer's specifications.

Contaminated Boots

Boots contaminated or damaged on the job will be replaced. Contaminated boots will be disposed of with the site waste.

6. TRAINING

Training in the proper use of PPE will generally be provided in conjunction with HAZWOPER training or via coursework selected and approved by Corporate H&S. Training will be completed prior to the employee's use of PPE, when changes in the work place alter the use or type of PPE, and when inadequacies in the employee's knowledge or use of PPE are noted.

The training will include at a minimum:

- When and what PPE is necessary;
- How to put on, adjust, wear and take off the PPE;
- Limitations of the PPE; and
- Proper care, maintenance, useful life, and proper disposal of PPE.

7. REFERENCES

- 29 CFR 1910.120 "Hazardous Waste Operations and Emergency Response"
- 29 CFR 1910 Subpart I "Personal Protective Equipment"

8. RECORDS

Records of the PPE training are retained by the Employee and in the ARCADIS training database. Medical certification/recertification are retained by Corporate H&S.

9. APPROVALS AND HISTORY OF CHANGE

Approved by: Michael A. Thomas, CIH, Director H&S Environmental Division

History of Change

Revision Date	Revision Number	Reason for change
20 February 2009	01	Original document

1. POLICY

It is ARCADIS US policy to be proactive in the identification, assessment and control of health and safety hazards and associated risks. ARCADIS will assess potential respiratory exposure hazards resulting from or encountered by our staff during job activities in accordance with the ARCADIS Industrial Hygiene Procedure ARC HSIH009. To the extent feasible, appropriate engineering and/or administrative controls will be used to reduce or eliminate exposure to airborne compounds. If those controls are not able to reduce exposure adequately, employees who are exposed or potentially exposed to a respiratory hazard at or above the applicable occupational exposure guideline are required to wear appropriate respiratory protection. ARCADIS' policy requires that our staff be adequately trained, medically cleared, and appropriately fit-tested before using respiratory protection.

2. PURPOSE AND SCOPE

2.1 This procedure sets forth the requirements for the selection, use and care of respiratory protective equipment (respirators) by ARCADIS staff.

2.2 This procedure applies to all employees who use or could potentially use respiratory protection. It also applies to all work where airborne hazards present the potential where respiratory protection may be required.

3. DEFINITIONS

All definitions are documented in Exhibit 1.

4. RESPONSIBILITIES

4.1 **Corporate H&S** - On an annual basis, review and update, as necessary, this procedure and associated attachments and assess the effectiveness of the program. In addition, Corporate H&S serves as the overall Respiratory Protection Program Administrator in accordance with OSHA 29 CFR 1910.134 (Exhibit 5).

4.2 **Operations Managers and Supervisors** - support the requirements of this procedure and provide the resources necessary to implement this procedure including equipment, time for training, medical exams, and fit-testing, and other appropriate and necessary resources.

4.3 **Project and Task Managers** – ensure the completion of exposure assessments on applicable projects to determine the need for respiratory protection. In addition, ensure that appropriate budgets are established on projects to provide the necessary respiratory protection based on the exposure assessments. Also, understand the requirements of the client with regards to respiratory protection.

4.4 **Health and Safety Staff and Project Site Safety Officers or Supervisors** – conduct or assist with the completion of exposure assessments and respirator training and fit-testing as necessary. These staff will also assist in the proper selection of respiratory protection and ensure the proper use and care of respiratory

protection by ARCADIS staff. In addition, these staff will assist in the assessment of this respiratory protection program and procedure.

4.5 **Designated Medical Provider – WorkCare** – coordinates annual medical surveillance exams to determine the employee's ability to use a respirator and provides documentation to the employee and ARCADIS in regard the employee's ability to wear a respirator. WorkCare may also coordinate fit testing and, in these situations, provide documentation as to the outcome of the fit test. WorkCare is responsible for maintaining all medical records, including the required medical questionnaire.

4.6 **Employees** - Wear respirators as required by project conditions and as outlined in the site-specific Health and Safety Plan (HASP) or approved project guidance. Use and maintain respirators per the manufacturer's recommendations and this procedure. Perform pre-use negative and positive pressure fit checks of respirators. Participate in the required medical evaluation, training, and fit test prior to assignment and inform the site supervisor if medical, training, or fit test certifications have expired. Provide the site supervisor with a copy of medical and training certifications, and fit test results, upon request.

5. PROCEDURE

5.1 Respirator Selection

Respirators will be selected as follows:

- All respirators must have NIOSH approval.
- Only respirators selected, supplied, and/or approved by ARCADIS may be used.
- The assigned protection factor (**APF**) shall be evaluated for proper respirator selection. The APF can be calculated by multiplying the APF rating for the respirator selected by the PEL for the contaminant of interest. If the airborne concentrations of the contaminant exceed the APF for the respirator then another respirator, meeting the APF requirements, shall be selected.
- The following "Rule of Thumb" may also be used in conjunction with the information below:
  - If the chemical has a boiling point >70° C and the concentration is <200 parts per million (ppm), a service life of 8 hours at a normal work rate can be expected.
  - Service life is inversely proportional to work rate.
  - Reducing the concentration by 10 will increase service life by a factor of 5.
  - Humidity above 85 percent will reduce service life by 50 percent.

5.1.1 Air purifying respirators

A. Air purifying respirators should be of the full-face dual cartridge design. In specific instances if approved by the Division Health and Safety Manager a half-face respirator may be used, assuming the protection factor is adequate for the exposure.

B. Respirator cartridge selection must be based on the anticipated hazards as identified in the site-specific health and safety plan (HASP). The following points must be considered when selecting air purifying cartridges*: [Air-purifying respirators do not supply oxygen and may not be used in oxygen-deficient atmospheres or in ones that are immediately dangerous to life or health (IDLH)].*

- The anticipated air contaminant(s) concentration and the potential for air contaminant(s) to be present in concentrations which present an immediate danger to life and health (IDLH) and/or an oxygen deficient atmosphere.
- The nature of the air contaminant (s) (e.g. gas, vapor, particulate).
- The odor characteristics and odor threshold of the contaminant.
- Irritant properties of the air contaminant(s).
- The Occupational Safety and Health Administration (OSHA), Permissible Exposure Limit (PEL), the American Conference of Governmental Industrial Hygienists (ACGIH), Threshold Limit Value (TLV), and/or the National Institute for Occupational Safety and Health (NIOSH), Recommended Exposure Limit (REL).
- Work activities and the anticipated duration of respirator usage.

C. The filters are split up into three classes: N, R, and P:

- N series filters: **N**ot resistant to oil - can be used in environments where oil particles are not present in the atmosphere.
- R series filters: **R**esistant to oil – can be used in atmospheres where oil particles are present.
- P series filters: oil **P**roof – can be used in atmospheres where oil particles are present for more than 8 hours.

In addition to the N, R, and P series above, filter efficiency shall also be considered for appropriate selection. There are three filter efficiency categories: 95 percent, 99 percent, and 99.7 percent. The higher the filter efficiency, the lower the filter leakage

D. Respirator cartridge End of Service Life Indicators (ESLIs) shall be factored when selecting the appropriate cartridge. Use of warning properties such as odor and taste are not permissible practices. The ESLI shall be identified and a cartridge change out schedule established in the task hazard analysis stage of the project. Information used to establish the change out schedule will be obtained from one or more of the following:

- Use of manufacturer supplied information for the contaminant of interest.
- Use of mathematical models to determine end of service life.
- Use of tables to determine end of service life.

5.1.2 Atmosphere-supplying respirators/ Supplied Air Respirators (SARs)

A. This section applies to compressed air/oxygen and liquid air/oxygen used for supplied-air and SCBA respirators. Atmosphere-supplying respirators are designed to provide breathable air from a clean air source other than the surrounding contaminated work atmosphere.

B. They include airline-type supplied-air systems supplying air from cascaded breathing air cylinders or compressors, systems, self-contained breathing apparatus (SCBA) and complete air-supplied suits.

C. Breathing air couplings must *not be compatible* with outlets for nonrespirable worksite air or other gas systems. Compressed and liquid oxygen will meet the U.S. Pharmacopoeia requirements. Compressed breathing air will meet at least the requirements for Grade D breathing air described in ANSI G-7.1-1989 to include:

- Oxygen content (v/v) of 19.5-23.5%;
- Hydrocarbon (condensed) content of 5 milligrams per cubic meter of air or less;
- Carbon monoxide (CO) content of 10 ppm or less;
- Carbon dioxide content of 1,000 ppm or less; and
- Lack of noticeable odor.

D. Cylinders of purchased breathing air must have a *certificate* of analysis from the supplier that the breathing air meets the requirements for Grade D breathing air. Cylinder air must be tested (Oxygen content (v/v) of 19.5-23.5%) by a calibrated oxygen sensor prior to being placed into service.

E. Cylinders used to supply breathing air must also be hydrostatically tested by a qualified organization. Steel tanks must be tested at least every five

year and composite tanks at least every three years. The tested tanks will be marked with the date of the last test. Breathing air containers must be marked in accordance with the NIOSH Respirator Certification Standard, 42 CFR Part 84.

F. Employees using SARs must attend additional respirator training covering the use, care, and limitations of this equipment.

G. Airlines used in compressor or cascaded cylinder systems shall be used only for breathing air and no other gas or liquid. Maximum length of the lines is 300 feet. Airlines will be inspected before each use and at a minimum, daily and checked for damage, contamination, etc.

H. Where airline systems are utilized, all users will be equipped with a suitable escape respirator system.

I. Compressors used to supply breathing air to respirators must be constructed and/or situated to provide the following:

- Prevent contaminated air from entering the system.
- Have in-line air-purifying filters to further ensure breathing air quality. Filters must be maintained and replaced periodically following the manufacturer's instructions.
- Display a tag with the most recent filter change date with the signature of the individual authorized to perform the filter maintenance.
- Have a carbon monoxide alarm to monitor carbon monoxide (CO) levels. Levels of CO in breathing air must be maintained below 10 ppm.

5.2 Fit Testing

Fit testing will be completed on all employees that may wear or do wear respirators as follows:

- Fit testing will be conducted as required in OSHA 29 CFR 1910.134 Appendix A which is mandatory and as described in Exhibit 2.
- Employees must have received an initial and annual medical examination in accordance with the ARCADIS Medical Surveillance Procedure prior to fit testing. Evidence of medical clearance or physician authorization must be provided for review to the individual conducting the fit test.
- The fit-tester will complete a fit-test form and provide a copy to the employee upon completion of the fit-test using the form shown in Exhibit 3 or similar form.

