



Site Specific Health & Safety Plan

Former Grand Dry Cleaners
175 West Union Street
Newark, NY 14513
U.S.A.

Prepared For:

Client Name: NYSDEC

Client Address: 625 Broadway Albany, NY 12233

Project #: 60735136

Prepared By:

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AECOM USA, Inc.
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Date Prepared: October 11, 2024

Signature

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Date Reviewed: October 16, 2024

Signature

Approver: (Project Manager, Project Director, or BL Lead)

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Title: Senior Project Manager

Date Approved: October 18, 2024

Signature

Expiration: October 18, 2025

Valid for one (1) year maximum or until the scope of work, subcontractor(s), methods and/or equipment change.



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Attachments

Attachment A:	THA Forms, and Tailgate Safety Meeting Form
Attachment B:	Applicable AECOM SHE Procedures
Attachment C:	Stretch/Flex Poster
Attachment D:	Site Safety Orientation
Attachment E:	NYSDOH Generic Community Air Monitoring Plan
Attachment F:	Project Hazardous Materials Communication Plan



1. HASP Summary Contact Information

SH&E Incident Reporting	SH&E Incident Hotline: 1-800-348-5046 TOLL-FREE 24 HOURS PER DAY 7 DAYS PER WEEK Immediately report all incidents including any potential work-related injuries, illnesses, discomfort/pain, property damage, security issues, regulatory inspections, and environmental impacts/spills.
------------------------------------	--

	Nearest Resource	Name and Address	Hours of Operation	Phone #
Medical Treatment Resources	Clinic	WellNow Urgent Care 1 White Springs Rd Geneva, NY 14456	8AM-5PM	(315) 230-4074
	Hospital	RRH Newark-Wayne Community Hospital 1200 Driving Park Ave, Newark, NY 14513	24 Hours	(315) 332-2022
	First Aid Providers	TBD		TBD
		TBD		TBD
	Nurse	1-512-419-5016 – 24 HOURS PER DAY 7 DAYS PER WEEK The hotline Operator will transfer injured/ill EE to nurse. If the transfer fails or EE's condition worsens following initial consultation, call direct.		
	Site Emergency Response	911		

	Level	Title	Name	Phone #
Key Personnel	Project Level	Project Manager (PM):	Kristine Garbarino, P.G.	(845) 309-9606
		Site Supervisor (SS):	Keith Stahle	(607) 398-4284
		Site Safety Officer (SSO):	Keith Stahle	(607) 398-4284
		Client Contact Person:	Josh J. Klier	(585) 226-5357
		Area/Business Line SH&E Manager:	Pete Wray	(302) 660-9178
		Regional SH&E Director:	Tony Indorato	(757) 298-1563

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List ALL Short-Service Employees (<6 Months with AECOM or in Current Area/Job Description):				
	SSE's Name	SSE's Phone Number	Mentor's Name	Mentor's Phone #
SSEs	N/A	N/A	N/A	N/A
	N/A	N/A	N/A	N/A

Other Important Numbers	Poison Control	American Association of Poison Control Centers	800-222-1222
	D&A Testing	AECOM Occupational Nurse AECOM D&A Program Administrator	512-419-5016
	INFOR TRAC	AECOM Account Number: 74984	800-535-5053
	HOLMAN	AECOM Fleet Management	800-227-2273

Contractual Requirements for Safety, Health, and the Environment

☒ I have reviewed the AECOM Contract with our client and described our contractual duties for SH&E Below.

Kristine Garbarino, P.G.

October 18, 2024

Project Manager Name

Project Manager Signature

Date

☒ AECOM is responsible for our own safety and that of our subcontractors.

☒ AECOM will be on-site with a General Contractor or other party who is responsible for their own safety. AECOM must comply with their safety plan in addition to our own plan; AECOM remains responsible for our safety and that of our subcontractors.

☐ AECOM has some level of safety responsibility for a General Contractor or other party (includes responsibility for reporting safety hazards, reviewing site controls etc.; describe below).

☐ Other/Additional Details: N/A

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2. Introduction

This written Health and Safety Plan (HASP) is designed to identify, evaluate, and control safety and health hazards, and to outline emergency response actions for AECOM-managed activities. This HASP must be kept on site during work activities and made available to all workers including subcontractors and other site occupants for informational purposes. AECOM subcontractors are expected to independently characterize, assess, and control site hazards created by their specific scope of work.

This section of the HASP summarizes important AECOM SH&E Procedures that apply to all DCS Americas jobs. See **Attachment A** for the project Task Hazard Assessment (THA) forms and **Attachment B** for a list of applicable field SH&E Procedures. These field SH&E procedures must be readily available to the field employees (i.e. PDF, electronically, etc.).

2.1 Applicable References

This HASP conforms to the regulatory requirements and guidelines established in the following documents:

- Federal Occupational Safety and Health Administration (OSHA) Code of Federal Regulation Title 29, Part 1910 (29 CFR Part 1910), Safety and Health Regulations for General Industry and 29 CFR 1926, Safety and Health Regulations for Construction.
- Scope of Work, WA D009803-52 Schedule 2.11 Submittal (AECOM, 2024)
- National Institute for Occupational Safety and Health/Occupational Safety and Hazards Administration/U.S. Coast Guard/U.S. Environmental Protection Agency, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, Publication No. 85-115, 1985.
- The requirements in this HASP also conform to AECOM's Safety for Life Program requirements as specified in the AECOM [Global Safety, Health, and Environment \(SH&E\) System Management Manual](#).



3. Verbal Incident Notifications

NOTE! In the event of a life-threatening emergency, call 911 FIRST. A life-threatening emergency can include:

- | | | | |
|------------------------------|----------------------------|------------------------------|------------------------|
| ■ Loss of consciousness | ■ Seizures | ■ Uncontrolled loss of blood | ■ Heat Stroke |
| ■ Head or spinal cord injury | ■ Severe allergic reaction | ■ Abdominal trauma | ■ Difficulty breathing |
| ■ Cardiac arrest | ■ Broken bones | | |

3.1 Incidents

Once immediate actions have been taken, if safe to do so, notifications (verbal) must be completed immediately and the involved employee, site supervisor or site safety officer must call the **AECOM Incident Reporting Hotline at 1-800-348-5046**. Notifications serve to engage additional resources in the management of the emergency and initiate additional processes such as medical case management, spill response, incident investigation, etc. Reporting initiates the formal documentation process and supports the development of key learnings to prevent a reoccurrence. No employee is authorized to report incidents to regulatory agencies. Only Senior members of the Health & Safety team are authorized to conduct regulatory reporting (i.e. Vice President).

Any incident for which assistance by SHE is required, including any injury – even if no first aid is required – must be immediately communicated to their manager or supervisor and the Incident Hotline at 1-800-348-5046. All incidents are also to be reported to IndustrySafe within 4 hours for significant incidents, or 24 hours for all other incidents.

Significant Incident:

- Fatality;
- Amputation;
- Hospitalization for treatment for more than 24 hours (admission);
- Any single event resulting in more than one employee requiring medical treatment or being away from work more than 3 days;
- Any SHE-related Consent Agreement/Order/Lawsuit or enforcement action seeking more than \$10,000 or alleging criminal activity;
- Any spill or release of a hazardous material that is reportable to a regulatory agency;
- Any Notices of Violation resulting from not operating within a regulatory agency permit/license or consent;
- Any incident resulting in property damage expected to exceed \$10,000 United States (US) dollars;
- Any security-related incident that could have caused significant harm to an AECOM employee; and/or
- Any Near Miss that may have resulted in any of the above, but because of “luck” did not happen.

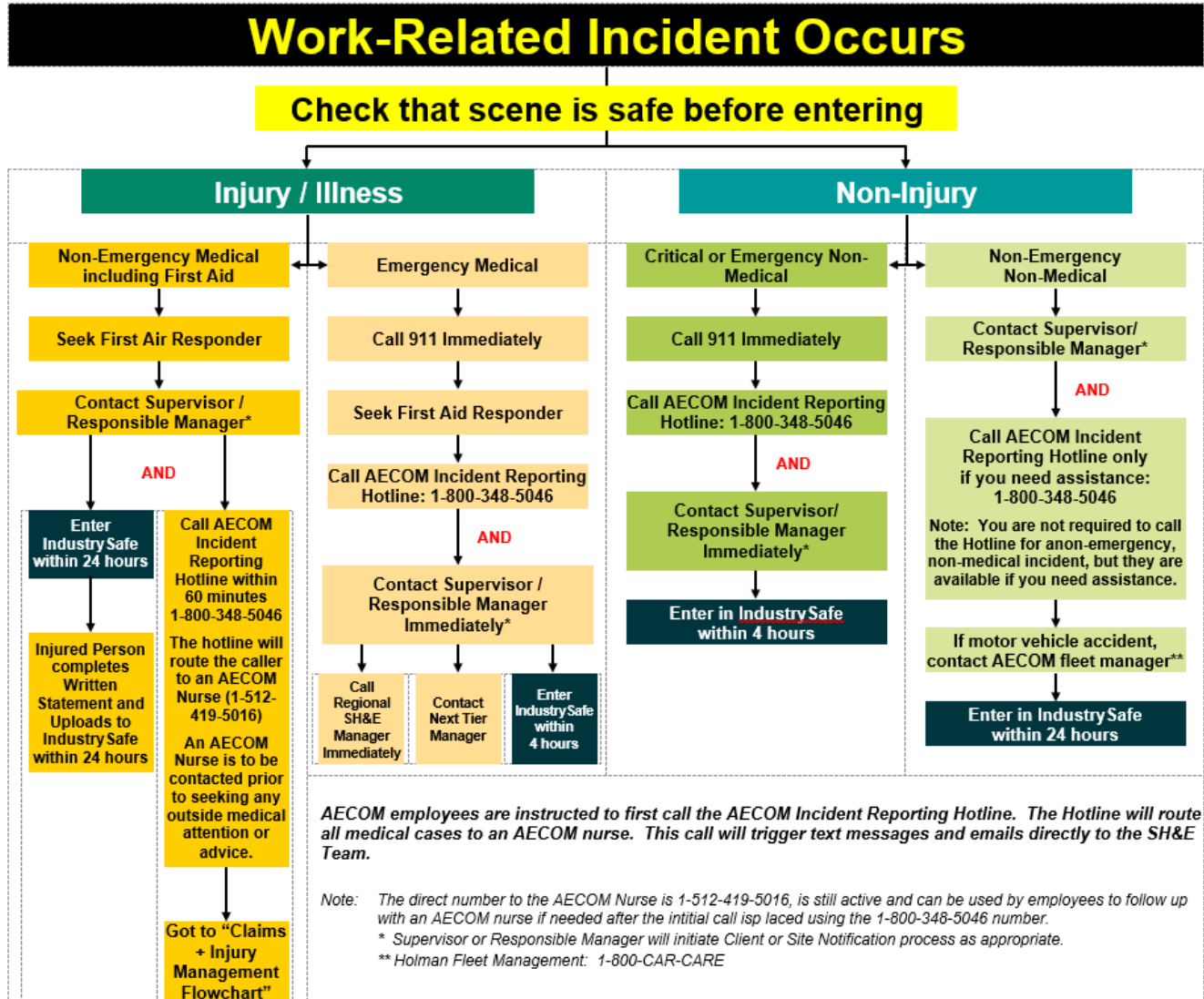
All Other Incidents:

- Any injury or illness to an AECOM employee or subcontractor, even if it does not require medical attention, including work-related injuries/illnesses that have become significantly aggravated by the work environment;
- An injury to a member of the public, or clients, occurring on an AECOM-controlled work site;
- Re-occurring conditions such as back pain or cumulative trauma disorders (e.g., carpal tunnel syndrome);
- Fire, explosion, or flash that is not an intended result of a planned event (e.g., remediation process, laboratory procedure);
- Any incident involving company-owned, rented, or leased vehicles (including personal vehicles used for company business); and/or



- Any failure to comply with the requirements of a regulatory permit issued to AECOM.

Table 3-1: Incident Notification & Reporting Flow Chart



3.2 AECOM Internal Notifications

For any incident or near miss, the involved employee must notify their site supervisor or site safety office. The site supervisor or site safety officer must notify their Project Manager. Depending on the severity of the incident, the Project Manager may need to notify the following individuals:

- Regional, area, business line, practice group or account SH&E manager.
- Program Manager or Client Account Manager
- Senior Leaders

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3.3 Client Specific Notifications

Project Manager and or Client Account Manager complete client specific notifications of incidents in accordance with client's incident notification requirements. See client contact information in the Key Personnel table at the bottom of the [Section 1](#) on Page 1.

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4. Emergency Response Plan

AECOM requires that all projects, plan for reasonably foreseeable emergencies. Prior to the start of site mobilization, all AECOM personnel shall review the site-specific information regarding evacuations, muster points, communication, emergency equipment and its location, and other site-specific emergency procedures.

Subcontractors will not use AECOM Hotline # and may use a different clinic based on their own Emergency Protocols. They will provide their own Project Emergency Plan to AECOM for review and acceptance. Any alterations to this plan must be communicated to all parties. Both AECOM and the subcontractor shall perform mock drills periodically in accordance with the length of the project.

4.1 Directions and Maps to Nearest Medical Treatment Resources

See following pages for directions and maps.



NEAREST HOSPITAL

RRH Newark-Wayne Community Hospital			315-332-2022	
Address:		1200 Driving Park Ave, Newark, NY 14513		
Hours of Operation:		24 Hours		
Travel Time:		5 Minutes	Travel Distance: 1.4 Miles	
DRIVING DIRECTIONS TO HOSPITAL				

From: 175 West Union Street
Newark, NY 14513
[New Start Address](#)

To: 1200 Driving Park Ave
Newark, NY 14513

1. Head **east** on **W Union St**

499 ft

2. Turn **left** onto **Main St**

0.7 mi

Pass by NAPA Auto Parts - Light's Auto Parts, Inc. (on the right)

3. Turn **left** onto **Stuerwald Ave**

0.2 mi

4. Turn **right** at the 1st cross street onto **Driving Park Ave**

0.2 mi

5. Turn **left** onto **Sunset Dr**

272 ft

6. Continue straight

207 ft

Destination will be on the left

Estimated driving time: 4 minutes

1.4 mi

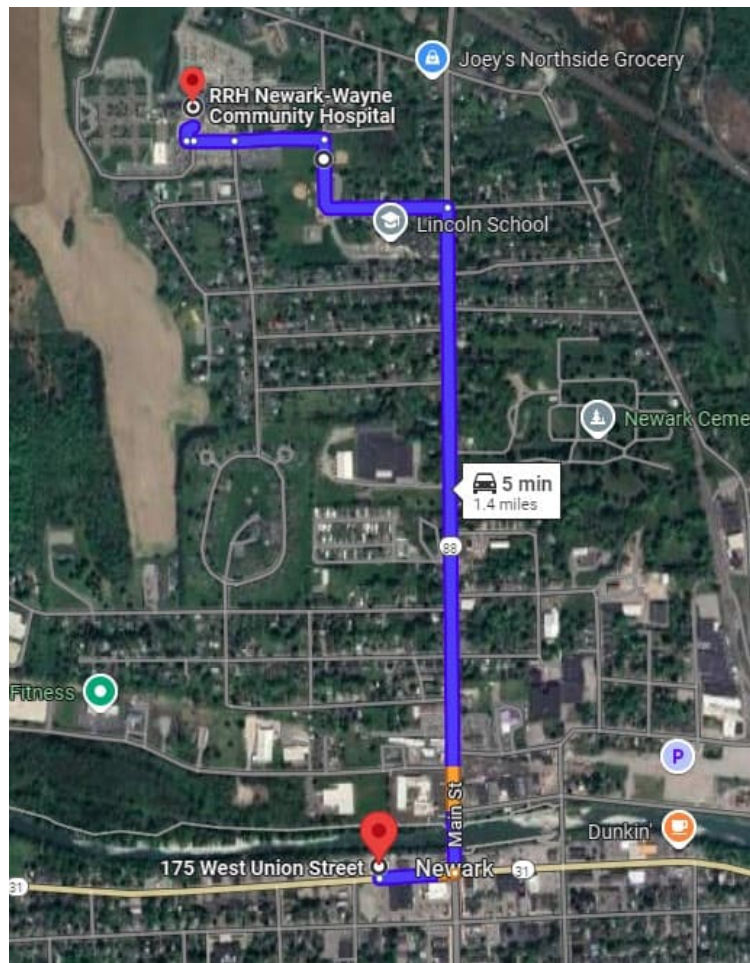
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ROUTE MAP TO HOSPITAL





NEAREST OCCUPATIONAL CLINIC

WellNow Urgent Care		315-230-4074	
Address:	1 White Springs Rd Geneva, NY 14456		
Hours of Operation:	8AM-5PM		
Travel Time:	26 Minutes	Travel Distance:	15.9 Miles

DRIVING DIRECTIONS TO OCCUPATIONAL CLINIC

From:

175 West Union Street
Newark, NY 14513
[New Start Address](#)

To:

1 White Springs Rd
Geneva, NY 14456

1. Head **east** on **W Union St**

499 ft
2. Turn **right** onto **NY-88 S/Main St**

6.2 mi
- Continue to follow NY-88 S
3. Continue onto **S Newark St**

0.5 mi
4. Continue onto **Melvin Hill Rd**

5.0 mi
5. Turn **left** onto **Co Rd 4**

0.2 mi
6. Turn **right** at the 1st cross street onto **Sutton Rd**

1.7 mi
7. Turn **left** onto **US-20 E**

2.1 mi
- Pass by Denny's (on the right in 1.4 mi)
8. Turn **right** onto **White Springs Rd**

390 ft
9. Turn **left**

112 ft
10. Turn **left**

174 ft

Destination will be on the right

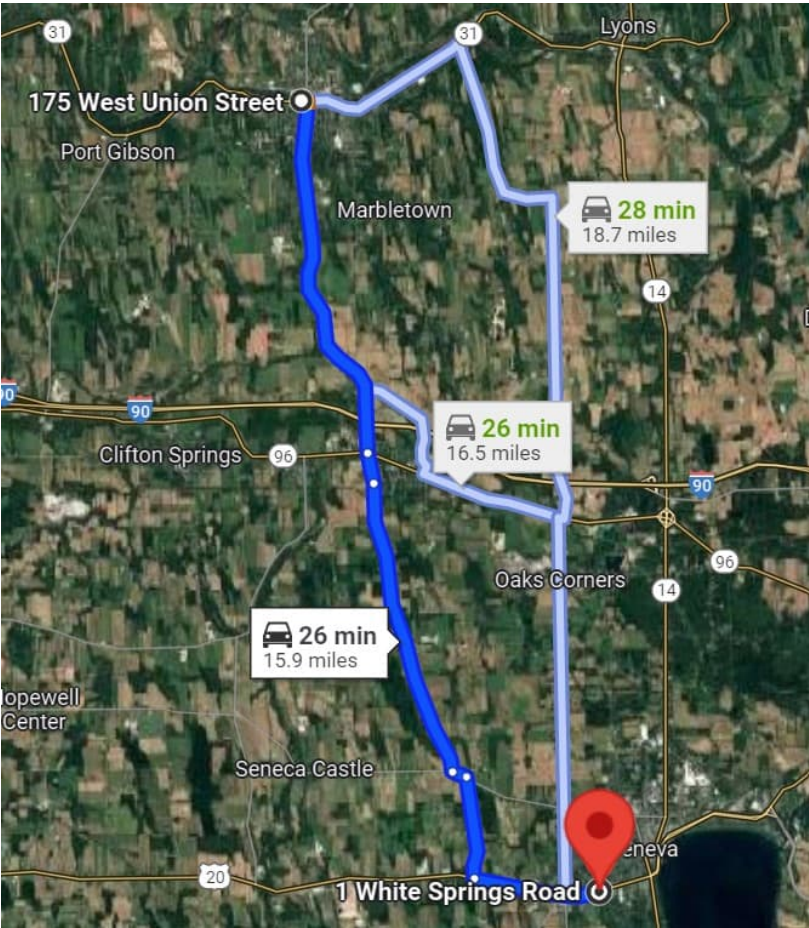
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ROUTE MAP TO OCCUPATIONAL CLINIC



4.2 Emergency Planning

AECOM requires that all projects plan for reasonably foreseeable emergencies (see Emergency Response Planning Procedure [S3AM-010-PR1](#)). Prior to the start of site operations, all personnel shall review Table 8-1 for site-specific information regarding evacuations, muster points, communication, and other site-specific emergency procedures.