- Fit testing will be conducted prior to actual respirator use and at least annually thereafter.
- Additional fit testing will be conducted in the event that an employee's physical condition changes resulting in the potential for an inadequate "fit." i.e. Significant weight gain/loss, reconstructive facial surgery, etc.
- Fit testing must be performed by trained and qualified individuals in accordance with the OSHA respiratory protection standard and manufacturer's specifications. Fit testing may be conducted by the ARCADIS medical exam provider or by an approved provider whether an internal or external source. (as long as the medical examination and qualification is received first). ARCADIS Corporate H&S will approve those fit-test providers.
- Only those respirators that have been properly fitted may be worn. Alternative respirator makes, models, and sizes will require additional fit testing.
- If after passing a fit test, an employee notifies a supervisor or the respirator program administrator that the fit is not acceptable, an additional fit test will be conducted.
- Fit testing will be, at a minimum, QLFT. QNFT will be conducted as required by the client or based on the exposure assessments completed before the initiation of a project. When QNFT is conducted, it will be done so using a Porta-Count or similar device. QLFT is also acceptable as long as the respirator is used at protection factors as designated by OSHA.
- If QLFT is used, ARCADIS prefers the use of irritant smoke as the test agent but also accepts banana oil or saccharine as determined by the fit testing organization.
- The person doing the fit-test will ensure the person is competent to conduct and understand the following:

  A. Donning and doffing

  B. Negative and positive fit checks

  C. Parts and pieces of the respirator

  D. Maintenance and care

  E. Inspections

5.3 Respirator Usage

5.3.1 General Requirements

A. Staff doing active field work will be provided their own full-face air purifying respirator.

B. Only medically cleared, trained, and fit tested, employees may use respirators.

C. Employees must use only those respirators for which they have been fit tested.

D. Employees must wear and use all respirators in accordance with training, this procedure, and the manufacturer's instructions.

E. Respirators must be assigned to a single individual for their exclusive use.

F. Respirators must not be worn if there is any condition that prohibits a good face to face piece seal (i.e., facial hair, glasses). If an employee requires corrective lenses, the Firm will provide glass inserts for the respirator.

G. Respirator users will conduct a respirator user seal check each time they put on a respirator.

H. Respirator users must exit the work area immediately upon the following:

- Odor breakthrough.
- Increased breathing resistance.
- Physical symptoms, such as headache, dizziness, nausea, blurred vision or any other conditions that indicate respirator failure.

I. Respirator users must leave the work area to change filter cartridges or air bottles.

J. Surveillance will be conducted during respirator use to monitor the work area, employee exposure, or any other condition that may affect respirator effectiveness.

K. The buddy system must be used during all activities requiring the use of a respirator.

L. Respirator cartridges must be changed when they are damaged, defective, dirty, odor breakthrough, or increased breathing resistance occurs, or when indicated by the end of life service indicator (ELSI), or in accordance with a project-specific change-out schedule that must be documented in the site-specific health and safety plan.

5.3.2 IDLH atmospheres

A. Work in an IDLH atmosphere shall be approved by the Environmental Division H&S Director or designate

B. In IDLH atmosphere situations, at least one person will be located outside the IDLH atmosphere. In addition visual, voice, or signal line

communication will be maintained between the person in and the person outside the IDLH atmosphere. The person located outside the IDLH atmosphere will be trained to provide effective emergency rescue, and will be equipped with pressure demand, other positive SCBA or supplied-air respirator with auxiliary SCBA and:

- Appropriate retrieval equipment if it will not increase the overall risk; or
- Equivalent means for rescue where retrieval equipment is not required as noted above.

C. The appropriate supervisor will be notified before the person located outside the IDLH atmosphere enters the IDLH atmosphere to provide emergency rescue. Once notified, the supervisor will provide assistance appropriate to the situation.

5.4 Program Evaluation

A. Evaluations of work areas (site inspections) will be conducted by supervisory and Health and Safety personnel to determine the effectiveness of the program.

B. During site inspections and the annual HAZWOPER 8-hour refresher-training program, employees will be consulted to assess program effectiveness and identify problem areas.

C. Corporate Health and Safety, will review information compiled during site inspections and employee discussions and make adjustments to the program to correct identified deficiencies.

5.5 Voluntary Respirator Use

A. Respirators will be provided at the request of an employee, if the use of the respirator will not create a hazard.

B. Prior to voluntary respirator use, employees must undergo a medical examination to ensure they are physically able to use the respirator.

C. Prior to voluntary respirator use, employees must be trained in the use, care, and limitations of the respirator.

D. Prior to voluntary respirator use, employees must be fit tested as outlined in section 5.2.

E. A copy of 29 CFR 1910.134 Appendix D “Information for Employees Using Respirators When Not Required Under the Standard” will be provided to any employee who wears a respirator when its use is not required.

5.6 Maintenance, Care, and Storage of Respirators

5.6.1 Inspection

A. All respirators will be inspected according to the schedule outlined below. The checklist shown in Exhibit 6 should be followed to ensure a complete and thorough inspection:

- Respirators used routinely will be inspected before each use and during cleaning;
- SCBAs will be inspected before each use, during cleaning and monthly; inspection will include making sure that the regulator and warning devices function properly;
- Respirators that are maintained for emergency use will be inspected monthly and in accordance with the manufacturer's recommendations; and
- Emergency escape-only respirators will be inspected before being taken to the work site.

B. Documentation of respirator inspections will include checks on the following:

- Respirator function.
- Tightness of connections and condition of parts (e.g., face piece, head straps, valves, connecting tube and filters, canisters or cartridges).
- Pliability and any deterioration of any elastic or elastic-type parts.
- Condition of the regulator.
- Proper functioning of warning devices.
- If air and oxygen cylinder are fully charged. Cylinders will be recharged when the pressure falls to 90% of the manufacturer's recommended pressure level.

C. Respirators that fail inspection must be removed from service and tagged "DO NOT USE."

5.6.2 Cleaning

- As often as necessary to maintain a sanitary condition if used exclusively by one employee.
- Each time before it is worn if used by more than one employee.

- After each use if maintained for emergency use.
- After each use if used for fit testing.

The procedure for cleaning respirators is presented in Exhibit 4.

5.6.3 Maintenance

Respirators requiring maintenance due to worn or malfunctioning parts will be repaired as follows:

- Repairs shall be conducted only by individuals appropriately trained to perform necessary repairs;
- Replacement parts shall be approved by the manufacturer of the respirator; be NIOSH approved for use with the respirator; and designed and manufactured for the specific respirator being repaired.
- Repairs are to be made in accordance with manufacturer recommendations and specifications.
- Reducing and admission valves, regulators, and alarms shall only be adjusted or repaired by an authorized technician trained by the manufacturer or by the manufacturer.

5.6.4 Storage

- All respirators shall be stored in the following manner which protects them from damage, contamination, dust, sunlight, temperature extremes, excessive moisture, damaging chemicals and shall be stored in a manner which prevents deformation of the face piece and exhalation valve.
- Emergency respirators shall be stored in readily accessible condition to the work area, stored in containers or covers clearly marked as containing emergency respirators, and stored in accordance with manufacturer recommendations. Since most emergency respirators are issued to ARCADIS by the client at job sites, any client protocol for proper storage and use shall be followed.

5.7 Work Area Surveillance

- Air monitoring will be performed continuously during any work that involves use of respiratory protection. The type of monitoring to be performed will be identified during the task hazard analysis phase of the work and will be specified in the site-specific health and safety plan for the project in accordance with policy ARC HSFS010, “Health and Safety Plans”.
- Workers wearing respirators will be monitored during work to ensure employees are not enduring undue stress or difficulty of any type while wearing

the respirator and to ensure the respirator is adequate protection for the hazard. Surveillance will also be conducted to identify any changes in the work method of environmental conditions which may alter the effectiveness of respirator use.

5.8 Medical Evaluation

- Because using a respirator may place a physiological burden on an employee that may vary depending upon the type of respirator and workplace conditions, the written Respiratory Protection Program includes what medical evaluation process we have implemented at ARCADIS. All employees who use a respirator as defined under this standard will participate in the company's medical monitoring program ARC HSGS010. Medical evaluations may cease if the employee is no longer required to use a respirator per the Medical Surveillance procedure.

- A physician or other licensed health care professional will perform the evaluation using a medical questionnaire as defined in CFR 1910.134, App C or an equivalent medical examination. A follow-up medical examination may be given depending upon the answers to the questionnaire and/or medical examination.

5.8.1 Timeframe of Medical Evaluations

Medical evaluations will take place according to the following schedule:

- Prior to fit testing and use at the work site;

- When an employee reports medical signs/symptoms that may be related to his/her ability to use a respirator;

- When a physician, supervisor or the respirator Program Administrator suggests/requests an evaluation;

- When information such as observations made during fit testing or program evaluation indicate a need; or

- When a change occurs in workplace conditions that may result in a substantial increase in the physiological burden placed on an employee (e.g., physical work effort, protective clothing, temperature, etc.).

5.8.2 Written Medical Opinion

The physician or other licensed health care professional will determine and provide a written opinion as to the employee's ability to use a respirator. This opinion will contain:

- Whether or not the employee is medically able to use the respirator;

- Any limitations on respirator use;

- The need for follow-up medical evaluations; and
- A statement that the employee was provided with a copy of the written recommendation.

6. TRAINING

Training will be provided prior to respirator use; annually; when changes in the workplace or respirator make the training obsolete; when inadequacies are found in the employee's knowledge or use of PPE; or any other situation in which retraining appears necessary.

6.1 General Requirements

A. All employees who use respirators must be trained in their use, care, and limitations. Employees will also be trained to understand why respirators are necessary and the importance of a proper fit, the signs and symptoms of over exposure, the requirements of this procedure and the general requirements of the OSHA Respiratory Protection Standard.

B. Respirator training will be conducted prior to actual respirator use and at least annually thereafter. Annual training will be conducted as part of the HAZWOPER 8-hour refresher-training program.

C. All training provided must be reviewed and approved by Corporate Health & Safety and will be managed through the corporate training database.

D. Documentation of training certification received by attendance at any training course including externally provided training courses will be kept by the employee with copies provided to the corporate training group.

6.2 Training Content Requirements

Training will ensure that employees can demonstrate, at a minimum, knowledge of the following:

- Why the respirator is necessary and its limitations and capabilities;
- How improper fit, usage, or maintenance can compromise the protective effect of the respirator, and how to recognize the signs and symptoms that may limit or prevent the effective use of respirators;
- How to use the respirator effectively in emergency situations, including when it malfunctions;
- How to inspect, put on and remove, use, and check the seals of the respirator;
- Proper procedures for maintenance and storage of the respirator; and
- The general requirements of this standard.

6.3 Other Training Considerations

- Training does not need to be repeated for a new employee if he/she can provide documentation of training within the 12 months prior.
- Although annual HAZWOPER training may be utilized to help meet compliance with the training portion of this standard, training will be specific to the type of respirator used and the conditions at the job/work site.

7. REFERENCES

- 29 CFR 1910.134 “Respiratory Protection”
- National Institute for Occupational Safety & Health (NIOSH) Guide to the Selection and Use of Particulate Respirators Certified under 42 CFR 84, NIOSH 96-101, 1996.
- NIOSH Guide to Industrial Respiratory Protection, NIOSH 87-116, 1987.
- ARCADIS Health and Safety Procedure ARC HSGE010– Medical Surveillance

8. RECORDS

- Training records will be kept by the individual employee with copies of such certificates kept by the ARCADIS corporate training group. Information related to the course such as training dates and vendors, will be kept by the corporate training group.
- Air monitoring results must be maintained with project files.
- Results of medical surveillance examinations will be maintained by the designated medical provider in compliance with 29 CFR 1910.1020.
- Fit test records will be maintained by the employee who is fit tested per CFR 1910.134 (m)(2)(11) and, where utilized, the designated medical provider
- Copies of fit test records are to be kept centrally at the corporate office.