Table 4-1: Method(s) of Alerting Personnel of an Emergency

<input checked="" type="checkbox"/> Cell Phone	<input type="checkbox"/> Hand Signal	<input type="checkbox"/> Radio (Channel No. _____)	<input type="checkbox"/> Satellite Phone
<input type="checkbox"/> Host Facility Alarm (specify):		[Insert Description]	= [Insert Meaning]
		[Insert Description]	= [Insert Meaning]
		[Insert Description]	= [Insert Meaning]
		[Insert Description]	= [Insert Meaning]

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Table 4-2: Muster Locations and Evacuation Route(s)

Muster Location Type	Location Description
Primary:	■ Site Entrance
Alternate:	● Nearest Cross Street
Shelter-In-Place:	◆ Site Building
Muster Locations and Evacuation Route Map	



Table 4-2: Muster Locations and Evacuation Route(s)



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Table 4-3: Site Emergency Equipment and Its Location

ITEM(S)	ITEM DESCRIPTION	LOCATION(S)
First Aid Kit(s)	■ ANSI Z308.1 Class A, Type III; Qty=1	■ AECOM Field Vehicle
Automated External Defibrillator(s) (AEDs)	■ Standard AED	■ N/A
Fire Extinguisher(s)	■ 2A:10: B:C (5 lb. ABC) ■ 4A:80B:C (10 lb. ABC)	■ AECOM Fleet Vehicle(s) ■ Drill Rig/Geoprobe
Spill Kit(s)	■ Universal Absorbents/Pads	■ Drill Rig/Geoprobe
Cold/Heat Stress Aids	■ Climate-Controlled Environment	■ Field Vehicle(s)

4.3 Potential Emergency Scenarios

This section covers emergency scenarios that could reasonably occur on the site or during work.

4.3.1 Evacuation

- If a situation requires an evacuation or emergency muster/assembly, the pre-determined alarm will be initiated.
- All personnel (e.g., workers, contractors, visitors) of the area requiring evacuation or muster/assembly will immediately assemble at the designated Muster Point, Assembly Point or Shelter-in-Place as determined by the alarm or communication.
- The Site Supervisor, Site Safety Officer, or designate will take action to account for all personnel, including visitors (i.e., head count, roll call).
- The Site Supervisor, Site Safety Officer, or designate shall ensure the appropriate emergency response is activated.
- Should it be determined that an individual is still within the hazard zone, establish whether a rescue can be safely attempted. Follow the 'Emergency Rescue Procedure' if properly trained and a rescue attempt will not put another individual in jeopardy.
- Personnel shall await further instruction from the Site Supervisor, Site Safety Officer, or designate (e.g., all clear and re-entry or further evacuation)

4.3.2 Medical Emergency

1. Stop the work activity.
2. Assess the cause of the injury to avoid injury to yourself (i.e. live wires, gases, hazardous materials).
3. Do not move the casualty unless they remain in danger.
4. First Aid Provider will designate an individual to call for medical assistance (e.g., ambulance, site medic).
5. First Aid Provider will designate an individual to retrieve the first aid kit and blankets.
6. Request assistance from other First Aid Providers as necessary. Administer first aid:
 - a) Assess responsiveness: ask permission.
 - b) Send for medical help.

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- c) Place casualty/victim face up.
 - d) Check Airway, Breathing and Circulation ABC's
 - e) Control severe bleeding.
7. If CPR is deemed necessary:
 - a) Begin chest compressions at a rate of at least 100 compressions per minute.
 - b) CPR shall be continued until:
 - i. until an AED is applied,
 - ii. casualty begins to respond,
 - iii. another first aid provider takes over,
 - iv. medical help takes over, or
 - v. physically unable to continue.
8. If the casualty begins to breathe on their own, place them in the recovery position, monitor and treat for shock as appropriate.
9. Individual in communication with the designated medical assistance shall attempt to answer any questions, stay on the line until information is verified and follow instruction.
10. Arrange for medical transport as needed. A designated individual should be positioned to direct medical transport to the casualty.
11. Personnel shall await further instruction from the Site Supervisor, Site Safety Officer, or designate (e.g., resume activity).

4.3.3 Lightning/Weather-Related Emergencies

Be Aware: Check the weather forecast before participating in outdoor activities. If the forecast calls for thunderstorms, postpone your trip or activity, or make sure adequate safe shelter is readily available. Many applications available for smart phones and devices have lightning alert capabilities or display lightning strikes on radar maps; download one for your smart phone and enable location services to receive alerts.

Go Indoors: Remember the phrase, “**When thunder roars, go indoors**”. If you see lightning and cannot count to 30 before hearing thunder, the lightning is too close for comfort. Find a safe, enclosed shelter when you hear thunder. Safe shelters include homes, offices, shopping centers, and hard-top vehicles with the windows rolled up.

Crouch Close to the Ground and Separate: If you are caught in an open area, crouch down in a ball-like position (**feet and knees together**) with your head tucked and hands over your ears so that you are down low with minimal contact with the ground. **Do NOT lie down.** Lightning causes electric currents along the top of the ground that can be deadly over 100 feet away. Crouching down is the best combination of being low and touching the ground as little as possible.

Separate: If you are in a group during a thunderstorm, separate from each other. This separation will reduce the number of injuries if lightning strikes the ground.

If a person is struck by lightning:

- Call 911 or other Emergency Services Contact.
- Assess the scene to ensure that continuing risk to rescuers does not exist if lightning strikes. For other electrical-related emergencies (non-lightning), ensure the source of electricity has been de-energized.
- Check to see if the victim is breathing and proceed with CPR if victim is not breathing.

4.3.4 Vehicle Incidents

All vehicles should be rented through Navan Travel (accessible via Ecosystem) to ensure that AECOM insurance is included in the rental rate. All other insurances should be declined. AECOM has negotiated contracts with Enterprise and National which are preferred vendors. If Enterprise or National are not available, Avis or Budget shall be used.

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In the event of a vehicle incident (including collisions as well as mechanical difficulties such as breakdowns and flat tires) the following response is recommended. For breakdowns and flat tires, contact an emergency provider. For rental vehicles, contact the rental company. To the extent possible, AECOM personnel should not change flat tires or perform similar repairs.

If a collision has occurred, assess the situation, and move all occupants (except the injured) out of further harm's way. If safe to do so, remove the car from the traveled way. Call 911 if necessary and report the incident to the Incident Hotline at **1-800-348-5046** as soon as practical. If in an AECOM leased vehicle, contact our fleet manager, *Holman*, at **1-800-227-2273**. If appropriate, wait for police to arrive. Provide insurance information to other drivers if necessary or requested, and collect the same (AECOM's rental vehicle insurance policy for Enterprise or Avis can be found on the DCS Americas [United States](#) or [Canada](#) travel pages). If possible, obtain names and phone numbers of witnesses. Take photographs of the scene. **DO NOT ADMIT LIABILITY, AGREE TO PAY FOR DAMAGE, OR SIGN A DOCUMENT RELATED TO AN INCIDENT EXCEPT AS REQUIRED BY LAW.**

For personal vehicles used on AECOM business, contact an emergency provider.

4.3.5 Fire

AECOM employees are not expected to attempt to put out fires. Stop work; notify all AECOM personnel, move upwind and contact 911 and/or emergency response at the site. If employees have been properly trained in the operation of a fire extinguisher, they may attempt to put out a small fire, if the following conditions are met:

- The fire must be small (i.e., smaller than a trash can) and in its early stages.
- The employee must have an escape route.
- The employee must be trained and know they have the right type of extinguisher.
- The employee must be safe from toxic gases.
- There must be no hazardous conditions that could quickly accelerate the fire (e.g., presence of chemicals and/or combustibles, especially dry grass, etc.).
- Above all, if in doubt, the employee must not attempt to fight the fire.

4.3.6 Other

The following additional emergency scenarios could potentially occur based on the site and/or planned scope of work:

- | | | | |
|---|--|--|-----------------------------------|
| <input type="checkbox"/> Avalanche | <input type="checkbox"/> Emergency Rescue | <input type="checkbox"/> Severe Winter Storm | <input type="checkbox"/> Tornado |
| <input type="checkbox"/> Bear Attacks / Charges | <input type="checkbox"/> Explosion | <input checked="" type="checkbox"/> Spill or Release | <input type="checkbox"/> Wildfire |
| <input type="checkbox"/> Earthquake | <input type="checkbox"/> Floods/Heavy Rain | <input type="checkbox"/> No Other Credible Scenarios | |
| <input type="checkbox"/> Electrical Live Line Contact | <input type="checkbox"/> Gas Leak | | |

NYSDEC Petroleum Spill Requirements

All petroleum spills that occur at the site must be reported to the **NYSDEC Spill Hotline (1-800-457-7362)** within 2 hours of discovery, except spills which meet all of the following criteria:

- The quantity is known to be less than 5 gallons; and
- The spill is contained and under the control of the spiller; and
- The spill has not and will not reach the State's water or any land; and
- The spill is cleaned up within 2 hours of discovery.

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4.4 Fitness for Duty and Illness Reporting

AECOM employees should always live our life-preserving principle of “Fitness for Duty”, which requires employees to stay home from work when they are sick, as they are not “Fit for Duty” when ill, whether with the flu, Coronavirus, or other illness, especially contagious illnesses.



5. Site Description

The Site, , is located at 175 West Union Street, Newark, NY 14513. The site was formerly occupied by Grand Dry Cleaners and is approximately 0.36 acres in size. The footprint of the former drycleaner is now occupied by the parking lot for Union Street Automotive repair shop and Gulf brand gasoline station (175 West Union Street) as well as a small portion of the Newark Mini Mart & Deli building footprint (105 West Union Street). The site is surrounded by commercial use buildings to the east, west, and south with the Erie Canal lining the northern border. NYSDEC State Superfund Site, NYSEG-Newark MGP-859021, is north of the site and its southern border is also lined by the Erie Canal.

5.1 Site Background/History

This facility was historically used as a drycleaner, a flour/feed mill, and commercial businesses including one identified as “Paints and Oils”, and another identified as “Radiator Repair” prior to operation as a former dry cleaner. Additionally, historic documents indicate the presence of gasoline tanks in the eastern and western portions of the Site. Previous investigations generally terminated test borings at depths less than 20 feet below the existing ground surface.

Prior investigations at the Site indicate that subsurface primary contaminants of concern include petroleum products and chlorinated volatile organic compounds (VOCs). Historical data indicates contaminant concentrations have exceeded CP-51 Soil Cleanup Levels for toluene (3640 ppb) and n-propylbenzene (5650 ppb). VOC concentrations have exceeded groundwater standards for benzene (8.8 ppb), n-butylbenzene (22.9 ppb), sec-butylbenzene (15.4 ppb), isopropylbenzene (55 ppb), n-propylbenzene (282 ppb), tetrachloroethene (387 ppb), trichloroethene (13.5 ppb). Metals concentrations have surpassed groundwater standards for arsenic (125 ppb), barium (1430 ppb), chromium (232 ppb), and lead (547 ppb).

5.2 Client and/or Third-Party Operations at Site

The Site is currently being used as a parking lot for the Union Street Automotive Repair Shop and a Gulf brand gasoline station. A small portion of the site is being used by Newark Mini Mart & Deli as a convenience store.

5.3 Scope of Work

AECOM prepared subcontractor scopes of work for drilling activities to install two bedrock monitoring wells and at least three and up to six overburden monitoring wells (if any of the existing three wells installed during previous investigations are damaged beyond repair) as part of the site characterization work. This task also includes a geophysical utility clearance, soil and groundwater sampling, transportation and off-site disposal of investigation-derived waste (IDW), and a site survey. The field work includes the following elements:

- Geophysical utility location services will be performed by an AECOM subcontractor.
- Existing monitoring wells will be inspected, redeveloped, gauged (using an oil/water interface meter) and sampled using low-flow sampling procedures for VOC analysis by EPA Method 8260C
- Soil borings will be advanced to bedrock utilizing a truck mounted drill rig by an AECOM subcontractor. The drill rig shall be capable of advancing a hollow stem auger with a 4¼ -inch inside diameter (I.D.) and capable of advancing 4-inch temporary spun casing into the top of bedrock as to create a seal to allow for the circulation of water for coring at two (2) of the boring locations. Bedrock wells will be installed approximately 15 feet into bedrock. Rock cores will be collected to obtain additional stratigraphic data. After the AECOM geologist completes logging and takes photographs, the rock cores will be drummed for off-site disposal. Drilling and soil sampling will be conducted continuously to classify subsurface material and select soil samples for laboratory analyses.

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- One soil sample will be collected from each of the five soil boring locations for a total of five soil samples (if the wells previously installed by Day Environmental in 2015 are not functional and need to be re-installed, one soil sample will also be collected from each of the reinstalled wells and be subjected to Volatile Organic Compound, Semi-Volatile Organic Compound, and Metals [including Mercury and Cyanide] Analysis).
- All soil borings will be converted to monitoring wells (overburden and bedrock).
- Each new monitoring well will be developed by pumping until the discharged water is relatively sediment free and the indicator parameters (pH, temperature, and specific conductivity) have reached steady state.
- Prior to collecting groundwater samples, a comprehensive round of water levels will be collected from the two new bedrock monitoring wells, three new overburden monitoring wells, and three existing monitoring wells.
- Groundwater samples will be collected from the two new bedrock, three new overburden monitoring wells and the five existing groundwater wells using low-flow sampling procedures.
- All soil spoils, rock cores, decontamination fluids, and well development and purge water will be drummed for off-site disposal.
- One solid and one aqueous sample will be collected for disposal parameters as required by the disposal facility to complete the waste profiles for the IDW transportation and off-site disposal.
- Location and elevation survey of the borings and monitoring wells will be performed by an AECOM subcontractor.

What means of transportation will be used to get to the jobsite?

☒ Rental or personal vehicle (include Driving Task Hazard Assessment)

☐ I will use other means of transportation*

*While AECOM always encourages the use of public transportation - in those instances where an employee is unfamiliar with a city, area, or transportation system, or the employee is apprehensive about using public transportation please use Uber or some other form of prearranged transportation. When using Uber or something similar never share the ride with anyone you don't know.

A Task Hazard Assessment (THA) for each operation being performed by AECOM and each operation performed by an AECOM subcontractor working under the AECOM HASP must be included in **Attachment A**, while those performed by the managed subcontractors should be prepared by the subcontractor.

Table 5-1: Task List

Task Name	Permit(s) Required		Primary Task Performed By		
			AECOM	SUB	Third-Party
Driving To and From the Site	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Load and Unload Vehicle	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Drilling, Grouting, Monitoring Wells	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Geoprobe Drilling Oversight	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Gauging Groundwater Monitoring Wells	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Groundwater Sampling – Low Flow	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hand and Power Tools	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Hollow Stem Auger Drilling Oversight	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
IDW Management	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Monitoring Well Construction	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Oversight of Utility Clearance	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Portable Generator Operation	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Site Walk – Construction/Demolition Site	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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5.4 Key Dates

Project Start Date:	July 15, 2024
Field Work Start Date:	November 4, 2024
Project Completion Date:	March 11, 2025

5.5 Physical and Biological Hazards

Physical and biological hazards are hazards that threaten the physical safety of an individual; contact with the hazard typically results in an incident or injury. The following table summarizes the physical and biological hazards present at the site and the associated procedures that address protection and prevention of harm.

- If there is a potential of physical or biological hazard when performing a specific task, it must be addressed in the THA.

Some tasks are considered High Potential (HiPo) Hazard Activities as identified in [S3AM-209-PR1](#), Risk Assessment, based on the factors contributing to the severity and probability of credible outcomes resulting from ineffective mitigation of their hazards and are designated with “HH” in the table below. High potential hazard activities typically require additional documents such as a Safe Work Permit ([S3AM-218-FM1](#)), activity-specific permit, site specific plans, task/equipment-specific training, pre-use inspections, a competent person, etc.

All checked procedures MUST be included in **Attachment B** for implementation and reference. The following hazards and their site-specific description are anticipated based on the scope of work and project site:

Table 5-2: Anticipated Activities, Situations and Physical & Biological Hazards

Activity / Situation / Physical or Biological Hazard	Applicable SH&E Procedure(s)	Related Activity-Specific Permit or Plan (Typically Required)
<input checked="" type="checkbox"/> Bloodborne Pathogens	S3AM-111-PR1	n/a
<input checked="" type="checkbox"/> Cold Stress	S3AM-112-PR1	n/a
<input checked="" type="checkbox"/> Corrosive Reactive Materials	S3AM-125-PR1	n/a
<input checked="" type="checkbox"/> Drilling, Boring & Direct Push Probing HH	S3AM-321-PR1	n/a
<input checked="" type="checkbox"/> Driving	S3AM-005-PR1	S3AM-005-FM1
<input checked="" type="checkbox"/> Flammable and Combustible Liquids	S3AM-126-PR1	n/a
<input checked="" type="checkbox"/> Hand and Power Tools (drill, chainsaw, grinder, power saw, pressure washer, etc.) HH	S3AM-305-PR1	n/a
<input checked="" type="checkbox"/> Hand Hazards	S3AM-317-PR1	n/a
<input checked="" type="checkbox"/> Hazardous Waste Operations HH	S3AM-117-PR1	n/a
<input checked="" type="checkbox"/> Heat Stress	S3AM-113-PR1	S4DCS-AM-113-FM1
<input checked="" type="checkbox"/> Heavy Equipment	S3AM-309-PR1	S3AM-218-FM1
<input checked="" type="checkbox"/> Manual Lifting	S3AM-014-PR1	n/a
<input checked="" type="checkbox"/> Material Storage	S3AM-316-PR1	n/a
<input checked="" type="checkbox"/> Non-Ionizing Radiation	S3AM-121-PR1	n/a
<input checked="" type="checkbox"/> Overhead Lines and Obstructions HH	S3AM-322-PR1	S3AM-218-FM1
<input checked="" type="checkbox"/> Underground Utilities HH	S3AM-331-PR1	S3AM-331-FM1
<input checked="" type="checkbox"/> Wildlife, Plants, and Insects	S3AM-313-PR1	n/a
<input checked="" type="checkbox"/> Working Alone HH	S3AM-314-PR1	Lone Worker Management Plan (Section 9.5)

Note: HH – High-Hazard Activity or Situation

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5.5.1 Competent Persons

A competent person is an employee who, through education, training, and experience, has knowledge of applicable regulatory requirements, is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them. AECOM's Competent Person Designation Procedure, [S3AM-202-PR1](#), explains the roles, responsibilities and procedures of naming a competent person.

Table 5-3: Competent Person Log

☒ Scope of Work requires one or more competent persons (see table below)

☐ None, Scope of Work does not require competent persons(s).

	Activity / Area of Competency	Name of Person (Affiliation) Note: Subcontractors may provide this person
<input checked="" type="checkbox"/>	Geophysical Survey	■ Keith Stahle - (607) 398-4284
<input checked="" type="checkbox"/>	Heavy Equipment	■ Greg T. Genco - (716) 649-8110

5.6 Chemical & Airborne Hazards/ Constituents of Concern

Airborne and chemical hazards are types of occupational hazards caused by workplace exposures. Exposure to airborne materials and chemicals in the workplace can cause acute or long-term detrimental health effects. Potential exposure to these hazards on AECOM projects can come from several sources including materials brought on site to perform work, constituents of concern found in environmental media under investigation, and simultaneous operations being performed at the site by the property owner/third parties.

Based on information obtained from historical investigations and other sources, the chemicals in the table below are known or suspected to be present at the site.