9. APPROVALS AND HISTORY OF CHANGE

Approved By:

History of Change

Revision Date	Revision Number	Reason for change
19 January 2009	01	Original document

Exhibit 1 – Definitions

Air-purifying respirator means a respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.

Assigned protection factor (APF) means the workplace level of respiratory protection that a respirator or class of respirators is expected to provide to employees when the employer implements a continuing, effective respiratory protection program as specified by this section.

Atmosphere-supplying respirator means a respirator that supplies the respirator user with suitable breathing air from a source independent of the ambient atmosphere, and includes supplied-air respirators (SARs) and self-contained breathing apparatus (SCBA) units.

Canister or cartridge means a container with a filter, sorbent, catalyst, or combination of these items, which removes specific contaminants from the air passed through the container.

Demand respirator means an atmosphere-supplying respirator that admits breathing air to the facepiece only when a negative pressure is created inside the facepiece by inhalation.

Emergency situation means any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that may or does result in an uncontrolled significant release of an airborne contaminant.

Employee exposure means exposure to a concentration of an airborne contaminant that would occur if the employee were not using respiratory protection. Note: all exposure assessments are made and reported regardless of the assigned protection factor of the respiratory protective device used

End-of-service-life indicator (ESLI) means a system that warns the respirator user of the approach of the end of adequate respiratory protection, for example, that the sorbent is approaching saturation or is no longer effective.

Escape-only respirator means a respirator intended to be used only for emergency exit.

Filter or air purifying element means a component used in respirators to remove solid or liquid aerosols from the inspired air.

Filtering facepiece (dust mask) means a negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.

Fit factor means a quantitative estimate of the fit of a particular respirator to a specific individual, and typically estimates the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn.

Fit test means the use of a protocol to qualitatively or quantitatively evaluate the fit of a respirator on an individual. See also Qualitative fit test (QLFT) and Quantitative fit test (QNFT).

Helmet means a rigid respiratory inlet covering that also provides head protection against impact and penetration.

High efficiency particulate air (HEPA) filter means a filter that is at least 99.97% efficient in removing monodisperse particles of 0.3 micrometers in diameter. The equivalent NIOSH 42 CFR 84 particulate filters are the N100, R100, and P100 filters.

Hood means a respiratory inlet covering that completely covers the head and neck and may also cover portions of the shoulders and torso.

Immediately dangerous to life or health (IDLH) means an atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.

Loose-fitting facepiece means a respiratory inlet covering that is designed to form a partial seal with the face.

Maximum use concentration (MUC) means the maximum atmospheric concentration of a hazardous substance from which an employee can be expected to be protected when wearing a respirator, and is determined by the assigned protection factor of the respirator or class of respirators and the exposure limit of the hazardous substance. The MUC can be determined mathematically by multiplying the assigned protection factor specified for a respirator by the required OSHA permissible exposure limit, short-term exposure limit, or ceiling limit. When no OSHA exposure limit is available for a hazardous substance, an employer must determine an MUC on the basis of relevant available information and informed professional judgment.

Negative pressure respirator (tight fitting) means a respirator in which the air pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator.

Oxygen deficient atmosphere means an atmosphere with oxygen content below 19.5% by volume.

Physician or other licensed health care professional (PLHCP) means an individual whose legally permitted scope of practice (i.e., license, registration, or certification) allows him or her to independently provide, or be delegated the responsibility to provide, some or all of the health care services required by paragraph (e) of this section.

Positive pressure respirator means a respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.

Powered air-purifying respirator (PAPR) means an air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.

Pressure demand respirator means a positive pressure atmosphere-supplying respirator that admits breathing air to the facepiece when the positive pressure is reduced inside the facepiece by inhalation.

Qualitative fit test (QLFT) means a pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.

Quantitative fit test (QNFT) means an assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

Respiratory inlet covering means that portion of a respirator that forms the protective barrier between the user's respiratory tract and an air-purifying device or breathing air source, or both. It may be a facepiece, helmet, hood, suit, or a mouthpiece respirator with nose clamp.

Self-contained breathing apparatus (SCBA) means an atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.

Service life means the period of time that a respirator, filter or sorbent, or other respiratory equipment provides adequate protection to the wearer.

Supplied-air respirator (SAR) or airline respirator means an atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.

Tight-fitting facepiece means a respiratory inlet covering that forms a complete seal with the face.

User seal check means an action conducted by the respirator user to determine if the respirator is properly seated to the face. This is conducted through the performance of a negative and positive pressure check each time the respirator is donned.

Exhibit 2 – Fit Testing Procedure

A. This is a summary of the fit-testing procedure. The person conducting the fit-test should thoroughly review OSHA 29 CFR 1910.134 Appendix A for the method of fit-testing that is to be performed.

B. The employee will be instructed in the proper placement and positioning of the respirator on the head and face. Proper tensioning of the straps will be reviewed as well as methods to determine proper and acceptable fit. A mirror should be provided to assist with this review.

C. The selected respirator shall be worn for 5 minutes to determine the comfort of the respirator. An assessment of comfort will include the following which will be discussed with the employee:

- Position of the mask on the nose
- Room for eye protection, as appropriate
- Room to talk
- Position of mask on the face and cheeks

D. Adequacy of the respirator selected will be evaluated using the following criteria:

- Proper placement of chin
- Adequate strap tension
- Fit across bridge of the nose
- Size of respirator appropriate to span distance from nose to chin
- Tendency of respirator to slip
- Employee evaluation of proper fit and position

E. The employee shall perform a seal check consisting of a positive and negative pressure check as follows:

- *Positive Pressure Check.* Close off exhalation valve and gently exhale into the facepiece. The test is satisfactory if slight positive pressure can be produced without any evidence of leakage from the mask and face seal.
- *Negative Pressure Check.* Close off the inlet opening of the canister or cartridge(s) by covering with palm of the hand(s) or by replacing filter seal(s). Inhale gently so that the mask collapses slightly and hold breath for 10 seconds. The test is considered satisfactory when the facepiece remains in its collapsed position and no inward leakage of air is detecte.

F. Perform test exercises as follows:

- *Normal breathing.* In a normal standing position, without talking, the employee shall breathe normally.
- *Deep breathing.* In a normal standing position, the employee shall breathe slowly and deeply, taking caution not to hyperventilate.
- *Turning head side to side.* Standing in place, the employee shall turn his/her head slowly from side to side between the extreme positions of each side. The head shall be held at each extreme side position momentarily so the employee can inhale.
- *Moving head up and down.* Standing in place, the employee shall slowly move his/her head up and down. The employee shall be instructed to inhale in the up position.
- *Talking.* The employee shall talk out loud slowly and loud enough to be heard by the individual conducting the test. The employee shall read the Rainbow Passage:

  "When sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is according to legend, a boiling pot of gold at each end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow."

- *Bending over.* The test subject shall bend over at the waist as if he/she were to touch his/her toes. Qualitative fit tests using a shroud or other device to contain the testing media may substitute jogging in place for bending over at the waist.
- *Normal breathing.* The employee shall repeat exercise number 1.

G. Each test shall be performed for one minute. The employee shall be questioned regarding the comfort of the respirator. If the respirator becomes unacceptable due to discomfort, adequacy of seals, or for any other reason identified during the fit test process, then the respirator will be replaced with another suitable and acceptable respirator and the fit test procedure repeated.

Exhibit 3 - Respirator Program Fit Test Form and Employee Checklist

Employee Name: _____
Last First

Employee Number: _____

Date: _____

Office: _____

Division: _____

Business practice: _____

Checklist Item	OK
Respirator Training	☐
Medical Review/Exam **(mandatory)** *Date completed:*	☐
Medical Clearance Records on File	☐

Fit Test Method: ___ Qualitative; (must use irritant smoke)

___ Quantitative; Model: _____ Size: _____

Response:	**Passed**	**Failed**	**Fit Factor (QN)**
Normal Breathing	☐	☐	_____
Deep Breathing	☐	☐	_____
Turning Head Side to Side	☐	☐	_____
Moving Heads Up and Down	☐	☐	_____
Talking	☐	☐	_____
Grimace	☐	☐	_____
Bending Over	☐	☐	_____
Normal Breathing	☐	☐	_____
Overall Fit Test Factor: (from Portacount)	☐	☐	_____

Employee: Printed name_____
Signature_____

Test Administrator: Printed name_____
Signature_____
Company_____

Respirator Type [1]	**Assigned Protection Factor**
Single use or quarter mask	5
Air purifying half mask with cartridge and/or any type of particulate filter	10
Air purifying full facepiece with cartridge and/or high efficiency filter	50
Supplied air equipped with full facepiece and operated in pressure demand or other positive pressure mode	2000
Self contained breathing apparatus with tight fitting facepiece and operated in pressure demand mode	10,000

[1]For respirators not listed in this table, contact corporate health and safety for assistance in determining APFs.

Exhibit 4 – Respirator Cleaning Procedure

- Remove cartridges/canisters/filters. Disassemble facepiece by removing speaking diaphragm, demand and pressure-demand valve assemblies, hoses, or any components recommended by the manufacturer.
- Wash components with warm (<110° F) water with a mild detergent or with a cleaner approved by the manufacturer. A soft, non-wire bristle brush may be used to facilitate dirt removal.
- Rinse with warm (<110° F) clean water, preferably running water.
- If the cleaner used does not contain a disinfecting agent, respirator components should be immersed in one of the following for two minutes:
    a. Hypochlorite solution (50 ppm chlorine) made by adding approximately 1 milliliter of laundry bleach to 1 liter of water at 110° F; or
    b. Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliters of tincture of iodine [6-8 grams ammonium and/or potassium iodide/100 cubic centimeters (cc) of 45 percent alcohol] to one liter of water at 110° F; or
    c. Other commercially available cleansers of equivalent disinfectant quality, when used as directed by the manufacturer, and are approved for use by the respirator manufacturer.
- Thoroughly rinse the respirator components in clean, warm, (<110° F) running water.
- Components should be hand dried with a soft lint free cloth or allowed to air dry.
- Reassemble the facepiece and restore cartridges/canisters/filters as necessary.
- Test the respirator for proper working condition.