Table 5-4: Summary of Hazardous Properties of Chemical and Airborne Hazards

Notes: PEL = Permissible Exposure Limit | TLV = Threshold Limit Value | IP = Ionization Potential | eV = Electron Volt

Chemical Name	Media		Primary Routes of Exposure	PEL	TLV	IP (eV)
Metals						
Arsenic	<input type="checkbox"/> Soil <input type="checkbox"/> Vapor	<input checked="" type="checkbox"/> Groundwater <input type="checkbox"/> N/A	Dermal	0.5 mg/m³	0.2 mg/m³	n/a
Barium	<input type="checkbox"/> Soil <input type="checkbox"/> Vapor	<input checked="" type="checkbox"/> Groundwater <input type="checkbox"/> N/A	Dermal	0.5 mg/m³	0.5 mg/m³	n/a
Chromium	<input type="checkbox"/> Soil <input type="checkbox"/> Vapor	<input checked="" type="checkbox"/> Groundwater <input type="checkbox"/> N/A	Dermal	0.5 mg/m³	0.5 mg/m³	n/a
Lead	<input type="checkbox"/> Soil <input type="checkbox"/> Vapor	<input checked="" type="checkbox"/> Groundwater <input type="checkbox"/> N/A	Dermal	0.05 mg/m³	0.05 mg/m³	n/a
Other Common Site COCs						
Benzene	<input checked="" type="checkbox"/> Soil <input type="checkbox"/> Vapor	<input checked="" type="checkbox"/> Groundwater <input type="checkbox"/> N/A	Inhalation	1 ppm	0.5 ppm	9.24
N-Propylbenzene	<input checked="" type="checkbox"/> Soil <input type="checkbox"/> Vapor	<input checked="" type="checkbox"/> Groundwater <input type="checkbox"/> N/A	Inhalation	N/A	N/A	N/A

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Table 5-4: Summary of Hazardous Properties of Chemical and Airborne Hazards

Notes: PEL = Permissible Exposure Limit | TLV = Threshold Limit Value | IP = Ionization Potential | eV = Electron Volt

Chemical Name	Media	Primary Routes of Exposure	PEL	TLV	IP (eV)
N-Butylbenzene	<input type="checkbox"/> Soil <input checked="" type="checkbox"/> Groundwater <input type="checkbox"/> Vapor <input type="checkbox"/> N/A	Inhalation	N/A	N/A	N/A
Sec-Butylbenzene	<input type="checkbox"/> Soil <input checked="" type="checkbox"/> Groundwater <input type="checkbox"/> Vapor <input type="checkbox"/> N/A	Inhalation	N/A	N/A	N/A
Isopropylbenzene	<input type="checkbox"/> Soil <input checked="" type="checkbox"/> Groundwater <input type="checkbox"/> Vapor <input type="checkbox"/> N/A	Inhalation	50 ppm	N/A	8.75
Cis-1,2-Dichloroethylene	<input type="checkbox"/> Soil <input checked="" type="checkbox"/> Groundwater <input type="checkbox"/> Vapor <input type="checkbox"/> N/A	Inhalation	200 ppm	50 ppm	10.0
Petroleum	<input type="checkbox"/> Soil <input checked="" type="checkbox"/> Groundwater <input type="checkbox"/> Vapor <input type="checkbox"/> N/A	Inhalation	500 ppm	N/A	N/A
Tetrachloroethylene (PCE)	<input type="checkbox"/> Soil <input checked="" type="checkbox"/> Groundwater <input type="checkbox"/> Vapor <input type="checkbox"/> N/A	Inhalation	100 ppm	25 ppm	9.32
Trichloroethylene (TCE)	<input type="checkbox"/> Soil <input checked="" type="checkbox"/> Groundwater <input type="checkbox"/> Vapor <input type="checkbox"/> N/A	Inhalation	100 ppm	50 ppm	9.45
Toluene	<input checked="" type="checkbox"/> Soil <input type="checkbox"/> Groundwater <input type="checkbox"/> Vapor <input type="checkbox"/> N/A	Inhalation	200 ppm	20 ppm	8.82

5.7 Decontamination

All possible and necessary steps shall be taken to reduce or minimize contact with chemicals and contaminated/impacted materials while performing field activities. Decontamination steps are outlined in the Hazardous Waste Operations procedure [S3AM-117-PR1](#). All decontaminated equipment shall be visually inspected for contamination prior to leaving the Contaminant Reduction Zone (CRZ).

Table 5-5: Decontamination Procedures & Equipment

Procedure	Equipment Needed
Remove all equipment, sample containers, and notes to the CRZ. Obtain decontamination solutions and decontaminate the tools (shovels, auger flights, etc.) by brushing them under a water rinse. A high-pressure steam cleaner also may be used for decontamination. All waste and spent decontamination solutions will be properly contained.	Alconox solution, deionized water, brushes
Remove disposable booties, or scrub boots with a stiff bristle brush and water, when necessary. Wash tubs and chairs will be provided.	Deionized water and brushes
Remove outer chemical resistant gloves (and boot covers, if used).	
Remove Tyvek coverall; discard in provided container.	
Remove hardhat and eye protection.	
Remove respirator.	
Remove inner gloves.	
Wash hands and face.	Deionized water
The decontamination area will be covered with plastic sheeting that will be replaced when torn or heavily soiled and at the end of each shift.	Plastic sheeting

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Table 5-6: Equipment Decontamination Procedures

Type Equipment	Decontamination Solution	Procedure
Respirator	Alconox Solution and deionized water	Washing: Disassemble and wash with an Alconox solution in deionized water. A stiff bristle (not wire) brush may be used. Rinsing: Rinse in deionized water to remove all traces of detergent. This is important to prevent dermatitis. Disinfecting: Thoroughly rinse or immerse in a sanitizer provided by the manufacturer. Final Rinsing: Rinse thoroughly in clean water to remove all traces of disinfectant. Drying: Drain and dry by hanging by the straps from racks or by towel drying with clean, soft cloths or paper towels.
Water quality meter, oil/water interface probe, down-hole water sampling pumps, reusable sampling tools/equipment	Alconox Solution and deionized water	Washing: Disassemble and wash with an Alconox solution in deionized water. Rinsing: Rinse in deionized water to remove all traces of detergent.
Drilling Equipment/ Tools	High-pressure steam cleaner	Apply steam cleaner to used equipment/ tools



6. Air Monitoring

Potential exposure to chemical hazards from sources including materials brought on site to perform work, constituents of concern found in environmental media under investigation, and/or simultaneous operations being performed at the site by the property owner/third parties are reasonably anticipated to have the potential to result in vapors, fumes, aerosols, mists, and/or airborne particulates/dusts at or near permissible exposure limits. Therefore, air monitoring that will be implemented is described below.

6.1 Real Time Exposure Measurements/Equipment

Monitoring shall be performed within the work area on site to detect the presence and relative levels of toxic substances. The data collected throughout monitoring shall be used to determine the appropriate levels of PPE. Monitoring shall be conducted as specified in the work permit and THA as work is performed. All instrumentation needs to be rated intrinsically safe to prevent fire or explosion.

Table 6-1: Air Monitoring Instrumentation Needed

Instrument	Manufacturer/Model	Substances Detected
☒ Photo Ionization Detector (PID)	<ul style="list-style-type: none"> ■ RAE Systems mini-RAE ■ Photovac Microtip ■ Hnu Model Hnu (min. 10.6 eV bulb) 	<ul style="list-style-type: none"> ■ Petroleum hydrocarbons ■ Organic Solvents
☒ Particulate Monitor	<ul style="list-style-type: none"> ■ MIE Model PDM-3 mini-RAM ■ TSI Dustrak 	<ul style="list-style-type: none"> ■ Aerosols, mist, dust, and fumes

6.2 Monitoring Procedures

The monitoring procedures shown below are general guidelines for sampling activities. In general, readings are considered actionable if sustained readings are observed for 5 minutes or more or if intermittent peaks are seen more than 1 time the action level. A reading more than action level outlined below will require additional ventilation (natural or mechanical) for 30 minutes, followed by re-monitoring.

Table 6-2: Monitoring Procedures and Action Levels

Parameter	Zone Location and Monitoring Interval	Action Level	Response Activity
☒ Volatile Organic Compounds (VOCs) and Volatile Hydrocarbons (total by PID)	Breathing zone, continuously during tasks where exposure to VOCs and volatile hydrocarbons is possible	<p>< 5 ppm</p> <p>5- 25 ppm (sustained for 5 minutes)</p>	<ul style="list-style-type: none"> ■ Continue monitoring, may continue work in required PPE ■ STOP WORK and notify PM. Investigate the cause of elevated VOC measurements and identify measures to reduce concentrations (cover impacted soils, ventilation, etc.). Work activities shall only continue once levels have decreased to or below 5 units above background. If levels continue above 5 units, only individuals who are medically qualified to wear respiratory protection are permitted to continue work activities with Project Manager approval. Don Level C PPE

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Table 6-2: Monitoring Procedures and Action Levels

	Parameter	Zone Location and Monitoring Interval	Action Level	Response Activity
				(organic vapor respirator cartridges), continue monitoring, and initiate continuous air monitoring for benzene.
			> 25 ppm (sustained for 5 minutes)	■ Cease work, exit, and contact the Site Safety Officer, Site Supervisor, and Project Manager.
☒	Volatile Organic Compounds (VOCs) and Volatile Hydrocarbons (total by PID)	Edge of Exclusion Zone. See guidance in NYSDOH's Generic Community Air Monitoring Plan (Attachment E).		■ See guidance in NYSDOH's Generic Community Air Monitoring Plan (Attachment E).
☒	Dust not otherwise classified (total by aerosol monitor)	Breathing zone every 30 minutes during field activities where exposure to excessive dusts are possible	< 5 mg/m ³	■ Continue work in Level D and continue monitoring
			> 5 mg/m ³	■ Upgrade to Level C (P100 respirator cartridges), implement dust suppression measures; contact the Site Safety Officer & Site Supervisor.
			> 10 mg/m ³	■ Cease activities, implement more effective dust suppression measures; contact the Site Safety Officer & Site Supervisor.
☒	Dust not otherwise classified (total by aerosol monitor)	Edge of Exclusion Zone. See guidance in NYSDOH's Generic Community Air Monitoring Plan (Attachment E).		■ See guidance in NYSDOH's Generic Community Air Monitoring Plan (Attachment E).



7. Subcontractor Selection

7.1 Subcontractor Pre-Qualification

Ensure all subcontractors including lower tier subcontractors are prequalified to perform work for AECOM. Coupa is the preferred method for pre-qualifying subcontractors. If a subcontractor is conditionally approved, ensure the subcontractor meets all conditions of approval. If a subcontractor requires a variance, complete the Subcontractor Variance form, [S3AM-213-FM2](#).

Subcontractor 1: Atlantic Testing Laboratories, Inc. (WBE)		
Scope of Work:		
ASSIGNED TASK(S)	HIGH RISK TASK	CONTRACTOR SITE SUPERVISOR
■ Drilling Services	■ Yes	Greg T. Genco: (716) 649-8110
Required Subcontractor Documents:		
PM must verify that the following documents are in-place for each subcontractor; check to verify.		
Select One:	<input checked="" type="checkbox"/> Copy of task specific THAs/JHAs and inspection/tailgate forms <input type="checkbox"/> Competent Person Documentation <input type="checkbox"/> Copy of their business license and training certificates (task specific) <input type="checkbox"/> Copy of their Corporate Safety Management Manual <input type="checkbox"/> Copy of the signed contract	
<input checked="" type="checkbox"/> Subcontractor's Project/Site-specific Health and Safety Plan OR <input type="checkbox"/> Subcontractor will work under AECOM's Health and Safety Plan and field personnel will sign the AECOM HASP Acknowledge Form		
Prequalification Status		
Supplier Status	Action(s)	
<input checked="" type="checkbox"/> Approved	None, skip to next subcontractor	
<input type="checkbox"/> Conditionally Approved	List condition(s) of approval below and describe how condition(s) will be met.	
<input type="checkbox"/> Pending Approval	Subcontractor is NOT approved for use	
Safety Conditions of Approval that Apply to Subcontractor (check all that apply)		
<input type="checkbox"/> AECOM PM will prepare and obtain AECOM SH&E approval of a variance to use this subcontractor. AECOM PM will ensure the control measures listed in the variance are implemented.		
<input checked="" type="checkbox"/> Subcontractor will work under the AECOM HASP. AECOM PM will verify that the AECOM HASP covers the subcontractor's scope of work. Subcontractor's field personnel will review the AECOM HASP and sign the HASP Acknowledgement Form (Section 19).		
<input checked="" type="checkbox"/> Subcontractor has prepared a Site-Specific HASP for their activities that has been reviewed and accepted by AECOM SH&E.		
<input checked="" type="checkbox"/> AECOM Site Supervisor and/or Site Safety Officer will supervise the subcontractor's field activities at the Site.		
<input type="checkbox"/> Other: N/A		

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Subcontractor 2: Advanced Geological Services		
Scope of Work:		
ASSIGNED TASK(S)	HIGH RISK TASK	CONTRACTOR SITE SUPERVISOR
■ Geophysical Survey Services	■ No	Robert J. Mundt: (610) 722-5500
Required Subcontractor Documents:		
PM must verify that the following documents are in-place for each subcontractor; check to verify.		
Select One:	<input checked="" type="checkbox"/> Copy of task specific THAs/JHAs and inspection/tailgate forms <input type="checkbox"/> Competent Person Documentation <input checked="" type="checkbox"/> Copy of their business license and training certificates (task specific) <input type="checkbox"/> Copy of their Corporate Safety Management Manual <input checked="" type="checkbox"/> Copy of the signed contract	
<input checked="" type="checkbox"/> Subcontractor's Project/Site-specific Health and Safety Plan OR <input type="checkbox"/> Subcontractor will work under AECOM's Health and Safety Plan and field personnel will sign the AECOM HASP Acknowledge Form		
Prequalification Status		
Supplier Status	Action(s)	
<input type="checkbox"/> Approved	None, skip to next subcontractor	
<input checked="" type="checkbox"/> Conditionally Approved	List condition(s) of approval below and describe how condition(s) will be met.	
<input type="checkbox"/> Pending Approval	Subcontractor is NOT approved for use	
Safety Conditions of Approval that Apply to Subcontractor (check all that apply)		
<input type="checkbox"/> AECOM PM will prepare and obtain AECOM SH&E approval of a variance to use this subcontractor. AECOM PM will ensure the control measures listed in the variance are implemented.		
<input checked="" type="checkbox"/> Subcontractor will work under the AECOM HASP. AECOM PM will verify that the AECOM HASP covers the subcontractor's scope of work. Subcontractor's field personnel will review the AECOM HASP and sign the HASP Acknowledgement Form (Section 19).		
<input checked="" type="checkbox"/> Subcontractor has prepared a Site-Specific HASP for their activities that has been reviewed and accepted by AECOM SH&E.		
<input checked="" type="checkbox"/> AECOM Site Supervisor and/or Site Safety Officer will supervise the subcontractor's field activities at the Site.		
<input type="checkbox"/> Other: N/A		

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Subcontractor 3: Franks Vacuum Truck Service		
Scope of Work:		
ASSIGNED TASK(S)	HIGH RISK TASK	CONTRACTOR SITE SUPERVISOR
■ IDW T&D Services	■ Yes	Pu Murell: (716) 284-2132
Required Subcontractor Documents:		
PM must verify that the following documents are in-place for each subcontractor; check to verify.		
Select One:	<input checked="" type="checkbox"/> Copy of task specific THAs/JHAs and inspection/tailgate forms <input type="checkbox"/> Competent Person Documentation <input type="checkbox"/> Copy of their business license and training certificates (task specific) <input type="checkbox"/> Copy of their Corporate Safety Management Manual <input type="checkbox"/> Copy of the signed contract	
<input checked="" type="checkbox"/> Subcontractor's Project/Site-specific Health and Safety Plan OR <input type="checkbox"/> Subcontractor will work under AECOM's Health and Safety Plan and field personnel will sign the AECOM HASP Acknowledge Form		
Prequalification Status		
Supplier Status	Action(s)	
<input type="checkbox"/> Approved	None, skip to next subcontractor	
<input type="checkbox"/> Conditionally Approved	List condition(s) of approval below and describe how condition(s) will be met.	
<input checked="" type="checkbox"/> Pending Approval	Subcontractor is NOT approved for use	
Safety Conditions of Approval that Apply to Subcontractor (check all that apply)		
<input type="checkbox"/> AECOM PM will prepare and obtain AECOM SH&E approval of a variance to use this subcontractor. AECOM PM will ensure the control measures listed in the variance are implemented.		
<input checked="" type="checkbox"/> Subcontractor will work under the AECOM HASP. AECOM PM will verify that the AECOM HASP covers the subcontractor's scope of work. Subcontractor's field personnel will review the AECOM HASP and sign the HASP Acknowledgement Form (Section 19).		
<input checked="" type="checkbox"/> Subcontractor has prepared a Site-Specific HASP for their activities that has been reviewed and accepted by AECOM SH&E.		
<input checked="" type="checkbox"/> AECOM Site Supervisor and/or Site Safety Officer will supervise the subcontractor's field activities at the Site.		
<input type="checkbox"/> Other: N/A		

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Subcontractor 4: Ravi Engineering & Land Surveying (MBE)		
Scope of Work:		
ASSIGNED TASK(S)	HIGH RISK TASK	CONTRACTOR SITE SUPERVISOR
■ Site Survey Services	■ No	Sean J. Baldwin: (585) 697-2823
Required Subcontractor Documents:		
PM must verify that the following documents are in-place for each subcontractor; check to verify.		
Select One:	<input checked="" type="checkbox"/> Copy of task specific THAs/JHAs and inspection/tailgate forms <input type="checkbox"/> Competent Person Documentation <input type="checkbox"/> Copy of their business license and training certificates (task specific) <input type="checkbox"/> Copy of their Corporate Safety Management Manual <input type="checkbox"/> Copy of the signed contract	
<input checked="" type="checkbox"/> Subcontractor's Project/Site-specific Health and Safety Plan OR <input type="checkbox"/> Subcontractor will work under AECOM's Health and Safety Plan and field personnel will sign the AECOM HASP Acknowledge Form		
Prequalification Status		
Supplier Status	Action(s)	
<input type="checkbox"/> Approved	None, skip to next subcontractor	
<input type="checkbox"/> Conditionally Approved	List condition(s) of approval below and describe how condition(s) will be met.	
<input checked="" type="checkbox"/> Pending Approval	Subcontractor is NOT approved for use	
Safety Conditions of Approval that Apply to Subcontractor (check all that apply)		
<input type="checkbox"/> AECOM PM will prepare and obtain AECOM SH&E approval of a variance to use this subcontractor. AECOM PM will ensure the control measures listed in the variance are implemented.		
<input type="checkbox"/> Subcontractor will work under the AECOM HASP. AECOM PM will verify that the AECOM HASP covers the subcontractor's scope of work. Subcontractor's field personnel will review the AECOM HASP and sign the HASP Acknowledgement Form (Section 19).		
<input checked="" type="checkbox"/> Subcontractor has prepared a Site-Specific HASP for their activities that has been reviewed and accepted by AECOM SH&E.		
<input checked="" type="checkbox"/> AECOM Site Supervisor and/or Site Safety Officer will supervise the subcontractor's field activities at the Site.		
<input type="checkbox"/> Other: N/A		

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8. Training and Documentation

All personnel at this site must be qualified and experienced in the tasks they are assigned. SH&E Training Procedure [S3AM-003-PR1](#) establishes the general training requirements for AECOM employees.