Exhibit 5 - OSHA Standards with Respiratory Protection Requirements

Compound	29 CFR
Asbestos	1910.1001
4-Nitrobiphenol	1910.1003
Alpha-Naphthylamine	1910.1004
Methyl-Chloromethyl Ether	1910.1006
3,3-Dichlorobenzidine (+ salts)	1910.1007
Bis-Chloromethyl Ether	1910.1008
Beta-Naphthylamine	1910.1009
Benzidine	1910.1010
4-Aminodiphenyl	1910.1011
Ethyleneimine	1910.1012
Beta-Propiolactone	1910.1013
2-Acetylaminofluorene	1910.1014
4-Dimethylaminoazobenzene	1910.1015
N-Nitrosodimethylamine	1910.1016
Vinyl Chloride	1910.1017
Inorganic Arsenic	1910.1018
Lead	1910.1025
Benzene	1910.1028
Coke Oven Emissions	1910.1029
Cotton Dust	1910.1043
1,2,Dibromo-3-Chloropropane	1910.1044
Acrylonitrile	1910.1045
Ethylene Oxide	1910.1047
Formaldehyde	1910.1048

Exhibit 6 – Respirator Inspection Checklist

The following is a guideline to be used when inspecting a respirator before wearing:

Head Strap

_____ attached properly to the respirator
_____ pliable, not stretched out or too stiff
_____ the rubber is not cracked or warped in anyway

Face Shield

_____ no visible cracks
_____ securely attached to the respirator
_____ not badly scratched, visibility is good
_____ there are no gouges or divots
_____ if there are screws, make sure they are securely in place

Nose Piece

_____ is securely in place
_____ contains all inhalation valves

Actual Face Seal

_____ pliable, not stiff
_____ does not contain any cracks or warped areas
_____ does not appear worn or discolored

Inhalation and Exhalation Valves

_____ are they in place
_____ they are not sealed shut
_____ pliable, not brittle

Cartridge Connectors

_____ plastic is not cracked
_____ if bayonet style, all three prongs are in place
_____ of screw-in style, it is not stripped
_____ O-ring is in place and not brittle

Speaker Diaphragm

_____ the diaphragm is not missing
_____ plastic cover is in place
_____ screw is in place and not loose

ARCADIS
Infrastructure, environment, facilities

Imagine the result

Root Cause Analysis and Solutions Development

HSP: ARC HSMS011

Revision #1

Revision Date: 22 October 2007

ARCADIS

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Exhibits

ARCADIS

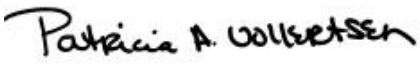
Root Causes Analysis and Solutions Development

Approval Signatures

Approved by:

Michael A. Thomas, CIH, Corporate HS Director

Approved by:



Patricia A. Vollertsen, Corporate HS Manager

Revision Date	Revision Number	Reason for change
22 October 2007	01	Original document

ARCADIS

1. Policy

It is the policy of ARCADIS to determine the Root Cause(s) of all incidents (as defined in ARC HSMS010) to allow for the proper development and implementation of solutions that will prevent similar incidents from occurring in the future.

ARCADIS

2. Purpose and Scope

2.1 Purpose

Identifying and addressing root cause(s) of incidents, questionable behaviors identified during a Loss Prevention Observation (LPO), and findings from inspections, audits, and reviews and developing appropriate solutions that match those root causes is essential in ARCADIS' efforts to prevent incidents and recurrence of incidents.

2.2 Scope

Root cause analysis and solution development procedures will be utilized for the following types of incidents reported and investigated:

- Work-related injuries and illnesses
  - fatality/permanent disability
  - lost time
  - restricted duty
  - medical treatment
  - first aid
- Near misses
- Motor vehicle accidents
- Environmental releases
- Equipment or property damage
- Regulatory violations
- Operational or system inefficiencies

In addition, root cause analysis and solution development is used whenever questionable behaviors are identified during the LPO process. It can also be used to address the findings resulting from audits, inspections, reviews, LPS field assessments, or other activities.

This procedure is also followed for any of the above as they pertain to subcontractors providing services to ARCADIS. Additional client-specific and contract requirements may also be required and implemented. In such cases, the investigation team will include subcontractor workers and a subcontractor supervisor. ARCADIS personnel may also participate on the investigation team to provide knowledge of the project site and to facilitate the proper use of the process.

ARCADIS

3. Definitions

See Exhibit A of ARC HSMS000 – ARCADIS US HS Management System.

Supervisor

As the employee's administrative supervisor may not be the person involved in the employee's day-to-day activities, the following defines what is meant by "supervisor" as it relates to the incident investigation, Loss Prevention Observations, and audits, inspections, reviews and assessments:

- For Field work/Client Site:
  - The "supervisor" is whoever provides regular daily direction to the person being observed in an LPO or the person(s) involved in an incident. This could be the PM, TM or field supervisor.

- For Office/Non-Field or Client Site Work:
  - The "supervisor" is the person to whom the employee reports administratively.

ARCADIS

4. Responsibilities

Supervisor - leads the investigation of the incident (per ARC HSMS010) for which the root causes are being determined, and is responsible for leading the investigation team in determining the appropriate root causes and the matching solutions. For the LPO process, leads LPO feedback session to determine appropriate root causes and solutions.

Employees – are responsible for following the solutions implemented and completing solutions as assigned.

Reviewers – are responsible for reviewing root causes and ensuring appropriateness and for providing comment on the solutions to assist in ensuring they match the root causes identified.

Managers – are responsible for validating and verifying the solutions.

ARCADIS

5. Procedure

Root cause analysis is used whenever questionable behaviors are identified during the LPO process and incident investigation processes. It can also be used at times following LPS field assessments and other H&S reviews when deficiencies are identified and require correction or prevention. Eight categories of root causes are used to guide the analysis process.

5.1 The Five Why's

To uncover issues that may be contributing to the incidents that occur, to questionable behaviors identified during an LPO, to findings from an LPS Field Assessment or to H&S project or office audit or review, a simple but effective tool should be used: "5 Whys." This method simply asks why something happened as many as five times.

For example, I tripped over the extension cord.

- Why did you trip? I caught my foot on it and lost my balance.
- Why did you catch your foot? I didn't see it.
- Why didn't you see it? I wasn't looking.
- Why, where were you looking? I was reading a report.
- Why were you reading? I was rushing to a meeting.

In this example, one contributing factor was that the individual was rushing to a meeting. This is what would be entered in the Section 5 of the LPO and the Contributing Factor section of the incident report. Then, the 5 Whys would be used to determine the second contributing factor: the position of the extension cord.

5.2 Root Cause Flow Chart

Once the contributing factors have been more clearly identified, follow the root cause process flow presented in Exhibit A to identify the root cause(s) of each of the contributing factors. It should be remembered that there could be more than one root cause. Start with the Personal Factors, move through the Job Factors and end with the External Factors to determine the root causes of each contributing factor.

The root causes for observed deviations from standards could be any one, or a combination of, the following:

- Personal factors:
  - lack of skill or knowledge
  - correct way takes more time and/or requires more effort

- short-cutting standard procedures is positively reinforced or tolerated
- in the past, no incident occurred when procedures were not followed

- Job factors:
  - lack of or inadequate operational procedures or work standards
  - inadequate communication of expectations regarding procedures or standards
  - inadequate tools or equipment

- External factors
  - Should rarely be used and are only for things fully out of the control of the person or the organization.

5.3 Solutions

After identifying the root cause(s), solutions are developed with a responsible person identified and notified for solution implementation with a set due date for completion. The investigation team cannot identify a root cause and then make no recommendation to address it. Furthermore, there must be a "match" between the root cause and the solution. All root causes and solutions are entered into the LPS database associated with the appropriate tool being used that resulted in the identification of incidents, questionable behaviors, audit, inspection, and review findings.

Solutions address and relate to the root cause(s) and contributing factor(s) to be effective. Solutions should be practical, cost beneficial and sustainable for the long term, and should focus on factors that can be controlled by the individual or supervisor. Effective solutions typically are "SMART" solutions:

- **S**pecific
- **M**easurable/observable
- **A**chievable
- **R**elevant
- **T**imely

Following the review and approval process (per the process being conducted that resulted in the activation of the root cause analysis process), the appropriate supervisor contacts the person(s) responsible for implementing the solution(s). Personnel must agree to both the solution(s) and the due date(s).

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6. Training

All employees receive Root Cause Analysis and Solutions Development training in the LPS training received by all employees.

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7. References

- ARC HSMS010 – Incident Reporting and Investigation
- ARC HSMS015 – Loss Prevention Observation
- ARC HSMS013 – HS Management System Assessment
- ARC HSGE013 – Agency Inspections
- ARC HSMS009 – Project and Office Compliance Auditing

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8. Records

All Root Cause Analysis and Solutions Development records are recorded and stored in the LPS database and maintained per ARCADIS recordkeeping requirements.

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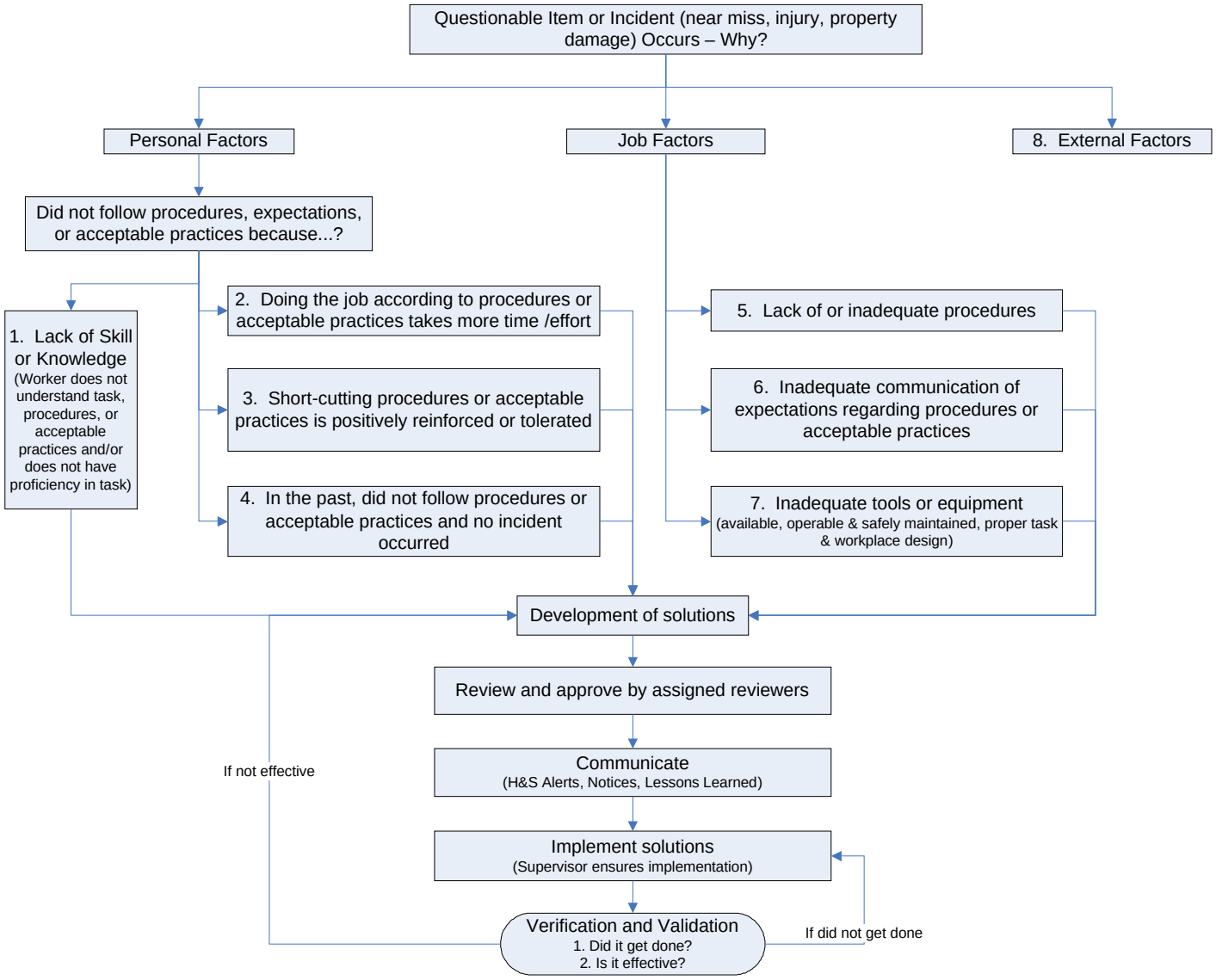
Exhibit A - Loss Prevention System Root Cause Analysis and Solution Development Process Flow