8.1 Site-Specific Training Requirements

The following training is applicable to the site and/or scope of work:

Table 8-1: Site Specific Training Requirements

Training		Applies to
<input checked="" type="checkbox"/>	ERP/HASP and Site Orientation	All Employees and Subcontractors
<input checked="" type="checkbox"/>	Vehicle/Driver Safety & Defensive Driving	All Employees who drive on behalf of AECOM
<input checked="" type="checkbox"/>	Field Safety	Employees visiting the field that does not require HAZWOPER
<input checked="" type="checkbox"/>	Speak Up/Listen Up (SULU)	All AECOM field employees and supervisors
<input checked="" type="checkbox"/>	First Aid / CPR	Designated employees or employees performing high risk activities and medical attention is more than 4 minutes away
<input checked="" type="checkbox"/>	OSHA 10-Hr. Construction Safety (or CSTS 2020 in Canada)	All employees working on jobsites with construction type hazards
<input checked="" type="checkbox"/>	OSHA 30-Hr. Construction Safety	All employees supervising/overseeing jobsites with construction type hazards
<input checked="" type="checkbox"/>	HAZWOPER 40-Hour and 8-Hr. Annual Refresher	On HAZWOPER sites, in EZ, exposed to hazardous contamination
<input checked="" type="checkbox"/>	HAZWOPER Supervisor	Employees managing others in HAZWOPER activities or at HAZWOPER Sites



9. Site Control

9.1 Site Work Zones

Site layout and site control need to be coordinated to achieve a productive work environment and efficient work process while minimizing exposure of employees and the public to hazards associated with the work. Consider the following items when planning the site layout and controls. Check the description of the site controls **already** in place:

Table 9-1: Site Controls Already in Place

- | | |
|-------------------------------------|---|
| <input type="checkbox"/> | Work area is within a facility/property with secure and restricted access provided by client or third party |
| <input type="checkbox"/> | Work area is enclosed within a facility/property, but access is not restricted via locks, guards, or gates |
| <input type="checkbox"/> | Work area is on a property that is open, but access by the public is unlikely |
| <input checked="" type="checkbox"/> | Work area is on a property that is open and access by the public is likely |
| <input type="checkbox"/> | Work area is in a roadway or right of way of a roadway (Traffic Control/Protection Plan required S3AM-306-PR1) |
| <input checked="" type="checkbox"/> | Work area is in a parking lot or driveway |
| <input type="checkbox"/> | Work area is on or near railroad, including right of way, active lines and crossings |
| <input type="checkbox"/> | Other: N/A |

Consider the following items when planning the site layout and controls:

- "Line of Fire" hazards- overhead utilities, falling/ tipping equipment, release of energy/ pressure, flying debris
- Noise, dust, odor suppression
- Contamination containment and decontamination area layout
- Traffic control for site vehicles/ equipment (public traffic control requires Traffic Control Plan)
- Restricted access for areas requiring special training, skills, or certifications
- Restriction of work near railroads
- Presence or creation of excavations
- Loading/unloading areas
- Portable restrooms
- Dumpsters and bins
- Equipment lay down
- Heavy equipment parking
- Overnight safety and security needs

The following additional site controls will be implemented in work area(s) to protect the public and AECOM work team:

Table 9-2: Additional Site Controls to be Implemented

Control Item	Description of Type and Application
<input type="checkbox"/> Fence	N/A
<input checked="" type="checkbox"/> Locks	Locks up monitoring wells to prevent access by public.
<input type="checkbox"/> Barricades	N/A
<input type="checkbox"/> Cones	N/A

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<input type="checkbox"/> Tape	N/A
<input type="checkbox"/> Hole Covers	N/A
<input type="checkbox"/> Other:	N/A

9.2 Simultaneous Operations

Simultaneous and neighboring operations, including activities performed by the general public, our clients, and other workers or contractors working near our employees, often present a need for added co-ordination and communication to address hazards that are presented by multiple operations.

Table 9-3: Simultaneous Operations Within the Site

☒ Yes, see table below for details

☐ None, not applicable

Activity	Company	Contact Person (Activity Lead)	Contact's Phone Number	Addressed in THA(s)	
Repair Shop	Union Auto Street Repair Shop	TBD	TBD	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Gas Station	Gulf	TBD	TBD	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Convenience Store	Newark Mini Mart & Deli	TBD	TBD	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No

Table 9-4: Simultaneous Operations on Neighboring Sites

☒ Yes, see table below for details

☐ None, not applicable

Activity	Company	Contact Person (Activity Lead)	Contact's Phone Number	Addressed in THA(s)	
NYSDEC State Superfund Site	NYSEG – Newark MGP	TBD	TBD	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
				<input type="checkbox"/> Yes	<input type="checkbox"/> No
				<input type="checkbox"/> Yes	<input type="checkbox"/> No

9.3 Site Control Maps/Diagrams

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Work Area Layout



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9.4 Situational Awareness – Personal Security

The ability to observe, identify, process, and understand critical elements of information within changing environments. If you see something, say something. Know what is going on around you, anticipate what might happen next. Have a plan of what you will do next, including where you are going, alternate routes and a plan of action. Evaluate what is happening around you as you move through daily activities, noting if something looks out of place or unusual. Be aware of barriers that may change your critical thinking such as distractions, being in a hurry, fatigue, focus lock and past experiences. Listen to your instinct – if something doesn't look or feel right, do something about it. All employees need to review the Situational Awareness Guidance for Employees. In event of a Security Issue please contact **Global Security & Resilience** at GSR@aecom.com.

9.5 Lone Worker

AECOM discourages employees from working alone (i.e., where AECOM personnel are out of visual and audio range of others) when performing field tasks (see Working Alone SHE Procedure [S3AM-314-PR1](#)). If lone work is to be performed, a communications/check-in plan must be developed and implemented using the table below.

Table 9-5: Lone Worker Management Plan

Justification:	Field activities do not warrant the need for two people.
Lone Worker:	TBD
Check-In Requirement:	Check in with project manager by text or phone within 1 hour of end of shift.
Check-In Contact:	Project Manager – Kristine Garbarino: (845)-309-9606
Hazard Summary:	Potential hazards include slip/trip/fall by tools of the job, vehicle hazards, injury by people, etc.
Response Plan:	Dispatch an available backup employee if required, call police/911



10. Personal Protective Equipment

The use of Personal Protective Equipment (PPE) forms the final barrier of protection between the employee and the hazard and applies to all employees at the work site, including Subcontractors, visitors and client or customer representatives. For additional information on PPE, please review the Personal Protective Equipment, [S3AM-208-PR1](#).

The minimum PPE required on an AECOM project is as follows:

- | | |
|---|--|
| ■ Hard Hat or Helmet | ■ Shirt with sleeves that cover the shoulders. |
| ■ Safety Glasses with side shields | ■ Long Pants |
| ■ High Visibility Safety Vest | ■ Safety-toe Boots |
| ■ Gloves (on person) – Required to be worn if handling materials, equipment, etc. | |

Specific PPE shall also be specified in Task Hazard Analyses (THAs) such as glove type (i.e. material, level of protection, etc.). Where possible, hazards will be eliminated or controlled to reduce the risk associated with a specific task.

These controls include:

- Elimination of the hazard
- Isolation of the hazard
- Engineering Controls
- Administrative Controls

With the exception of prescription safety eyewear and safety toed boots (there may be allowances for the purchase of these items), AECOM will make available all required PPE for its employees. All employees will receive training in the use, care, maintenance, and storage of the PPE issued to them.

All personal protective equipment will meet the requirements of local, state, federal, client and AECOM SH&E regulations and procedures. Where site-specific PPE requirements exist, all AECOM employees, subcontractors, and visitors, who work on the Project, will follow those requirements.

- PPE will **not** be modified or changed.
- All PPE that is damaged or in need of service or repair will be removed from service immediately.
- All PPE that has been removed from service will be tagged “OUT OF SERVICE” and will not be returned until repaired and inspected by a qualified person. Defective PPE must be removed from site to prevent it from being used.

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11. SH&E Technology

At AECOM, we encourage the use of new technology to eliminate or reduce the risk our employees are exposed to. Mark the technology you will be using in this project (if any):

Table 11-1: SH&E Technology Being Used on Site/Project

- | | |
|-------------------------------------|--|
| <input type="checkbox"/> | Wearable Technology/Smart PPEs (e.g. clothes, helmets, glasses, harness) |
| <input type="checkbox"/> | Site Sensors (e.g. Movement, angle, noise, carbon monoxide, Dust) |
| <input type="checkbox"/> | Fatigue Monitoring |
| <input checked="" type="checkbox"/> | Phone/Tablet Applications or software: Google Earth/Maps |
| <input type="checkbox"/> | Connected Worksites (i.e., connection between employees or project elements to be successful) |
| <input type="checkbox"/> | Drones |
| <input type="checkbox"/> | Virtual Reality (VR) or Augmented Reality (AR) |
| <input type="checkbox"/> | GPS – Location devices: N/A |
| <input type="checkbox"/> | Radio Frequency Identification (RFID) |
| <input type="checkbox"/> | Other: N/A |
| <input type="checkbox"/> | None of these: We will not use any technology in this project to reduce hazards |

Find available tools and/or share the tools you will be using in the AECOM Technology Toolbox or let us know what would be interesting to assess by [clicking here](#) or explore in the [NSC Technology site](#) for new available safety technology.





12. Safety, Health, and Environment Program

12.1 AECOM SH&E Policy

AECOM's [Safety, Health and Environment Policy](#), which establishes the framework to attain best-in-class Safety, Health and Environmental (SH&E) performance in the interest of benefitting AECOM's employees and stakeholder in the global marketplace, is available on AECOM's Ecosystem (intranet).

12.2 Safety for Life

"Safety for Life" is a comprehensive integrated AECOM Safety Management System that drives our employees toward AECOM's commitment to achieving zero work-related injuries and/or illnesses; preventing damage to property and the environment; and maintaining an environmentally friendly and sustainable workplace. Our Safety for Life program is supported by nine Life Preserving Principles that apply to all AECOM activities.



12.3 Life Preserving Principles

AECOM has adopted these "Life-Preserving Principles" to help demonstrate the commitment of our Safety for Life program. We firmly believe these "Life-Preserving Principles" will enable AECOM to achieve its goal of zero employee injuries, property damage and an environmentally friendly and sustainable workplace. The nine Life-Preserving Principles ([S2-001-W11](#)), along with their descriptions, can be found on AECOM's Ecosystem (intranet).

	Commitment: Managers will lead on safety, continuously demonstrating commitment to the highest standards.		Recognition and Rewards: Employees are rewarded for safety excellence, and we share best practices.
	Participation: All employees are encouraged to engage in helping to control the risks we face.		Orientation and Training: Our employees will be provided with effective safety training in order to identify and mitigate hazards in the workplace to prevent injuries to themselves and others who may be affected by their actions.
	Budgeting and Staffing for Safety: The costs of managing SH&E are budgeted into every project. Our safety staff are fully trained to provide expert guidance.		Incident Investigation: We investigate recordable incidents and serious near misses to understand the causes and take action to prevent recurrence.
	Pre-planning: We assess risks and produce detailed plans to control them during design, planning, and execution of work.		Fit for Duty: All staff come to work each day fit and well, so they do not pose a hazard to themselves or others.
	Contractor Management: We carefully select and collaborate with all our partners to create a safe working environment.		

12.4 Fitness for Duty

One of AECOM's nine Life-Preserving Principles is Fitness for Duty (see Fitness for Duty procedure ([S3AM-008-PR1](#))). Fitness for Duty means that individuals are in a state (physical, mental, and emotional) that enables them to perform assignments competently and in a manner that does not threaten the health and safety of themselves or others. On certain projects or for specific tasks, fit for duty certifications may be requested of medical providers by SH&E Managers or Human Resources (HR). Employees should ensure they are fit for duty prior to leaving home and unimpaired by substances or fatigue, and if necessary, contact your supervisor rather than attempting to report to work in unfit condition. Supervisors must observe their employees

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and work with the employee, SH&E staff, and HR to address deficiencies. AECOM will **NOT** tolerate retaliation against any employee for filing a complaint or concern regarding their fitness for duty or participating in any way in an investigation.

12.5 Proactive Health

AECOM is committed to promoting proactive health activities in addition to the planning for prevention of safety and environmental incidents. Proactive health activities will be completed on an on-going basis at AECOM on a corporate-wide basis (i.e., the wellness program associated with employee benefits), at offices, and at this project site. Management will be actively involved in providing and encouraging opportunities for health and wellness education and improvement. Health initiatives and education will be discussed periodically during office-based meetings as the safety moment or during the daily tailgate meeting as a toolbox talk. Topics may be related to, but are not limited to, the following:

- | | | |
|---------------------|-----------------------|---------------------|
| ✓ Heart health | ✓ Smoking cessation | ✓ Diet |
| ✓ Stress management | ✓ Diabetes prevention | ✓ Exercise benefits |

Topics and educational materials can be located on the AECOM Wellness page, National Institutes of Health website, Centers for Disease Control and Prevention website, and other reputable sources online.

In addition, the field team will be encouraged to participate in a daily stretch and flex routine (a standardized way to avoid soft tissue damage from work activities) to the best of their abilities, given their own personal limits. It is particularly beneficial to warm and loosen muscles before repetitive work, manual handling of loads, and when working in cold temperatures or with static postures. The Stretch and Flex manual and poster (**Attachment C**) serve as guidance for the leader to follow.

12.6 Fatigue

One aspect of fit for duty is fatigue management. AECOM has developed procedures that limit work periods or requires additional rest under certain circumstances, including during long-distance travel or when working at high altitudes. These procedures also set limits on extended work periods of 14 hours per day or 60 hours per week. A fatigue management plan is required if longer working hours are necessary (see Fatigue Management Procedure [S3AM-009-PR1](#)).

12.7 Driving and Vehicle Safety

The proper operation of vehicles is critical to protecting the safety of AECOM employees and subcontractors. Drivers face numerous hazards while operating vehicles. Some of the hazards include collision with another vehicle, collision with a fixed object, vehicle break down or failure, or falling asleep or becoming otherwise incapacitated while driving. All employees will adhere to Driving procedure [S3AM-005-PR1](#), which includes the following key practices:

1. Authorized Drivers

Managers must authorize drivers following evaluation of driver criteria to drive and maintain an AECOM-owned, leased or rented vehicle, a client or customer-owned vehicle, or a personal vehicle operated in the course of conducting AECOM business.

2. Electronic Devices Prohibited

AECOM prohibits use of all portable electronic devices while operating a motor vehicle/ equipment, which includes being stopped at a traffic light or stop sign. Electronic devices include, but are not limited to, all mobile phones, two-way radios, pagers, iPods, MP3s, GPS, DVD players, tablets laptops, and other portable electronic devices that can cause driver distraction. Hands-free device use is **NOT** allowed.

- GPS units and devices used for navigation may only be used if factory installed or secured to the vehicle with a bracket that allows the driver to view the image without having to take their eyes off the road. Electronic devices shall be setup for operation prior to commencing driving activities and shall NOT be changed by the driver while driving.

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3. Vehicle Inspections

The driver shall conduct pre-trip vehicle inspections prior to each trip. A vehicle inspection checklist, [S3AM-005-FM2](#), can be used to guide and document the inspection process. Vehicle inspection is to include a 360-degree walk around and visual inspection under the vehicle for leaks and obstructions prior to moving the vehicle.

4. Training

All drivers shall complete defensive driver training. Additional training (i.e., hands-on defensive driver training) may apply for medium and high-risk drivers; see Driving procedure [S3AM-005-PR1](#) and SHE Training procedure [S3AM-003-PR1](#) for more details.

5. Journey Management Plan

Drivers who undertake trips in excess of 250 miles (400 kilometers) one way, drive in remote or hazardous areas, or when otherwise deemed necessary, shall develop and document a Journey Management Plan using [S3AM-005-FM1](#) or equivalent.

6. Secure Loads

Cargo is only to be carried within the passenger compartment of a vehicle when segregated and restrained to prevent objects from becoming distractions, obstructions, or projectiles to occupants should emergency vehicle maneuvers be required (e.g., harsh braking or crash). All goods transported on flatbed trucks or in pickup beds must be securely fastened to prevent them from becoming hazards. All applicable laws and regulations regarding securing of loads must be met. It is prudent to check the load after a few miles to ensure that load has not shifted or loosened prior to completing the remainder of the trip.

12.8 Fatigue and Driving Safety

The effect of fatigue is both physiological and psychological and can severely impair a driver's judgement. Fatigue can cause lapses in concentration which could prove fatal. Fatigue is not just a problem for drivers on long trips, as drivers can also suffer from fatigue on short trips.

- ✓ After strenuous fieldwork, consider overnight accommodation or vehicle sharing for staff who are not acclimatized to the type of work.
- ✓ Microsleep can occur with a limited warning, and may be linked to several factors, for example:
 - Microsleep is most likely to occur during times when the circadian rhythm dictates the body should be asleep, such as at dawn, late at night, or in the mid-afternoon (e.g., 1 and 4 am and 1 and 4 pm.).
 - Potential to feel drowsy after a meal.
 - Driving long distances (considered potentially monotonous) even with sufficient sleep.
 - Prolonged sitting and warm ambient temperature may also increase the feeling of sleepiness.
- ✓ If safe to do so, consider undertaking actions to disrupt the microsleep event while identifying a safe place to stop, e.g., open a vehicle window, listen to upbeat music/change music source, or ask the passenger (if present) to engage in conversation.
- ✓ Ensure field staff are familiar with the signs of fatigue and mitigation factors.

The most common visible signs of microsleep include the following:

- | | | |
|-------------------|----------------------------|----------------------|
| ■ Eyelid drooping | ■ Head nodding | ■ Wandering thoughts |
| ■ Eyelid closure | ■ Brief periods of snoring | |

If any of the above become apparent, immediately pull over to a safe location and contact your PM or SH&E representative.



12.9 Hand Safety

The hands are exposed to hazards more than any body part. SH&E Hand Safety Procedure [S3AM-317-PR1](#) describes requirements and best practices including these notable practices:

- **All personnel shall have gloves in their immediate possession 100%** of the time when in a shop or on a work site. Gloves that address the hazard shall be worn when employees work with or near any materials or equipment that present the potential for hand injury due to sharp edges, corrosives, flammable and irritating materials, extreme temperatures, splinters, etc. Use the Gloves Needs Assessment ([S3AM-317-FM1](#)) to help determine the appropriate glove for the hazard(s).
- **Fixed open-blade knives are prohibited** from use during the course of AECOM work. Examples of fixed open-blade knives include pocket-knives, multi-tools, hunting knives, and standard utility knives. For more information about cutting tools, see [S3AM-317-ATT1](#) Safe Alternative Tools.

12.10 Substance Abuse

Drug and alcohol abuse pose a serious threat to the health and safety of employees, clients, and the general public as well as the security of our job sites, equipment, and facilities. AECOM is committed to the elimination of illegal drug use and alcohol abuse in its workplace and regards any misuse of drugs or alcohol by employees to be unacceptable. AECOM Substance Abuse Prevention Procedure ([S3AM-019-PR1](#)) prohibits the use, possession, presence in the body, manufacture, concealment, transportation, promotion or sale of the following items or substances on company premises. Company premises refer to all property, offices, facilities, land, buildings, structures, fixtures, installations, aircraft, automobiles, vessels, trucks and all other vehicles and equipment - whether owned, leased, or used.

- Illegal drugs (or their metabolites), designer and synthetic drugs, mood- or mind-altering substances, and drug use related paraphernalia unless authorized for administering currently prescribed medication;
- Controlled substances that are not used in accordance with physician instructions or non-prescribed controlled substances; and
- Alcoholic beverages while at work or while on any customer- or AECOM-controlled property.

This policy does not prohibit lawful use and possession of current medication prescribed in the employee's name or over-the-counter medications. Employees must consult with their health care provider about any prescribed medication's effect on their ability to perform work safely and disclose any restrictions to their supervisor.

Although some states may pass laws legalizing medical or recreational marijuana use, the use, sale, distribution, and possession of marijuana are violations of federal law and AECOM policy and will subject an employee to disciplinary action up to and including termination in accordance with controlling law. In Canada, where medical and recreational marijuana use is legal, employees must still follow Federal and Provincial laws, and AECOM policy with regards to use and possession. Employees found to be in contravention of legal requirements or AECOM policy will be subject to disciplinary action up to and including termination.

12.11 Rewards and Recognition

One of AECOM's Life Preserving Principles is Recognition and Rewards for proactive safety, health, and environmentally focused behaviors. All projects are expected to participate in the rewards and recognition programs available on the Corporate and DCS Americas SH&E ecosystem pages. Large, long term projects are encouraged to establish a project specific rewards and recognition program which incorporates project specific goals and activities ([template available S3AM-020-FM1](#)). **All rewards and recognition programs must emphasize the 9 Life Preserving Principles and proactive SH&E activities NOT solely the achievement of lagging metrics ("injury/incident-free" hours, etc.) as those may discourage incident reporting.**

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12.12 Stop Work Authority

AECOM empowers and expects all employees to exercise their Stop Work Authority (see Stop Work Authority Procedure ([S3AM-002-PR1](#))) if an incident appears imminent, or when hazardous behaviors or conditions are observed. A stop work request can be informal if the situation can be easily corrected or may require shutting down operations if revised procedures are necessary to mitigate the hazard. If an AECOM employee observes an imminently hazardous situation on a site controlled by others (i.e., a client-managed contractor), the employee can always stop work for themselves by removing themselves from the situation. Employees also may attempt to stop work to avoid allowing the contractor to come to harm by immediately notifying the contractor foreman or site engineer, or if necessary, the client or party managing the contractor.

No employee should object to the issuance of a stop-work request, nor can any disciplinary action be levied against the employee. All employees must agree that the situation has been mitigated before resuming work. No employee will be disciplined for refusing to work if they feel it is unsafe.