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Appendix F

JLAs

Job Loss Analysis

General

Client Name	RPM, INC.
JSA ID	764
Job Name	Environmental-Drilling, soil sampling, well installation
Task Description	Drilling
Project Number	AY0002730007
Project Name	REMEDIAL CONSTRUCTION & REPORTING
PIC Name	
Project Manager	SANFORD, MARC
Status Name	(1) Initial
Cretaion Date	8/21/2009 10:43:41 AM

User Roles

Role	Employee	Due Date	Completed	Approve	Supervisor	Active Employee
Created By	Sanford, Marc	9/11/2009			Ulm, David	True
Developer	Collins, Lisa	9/11/2009			Sanford, Marc	True
HASP Reviewer	Patterson, David				LaBarge, Jason	True
Reviewer	Carignan, Todd				Sanford, Marc	True

Job Steps

Job Step	Job Step Description		Potential Hazard	Critical Action	HSP Reference
1	Set up necessary traffic and public access controls	1	Struck by vehicle due to improper traffic controls	Use a buddy system for placing site control cones and/or signage. Position vehicle so that you are protected from moving traffic. Wear Class II traffic vest	Field H&S Handbook--roadway safety
2	Utility Clearance	1	Potential to encounter underground or aboveground utilities while drilling	Complete utility clearance in accordance with the ARCADIS H&S procedure	ARCADIS H&S Procedure ARCHSFS019
3	General drill rig operation	1	When the engine is used at high RPMs excessive noise can be generated	When the engine is used at high RPMs or soil samples are being collected, use hearing protection.	
		2	During drill rig operation, surfaces will become hot and cause burns if touched, and COCs in the soils more readily vaporize generating airborne contaminates.	Due to friction and lack of a drilling fluid, heat will be produced during this method. Mainly drill augers. Be careful handling split spoons. Wear proper work gloves. When soils and parts become heated, the COC could volatilize. Air monitoring should always be performed in accordance with the HASP.	
		3	Moving parts of the drilling rig can pull you in causing injury. Pinch points on the rig and auger connections can cause pinching or crushing of body parts.	Stay at least 5 feet away from moving parts of the drill rig. Know where the kill switch is, and have the drillers test it to verify that it is working. Do not wear loose clothing, and tie long hair back. Avoid wearing jewelry while drilling. Cone off the work area to keep general public away from the drilling rig	

3	General drill rig operation	4	Drilling equipment laying on the ground (i.e. augers, split spoons, decon equipment, coolers, etc), create a tripping hazard. Water from decon buckets generate mud and cause a slipping hazard.	Keep equipment and trash picked up, and store away from the primary work area.	
		5	Dust and debris can cause eye injury and soil cuttings and/or water could contain COCs.	Wear safety glasses and stay as far away from actual drilling. W operation as practicable. Wear appropriate gloves to protect from COCs.	
		6	drill rig can tip or derrick can encounter overhead objects	Never move the rig with the derrick up. Ensure there is proper clearance to raise the derrick, and that you are far enough away from overhead power lines and other overhead objects. Set-up rig on level surface where possible, and ensure that stabilizers are located on competent surface. Never force drillers to position a rig in questionable area	
4	Indoor drilling engineering controls	1	CO, VOC, LEL, Dust concentrations could exceed HASP action levels	Perform continuous air monitoring during all drilling activities. Utilize ehhaust hoods/ducts and fans to mitigate exhaust fumes and odors.	HASP - Air Monitoring Requirements
5	Hollow stem auger drilling	1	Due to friction and lack of a drilling fluid, heat will be produced mainly on drill augers.	Be careful handling split spoons. Wear proper work gloves. When soils and parts become heated, the COC could volatilize. Air monitoring should always be performed in accordance with the HASP.	
8	Direct push drilling	1	staff can get caught between rig and objects	The direct push rigs are uaually meant to fit in spaces where larger rig can't. Do not put yourself between the rig and a fixed object. Use Spotters or a tape measure to ensure clearances in tight areas.Plan out travel from location to next before hand.	
		2	Wireless Controls can fail	The drill rig should be used in a large open area to test wireless controls prior to moving to boring locations. The operator of the rig will test the kill switch with wireless remote prior to use. Operator will stay in range of rig while moving so that wireless signal will not be too weak and cause errors to the controls.	
11	Mudd Rotary drilling	1	This technology uses fluid, which collects with sediments in large basin. Fluid can splash out and cause slipping/mud hazard. Liquid mixture can splash into your eyes.	Wear rubber boots if needed, and keep clear of muddy/wet area as much as practicable. If area becomes excessively muddy, consider mud spikes or covering the area with a material that improves traction. Wear safety glasses.	
12	Sample collection and processing	1	Injuries can result from pinch points on sampling equipment, and from breakage of sample containers.	Care should be taken when opening sampling equipment. Look at empty containers before picking them up, and do not over-tighten container caps. Use dividers to store containers in the cooler so they do not break.	
		2	lifting heavy coolers can cause back injuries	Use two people to move heavy coolers. Use proper lifting techniques.	
13	Monitoring well installation	1	monitoring well construction materials can clutter the work area causing tripping hazards.	Well construction materials should be picked up during the well installation process.	

13	Monitoring well installation	2	Heavy lifting can cause muscle strains, and cutting open bags can cause lacerations.	Well construction materials are usually 50 lbs or greater. Team lift or use drill rig to hoist bags. Always use work gloves while cutting open bags.	
		3	Well pack material (i.e. sand, grout, bentonite) can become airborne and get in your eyes.	Wear safety glasses for protection from airborne sand and dust.	
		4	Cutting the top of the well to size can cause jagged/sharp edges on the top of the well casing.	Wear gloves when working with the top of the well casing, and file any sharp jagged edges that resulted from cutting to size.	
14	Soil cutting and purge water management	1	Moving full drums can cause back injury, or pinching/crushing injury.	Preferably have the drilling contractor move full drums with their equipment. If this is not practicable, use lift assist devices such as drum dollys, lift gates, etc. Employ proper lifting techniques, and perfrom TRACK to identify pinch/crush points. Wear leather work gloves, and clear all walking and work areas of debris prior to moving a drum.	

Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Eye Protection	Required		Required
Foot Protection	Recommended	Hearing protection	Recommended
Foot Protection	Required		Required
Hand Protection	Required	nitrile	Required
Hand Protection	Required		Required
Head Protection	Required		Required
Hearing Protection	Required		Required
Miscellaneous PPE	Required		Required
Respiratory Protection	Required		Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)		Required
Miscellaneous	fire extinguisher		Required
Miscellaneous	first aid kit		Required
Miscellaneous	Other	Fans	Required
Miscellaneous	Other	Exhaust hoses	Required
Personal	eye wash (specify type)		Required
Traffic Control	traffic cones		Required

Job Loss Analysis

General

Client Name	RPM, INC.
JSA ID	760
Job Name	Construction-Excavation and trenching
Task Description	Trenching and pipe installation for Treatment System
Project Number	AY0002730007
Project Name	REMEDIAL CONSTRUCTION & REPORTING
PIC Name	
Project Manager	SANFORD, MARC
Status Name	(2) Review
Cretaion Date	8/20/2009 2:36:22 PM

User Roles

Role	Employee	Due Date	Completed	Approve	Supervisor	Active Employee
Created By	Miles, Gretchen	8/21/2009	8/21/2009		Sanford, Marc	True
Developer (Primary Contact)	Carignan, Todd	8/21/2009	8/21/2009		Sanford, Marc	True
HASP Reviewer	Coppola, Mija	9/4/2009	8/26/2009	True	Reed, Andrew	True
Reviewer	Sanford, Marc	9/4/2009			Ulm, David	True

Reviewer Comments

Role	Employee	Approval Status	Completed Date	Comments
HASP Reviewer	Coppola, Mija	Approve	08/26/2009	recommend using the templates--they are very detailed and will save you so much time. Let me know if you don't know how to get to them, and I can walk you through it.

Job Steps

Job Step	Job Step Description		Potential Hazard	Critical Action	HSP Reference
1	Tailgate safety meeting, don PPE.	1	discuss potiential hazards. chemical, physical, equipment, indoor traffic, air quality	Don appropriate Level D PPE.	ARCADIS H&S Procedure ARC HSGE015
2	Utility Clearance	1	Potential to encounter underground or aboveground utilities while clearing trenches.	Complete utility clearance in accordance with the ARCADIS H&S Procedure.	ARCADIS H&S Procedure ARC HSFS019
3	Set up Work Zone	1	Struck by forklift, excavator, etc.	Use buddy system while placing site control cones, caution tape, barrels, and/or signage. Position self away from equipment pathways. Wear visible orange t-shirt or safety vest.	
		2	Dim Lighting	Set up portable lighting as needed.	
		3	Air Quality	Monitor work zone and surrounding area for dust, VOCs, and flamable gases.	
		4	Personal Injury or Equipment Damage	Use and set up equipment properly (secure and level), do not leave tools and/or equipment lieing around.	
		5	Personal injury, or equipment damage from nearby structures or obstructions	Surface obstructions must be moved or supported to ensure work zone is secure.	
		6	Obstructed vehicle pathways	A competent person should design and install ramps/bridges to allow Power Pallet workers, and ARCADIS contracted workers to cross open trenches.	
4	Open trenches.	1	Trench cave in.	All spoils shall be placed atleast 2 feet away from edge of trenches	ARCADIS H&S Procedure ARC HSCS005
		2	Moving Equipment	Personnel should not stand within 20 feet of moving or rotating equipment and parts. Personnel should make eye contact and use hand signals with operators when in vicinity of equipment.	ARCADIS H&S Procedure ARC HSCS005
		3	Air Quality	Monitor air throughout intrusive work for dust, VOCs, and flamable gases.	ARCADIS H&S Procedure ARC HSCS005
		4	Poor Lighting	Use lights on equipment and set up portable lights as needed.	ARCADIS H&S Procedure ARC HSCS005
5	Excavate material from trenches.	1	Same as Step 5	Same as Step 5	ARCADIS H&S Procedure ARC HSCS005
6	Install piping and pipe bedding.	1	Same as Step 5 and 6.	Same as Step 5 and 6.	
		2	Pipe damage	Take care when moving and installing system piping. Ensure adequate space and cushion/bedding for all piping in trenches.	
7	Mix and pour concrete (floor)	1	Dust inhalation	Wear dust mask to prevent inhalation of concrete mix. Monitor air quality.	
		2	Slips, trips, falls	Clean up concrete and concrete mix spills as they occur.	
		3	Damage to freshly poured concrete.	Install bridges over fresh concrete in vehicle pathways. Allow sufficient time for concrete to cure prior to applying significant pressure (i.e. fork lifts).	

Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Dermal Protection	Required	Long pants	Required
Eye Protection	Required		Required
Foot Protection	Required		Required
Hand Protection	Required	nitrile	Required
Hand Protection	Required	leather	Required
Head Protection	Required		Required
Hearing Protection	Recommended		Recommended
Hearing Protection	Required		Required
Miscellaneous PPE	Recommended		Recommended
Respiratory Protection	Recommended		Recommended

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)		Required
Miscellaneous	auxilary lighting		Recommended
Miscellaneous	fire extinguisher		Required
Miscellaneous	first aid kit		Required
Miscellaneous	flashlight		Required
Miscellaneous	Other	Air Monitoring Equipment	Required
Personal	eye wash (specify type)		Required
Traffic Control	barricades		Required
Traffic Control	traffic cones		Required

Job Loss Analysis

General

Client Name	RPM, INC.
JSA ID	758
Job Name	Environmental-Concrete work
Task Description	Core or sawcut concrete floor
Project Number	AY0002730007
Project Name	REMEDIAL CONSTRUCTION & REPORTING
PIC Name	
Project Manager	SANFORD, MARC
Status Name	(2) Review
Cretaion Date	8/20/2009 1:03:18 PM

User Roles

Role	Employee	Due Date	Completed	Approve	Supervisor	Active Employee
Created By	Miles, Gretchen	8/20/2009	8/20/2009		Sanford, Marc	True
Developer (Primary Contact)	Carignan, Todd	8/20/2009	8/20/2009		Sanford, Marc	True
HASP Reviewer	Coppola, Mija	9/3/2009	8/21/2009	True	Reed, Andrew	True
Reviewer	Sanford, Marc	9/3/2009			Ulm, David	True

Reviewer Comments

Role	Employee	Approval Status	Completed Date	Comments
HASP Reviewer	Coppola, Mija	Approve	08/21/2009	

Job Steps

Job Step	Job Step Description		Potential Hazard	Critical Action	HSP Reference
1	Don PPE	1	Chemical and Physical Hazards, Electrical, pinch points.	Don appropriate level D PPE.	ARCADIS H&S Procedure ARC HSGE015
2	Calibrate Air Monitoring Equipment (Monitor CO, H2S, LEL, O2, VOCs, and Dust)	1	Handling Calibration Gases: accidental release, discharge, inhalation	Handle canisters with care, use caution when moving from storage area to nearby workspace. Install regulator on canister prior to use and remove immediately after. Listen for leaks. Store is safe location.	ARCADIS Employee Field Health & Safety Handbook IV. I. Industrial Hygiene and Monitoring Equipment
3	Set up work zone	1	Struck by forklift.	Use buddy system while placing site control cones, caution tape, barrels, and/or signage. Position self away from forklift pathways. Wear visible orange t-shirt or safety vest.	
		2	Dim Lighting	Set up portable lighting as needed.	
4	Utility Clearance	1	Potential to encounter underground utilities.	Complete utility clearance in accordance with the ARCADIS H&S Procedure.	ARCADIS H&S Procedure ARC HSFS019
5	Inspect and set up equipment.	1	Electric shock	Inspect concrete saw/corer for defects, check cords for cuts or frayed wire. Do not operate in pooled water. Inspect generator and let run prior to plugging in high voltage (or reg. voltage) saws.	
		2	work floor surface	check work surface for trip hazards (uneven floor, remnants from former walls or equipment stabilization apparatus). Check floor for areas that may potentially gather or pool water. Have a shop vac on hand to collect water from core or sawing practices.	
6	Core or saw floor	1	Exposure to Dust (inhalation, eyes)	Connect drill/saw to water hose and use to suppress dust. Wear dust mask and safety glasses. Keep a first aid kit and eye wash bottle onsite.	
		2	Excessive Noise	Wear Hearing Protection.	
		3	Muscle fatigue, strain, body position	Take breaks to rest and rehydrate, be aware of body position.	
7	Remove core from borehole	1	Dust inhalation, pinch points, lacerations	Continue to wear dust mask. Wear work gloves while adjusting wire to remove core. Keep core on plastic to avoid contamination.	
8	Hand clear soil beneath concrete to specified height.	1	Body position, muscle fatigue, exposure to subslab soils	Use right tools for job: post digger and pick bar. Place removed soils on plastic sheeting and store in appropriate receptacle for profilng and disposal (55 gallon steel drum).	
9	Secure borehole	1	trip, fall	Cover borehole with safety cone or barrel to prevent personal injury or equipment damage.	

Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Dermal Protection	Required	long pants	Required
Eye Protection	Required	clear safety glasses	Required
Foot Protection	Required		Required
Hand Protection	Required	nitrile	Required
Hand Protection	Required	leather	Required
Head Protection	Required		Required
Hearing Protection	Recommended		Recommended
Hearing Protection	Required		Required
Respiratory Protection	Recommended	Based on field readings	Recommended

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)		Required
Miscellaneous	auxilary lighting		Recommended
Miscellaneous	fire extinguisher		Required
Miscellaneous	first aid kit		Required
Miscellaneous	flashlight		Required
Miscellaneous	Other	Air Monitoring Equipment	Required
Traffic Control	traffic cones		Required

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Appendix G

Emergency Action Plan (EAP) and Route to Hospital

EMERGENCY ACTION PLAN

Emergency Contact List

Emergency Contact	Phone
Local Police –	911 (if appropriate) and 518.842.1100
Local Ambulance –	911 (if appropriate) and 518.773.4500
Local Fire Department –	911 (if appropriate) and 518.843.1312
Local Hospital – St Mary's	518.842.1900
Local Weather Data –	www.findlocalweather.com/forecast/ny/amsterdam.html
Poison Control	800.332.3073
National Response Center (all spills in reportable quantities)	800.424.8802
U.S. Coast Guard (spills to water)	800.424.8802
Project Manager –	Marc Sanford - 518.452.7826 x15
Site Manager –	Todd Carignan – 518.452.7826 x18
H&S Manager –	Ed Roberts – 315.638.7445
Client Contact –	Ken Armstrong - 800-776-4488

Emergency Notification Procedure for the project:

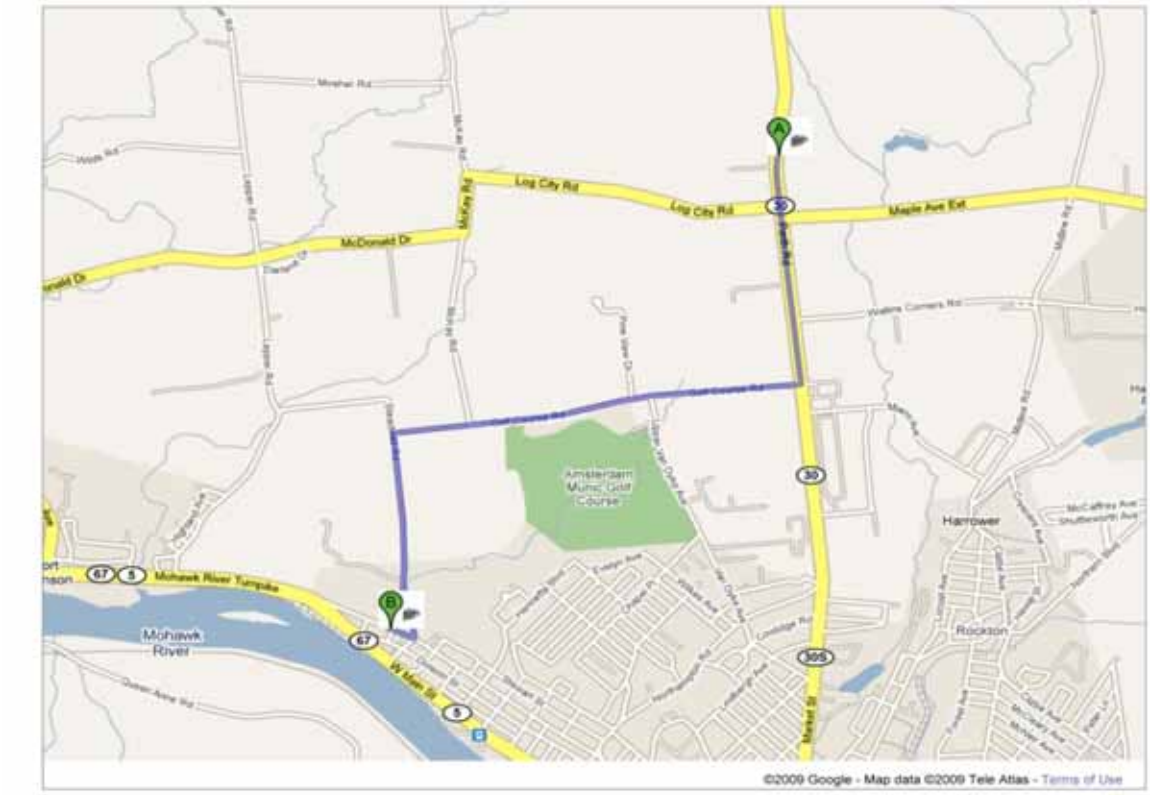
Step 1:Dial 911 (if necessary) and/or Work Care 800-455-6155
Step 2:Contact PIC/PM/TM
Step 3:Contact H&S and CN as required
Step 4:Contact Near Loss Reporting Hotline 866-242-4304

If emergency attention is not needed but professional medical attention is necessary, the employee will be taken to (see hospital route, see Figure 1 below):

A: Power Pallet, Inc. (Former Mohawk Finishing Products Site) 4715 State Highway 30, Amsterdam, NY 12010

B: St Mary's Hospital, 427 Guy Park Avenue, Amsterdam, NY 12010

Figure 1. Route to St Mary's Hospital



Hospital Route/Driving Directions From Site:

1. Head south on NY-30/Perth Rd toward Lorraine Blvd (0.9 miles)
2. Turn right at Golf Course Rd (1.5 miles)
3. Turn left at Steadwell Rd (0.8 miles)
4. Turn right at Guy Park Ave (315 feet)

Emergency Supplies and Equipment List

Emergency Supplies and Equipment (check all that apply)	Location on Project Site
☒ First Aid Kit (type):	Field Vehicle and Facility Break Room
☒ Fire Extinguisher	Field Vehicle
☒ Mobile Phone ☐ Satellite Phone	On Person
☒ Traffic Cones	Field Vehicle and/or provided by subcontractor.
☐ Walkie Talkies	
☐ Water or Other Fluid Replenishment	
☐ Eye Wash/Quick Drench Station	
☒ Eye Wash Bottle	Field Vehicle
☐ Wash and Dry Towelettes	
☒ Sunscreen (SPF 15 or higher)	Field Vehicle
☒ Insect Repellant	Field Vehicle
☐ Chemical Spill Kit	
☐ *Other (specify):*	

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Appendix H

MSDSs

September 2005

NIOSH Pocket Guide to Chemical Hazards

NPG Home | Introduction | Synonyms & Trade Names | Chemical Names | CAS Numbers | RTECS Numbers | Appendices | Search

1,2,4-Trimethylbenzene

CAS 95-63-6

$C_6H_3(CH_3)_3$

RTECS DC3325000

Synonyms & Trade Names
Asymmetrical trimethylbenzene, psi-Cumene, Pseudocumene [Note: hemimellitene is a mixture of the 1,2,3-isomer with up to 10% of related aromatics such as the 1,2,4-isomer.]