13. Roles and Responsibilities

13.1 AECOM Project Manager

The AECOM Project Manager (PM) may delegate responsibilities to an AECOM Deputy PM or AECOM Task Manager (TM) with equivalent competencies. The AECOM PM is responsible to:

- Understand the scope, performance standards, objectives, and applicable AECOM and bp requirements and expectations,
- Ensure the workforce, including subcontractors, is aware of the project scope and objectives, and the associated performance standards, requirements, and expectations,
- Verify that the full scope of work has been risk assessed with Task Hazard Assessment (THA) prepared, reviewed, and approved for each task,
- Authorize the start of all work tasks/activities within area of responsibility,
- Assign competent Crew Leaders, Permit Issuers/Approvers, and Persons in Charge as appropriate for the project scope of work,
- Be knowledgeable of and participate, where needed, in permit development and verification of the necessary work permits, and
- Verify that work activities are consistent with the policies and procedures.

13.2 AECOM Site Supervisor

The Site Supervisor has the overall responsibility and authority to direct work operations at the job site according to the provided work plans and HASP. The Project Manager may act as the Site Supervisor while on site. The Site Supervisor's responsibilities include:

- Verify the personnel, equipment/machinery and instruments anticipated to mobilize to site.
- Communicate project roles and responsibilities.
- Discuss planned activities for the day and any potential simultaneous operations (SIMOPs).
- Establish staging and work areas for planned activities.
- Confirm crews have reviewed and updated, as necessary, task hazard assessments prior to beginning the task.
- Coordinate and document project activities.
- Monitor for deviations and changes in scope, personnel, methods, materials, equipment/machinery, instrumentation, and site conditions.
- Notify the AECOM project manager of changes and coordinate change management.
- Escort or delegate the escorting of site visitors.
- Serve as AECOM's point of contact with the host facility and person-in-charge for simultaneous operations (SIMOPs).
- Delegate stop work authority to all project employees and report all unsafe acts/behaviors and conditions, near misses and incidents to the AECOM project manager.
- Lead by example – walk the talk.



13.3 AECOM Site Safety Officer

The Site Safety Officer supports the Site Supervisor in providing a safe work environment. Not all sites will have a designated Site Safety Officer; the decision should be made by the Project Manager and SH&E Manager taking into consideration the complexity and risks of the scope of work. The Site Supervisor may act as the Site Safety Officer on sites without one. The Site Safety Officer's responsibilities include:

- Conduct the site safety orientation for the entire field team, including subcontractors, and site visitors.
- Lead the tailgate safety meeting.
- Discuss hazards present at the site and/or within environmental media and their control measures.
- Communicate air monitoring methods and action levels.
- Explain emergency response and reporting procedures, including emergency contacts and muster and shelter-in-place locations.
- Establish exclusion and contamination reduction zones, as needed.
- Verify SWP/HASP, THA and safety requirements and expectations are being met.
- Confirm hazard control measures are in-place and effective.
- Perform housekeeping and site inspections to ensure a safe working environment.
- Engage outside safety, health & environment resources, as needed, to allow for the safe performance of the work.
- Assist in incident investigations and identification and implementation of corrective actions.
- Lead by example – walk the talk.

13.4 AECOM SH&E Manager

Responsibilities of the SH&E manager is to:

- Promote the AECOM Safety for Life Program and our Nine Life Preserving Principles.
- Understand the application of SH&E regulatory requirements relevant to SH&E in the company's operations and be aware of changes in regulations which may affect the company.
- Be formally trained, licensed, or certified where the regulations require.
- Assist with the budgeting and staffing process to ensure project teams have the knowledge and resources needed to perform their work safely.
- Be aware of all incidents, near misses, observations, unsafe acts, and unsafe conditions that are reported and participate in the investigation process where required.
- Verify incidents are reported to regulatory bodies in accordance with local legislation.
- Review investigation findings to confirm identified corrective actions are appropriate and subsequently implemented.
- Review and accept site-specific SH&E Plans and Task Hazard Analyses (THAs).
- Assist in the preparation of risk assessments.
- Assist in the review of SH&E training needs.
- Verify necessary training as required by AECOM policies and procedures and/or the regulations.
- Assist in the setting of SH&E expectations at project level and review them periodically.
- Perform project SH&E audits on a periodic basis.
- Monitor the corrective actions taken, where audits identify non-conformance or opportunities for improvement, for confirmation of their completion and effectiveness.
- Lead by example, walk the talk.



13.5 AECOM Workforce

The workforce members play an important role in safety. Each workforce member shall:

- Comply with the host facility, client, and AECOM requirements for their assigned tasks and the site.
- Have the appropriate training/competencies to complete their assigned task(s) safely and efficiently.
- Participate in risk reviews and/or THAs and provide input to ensure that the full scope of work, associated hazard, and their control measures have been adequately addressed to allow for the work to proceed safely and efficiently.
- Conduct appropriate work area and equipment inspections prior to work activities.
- Assist in identification of work process deficiencies and recommend possible improvements if applicable.
- Remain focused and aware of surroundings while on the jobsite to changes that may impact ability to perform job task or affect the safety of other team members.
- Understand the Emergency Response Plan (ERP) and be able to respond as it directs per the assigned role.
- Stop work, intervene (Speak Up, Listen Up), and report all observed unsafe work activities, unsafe site conditions, and any incidents with or without (near miss) consequences.
- Upon request, participate in incident investigations and/or re-enactments.

13.6 Visitors

Authorized visitors (e.g., client representatives, regulators, AECOM management staff, etc.) requiring entry to any work location on the site will be briefed by the Project Manager, Site Supervisor, or Site Safety Officer on the hazards present at that location. Visitors will be escorted at all times at the work location and will be responsible for compliance with their employer's health and safety policies. In addition, this HASP specifies the minimum acceptable qualifications, training and PPE that are required for entry to any controlled work area; visitors must comply with these requirements at all times.

If the site visitor requires entry to any exclusion zone (EZ), but does not comply with the above requirements, the visitor will be denied access to the EZ. If the visitor disregards instructions to remain outside the EZ, work activities will be immediately suspended, and the situation reported and documented.

Unauthorized visitors, and visitors not meeting the specified qualifications, will **NOT** be permitted within established controlled work areas. If unauthorized visitors and/or visitors not meeting the specified qualifications enter a controlled work area and/or EZ, work activities will be immediately suspended, and the situation reported and documented.



14. Subcontractor Management

14.1 AECOM Roles/Responsibilities for Sub Management

When managing an AECOM Subcontractor of any tier, AECOM management and supervision will follow the requirements in [S3AM-213-PR1](#) and are responsible for the following:

- Direct all activities of the facility, site, or project location.
- Ensure appropriate training and experience of AECOM personnel responsible for overseeing subcontractor work.
- Verify subcontractors have the appropriate trained and competent personnel to perform their activities in a safe, healthful, and environmentally responsible manner.
- Pre-qualification of Subcontractor – Prior to performing work on an AECOM project, management and supervision must verify the Subcontractor has been pre-qualified. AECOM's preferred method of prequalification in Coupa, but there are other ways to prequalify a subcontractor.
- Ensure all subcontractor employees attend the AECOM daily tailgate safety meeting.
- If you have any questions about subcontractor pre-qualification, reach out to an AECOM SH&E professional.

14.2 Subcontractor Roles/Responsibilities for Safety

Subcontractors must provide AECOM with a designated Subcontractor Safety Representative (SSR). Their responsibilities are as follows:

- Direct employees' means and methods of work and how to work safely.
- Be knowledgeable of and understand the safety requirements of the subcontractor's activities.
- Staff the project with employees that are trained and knowledgeable of the tasks they will be performing.
- Have the ability to recognize hazards and the authority to take prompt corrective actions.
- Implement the subcontractor safety program.
- Serve as the direct contact with AECOM regarding resolution of SH&E issues.
- Immediately report all work-related injuries/illnesses/incidents, environmental incidents, and regulatory inspections/violations to AECOM according to AECOM procedures and/or client requirements.

14.3 Subcontractor HASP/THAs

If the subcontractor's scope of work includes hazards that are not covered by the AECOM Health and Safety Plan (HASP), the subcontractor will need to provide AECOM with their site-specific HASP and task-specific Task Hazard Analyses (THAs). All subcontractor procedures must at a minimum comply with client and AECOM requirements to ensure that hazards associated with the performance of their work activities are properly controlled. Copies of any required safety documentation for a subcontractor's work activities will be provided to AECOM for review prior mobilization to the site.



15. Training and Documentation

The following sections describe the standard practices or programs that AECOM will establish to prepare employees to perform work safely and consistent with AECOM policy and Procedures. For additional information on SH&E Training, review the Safety, Health and Environment Training, [S3AM-003-PR1](#).

15.1 HASP/Site Safety Orientation

The Project Manager shall conduct a project/site-specific HASP orientation prior to the start of field operations, with support as needed by the SH&E Manager, Site Safety Officer, or Site Supervisor. This meeting will involve representatives from all organizations with a direct contractual relationship with AECOM on the job site. Minimum items to be covered are listed in **Attachment D**. Participants will then sign the HASP Personnel Acknowledgement register at the end of the HASP.

15.2 Worker Training and Qualifications

All personnel at this site must be qualified and experienced in the tasks they are assigned. SH&E Training Procedure [S3AM-003-PR1](#) establishes the general training requirements for AECOM employees.

See **Section 8.1** of this HASP for site-specific required safety training and documentation.

15.3 Competent Person(s)

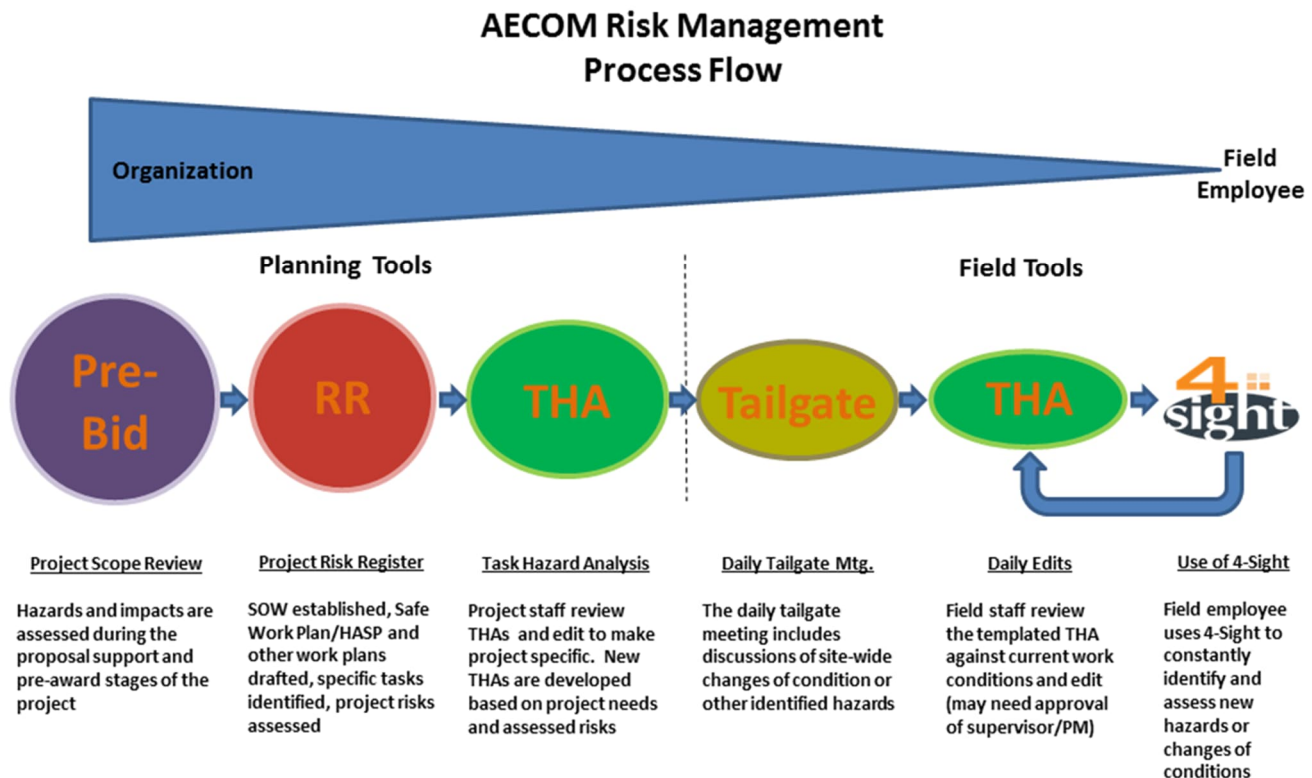
A competent person is an employee who, through education, training, and experience, has knowledge of applicable regulatory requirements, is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

AECOM's Competent Person Designation Procedure, [S3AM-202-PR1](#), explains the roles, responsibilities and procedures of naming a competent person. Review Error! Reference source not found. of this HASP for a list of site-specific competent person(s) required for this scope of work.



16. Hazard Assessment and Control

AECOM has adopted an approach to hazard assessment and control that incorporates both qualitative and quantitative methods to identify hazards and the degree to which they may impact employees and AECOM operations. See [S3AM-209-PR1](#), Risk Assessment and Management, for details regarding AECOM's process. This approach is illustrated below and described in the following section.



AECOM has adopted an approach to hazard assessment and control that incorporates both qualitative and quantitative methods to identify hazards and the degree to which they may impact employees and AECOM operations. See [S3AM-209-PR1](#), Risk Assessment and Management, for details regarding AECOM's process. This approach is illustrated below and described in the following section.

16.1 SH&E Procedures

All AECOM SH&E procedures, in their controlled copy version, are available on the [internal SH&E Policy and Procedures ecosystem page](#). Programmatic procedures referenced in this document (for example SH&E Training) do not need to be printed for inclusion in this HASP. The applicable field procedures checklist is in the Physical Hazards section below and procedures are included in **Attachment B**.



16.2 Task Hazard Assessments and Daily Tailgate Meetings

THA forms (a blank version is located in [S3AM-209-PR1](#)) shall be prepared for each task to be performed as part of the scope of work. This includes driving to the site, parking, and walking as well as the hazards, associated risk, and appropriate controls for all other work activities. The [DCS Americas Templated THA Library](#) may also be used to find previously approved THAs, though these should be modified to be project and site-specific. The preparer shall have one THA form for each task in the Scope of Work found in this work plan (**Attachment A**) and shall also include blank copies.

In the field, all employees and visitors shall review the daily THAs and conduct and attend the daily tailgate meeting. When employees arrive on site, conditions may be different than originally planned or additional job steps may be required. The THA requires workers to update or 'dirty up' the THA in the 'On-Site Edits' rows to assess the risks presented by the changed condition(s) and requires the worker to describe steps to reduce the risk. If the hazard(s) cannot be successfully mitigated, the work will **NOT** proceed.

A Site Safety Officer (SSO) or field supervisor shall conduct a daily tailgate meeting to review the specific requirements of this HASP prior to the commencement of daily project activities. Attendance at the daily tailgate meeting is mandatory for all employees and subcontractors at the site covered by this HASP. Simultaneous operations are encouraged to attend each other's tailgate meetings or at the very least the supervisors shall discuss the coordination of activities and associated hazards of each other's tasks. The tailgate meeting must be documented by the field Supervisor or SSO, using the New Daily Tailgate Meeting App. Use the appropriate QR code to download the App and/or go to the [Daily Tailgate Meeting App Ecosystem page](#) for details, guides, training sessions and/or other information:



[iOS](#)



[Android](#)






As an alternative you can also use or the Daily Tailgate Meeting form ([S3AM-209-FM5](#)), a blank copy of which is included in **Attachment A**.

16.3 Hazard Categories

THAs should include consideration of the following hazard categories when identifying hazards and task specific controls:

Table 16-1: AECOM Hazard Categories

Category	Definition
	A biological hazard is any living organism that could cause irritation, allergic reaction, bites, stings, illness, infection, or other injury.
	A chemical hazard is any chemical substance that could potentially cause harm to humans, equipment, or the environment either through contact, ingestion, absorption, inhalation, or reaction.
	Electrical hazards are present whenever there is potential for contact with an electric charge.




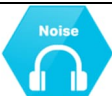



Site Specific Health & Safety Plan

For use on all high-risk, industrial and HAZWOPER projects

Former Grand Dry Cleaners



Table 16-1: AECOM Hazard Categories

Category	Definition
	Gravitational force can cause tools, equipment, materials, and people to fall either to the same level or from heights to the earth or a lower surface.
	A mechanical hazard when there is energy within the components of a mechanical system within an otherwise stationary piece of equipment/machinery.
	Objects or substances that can move or are moving not due to gravity create a motion hazard. Motion hazards also include body motions and positioning such as bending, stretching, kneeling, etc.
	Noise hazards are sounds that may prevent effective communication or cause hearing loss.
	Any physical matter such as gases, liquids, and springs that is compressed or under a vacuum creates a pressure hazard.
	Radiation hazards include both ionizing and non-ionizing energy emitted from radioactive elements or sources.
	Thermal hazards can cause injury or damage due to their temperature.

16.4 4-Sight

When preparing hazard assessments and throughout the day workers should use 4-Sight. This is a mental process through which workers ask themselves (and each other) four questions designed to effectively assess hazards. Using these questions during each task, especially those without established THAs, will help workers identify hazards and condition changes so that they can control them or stop work to seek assistance.



- What am I about to do?
- What could go wrong?
- What could be done to make it safer?
- What have I done to communicate the hazard?

16.5 Speak Up/Listen Up

All AECOM employees have a responsibility to help create the environment where the expectation is Safety for Life. Speak Up/Listen Up (SULU) is a technique to steward jobsite safety by utilizing 4-Sight as a basis for safety feedback conversations. SULU has two main parts:

- **Speak Up** where employees use three simple steps when providing feedback to others about unsafe acts:
 - Ask to discuss their hazard assessment or 4-Sight for the task;
 - Get a commitment from the employee to apply the hazard controls and perform the task according to the accepted procedures; and

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- Follow up to ensure the employee is working safely.

- **Listen Up** where employees use two simple steps when responding to safety feedback:

- Listen – Focus on the message, not the messenger; and
- Commit to performing the task the safer way.

SULU conversations should happen consistently throughout the workday to create clear expectations of how work should be performed. All employees should recognize safe work behaviors in order to reinforce them and keep them going. An occasional correction is much more effective when employees are frequently encouraged and positively recognized for their safe actions. Managers and supervisors should be having SULU conversations during site visits and ensure peer to peer and site supervisor to crew SULU conversations are being held.



17. SH&E Event Reporting & Investigation

17.1 Incidents and Near Misses

All incidents and near misses (i.e., incidents without consequences), regardless of type and perceived severity, must be reported in accordance with the Incident Reporting, Notifications and Investigation, [S3AM-004-PR1](#) and entered into **IndustrySafe** (AECOM's SH&E Database) within the timeframes listed below:

Table 17-1: Incident Reporting Timeframes

Incident Type	IndustrySafe Reporting Timeframe
<u>Significant Incident</u> , including any injury to an AECOM employee or Subcontractor	Within 4 hours
All Other Incidents	Within 24 Hours

17.2 Investigation

All incidents and near misses will be investigated and documented to determine the contributing and root causes. The investigation will verify the need for corrective actions and identify opportunities for Lessons Learned and continuous improvement. For more information in incident investigations, please review the Incident reporting, Notifications and Investigation procedure, [S3AM-004-PR1](#).

As soon as it is safe to do so after an incident occurs, the following information will be gathered:

- An incident timeline;
- Witness statements;
- Photos of the incident;
- Police reports, if applicable;
- Any additional information that will assist in the investigation; and
- Copies of daily safety documentation and/or field notes.

Note: Only the basic facts, who, what, when, where and how, are needed to complete the initial IndustrySafe report. SH&E Managers will assist you in updating the report as additional information becomes available.

17.3 Audits & Inspections

Safety audits and inspections at the project level can occur at any stage in the project lifecycle. Audits and inspections can focus on AECOM, subcontractors, or both. Audits and inspections may be performed by Project Managers, Operations Management and SH&E Managers. Virtual or in-person (field) audits and inspections may be performed. Several checklists are available to guide the evidence-based audit and inspections. Audits and inspections will be documented in one of AECOM's SH&E databases along with any corrective actions. The database will be used to track corrective actions to completion. For more information on audits and inspections, please review the Compliance Assurance procedure, [S3AM-216-PR1](#). The following checklists are available to guide audits and inspections:

- **Project Manager Self-Assessment**
- **Senior Management Activities (SMAs)**
- **Project Safety Reviews (PSRs)**
- **Site Safety Inspections (OSHA Type)**
- **Healthy Starts / Project Risk Reviews**

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- Subcontractor SH&E Performance Assessment ([S3AM-213-FM3](#))
- Environmental Compliance Assessment Checklist ([S3AM-204-FM1](#))

External Regulatory Inspections – If a regulatory inspector shows up on site. **STOP WORK** and contact your Project Manager and SH&E Manager. AECOM will follow the requirements in our Regulatory Inspections procedure [S3AM-211-PR1](#).

17.4 Safety Observations

All safety observations must be entered into **IndustrySafe™** or **Lifeguard™** (AECOM's SH&E Databases).

17.5 SH&E Database Access

Incidents, near misses, and audits/inspections must be entered into **IndustrySafe™**, which is one of AECOM's SH&E Databases. Safety observations may also be entered into **IndustrySafe™** at the AECOM Project Manager's discretion. **IndustrySafe™** can be accessed via the SH&E Page on Ecosystem when you are in the office or connected to the AECOM network via VPN. IndustrySafe may also be accessed from your smartphone/device, if equipped with a QR Code Reader App, using the QR Code to the right.



↑ Incidents, Near Misses, Audits/Inspections and Safety Observations ↑

Safety observations may also be entered into **Lifeguard™**, which is one of AECOM's SH&E Databases, at the AECOM Project Manager's discretion. **Lifeguard™** can be accessed via the SH&E Page on Ecosystem when you are in the office or connected to the AECOM network via VPN. **Lifeguard™** may also be accessed from your smartphone/device, if equipped with a QR Code Reader App, using the QR Code to the right.



17.6 Reporting Assistance

If your field schedule, access to internet, and/or limited cellular phone coverage have the potential to impact timely incident, near miss, and/or safety observation reporting, please contact your AECOM Project Manager and/or SH&E Manager for assistance.



18. Environmental Management

18.1 Scope

AECOM implements policies and procedures to reduce risk of land and/or water pollution and other environmental concerns during the life of the project. The AECOM Project Manager will ensure compliance with all local, state, federal and client environmental laws and/or regulations. For additional information on Environmental Management, please review the Environmental Compliance procedure, [S3AM-204-PR1](#).

18.2 Roles and Responsibilities

All AECOM staff through the leadership of the AECOM Project Manager are responsible for reducing or eliminating environmental impacts by AECOM personnel. The site supervisor and/or the site safety officer will be immediately notified of any spills, leaks, or other impacts to the ground and/or water, or other environmental emergencies, after emergency respondents have been called, if necessary. The Project Manager will be responsible for making any further notifications as required.

18.3 Staffing and Awareness

AECOM staff will receive relevant awareness training to ensure proper knowledge and training when performing activities with the potential to impact the environment, as well as the requirement of this plan for proper preparedness and response.

18.4 Pollution Prevention

Pollution/impact to the environment could be caused by the following sources:

- | | |
|-----------------------|------------------------------------|
| ■ Air emissions | ■ Solid waste |
| ■ Wastewater | ■ Hydrocarbons |
| ■ Hazardous materials | ■ Storm water and sediment/erosion |

AECOM will employ prevention and control measures to prevent impacts to the environment. In addition, a spill kit consisting of sorbent socks, pads, shovels, and personal protective equipment (PPE) will be maintained on site by AECOM and each subcontractor. Solid waste will be collected, segregated (recyclable, non-flammable, and flammable) and removed on a regular basis.



19. Project Closeout

Completing a project requires procedures to close out Project Contractual and Administrative activities. The closeout process ensures all documentation is finalized and any Contractual Obligations are met. The Project is ready for close-out once it has been accepted by the end user organization. Project close-out is complete after all physical, regulatory, contractual, and financial close-out activities are complete.

19.1 Health and Safety File

The Health and Safety File will normally include:

- Brief description of the work carried out.
- Residual hazards which remain and how they have been dealt with (e.g. surveys, or information on asbestos, contaminated land, water bearing strata, buried services etc.).
- Key structural principles incorporated in the design (e.g. bracing) safe working loads etc.
- Any hazards associated with the materials used.
- Nature, location, and markings of significant services including underground cables, gas supplies, firefighting etc.
- Information and 'as built' drawings including safe access to and from confined spaces etc.
- Daily Tailgate Meeting Forms
- Lessons Learned



20. Personal Acknowledgement

By signing below, the undersigned acknowledges that he/she has reviewed the AECOM Health and Safety Plan for the site. The undersigned also acknowledges that he/she has been instructed in the contents of this document and understands the information pertaining to the specified work and will comply with the provisions contained therein. The employee understands that they are **NOT** to perform any work that they have not been adequately trained for and that they are to stop work if it is unsafe to proceed. Finally, the employee understands to notify the Site Supervisor and the **Incident Hotline at 800-348-5046** for any incident, **including ANY injury even if no first aid or medical treatment is required.**

Print Name Clearly	Signature	Organization	Date

20.1 Disclaimer

This HASP, and each of its provisions, is applicable only to, and for use only by, AECOM, its affiliates, and its subcontractors. Any use of this Plan by other parties, including, without limitation, third-party contractors on industrial sites or projects where AECOM is providing engineering, construction management, or similar services, without the express written permission of AECOM, will be at that party’s sole risk, and AECOM Corporation shall have no responsibility. The existence and use of this Plan by AECOM shall not be deemed an admission or evidence of any acceptance of any safety responsibility by AECOM for other parties unless such responsibility is expressly assumed in writing by AECOM in a specific project contract.

Attachment A

THA Forms, and Tailgate Safety Meeting Form



Attachment A: THA Forms, and Tailgate Safety Meeting Form

Task Hazard Assessment Instructions:

Each unique task or work group should have their own THAs. If workers have a THA for their task(s) in hand, they should simply review it and document the site-specific edits in the appropriate section. If workers do ***not*** have a THA for all tasks to be performed, a THA must be [obtained](#) or drafted *prior to starting work* on that task. Use additional pages as needed.

- Identify the basic steps of the task that must be performed in order and their associated hazards. Identify controls or barriers to mitigate each identified hazard.
- Clearly identify any **STOP WORK** triggers.
- Document stop work and change management if conditions/ scope changes.
- Use 4-Sight to identify and mitigate site-specific hazards throughout the day. Modify the THA as needed. Contact site supervisors or the PM for any significant scope changes or changes of expected conditions.
- All THAs shall be 3 pages (maximum) or less (preferred). If they are longer, the task is too broad.
- All hazards will use standardized nomenclature (Hazard Wheel), should be specific, detail how someone could be hurt and what the outcome could be.
- All actions to mitigate hazards must be specific, clearly aligned with its respective hazard and not generic. Avoid words such as “*proper*”, “*correct*”, or “*appropriate*”. Use specifics and numerical values (i.e., wear disposable nitrile gloves, stand back 6 feet/1.8 meters, take a 10-minute break every hour).
- PPE cannot be the only line of defense - PPE is always the last line of defense, so think through what other controls (engineering, administrative, etc.) could mitigate hazards.

Task Hazard Assessment

Task Name:	Driving to and From Site	Control #:	01-01-12-02
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Project Name:	Former Grand Dry Cleaners Site	Client:	NYSDEC	Date:	10/15/2024
Permits Required? (list):		Work Location:	175 West Union Street, Newark, NY 14513		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	<input type="checkbox"/> Hard Hat <input type="checkbox"/> Safety Glasses <input type="checkbox"/> HiVis Vest <input type="checkbox"/> Safety Toe Boots <input type="checkbox"/> Gloves: _____ <input type="checkbox"/> Hearing Protection <input type="checkbox"/> Other: _____ Leather / Nitrile				
Tools & Equipment:	Emergency kit Communication device (cell phone) Navigation system				

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!					
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>	Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk (initial)	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	Risk (final)	
1. Trip Planning	1a. Unauthorized driving	9	1a. You must be an AECOM authorized driver to drive for AECOM business purposes. Consult the requirements of S3AM-005-PR1. Authorized Drivers shall maintain a current driver's license with full privileges applicable to the vehicle to be operated. Develop a Journey Management Plan if applicable.	4	
	1b. Inclement weather	6	1b. Evaluate weather conditions prior to beginning the travel to determine if travel should proceed. Verify your vehicle is equipped to travel in poor weather. Have supplies on hand in the event that you become stranded, including a communication device to call for help.	4	
	1c. Getting Lost	6	1c. Review route in advance and program GPS prior to leaving	3	
	1d. Inadequate vehicle for the site/trip	7	1d. Understand what type of vehicle is necessary to transport tools & equipment to the site. Know site conditions before departure and obtain proper vehicle, 4-Wheel drive if necessary	4	
	1e. Vehicle malfunction	8	1e. Inspect vehicle prior to leaving. Verify that maintenance records are current.	4	
On-Site Edits:					
2. Driving	2a. Fatigue	15	2a. Start trip well rested & take breaks when needed. Share driving responsibilities where possible. STOP DRIVING AND PULL OVER in a safe place if you begin nodding off or showing other signs of fatigue.	4	

Task Hazard Analysis

Task Name:	Driving to and From Site	Control #:	Error! Reference source not found.
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REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!				
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>	Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	Risk <i>(final)</i>
	2b. Risky driving practices	15	2b. Practice defensive driving techniques and avoid bad driving habits <ul style="list-style-type: none"> Allow for adequate time to make the trip Do not speed or attempt to multi-task Do not use cell phone or text or attempt to program GPS while driving 	4
On-Site Edits:				
3. Stops/breaks during transit	3a. Theft of equipment/materials	6	3a. Place any likely theft items out of sight and lock vehicle when leaving it. Do not leave vehicle unattended for longer than necessary. If at all possible, avoid leaving packed vehicles in public parking areas overnight, unload if possible. Park in well lighted areas.	4
	3b. Personal security risk	10	3b. Be alert and aware of surroundings when making stops. Stop at areas which are well lit and have security if possible.	3
On-Site Edits:				
4.	4a.		4a.	
On-Site Edits:				

Additional Notes:

Task Hazard Assessment

All Employees:

STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

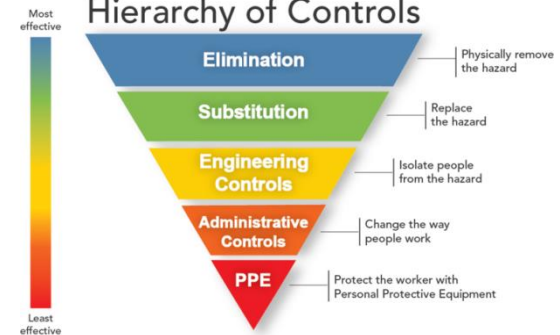
Use **4-Sight**, AECOM's last minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

- ▶ **What am I about to do?**
- ▶ **What can go wrong?**
- ▶ **What can be done to make it safer?**
- ▶ **What have I done to communicate the hazards?**

For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories



Hierarchy of Controls



- ▶ **Most hazards need more than one control**
- ▶ **What should you do? Stack your controls**
- ▶ **PPE can NEVER be your only means of protection**

Worker Sign On	
<i>I participated in the on-site review and fully understand the content of this Task Hazard Assessment.</i>	
Printed Name	Signature
1. Supervisor:	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

Visitor Acknowledgement
<i>Visitors review task hazards and acknowledge understanding</i>
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Submit a new THA for addition to the DCSA THA Library or send THA improvement suggestions to DCSA.THA.Library@AECOM.com
Include a copy of the new THA or a photo of the THA modifications as appropriate.

Task Hazard Assessment

Task Name:	Load and Unload Vehicle	Control #:	01-01-12-04
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Project Name:	Former Grand Dry Cleaners Site	Client:	NYSDEC	Date:	10/15/2024
Permits Required? (list):		Work Location:	175 West Union Street, Newark, NY 14513		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	<input type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses <input checked="" type="checkbox"/> HiVis Vest <input checked="" type="checkbox"/> Safety Toe Boots <input checked="" type="checkbox"/> Gloves: High vis mechanix style gloves <input type="checkbox"/> Hearing Protection <input type="checkbox"/> Other:
Tools & Equipment:	Hand truck or dolly

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!					
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>	Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk (initial)	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	Risk (final)	
1. Load & Unload Vehicle	1a. Sprains/strains/overexertion	8	1a. To minimize the risk: <ul style="list-style-type: none"> Use dollies, carts, come-alongs, or rollers whenever possible rather than the employee physically moving materials. Use proper lifting techniques by bending and lifting with legs and not back, and do not over extend or twist. Do not lift over 49 lbs. without assistance. Seek assistance when needed and know your lifting limit Minimize distance needed to move materials and stage loading and unloading areas as close as possible. 	4	
	1b. Pinch points between load and vehicle or between load items	10	1b. Know where your hands and other people's hands are at all times. Wear high vis gloves as a reminder. Avoid placing fingers under load while positioning. Use caution with tailgates and vehicle doors, especially under windy conditions.	4	
	1c. Slips/trips/falls	10	1c. Inspect and clear walking path prior to beginning loading. Do not stack loads that impair visibility.	4	
	1d. Nicks and cuts from equipment edges	6	1d. Inspect materials and equipment for rough edges and burrs. Wear cut resistant gloves.	4	
On-Site Edits:					

Task Hazard Analysis

Task Name:	Load and Unload Vehicle	Control #:	Error! Reference source not found.
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REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!				
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>	Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	Risk <i>(final)</i>
2. Secure & cover exposed loads	2a. Line of fire hazards from straps/bungee cords	15	2a. Do not throw straps toward other personnel. Using extreme caution when stretching the bungee cord over a load. ALWAYS use safety glasses when handling bungee cords. Securing hook ends carefully and never extend the cord beyond its capacity of length or load. Keep your face and other parts away from the cord's rebound path just in case of failure or recoil.	4
	2b. Load shift in transit	10	2b. Use straps or bungee cords to properly secure load. Use a bulkhead to prevent heavy loads from shifting upon sudden stops.	4
	2c. Theft of tools & equipment	8	2c. Place any likely theft items out of sight and lock vehicle when leaving it. Do not leave vehicle unattended for longer than necessary. If at all possible, avoid leaving packed vehicles in public parking areas overnight, unload if possible. Park in well lighted areas.	4
On-Site Edits:				
3.	3a.		3a.	
On-Site Edits				
4.	4a.		4a.	

Task Hazard Analysis

Task Name:	Load and Unload Vehicle	Control #:	Error! Reference source not found.
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Additional Notes:

Task Hazard Analysis

Task Name: Load and Unload Vehicle

Control #: Error! Reference source not found.

All Employees:

STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

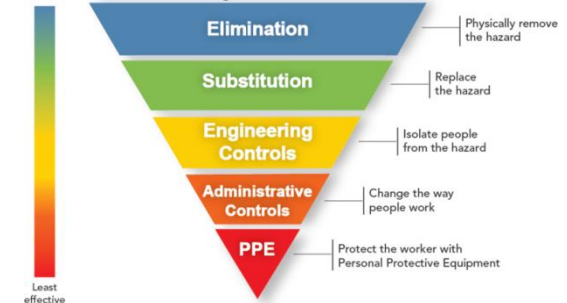
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- ▶ **What am I about to do?**
- ▶ **What can go wrong?**
- ▶ **What can be done to make it safer?**
- ▶ **What have I done to communicate the hazards?**

For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories



Hierarchy of Controls



- ▶ **Most hazards need more than one control**
- ▶ **What should you do? Stack your controls**
- ▶ **PPE can NEVER be your only means of protection**

Worker Sign On

I participated in the on-site review and fully understand the content of this Task Hazard Assessment.

Printed Name	Signature
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Include a copy of the new THA or a photo of the THA modifications as appropriate.

Task Hazard Assessment

Task Name:	DRILLING, GROUTING, MONITORING WELLS	Control #:	01-01-03-07
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Project Name:	Former Grand Dry Cleaners Site	Client:	NYSDEC	Date:	10/15/2024
Permits Required? (list):		Work Location:	175 West Union Street, Newark, NY 14513		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	<input checked="" type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses <input checked="" type="checkbox"/> HiVis Vest <input checked="" type="checkbox"/> Safety Toe Boots <input checked="" type="checkbox"/> Gloves: <u>Leather, nitrile</u> <input checked="" type="checkbox"/> Hearing Protection <input type="checkbox"/> Other: _____
Tools & Equipment:	Cutting tools, Hot Work Permit

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!					
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	Risk <i>(final)</i>
1.	Pre-mobilization, Equipment Inspection. Contact One-Call, private utility contractor, and/or site personnel to locate and mark underground utilities.	1a. Injury from equipment malfunction	5	1a. Ensure that PM or person responsible for scheduling rental equipment requests that the vendor inspects the equipment prior to site delivery to ensure all appliances are in working order and fit for use.	4
		1b. Failure to have underground utilities identified could result in explosion, electrocution, injury, death, property damage.	10	1b. Call public utility locating service prior to initiating work activities. Use private locating service to mark out areas on private property. Verify location of utility marks; do not perform intrusive work if utility location marks cannot be found or if marks are destroyed. Preserve utility marks as much as possible. Call to have utilities remarked if unsure as to their location. Complete utility checklist form.	4
On-Site Edits:					
2.	Setup Drill Rig and work zone	<u>2a.</u> Struck by vehicle or equipment traffic	8	<u>2a.</u> Verify that drilling contractor inspects equipment daily using S3AM-321-FM1 Daily Drilling, Boring & Direct-Push Equipment Inspection or equivalent. Verify that kill switch on rig is tested and operational. Establish work zone using traffic control devices, signs, cones, etc. in advance of initiating monitoring well abandonment activities. Restrict access to observers and passersby.	4
		<u>2b.</u> Sprain or broken bones due to slip, trip or fall	6	<u>2b.</u> Maintain required housekeeping in work area, do not carry equipment where visibility of ground is impaired, remove or mark all trip hazards in work area.	2
		<u>2c.</u> Struck-by, crushed-by, caught-by drill rig.	10	<u>2c.</u> Communicate path of movement to all project personnel. Establish and use agreed upon hand signals during spotting activities. Always use a spotter(s) to direct movement of drill rig and watch for vehicle and pedestrian traffic. Additional spotter(s) will be used in	4

Task Hazard Analysis

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found. 01-01-03-07
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REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!				
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>	Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	Risk <i>(final)</i>
	<p>2d. Contact with overhead utilities.</p> <p>2f. Hydraulic failure causing release to the environment.</p>	<p>10</p> <p>10</p>	<p>high traffic areas and in areas with blind spots where traffic is difficult to observe. Chock wheels ensure outriggers/jacks are used.</p> <p>2d. Keep a minimum of 15 feet from overhead power lines (20 ft. if 230-285 KV, 25 ft. if 285-345 KV, 35 ft. if 345-500 KV) Check HASP to ensure client/site does not have stricter requirements. Mast shall be down when rig is in motion.</p> <p>2f. Place secondary containment on ground under rig. Ensure that secondary containment is setup with 'berms/barriers' or containment is securely clipped onto the rig tracks/wheels to protect from any fluid leaking off the plastic.</p>	<p>4</p> <p>3</p>
On-Site Edits:				
3. Commence drilling	<p>3a. Cuts, contusions or broken fingers due to contact with moving parts</p> <p>3b. Entanglement</p> <p>3c. Noise</p> <p>3d. Back strain/ overexertion when unloading equipment</p> <p>3e. Contusions to face or eyes due to flying/shattering objects</p> <p>3f. Hand positioning/pinch points</p>	<p>6</p> <p>10</p> <p>6</p> <p>8</p> <p>8</p> <p>8</p>	<p>3a. Never place hands, fingers, feet under the bottom of an auger flight, or other location where these heavy items could be set down or could fall suddenly.</p> <p>3b. Ensure rotating parts are properly guarded. Remove loose clothing and jewelry that could become entangled in moving parts. Use a long handled shovel to remove cuttings from the auger/rods.</p> <p>3c. Wear hearing protection while equipment is in use.</p> <p>3d. Stretch before working. Bend and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds.</p> <p>3e. Have bystanders maintain a 5 foot distance from the operation at all times. Set up work area the mast plus 5 feet and no less than 30 feet. Wear all required PPE.</p> <p>3f. Wear leather or thick puncture-resistant gloves, communication between driller, helpers, and logger. All pinch point hazards should be labeled on rig with warnings.</p>	<p>2</p> <p>4</p> <p>2</p> <p>4</p> <p>4</p> <p>4</p>