DOT ID & Guide

Exposure Limits	
	NIOSH REL: TWA 25 ppm (125 mg/m^3)
	OSHA PEL†: none

IDLH N.D. See: IDLH INDEX

Conversion 1 ppm = 4.92 mg/m^3

Physical Description
Clear, colorless liquid with a distinctive, aromatic odor.

MW: 120.2	BP: 337°F	FRZ: -77°F	Sol: 0.006%
VP(56°F): 1 mmHg	IP: 8.27 eV		Sp.Gr: 0.88
Fl.P: 112°F	UEL: 6.4%	LEL: 0.9%	

Class II Flammable Liquid

Incompatibilities & Reactivities
Oxidizers, nitric acid

Measurement Methods
OSHA PV2091
See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection)
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: No recommendation

First Aid (See procedures)
Eye: Irrigate immediately
Skin: Soap wash
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations Not available.
Important additional information about respirator selection

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms Irritation eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, fatigue, dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)

Target Organs Eyes, skin, respiratory system, central nervous system, blood

See also: INTRODUCTION See ICSC CARD: 1433

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September 2005

NIOSH Pocket Guide to Chemical Hazards

NPG Home | Introduction | Synonyms & Trade Names | Chemical Names | CAS Numbers | RTECS Numbers | Appendices | Search

1,2-Dichloroethylene

CAS 540-59-0

ClCH=CHCl

RTECS KV9360000

Synonyms & Trade Names
Acetylene dichloride, cis-Acetylene dichloride, trans-Acetylene dichloride, sym-Dichloroethylene

DOT ID & Guide
1150 130P

Exposure Limits	
	NIOSH REL: TWA 200 ppm (790 mg/m^3)
	OSHA PEL: TWA 200 ppm (790 mg/m^3)

IDLH 1000 ppm See: 540590

Conversion 1 ppm = 3.97 mg/m^3

Physical Description
Colorless liquid (usually a mixture of the cis & trans isomers) with a slightly acrid, chloroform-like odor.

MW: 97.0	BP: 118-140°F	FRZ: -57 to -115°F	Sol: 0.4%
VP: 180-265 mmHg	IP: 9.65 eV		Sp.Gr(77°F): 1.27
Fl.P: 36-39°F	UEL: 12.8%	LEL: 5.6%	

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities
Strong oxidizers, strong alkalis, potassium hydroxide, copper [Note: Usually contains inhibitors to prevent polymerization.]

Measurement Methods
NIOSH 1003; OSHA 7
See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection)
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation

First Aid (See procedures)
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations NIOSH/OSHA
Up to 1000 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode£
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)£
(APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece
Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms Irritation eyes, respiratory system; central nervous system depression

Target Organs Eyes, respiratory system, central nervous system

See also: INTRODUCTION See ICSC CARD: 0436

NIOSH Publication 2005-149 **September 2005**

NIOSH Pocket Guide to Chemical Hazards

NPG Home | Introduction | Synonyms & Trade Names | Chemical Names | CAS Numbers | RTECS Numbers | Appendices | Search

1,1-Dichloroethane

CAS 75-34-3

RTECS KI0175000

$CHCl_2CH_3$

Synonyms & Trade Names
Asymmetrical dichloroethane; Ethylidene chloride; 1,1-Ethylidene dichloride

DOT ID & Guide
2362 130

Exposure Limits

NIOSH REL: TWA 100 ppm (400 mg/m^3) See Appendix C (Chloroethanes)

OSHA PEL: TWA 100 ppm (400 mg/m^3)

IDLH 3000 ppm See: 75343

Conversion 1 ppm = 4.05 mg/m^3

Physical Description
Colorless, oily liquid with a chloroform-like odor.

MW: 99.0	BP: 135°F	FRZ: -143°F	Sol: 0.6%
VP: 182 mmHg	IP: 11.06 eV		Sp.Gr: 1.18
Fl.P: 2°F	UEL: 11.4%	LEL: 5.4%	

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities
Strong oxidizers, strong caustics

Measurement Methods
NIOSH 1003; OSHA 7
See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection codes)
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation

First Aid (See procedures)
Eye: Irrigate immediately
Skin: Soap flush promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations NIOSH/OSHA
Up to 1000 ppm:
(APF = 10) Any supplied-air respirator
Up to 2500 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode
Up to 3000 ppm:
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece
Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms Irritation skin; central nervous system depression; liver, kidney, lung damage

Target Organs Skin, liver, kidneys, lungs, central nervous system

See also: INTRODUCTION See ICSC CARD: 0249

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2-Butanone

CAS 78-93-3

$CH_3COCH_2CH_3$

RTECS EL6475000

Synonyms & Trade Names
Ethyl methyl ketone, MEK, Methyl acetone, Methyl ethyl ketone

DOT ID & Guide
1193 127

Exposure Limits	
	NIOSH REL: TWA 200 ppm (590 mg/m^3) ST 300 ppm (885 mg/m^3)
	OSHA PEL†: TWA 200 ppm (590 mg/m^3)

IDLH 3000 ppm See: 78933

Conversion 1 ppm = 2.95 mg/m^3

Physical Description
Colorless liquid with a moderately sharp, fragrant, mint- or acetone-like odor.

MW: 72.1	BP: 175°F	FRZ: -123°F	Sol: 28%
VP: 78 mmHg	IP: 9.54 eV		Sp.Gr: 0.81
Fl.P: 16°F	UEL(200°F): 11.4%	LEL(200°F): 1.4%	

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities
Strong oxidizers, amines, ammonia, inorganic acids, caustics, isocyanates, pyridines

Measurement Methods
NIOSH 2500, 2555, 3800; OSHA 16, 84, 1004
See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection)
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation
Provide: Eyewash

First Aid (See procedures)
Eye: Irrigate immediately
Skin: Water wash immediately
Breathing: Fresh air
Swallow: Medical attention immediately

Respirator Recommendations NIOSH/OSHA
Up to 3000 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode£
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)£
(APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece
Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms Irritation eyes, skin, nose; headache; dizziness; vomiting; dermatitis

Target Organs Eyes, skin, respiratory system, central nervous system

See also: INTRODUCTION See ICSC CARD: 0179 See MEDICAL TESTS: 0133

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Hexone	**CAS** 108-10-1
$CH_3COCH_2CH(CH_3)_2$	**RTECS** SA9275000
Synonyms & Trade Names Isobutyl methyl ketone, Methyl isobutyl ketone, 4-Methyl 2-pentanone, MIBK	**DOT ID & Guide** 1245 127

Exposure Limits	**NIOSH REL**: TWA 50 ppm (205 mg/m^3) ST 75 ppm (300 mg/m^3)
	OSHA PEL†: TWA 100 ppm (410 mg/m^3)

IDLH 500 ppm See: 108101	**Conversion** 1 ppm = 4.10 mg/m^3

Physical Description
Colorless liquid with a pleasant odor.

MW: 100.2	BP: 242°F	FRZ: -120°F	Sol: 2%
VP: 16 mmHg	IP: 9.30 eV		Sp.Gr: 0.80
Fl.P: 64°F	UEL(200°F): 8.0%	LEL(200°F): 1.2%	

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities
Strong oxidizers, potassium tert-butoxide

Measurement Methods
NIOSH 1300, 2555; OSHA 1004
See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection)
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation

First Aid (See procedures)
Eye: Irrigate immediately
Skin: Water flush promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations NIOSH
Up to 500 ppm:
(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and organic vapor cartridge(s)*
(APF = 10) Any supplied-air respirator*
(APF = 50) Any self-contained breathing apparatus with a full facepiece
Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms Irritation eyes, skin, mucous membrane; headache, narcosis, coma; dermatitis; in animals: liver, kidney damage

Target Organs Eyes, skin, respiratory system, central nervous system, liver, kidneys

See also: INTRODUCTION See ICSC CARD: 0511 See MEDICAL TESTS: 0134

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Acetone	**CAS** 67-64-1
$(CH_3)_2CO$	**RTECS** AL3150000
Synonyms & Trade Names Dimethyl ketone, Ketone propane, 2-Propanone	**DOT ID & Guide** 1090 127

Exposure Limits	**NIOSH REL**: TWA 250 ppm (590 mg/m^3)
	OSHA PEL†: TWA 1000 ppm (2400 mg/m^3)

IDLH 2500 ppm [10%LEL] See: 67641	**Conversion** 1 ppm = 2.38 mg/m^3

Physical Description
Colorless liquid with a fragrant, mint-like odor.

MW: 58.1	BP: 133°F	FRZ: -140°F	Sol: Miscible
VP: 180 mmHg	IP: 9.69 eV		Sp.Gr: 0.79
Fl.P: 0°F	UEL: 12.8%	LEL: 2.5%	

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities
Oxidizers, acids

Measurement Methods
NIOSH 1300, 2555, 3800; OSHA 69
See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection) Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation	**First Aid** (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Respirator Recommendations NIOSH
Up to 2500 ppm:
(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)*
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
(APF = 10) Any supplied-air respirator*
(APF = 50) Any self-contained breathing apparatus with a full facepiece
Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms Irritation eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis

Target Organs Eyes, skin, respiratory system, central nervous system

See also: INTRODUCTION See ICSC CARD: 0087 See MEDICAL TESTS: 0002

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Methylene chloride

CAS 75-09-2

CH_2Cl_2

RTECS PA8050000

Synonyms & Trade Names
Dichloromethane, Methylene dichloride

DOT ID & Guide
1593 160

Exposure Limits

NIOSH REL: Ca See Appendix A

OSHA PEL: [1910.1052] TWA 25 ppm ST 125 ppm

IDLH Ca [2300 ppm] See: 75092

Conversion 1 ppm = 3.47 mg/m^3

Physical Description
Colorless liquid with a chloroform-like odor. [Note: A gas above 104°F.]