Task Hazard Analysis

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found. 01-01-03-07
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On-Site Edits:				
4. Inspect grout mixer/pump	<p>4a. Personnel, property, and/or equipment damage due to failure to inspect mixer/pump properly</p> <p>4b. Skin irritations or labored breathing due to contact with fuel</p>	<p>6</p> <p>3</p>	<p>4a. Read start-up and shutdown procedures shown on grout mixer/pump or read operating manual that accompanies unit. Check all fluid levels if equipped with gas engine. Be familiar with how to shut off mixer/pump in case of an emergency. Check that unit has adequate amount of fuel in the tank. Check all hydraulic hoses and fittings for leaks, wear, and proper connection. Ensure all guards are in place.</p> <p>4b. Never overfill tank due to fuels expanding when heated. Make certain that fuel cap is fastened tight. Wear nitrile gloves underneath leather gloves during inspection</p>	<p>2</p> <p>1</p>
On-Site Edits:				
5. Grouting, Installing Well Pad	<p>5a. Exposure to cement dust and mixed cement, skin, eye, and inhalation</p> <p>5b. Injury from entanglement in drive shaft or mixing paddles</p> <p>5c. Splashes and spills</p> <p>5d. Muscle strain</p> <p>5e. Hand injury from opening bags</p>	<p>6</p> <p>6</p> <p>4</p> <p>9</p>	<p>5a. Wear a dust mask to protect against airborne particles. Wear leather gloves when adding materials to mixing tank. Open bags of dry materials in a controlled manner to minimize dust. Try to stay upwind from grout mixing.</p> <p>5b. Do not reach into the mixing tank during operation. Do not wear loose clothing or use tools that could become entangled in drive shaft or mixing paddles. Turn the unit off before attempting to service the mixer or clear debris.</p> <p>5c. Wear face shield to guard against splashes. Add water or other liquid additives in a controlled manner to avoid splashes. Do not exceed the capacity of the mixing tank</p> <p>5d. Stage bags of dry materials as close to mixer as possible. Use a buddy to help move heavy bags. If possible, lower the height of mixer to minimize lifting.</p> <p>5e. Wear leather gloves when placing bags of dry materials onto bag breakers. Do not</p>	<p>2</p> <p>2</p> <p>1</p> <p>3</p> <p>2</p>

Task Hazard Analysis

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found. 01-01-03-07
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	on breakers. Pinch points. 5f. Cuts or contusions to hands, fingers from assembling well frame	6 8	place hands between heavy bags and the bag breakers. 5f. Wear cut resistant gloves at all times and watch hand placement to avoid sharp edges and pinch points. Keep face, hands, fingers, and feet out of the line of fire of moving parts and tools	4
On-Site Edits:				
6. Debris handling and disposal	6a. Cuts and abrasions and pinch points during debris handling	6	6a. Note pinch points and sharp edges on concrete, well vaults, protective casings, metal skirts, and bollard debris and avoid. Don leather gloves	4
On-Site Edits:				
7. Environmental Concerns while on site	7a. Inclement weather 7b. Hypothermia 7c. Heat stress/heat illness 7d. Sunburn 7e. Biological Hazards	10 10 6 8 6	7a. Check weather forecast daily, have appropriate clothing and gear for weather conditions 7b. Discuss symptoms of hypothermia before deployment. Have a means of warming (hot liquids, hand warmers, etc., and a set of dry clothing, etc. available on the vessel. Change into dry clothing if you become wet at cold temperatures. 7c. Provide drinking water and electrolytes. Have a heat stress control plan (including shelters, work rotation, methods of cooling). Review prevention, symptoms and treatment guidance before deployment. 7d. Wear sunscreen and hat, prevent as much solar exposure as possible 7e. Assess work area for poisonous plants and communicate observations to avoid them. All field clothing and equipment should be thoroughly cleaned, removed and/or segregated from clean clothing, equipment and supplies to avoid transfer of hazardous plants oils and insects. If contact with poisonous plants or ticks are unavoidable, use controls including the use of disposable (Tyvek) coveralls, insect repellent (23.8% DEET or similar), light colored clothing, barrier creams, and frequent	6 5 4 5 4

Task Hazard Analysis

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found. 01-01-03-07
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				tick checks. All employees should bath immediately following fieldwork and use soaps/ cleansers designed to remove oils associated with poison oak, and conduct a full body tick check using a mirror. If any crew member has a bee allergy, they must have at least one EpiPen properly stored on site.	
On-Site Edits:					

Additional Notes:

Task Hazard Analysis

Task Name: Error! Reference source not found.

Control #: Error! Reference source not found.**01-01-03-07**

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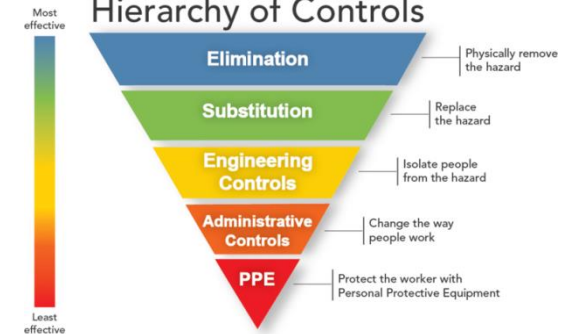
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Hierarchy of Controls



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Task Hazard Analysis

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found. 01-01-03-07
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Include a copy of the new THA or a photo of the THA modifications as appropriate.

Task Hazard Assessment

Task Name:	Geoprobe Drilling Oversight	Control #:	01-01-03-01
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Project Name:	Former Grand Dry Cleaners Site	Client:	NYSDEC	Date:	10/15/2024
Permits Required? (list):		Work Location:	175 West Union Street, Newark, NY 14513		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	<input checked="" type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses <input checked="" type="checkbox"/> HiVis Vest <input checked="" type="checkbox"/> Safety Toe Boots <input checked="" type="checkbox"/> Gloves: <u>Leather, nitrile</u> <input checked="" type="checkbox"/> Hearing Protection <input type="checkbox"/> Other: _____
Tools & Equipment:	

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!					
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	Risk <i>(final)</i>
1. Mobilization		1a. Striking unidentified underground utilities	15	1a. Call public utility locating service prior to initiating work activities. Use private locating service to mark out areas on private property. Verify location of utility marks; do not perform intrusive work if utility location marks cannot be found or if marks are destroyed. Preserve utility marks as much as possible. Call to have utilities remarked if unsure as to their location.	4
		1b. Striking overhead utilities	15	1b. Follow the requirements of S3AM-322-PR1 Overhead Lines. Verify adequate clearance of all drilling locations prior to setting up at drilling location.	4
On-Site Edits:					
2. Setting up at drilling location		2a. Biological hazards causing bites, stings or other injury	8	2a. Examine ground surface for biological hazards prior to setting up equipment. If biological hazards exist, move equipment to a different area for set up if possible. Machetes, or other fixed open blade tools, are not permitted for clearing vegetation. Use insect repellent and check clothing for ticks periodically when applicable.	4
		2b. Struck by traffic	10	2b. Be alert to other vehicles or pedestrians if work area is in an area with public access. Communicate with any heavy equipment operators in the area to ensure they know where you and the equipment are located. Don high visibility vest.	4
		2c. Unstable Rig platform	10	2c. Verify with contractor that rig is set up level and properly chocked and blocked.	2
On-Site Edits:					

Task Hazard Analysis

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found.
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3. Oversight of rig inspection		3a. Mechanical failure of equipment 3b. Emergency shut off disabled	10 6	3a. Verify that drilling contractor inspects equipment daily using S3AM-321-FM1 Daily Drilling, Boring & Direct-Push Equipment Inspection or equivalent. 3b. Verify that kill switch on rig is tested and operational	4 3
On-Site Edits:					
4. Drilling Oversight		4a. Flying debris, caught by/ struck by injuries 4b. Caught in/by equipment 4c. Exposure to contaminants 4d. Noise-induced hearing loss	8 10 8 5	4a. Keep a safe distance away during rig operation. Do not talk on cell phone or be distracted by paperwork when in immediate proximity to rig. Wear PPE including hard hats, steel-toe safety boots, safety glasses, and hearing protection. 4b. Keep hands, feet and other body parts shall be kept away from moving parts. Do not approach operator without making eye contact and getting approval. 4c. Position yourself upwind of the borehole whenever possible. Perform air monitoring using a PID as described in the HASP. STOP WORK if the action level is exceeded. 4d. Setup away from noisy operations. Don't be near the rig when hammering. Wear hearing protection.	4 4 4 3
On-Site Edits:					
5.		5a.		5a.	
On-Site Edits:					
6.		6a.		6a.	
On-Site Edits:					

Task Hazard Analysis

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On-Site Edits:					

Additional Notes:

Task Hazard Analysis

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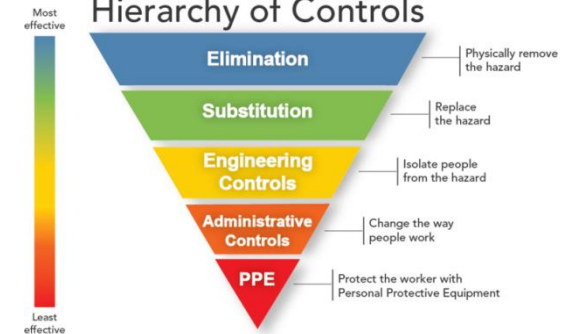
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Task Hazard Analysis

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found.
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Task Hazard Assessment

Task Name:	Gauging Liquid Levels in Groundwater Monitoring Wells	Control #:	01-01-05-07
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Project Name:	Former Grand Dry Cleaners Site	Client:	NYSDEC	Date:	10/15/2024
Permits Required? (list):		Work Location:	175 West Union Street, Newark, NY 14513		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	<input checked="" type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses <input checked="" type="checkbox"/> HiVis Vest <input checked="" type="checkbox"/> Safety Toe Boots <input checked="" type="checkbox"/> Gloves: <u>Leather, nitrile</u> <input type="checkbox"/> Hearing Protection <input type="checkbox"/> Other: _____				
Tools & Equipment:	Hand Tools	Liquid level/Interface probe	Decon materials		

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>	Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk (initial)	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	Risk (final)
1. Visually clear proposed gauging locations	1a. Exposure to biologic hazards: insects, poisonous plants and animals. Injuries could include anaphylactic shock, allergic reaction, rabies	6	1a. Identify and avoid hazardous plants and animals on site. Look for signs (spider webs, droppings, etc.). Wear cut resistant gloves, insect repellent; use a broom or a rake to move vegetation, not your hand or foot; move slowly	4
	1b. Damage to equipment or vehicles due to surface / subsurface obstructions	6	1b. Investigate travel path. Look for surface obstructions such as rubble, debris, old foundations or rebar. Use spotter is available or park in such a manner as to not have to back-up.	4
	1c. Slips / trips / falls due to uneven terrain resulting in broken bones or torn ligaments.	6	1c. Identify, mark and avoid slip, trip and fall hazards (holes, obstructions protruding from the ground, or debris). Contact PM immediately and do not proceed if any conditions are observed that cannot be controlled to make well gauging in the area safe.	4
	1d. Struck by vehicle resulting in severe trauma or death	10	1d. Visually inspect roadway for moving equipment if walking and set up vehicle as a barrier if driving. Set up exclusion zone around each well. Don reflective vest	4
On-Site Edits:				
2. Opening well casings / flush-mount covers and well plug lock	2a. Cuts / lacerations / crushing, bruises	6	2a. Avoid touching sharp materials/ edges. Wear cut resistant ANSI 2 gloves. Keep face, hands, fingers, and feet clear when opening and closing well cover. Inspect ground before kneeling, d on knee pads.	2
	2b. Back strain	4	2b. Stretch before working. DO NOT use awkward positioning. Keep back straight. Take regular rest/stretch breaks. Change position regularly.	2
	2c. Vapor exposure resulting	4	2c. Stand upwind from the well opening to avoid vapor exposure. Loosen well	2

Task Hazard Analysis

Task Name:	<u>Gauging Liquid Levels in Groundwater Monitoring Wells</u>	Control #:	Error! Reference source not found.
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REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!					
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	Risk <i>(final)</i>
		in inhalation hazards or illness 2d. Biologic hazards: insects, poisonous plants, and animals	6	cap slowly, keeping control if pressure is released due to vapors. Keep face out of line-of-fire. 2d. Slowly lift the well cover away from person and look for insects underneath the well. Use long handle tool to remove or kill any insects (i.e. screwdriver).	4
On-Site Edits:					
3.	Lowering fluid meter probe and measuring tape to detect fluid level and total depth	3a. Cuts / lacerations / bruises to knees (flush mount)	4	3a. Inspect ground before kneeling. Remove any objects. Don knee pads	2
		3b. Aches and strains from repetitive motion	4	3b. Do not use awkward positioning. Keep back straight, take regular rest/stretch breaks. Change position regularly.	2
		3c. Exposure to chemical hazards in groundwater resulting in skin irritation or illness	3	3c. Use smooth movements to avoid splashes. Don nitrile gloves over cut resistant gloves and safety glasses with side shields. Check gloves for damages/ rips.	2
On-Site Edits:					
4.	Removing fluid meter measuring tape and probe from well	4a. Exposure to chemical hazards in groundwater resulting in inhalation hazard or illness	4	4a. Stay upwind to avoid vapor exposure.	2
		4b. Cross contamination of equipment	4	4b. Clean the tape and probe using non-phosphate soap and distilled water. Wipe with clean paper towel. Collect decontamination materials for waste disposal. Wear disposable nitrile gloves.	2
		4c. Cuts / lacerations / bruises to knees (flush mount)	4	4c. Don knee pads and inspect ground before kneeling down and take frequent breaks to stand and stretch.	2
		4d. Aches and strains from repetitive motion	4	4d. See Step 3b.	2
		4e. Trips / falls from entanglement in measuring tape	3	4e. Check for location of measuring tape before walking or moving around.	2
On-Site Edits:					

Task Hazard Analysis

Task Name:	<u>Gauging Liquid Levels in Groundwater Monitoring Wells</u>	Control #:	Error! Reference source not found.
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REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!					
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any ‘Stop Work’ triggers.</i>	Risk <i>(final)</i>
5.	Closing well casings / flush-mount covers	5a. Cuts / lacerations / crushing / bruises	4	5a. Avoid touching sharp materials/ edges. Keep face, hands, fingers, and feet clear when opening and closing well cover. Don knee pads and inspect ground before kneeling down.	2
		5b. Back strain from heavy / awkward materials handling	4	5b. Keep back straight. Take regular rest/stretch breaks. Change position regularly. * Verify that well covers are secure upon departure.	2
On-Site Edits:					
6.	Gather gauging equipment and tools, place in work vehicle	6a. Cuts / lacerations / crushing / bruises from gathering or dropping equipment	3	6a. Maintain a secure grip on equipment and only carry manageable amount of equipment when demobilizing.	2
		6b. Aches and strains from improper lifting	4	6b. Bend and lift with legs. Keep back straight. Take regular rest/ stretch breaks. Change position regularly. Team lift is required for items over 50 lbs. (or awkward items). * Verify all tools and equipment are removed from the site.	2
On-Site Edits:					

Additional Notes:

Task Hazard Analysis

Task Name: Gauging Liquid Levels in Groundwater Monitoring Wells

Control #: Error! Reference source not found.

All Employees:

STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

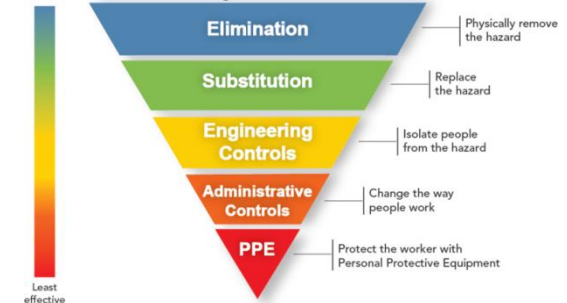
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- ▶ **What can go wrong?**
- ▶ **What can be done to make it safer?**
- ▶ **What have I done to communicate the hazards?**

For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories



Hierarchy of Controls



- ▶ **Most hazards need more than one control**
- ▶ **What should you do? Stack your controls**
- ▶ **PPE can NEVER be your only means of protection**

Worker Sign On

I participated in the on-site review and fully understand the content of this Task Hazard Assessment.

Printed Name	Signature
1. Supervisor:	
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Visitor Acknowledgement

Visitors review task hazards and acknowledge understanding

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Task Hazard Assessment

Task Name:	Groundwater Sampling – Low Flow	Control #:	01-01-05-12
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Project Name:	Former Grand Dry Cleaners Site	Client:	NYSDEC	Date:	10/15/2024
Permits Required? (list):		Work Location:	175 West Union Street, Newark, NY 14513		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	<input checked="" type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses <input checked="" type="checkbox"/> HiVis Vest <input checked="" type="checkbox"/> Safety Toe Boots <input checked="" type="checkbox"/> Gloves: Leather, nitrile, cut resistant _____ <input type="checkbox"/> Hearing Protection <input type="checkbox"/> Other: _____				
Tools & Equipment:	Hand tools	YSI	Pump		

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>	Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk (initial)	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	Risk (final)
1. Visually clear proposed sampling locations	1a. Exposure to biological hazards: insects, poisonous plants and animals. Injuries could include anaphylactic shock, allergic reactions, rabies.	6	1a. Identify and avoid hazardous plants and animals on site. Look for signs (spider webs, droppings, etc.). Wear cut resistant gloves, insect repellant, use a broom or a rake to move vegetation, not your hand or foot, move slowly	4
	1b. Slip/trips, falls due to uneven terrain resulting in broken bones or torn ligaments.	6	1b. Identify, mark and avoid slip, trip and fall hazards (holes, obstructions protruding from ground, or debris). Contact PM immediately and do not proceed if any conditions are observed that cannot be controlled to make well sampling in the area safe.	4
	1c. Struck by vehicle resulting in severe trauma or death	10	1c. Visually inspect roadway for moving equipment if walking and set up vehicle as a barrier if driving. Set up exclusion zone around each well. Don reflective vest.	4
On-Site Edits:				
2. Open well casing/flush-mount covers and well plug lock.	2a. Cuts/lacerations/crushing, bruises	6	2a. Avoid touching sharp material/edges. Wear cut resistant ANSI 2 gloves. Keep face, hands, fingers, and feet clear when opening and closing well cover. Inspect ground before kneeling. Don knee pads.	2
	2b. Back strain from improper lifting	4	2b. Stretch before working. DO NOT use awkward positioning. Keep back straight. Take regular rest/stretch breaks. Change position regularly.	2
	2c. Vapor exposure resulting in inhalation hazards or illness	4	2c. Stand upwind from the well opening to avoid vapor exposure. Loosen well cap slowly, keeping control if pressure is released due to vapors. Keep face out of line-of-fire.	2

Task Hazard Analysis

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found.
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REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!					
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	Risk <i>(final)</i>
		2d. Biologic hazards; insects, poisonous plants, and animals	6	2d. Slowly lift the well cover away from person and look for insects underneath the well. Use long handle tool to remove or kill any insects (i.e. screwdriver).	4
On-Site Edits:					
3.	Installing tubing in well and setting up equipment.	3a. Cuts/lacerations/crushing, bruises	6	3a. Avoid touching sharp material/edges. Keep face, hands, fingers feet clear when cutting tubing and setting up equipment. Wear cut resistant ANSI 2 gloves with disposable nitrile over gloves	2
On-Site Edits:					
4.	Removing tubing from well	4a. Exposure to chemical hazards in groundwater resulting in inhalation hazard or illness	4	4a. Stay upwind to avoid vapor exposure	2
		4b. Cuts/lacerations/bruises to knee (flush mount)	4	4b. Don knee pads and inspect ground before kneeling down and take frequent breaks to stand and stretch	2
On-Site Edits:					
5.	Closing well casings/flush mount covers	5a. Cuts/ lacerations/crushing, bruises	4	5a. Avoid touching sharp material/edges. Wear cut resistant ANSI 2 gloves. Keep face, hands, fingers feet clear when closing well cover. Don knee pads and inspect ground before kneeling down.	2
		5b. Back strain from heavy/awkward material handling	4	5b. Keep back straight. Take regular rest/stretch breaks. Change position regularly.	
On-Site Edits:					

Task Hazard Analysis

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found.
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6. Gather sampling equipment and tools, place in work vehicle	6a. Cuts/lacerations/crushing/bruises from gathering or dropping equipment	3	6a. Maintain a secure grip on equipment and only carry manageable amount of equipment when demobilizing.	2
	6b. Aches and strains from improper lifting	4	6b. Bend and lift with legs. Keep back straight. Take regular rest/stretch breaks. Change position regularly. Team lift is required for items over 50 lbs (or awkward items)	2
On-Site Edits:				
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On-Site Edits:				

Additional Notes:

Task Hazard Analysis

Task Name: Error! Reference source not found.