MW: 84.9	BP: 104°F	FRZ: -139°F	Sol: 2%
VP: 350 mmHg	IP: 11.32 eV		Sp.Gr: 1.33
Fl.P: ?	UEL: 23%	LEL: 13%	

Combustible Liquid

Incompatibilities & Reactivities
Strong oxidizers; caustics; chemically-active metals such as aluminum, magnesium powders, potassium & sodium; concentrated nitric acid

Measurement Methods
NIOSH 1005, 3800; OSHA 59, 80
See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection)
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: No recommendation
Provide: Eyewash, Quick drench

First Aid (See procedures)
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations (See Appendix E) NIOSH
At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms Irritation eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numbness, tingle limbs; nausea; [potential occupational carcinogen]

Target Organs Eyes, skin, cardiovascular system, central nervous system

Cancer Site [in animals: lung, liver, salivary & mammary gland tumors]

See also: INTRODUCTION See ICSC CARD: 0058 See MEDICAL TESTS: 0148

Safety data for dichloromethane

Click here for data on dichloromethane in student-friendly format, from the HSci project

Glossary of terms on this data sheet.

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: HCC 30, methane dichloride, **methylene chloride**, **methylene** dichloride, aerothene MM, DCM, narkotil, solaesthin, solmethine, NCI-C50102, R 30, **methylene** bichloride, Freon 30
Molecular formula: CH_2Cl_2

CAS No: 75-09-2
EC No: 200-838-9
EC Index No: 602-004-00-3

Physical data

Appearance: colourless liquid

Melting **point**: -97 C
Boiling **point**: 40 C
Vapour density: 2.9
Vapour pressure: 6.8 psi at 20 C
Specific gravity: 1.32
Flash point: none
Explosion limits: 14 % - 22%
Autoignition temperature: 661 C
Water solubility: slight

Stability

Stable. Incompatible with alkali metals, aluminium, strong oxidizing agents, strong caustics, some forms of plastic, titanium. A small amount of added amylene (1-pentene) may be present to enhance stability.

Toxicology

Harmful if swallowed or inhaled. May be harmful by skin contact. Eye and skin irritant. Readily absorbed through the skin. Asphyxiant. Causes CNS depression. Possibly carcinogenic in humans. Possible mutagen. Experimental reproductive effects.

Toxicity data

(The meaning of any abbreviations which appear in this section is given here.)
IHL-HMN TCLO 500 ppm/8h
SCU-DOG LDLO 2700 mg kg^{-1}
IHL-GPG LCLO 5000 ppm/2h
ORL-RAT LD50 1600 mg kg^{-1}
ORL-HMN LDLO 357 mg kg^{-1}
IPR-MUS LD50 437 mg kg^{-1}
IHL-MUS LC50 14400 mppm/7h.

Risk phrases

(The meaning of any risk phrases which appear in this section is given here.)
R20 R22 R40.

Transport information

(The meaning of any UN hazard codes which appear in this section is given here.)
Packing group III. Hazard class 6.1. UN No 1593.

Personal protection

Safety glasses and gloves. Good ventilation.

Safety phrases

(The meaning of any safety phrases which appear in this section is given here.)
S23 S24 S25 S36 S37.

[Return to Physical & Theoretical Chemistry Lab. Safety home page.]

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Tetrachloroethylene

CAS 127-18-4

$Cl_2C=CCl_2$

RTECS KX3850000

Synonyms & Trade Names
Perchlorethylene, Perchloroethylene, Perk, Tetrachlorethylene

DOT ID & Guide
1897 160

Exposure Limits

NIOSH REL: Ca Minimize workplace exposure concentrations. See Appendix A

OSHA PEL†: †: TWA 100 ppm
C 200 ppm (for 5 minutes in any 3-hour period), with a maximum peak of 300 ppm

IDLH Ca [150 ppm] See: 127184

Conversion 1 ppm = 6.78 mg/m^3

Physical Description
Colorless liquid with a mild, chloroform-like odor.

MW: 165.8	BP: 250°F	FRZ: -2°F	Sol: 0.02%
VP: 14 mmHg	IP: 9.32 eV		Sp.Gr: 1.62
Fl.P: NA	UEL: NA	LEL: NA	

Noncombustible Liquid, but decomposes in a fire to hydrogen chloride and phosgene.

Incompatibilities & Reactivities
Strong oxidizers; chemically-active metals such as lithium, beryllium & barium; caustic soda; sodium hydroxide; potash

Measurement Methods
NIOSH 1003; OSHA 1001
See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection)
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: No recommendation
Provide: Eyewash, Quick drench

First Aid (See procedures)
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations NIOSH
At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]

Target Organs Eyes, skin, respiratory system, liver, kidneys, central nervous system

Cancer Site [in animals: liver tumors]

See also: INTRODUCTION See ICSC CARD: 0076 See MEDICAL TESTS: 0179

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Trichloroethylene

CAS 79-01-6

$ClCH=CCl_2$

RTECS KX4550000

Synonyms & Trade Names
Ethylene trichloride, TCE, Trichloroethene, Trilene

DOT ID & Guide
1710 160

Exposure Limits

NIOSH REL: Ca See Appendix A See Appendix C

OSHA PEL†: TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 2 hours)

IDLH Ca [1000 ppm] See: 79016

Conversion 1 ppm = 5.37 mg/m^3

Physical Description
Colorless liquid (unless dyed blue) with a chloroform-like odor.

MW: 131.4	BP: 189°F	FRZ: -99°F	Sol(77°F): 0.1%
VP: 58 mmHg	IP: 9.45 eV		Sp.Gr: 1.46
Fl.P: ?	UEL(77°F): 10.5%	LEL(77°F): 8%	

Combustible Liquid, but burns with difficulty.

Incompatibilities & Reactivities
Strong caustics & alkalis; chemically-active metals (such as barium, lithium, sodium, magnesium, titanium & beryllium)

Measurement Methods
NIOSH 1022, 3800; OSHA 1001
See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection)
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: No recommendation
Provide: Eyewash, Quick drench

First Aid (See procedures)
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations NIOSH
At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]

Target Organs Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system

Cancer Site [in animals: liver & kidney cancer]

See also: INTRODUCTION See ICSC CARD: 0081 See MEDICAL TESTS: 0236

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VM & P Naphtha

CAS 8032-32-4

RTECS OI6180000

Synonyms & Trade Names
Ligroin, Painters naphtha, Petroleum ether, Petroleum spirit, Refined solvent naphtha, Varnish makers' & painters' naphtha

DOT ID & Guide
1268 128 (petroleum distillates, n.o.s.)

Exposure Limits

NIOSH REL: TWA 350 mg/m^3 C 1800 mg/m^3 [15-minute]

OSHA PEL†: none

IDLH N.D. See: IDLH INDEX

Conversion

Physical Description
Clear to yellowish liquid with a pleasant, aromatic odor.

MW: 87-114 (approx)	BP: 203-320°F	FRZ: ?	Sol: Insoluble
VP: 2-20 mmHg	IP: ?		Sp.Gr(60°F): 0.73-0.76
Fl.P: 20-55°F	UEL: 6.0%	LEL: 1.2%	

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities
None reported [Note: VM&P Naphtha is a refined petroleum solvent predominantly C7-C11 which is typically 55% paraffins, 30% monocycloparaffins, 2% dicycloparaffins & 12% alklybenzenes.]

Measurement Methods
NIOSH 1550; OSHA 48
See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection)
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation

First Aid (See procedures)
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations NIOSH

Up to 3500 mg/m^3:
(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)
(APF = 10) Any supplied-air respirator

Up to 8750 mg/m^3:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)

Up to 17,500 mg/m^3:
(APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and organic vapor cartridge(s)
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection

Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, upper respiratory system; dermatitis; central nervous system depression; chemical pneumonitis (aspiration liquid)
Target Organs Eyes, skin, respiratory system, central nervous system
See also: INTRODUCTION

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Carbon monoxide

CAS 630-08-0

CO

RTECS FG3500000

Synonyms & Trade Names
Carbon oxide, Flue gas, Monoxide

DOT ID & Guide
1016 119
9202 168 (cryogenic liquid)

Exposure Limits
NIOSH REL: TWA 35 ppm (40 mg/m^3) C 200 ppm (229 mg/m^3)
OSHA PEL†: TWA 50 ppm (55 mg/m^3)

IDLH 1200 ppm See: 630080

Conversion 1 ppm = 1.15 mg/m^3

Physical Description
Colorless, odorless gas. [Note: Shipped as a nonliquefied or liquefied compressed gas.]

MW: 28.0	BP: -313°F	MLT: -337°F	Sol: 2%
VP: >35 atm	IP: 14.01 eV	RGasD: 0.97	
Fl.P: NA (Gas)	UEL: 74%	LEL: 12.5%	

Flammable Gas

Incompatibilities & Reactivities
Strong oxidizers, bromine trifluoride, chlorine trifluoride, lithium

Measurement Methods
NIOSH 6604; OSHA ID209, ID210
See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection codes)
Skin: Frostbite
Eyes: Frostbite
Wash skin: No recommendation
Remove: When wet (flammable)
Change: No recommendation
Provide: Frostbite wash

First Aid (See procedures)
Eye: Frostbite
Skin: Frostbite
Breathing: Respiratory support

Respirator Recommendations NIOSH
Up to 350 ppm:
(APF = 10) Any supplied-air respirator
Up to 875 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode
Up to 1200 ppm:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern†
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece
Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern†/Any appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

Exposure Routes inhalation, skin and/or eye contact (liquid)

Symptoms Headache, tachypnea, nausea, lassitude (weakness, exhaustion), dizziness, confusion, hallucinations; cyanosis; depressed S-T segment of electrocardiogram, angina, syncope

Target Organs cardiovascular system, lungs, blood, central nervous system

See also: INTRODUCTION See ICSC CARD: 0023 See MEDICAL TESTS: 0040

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Wood dust

CAS

RTECS ZC9850000

Synonyms & Trade Names
Hard wood dust, Soft wood dust, Western red cedar dust

DOT ID & Guide

Exposure Limits	**NIOSH REL**: Ca TWA 1 mg/m^3 See Appendix A
	OSHA PEL†: TWA 15 mg/m^3 (total) TWA 5 mg/m^3 (resp)

IDLH Ca [N.D.] See: IDLH INDEX

Conversion

Physical Description
Dust from various types of wood.

MW: varies	BP: NA	MLT: NA	Sol: ?
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: ?
Fl.P: NA	UEL: NA	LEL: NA	

Combustible Solid

Incompatibilities & Reactivities
None reported

Measurement Methods
NIOSH 0500
See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection codes)
Skin: No recommendation
Eyes: No recommendation
Wash skin: No recommendation
Remove: No recommendation
Change: No recommendation

First Aid (See procedures)
Eye: Irrigate immediately
Skin: Soap wash
Breathing: Fresh air

Respirator Recommendations NIOSH
At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape:
(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. Click here for information on selection of N, R, or P filters./Any appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

Exposure Routes inhalation, skin and/or eye contact

Symptoms Irritation eyes; epistaxis (nosebleed); dermatitis; respiratory hypersensitivity; granulomatous pneumonitis; asthma, cough, wheezing, sinusitis; prolonged colds; [potential occupational carcinogen]

Target Organs Eyes, skin, respiratory system

Cancer Site [nasal cancer]

See also: INTRODUCTION