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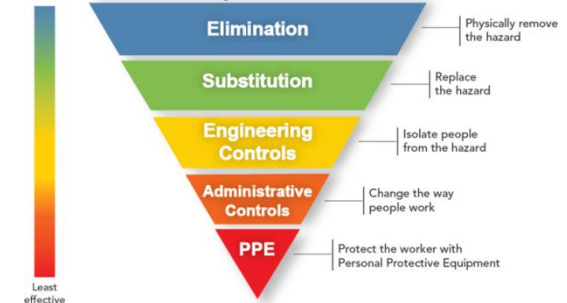
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Hierarchy of Controls



- ▶ **Most hazards need more than one control**
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Worker Sign On

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Printed Name	Signature
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Task Hazard Assessment

Task Name:	Hand and Power Tools	Control #:	01-01-08-01
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Project Name:	Former Grand Dry Cleaners Site	Client:	NYSDEC	Date:	10/15/2024
Permits Required? (list):		Work Location:	175 West Union Street, Newark, NY 14513		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	<input type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses <input checked="" type="checkbox"/> HiVis Vest <input checked="" type="checkbox"/> Safety Boots <input checked="" type="checkbox"/> Gloves: cut/impact resistant based on <u>Glove Needs Assessment</u> <input type="checkbox"/> Hearing Protection: based on hearing protection <input type="checkbox"/> Other: <u>needs assessment</u>
Tools & Equipment:	Hand and Powered Tools, e.g., drills, sledgehammers, shovels, digging bars, sanders, hammers

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!				
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>	Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk (initial)	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	Risk (final)
1. Using Hand or Power Tools	1a. Broken bones or cuts due to improper tools for task	8	1a. Inspect tools prior to use. Broken or worn tools should be repaired or replaced. Use tools for their intended purpose to avoid unexpected failure. Don leather gloves and safety glasses when inspecting tools.	3
	1b. Cuts, contusions or sprains to various body parts due to tool use	8	1b. Look around and behind you before starting. <ul style="list-style-type: none"> Inspect tools prior to use. Broken or worn tools should be repaired or replaced. Use tools for their intended purpose to avoid unexpected failure. Ensure work area is free of clutter or other workers which may interfere with ability to handle tools safely. Do not swing or apply tool (sledge hammer, shovel, digging bar) until area is free of bystanders. Do not use extreme force. Use controlled motions and avoid having prying tool "break free". Ensure limbs such as hands, and digits such as fingers and toes, are out of the "line of fire" prior to undertaking the task. Review and understand manufacturer's instructions and ensure they are followed. Use tools only for tasks they were designed/intended, not as stand-in for tools unavailable. Don safety glasses, leather gloves. 	8

Task Hazard Analysis

Task Name:	Hand and Power Tools	Control #:	Error! Reference source not found.01-01-08-01
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REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!				
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	1c. Slips, trips, and fall injuries	8	1c. Practice required housekeeping and frequently clear debris if created by the use of the hand or power tools. Keep unused tools off the ground. Do not carry debris long distances for disposal; if possible, park support vehicles in close proximity to well.	3
	1d. Eye or body injury from flying debris	8	1d. Observers should maintain a 2' distance from the area of work, have donned protective PPE, and are outside of the "line of fire". Remain vigilant as a support to the worker handling the tools, and do not distract or interfere abruptly with that worker.	3
On-Site Edits:				
2.	2a.		2a.	
On-Site Edits				

Additional Notes:

Task Hazard Analysis

Task Name: Hand and Power Tools

Control #: Error! Reference source not found.01-01-08-01

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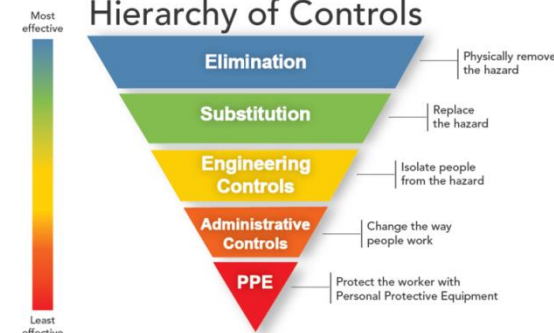
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Printed Name	Signature
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AECOM Imagine it.
Delivered.

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Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	Risk <i>(final)</i>
1. Mobilization		1a. Striking unidentified underground utilities	15	1a. Call public utility locating service prior to initiating work activities. Use private locating service to mark out areas on private property. Verify location of utility marks; do not perform intrusive work if utility location marks cannot be found or if marks are destroyed. Preserve utility marks as much as possible. Call to have utilities remarked if unsure as to their location.	4
		1b. Striking overhead utilities	15	1b. Follow the requirements of S3AM-322-PR1 Overhead Lines. Verify adequate clearance of all drilling locations prior to setting up at drilling location.	4
On-Site Edits:					
2. Setting up at drilling location		2a. Biological hazards causing bites, stings or other injury	8	2a. Examine ground surface for biological hazards prior to setting up equipment. If biological hazards exist, move equipment to a different area for set up if possible. Machetes, or other fixed open blade tools, are not permitted for clearing vegetation. Use insect repellent and check clothing for ticks periodically when applicable.	4
		2b. Struck by traffic causing serious bodily injury	10	2b. Be alert to other vehicles or pedestrians if work area is in an area with public access. Communicate with any heavy equipment operators in the area to ensure they know where you and the equipment are located. Don high visibility vest.	4
		2c. Unstable Rig platform causing tip/fall with crushing injuries	10	2c. Verify with contractor that rig is set up level and properly chocked and blocked.	2

Task Hazard Analysis

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found.
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On-Site Edits:					
3.	Oversight of rig inspection	3a. Mechanical failure of equipment 3b. Emergency shut off disabled	10 6	3a. Verify that drilling contractor inspects equipment daily using S3AM-321-FM1 Daily Drilling, Boring & Direct-Push Equipment Inspection or equivalent. 3b. Verify that kill switch on rig is tested and operational	4 3
On-Site Edits:					
4.	Drilling Oversight	4a. Flying debris, caught by/ struck by injuries 4b. Caught in/by equipment 4c. Exposure to contaminants causing injury or illness 4d. Noise-induced hearing loss from loud drilling operations	8 10 8 5	4a. Keep a safe distance away during rig operation. Always stand outside of the tip/fall radius of the mast, recommended safe distance is to be no less than 30 feet away from the rig, or the mast height plus 5 feet. Do not talk on cell phone or be distracted by paperwork when in immediate proximity to rig. Stay a safe distance (minimum 5') from outriggers. Do not place or store any equipment on the rig. Verify that all personnel follow S3NA_321_PR1 Drilling, Boring, Direct Push Probing. Wear PPE including hard hats, steel-toe safety boots, safety glasses, and hearing protection. 4b. Keep hands, feet and other body parts shall be kept a minimum of 5' away from moving parts. When augers are rotating, stay clear of the rotating auger and other rotating/moving components of the drill rig, i.e. outriggers. Do not approach operator without making eye contact and getting approval. Watch for loose clothing (hooded sweatshirts, baggy clothing, loose shoelaces). 4c. Position yourself upwind of the borehole whenever possible. Perform air monitoring using a PID as described in the HASP. STOP WORK if the action level is exceeded. 4d. Setup at least 30' away from noisy operations. Don't be near the rig when hammering. Measure dB levels with a noise meter. Wear hearing protection.	4 4 4 3
On-Site Edits:					

Task Hazard Analysis

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found.
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Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	Risk <i>(final)</i>
5.		5a.		5a.	
On-Site Edits:					
6.		6a.		6a.	
On-Site Edits:					
7.		7a.		7a.	
On-Site Edits:					

Additional Notes:

Task Hazard Analysis

Task Name: Error! Reference source not found.

Control #: Error! Reference source not found.

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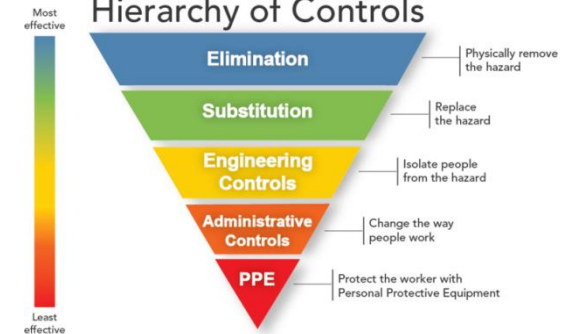
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Worker Sign On

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Task Hazard Analysis

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found.
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Task Hazard Assessment

Task Name:	Investigation Derived Waste Management	Control #:	01-01-14-02
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Project Name:	Former Grand Dry Cleaners Site	Client:	NYSDEC	Date:	10/15/2024
Permits Required? (list):		Work Location:	175 West Union Street, Newark, NY 14513		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	<input checked="" type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses <input type="checkbox"/> HiVis Vest <input checked="" type="checkbox"/> Safety Toe Boots <input checked="" type="checkbox"/> Gloves: Leather or work gloves with Nitrile undergloves <input type="checkbox"/> Hearing Protection <input checked="" type="checkbox"/> Other: Tyvek as needed to protect skin and clothing				
Tools & Equipment:	Socket set	55-gallon open top drum	Emergency eyewash and rinse water	Spill kit	Photoionization detector with 11.7 eV lamp

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!					
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	Risk <i>(final)</i>
1. Secure work area from traffic		1a. Struck by traffic	10	1a. Establish work area so that each site vehicle used for activity are in close proximity of each other; this would prevent unnecessary trips outside of work zone and into potential traffic area. Establish barricaded area using cones and barricade tape. Wear required highly visible clothing.	4
On-Site Edits:					
2. Prepare work area		2a. Trips & falls 2b. Tools and emergency equipment not present	6 8	2a. Clear any trip/fall hazards from work area. Scan ground prior to moving or walking 2b. Obtain tools and emergency equipment and stage adjacent to work area	4 4
On-Site Edits:					
3. Remove drum lid		3a. Pinch points at drum ring 3b. Sharp edges on drum ring or rim	6 7	3a. Use socket set to loosen drum ring, avoid placing fingers in to pinch points. Make sure cut-resistant gloves fit properly (not too big so fingertips get caught) 3b. Evaluate rim and ring for sharp edges, avoid handling as much as possible. Wear cut resistant gloves	4 4

Task Hazard Analysis

Task Name:	Error! Reference source not found. Investigation Derived Waste Management	Control #:	Error! Reference source not found.
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REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!					
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	Risk <i>(final)</i>
On-Site Edits:					
4. Load soil into drums	4a. Exertion/sprains/strains	8	4a. Exertion/sprains/strains <ul style="list-style-type: none">Use proper lifting techniques; this consists of bending your knees and lifting with your back straight.Shovel loads heavier than 50 lbs or awkward to handle use a mechanical loading device or ask for help.Grasp shovel handle properly: Position one hand at base of shovel handle and your other hand near the top of the handle.Rotate task with others if needed and take breaks.	7	
	4b. Exposure to contaminants	6	4b. Exposure <ul style="list-style-type: none">Set up upwind of drum.Wear PPE (e.g., eye protection-goggles, long pants, Nitrile exam gloves, Nitrile over-gloves (11-mil), long wrist) Tyvek coveralls, shirt with sleeves, steel-toed shoes with boot covers, half-face air purifying respirator fitted with an organic vapor, acid, HEPA filter combination cartridge).Perform air monitoring as per HASP. STOP WORK if action level is exceeded.	4	
	4c. Slips/trips/falls	6	4c. Be alert for uneven and slippery terrain. Keep tools and equipment away from walking paths.	4	
	4d. Sharp edges on drum rim	6	4d. Inspect rim for sharp and rough edges, avoid leaning into drum or placing hands onto rim edge Wear cut-resistant gloves	2	
On-Site Edits:					
5. Replacing drum ring	5a. Pinch points	7	5a. Use socket set to tighten drum ring, avoid placing fingers in to pinch points. Make sure gloves fit properly (not too big so fingertips get caught)	5	

Task Hazard Analysis

Task Name:	Error! Reference source not found. Investigation Derived Waste Management	Control #:	Error! Reference source not found.
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REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!					
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	Risk <i>(final)</i>
On-Site Edits:					
6. Moving/relocating drums		6a. Exertion	15	6a. Exertion <ul style="list-style-type: none"> If drums must be moved utilize a drum dolly. DO NOT ATTEMPT TO "WALK" or "ROCK" DRUMS TO MOVE THEM. Drums can become unstable and easily tip-over causing possible damage and personal injury as well as releasing the material contained. 	4
		6b. Trips and Falls	6	6b. See 2a above	5
On-Site Edits:					
7.		7a.		7a.	
On-Site Edits:					

Additional Notes:

Task Hazard Analysis

Task Name:	Error! Reference source not found. Investigation Derived Waste Management	Control #:	Error! Reference source not found.
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All Employees:

STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

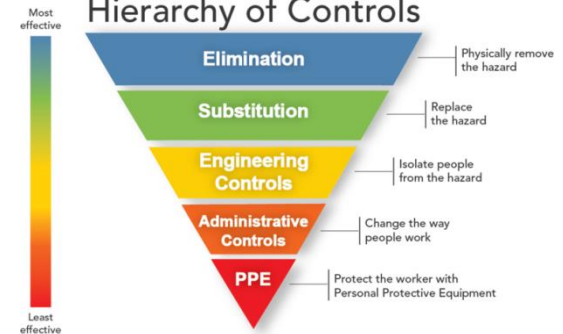
Use **4-Sight**, AECOM's last minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

- ▶ **What am I about to do?**
- ▶ **What can go wrong?**
- ▶ **What can be done to make it safer?**
- ▶ **What have I done to communicate the hazards?**

For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories



Hierarchy of Controls



- ▶ **Most hazards need more than one control**
- ▶ **What should you do? Stack your controls**
- ▶ **PPE can NEVER be your only means of protection**

Worker Sign On	
<i>I participated in the on-site review and fully understand the content of this Task Hazard Assessment.</i>	
Printed Name	Signature
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Visitor Acknowledgement
<i>Visitors review task hazards and acknowledge understanding</i>
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Submit a new THA for addition to the DCSA THA Library or send THA improvement suggestions to DCSA.THA.Library@AECOM.com

Task Hazard Analysis

Task Name:	Error! Reference source not found. Investigation Derived Waste Management	Control #:	Error! Reference source not found.
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Include a copy of the new THA or a photo of the THA modifications as appropriate.

Task Hazard Assessment

Task Name:	Monitoring Well Construction	Control #:	01-01-05-05
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Project Name:	Former Grand Dry Cleaners Site	Client:	NYSDEC	Date:	10/15/2024
Permits Required? (list):		Work Location:	175 West Union Street, Newark, NY 14513		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	X Hard Hat X Safety Glasses X HiVis Vest X Safety Toe Boots X Gloves: _____ <input type="checkbox"/> Hearing Protection <input type="checkbox"/> Other: _____				
Tools & Equipment:	First Aid Kit Hand tools	Fire Extinguisher	Decon Supplies	4-gas multi-meter	

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!					
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>		Risk (initial)	
				Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	
1. Contact One-Call, private utility contractor, and/or site personnel to locate and mark underground utilities.		1a. Failure to have underground utilities identified could result in explosion, electrocution, injury, death, property damage.		10	
1a. Call public utility locating service prior to initiating work activities. Use private locating service to mark out areas on private property. Verify location of utility marks; do not perform intrusive work if utility location marks cannot be found or if marks are destroyed. Preserve utility marks as much as possible. Call to have utilities remarked if unsure as to their location.				4	
On-Site Edits:					
2. Unload equipment		2a. Cuts or hand injuries from pinch points		6	
		2b. Back strain/ overexertion when unloading equipment		6	
2a. Inspect equipment for damage and sharp edges, replace all broken or damaged equipment. Wear cut resistant gloves at all times and watch hand placement to avoid sharp edges and pinch points. Keep face, hands, fingers, and feet out of the line of fire of moving parts and tools				2	
2b. Stretch before working. Bend and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds. If removing from the back of a truck, slide the case to the tailgate and lift from tailgate and not from the side of the truck bed.				2	
On-Site Edits:					

Task Hazard Analysis

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found.
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REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!				
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>	Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	Risk <i>(final)</i>
3. Set up work zone	3a. Struck by vehicle or equipment traffic 3b. Slip, Trip or Fall	8 6	3a. Establish work zone using traffic control devices, signs, cones, etc. in advance of initiating monitoring well abandonment activities. Restrict access to observers and passersby. 3b. Maintain good housekeeping in work area, do not carry equipment where visibility of ground is impaired, remove or mark all trip hazards in work area.	4 2
On-Site Edits:				
4. Position drill rig over pre-cleared borehole in position to tower up mast	4a. Struck-by, crushed-by, caught-by drill rig. 4b. Contact with overhead utilities. 4c. Slip, trip, and fall (STF) hazards from uneven 4d. Hydraulic failure causing release to the environment.	10 10 8 10	4a. Communicate path of movement to all project personnel. Establish and use agreed upon hand signals during spotting activities. Always use a spotter(s) to direct movement of drill rig and watch for vehicle and pedestrian traffic. Additional spotter(s) will be used in high traffic areas and in areas with blind spots where traffic is difficult to observe. 4b. Keep a minimum of 15 feet from overhead power lines (20 ft. if 230-285 KV, 25 ft. if 285-345 KV, 35 ft. if 345-500 KV) Check HASP to ensure client/site does not have stricter requirements. 4c. Check walking/movement path for STF obstructions. Conduct pre-site walk with crew prior to drilling and remove or isolate STF hazards. 4d. Place secondary containment on ground under rig. Ensure that secondary containment is setup with 'berms/barriers' or containment is securely clipped onto the rig tracks/wheels to protect from any fluid leaking off the plastic.	4 4 4 3
On-Site Edits:				
5. Commence drilling	5a. Pinch points 5b. Entanglement 5c. Noise	6 10 6	5a. Never place hands, fingers, feet under the bottom of an auger flight, or other location where these heavy items could be set down or could fall suddenly. 5b. Ensure rotating parts are properly guarded. Remove loose clothing and jewelry that could become entangled in moving parts. Use a long handled shovel to remove cuttings from the auger. 5c. Wear hearing protection while equipment is in use. 5d. Stretch before working. Bend and lift with legs and arms, not back. Team-lift	2 4 2 4

Task Hazard Analysis

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found.
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		5d. Back strain/ overexertion when unloading equipment	8	any items that are awkward or over 50 pounds.	
On-Site Edits:					
6. Well Casing Assembly and Installation	6a. Muscle strain.	8	6a. Stretch before working. Bend and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds.	4	
	6b. Slip, trip, and fall (STF) hazards from uneven	8	6b. Check walking/movement path for STF obstructions. Conduct pre-site walk with crew prior to work and remove or isolate STF hazards.	4	
	6c. Injury from improper tool use.	8	6c. Do not use tools for unintended purposes (such as a saw to open bags of bentonite instead of an approved cutting tool).	3	
	6d. Dust inhalation.	6	6d. Wear a dust mask and minimize dust when pouring powdered bentonite, concrete, or cement.	2	
	6e. Cutting PVC, cuts, lacerations	8	6e. Use PVC cutter for cutting PVC. Wear cut-resistant gloves (Level 2), keep fingers and other body parts away from cutting tool blade.	3	
	6f. Exposure to airborne chemicals or explosive atmosphere	8	6f. Conduct air monitoring with PID and 4-gas in background areas and breathing zone of all workers, Stop work if PID or LEL indicates action level, Wear respirator with organic vapor cartridge if VOCs cannot be controlled.	4	
	6g. Crushed by, pinch point on drill rig	10	6g. Keep body parts away from moving parts on drill rig.	4	
	On-Site Edits:				
7. Installation of sand filter pack/bentonite	7a. Injury from cutting bags open	8	7a. Use a safety knife. No fixed-blade knives allowed on site. Wear minimum Level 2 cut-resistant gloves. Cut away from the body	4	
	7b. Eye and respiratory injury due to dust and other airborne particles	6	7b. Refer to the SDS for use information. Wear long sleeved shirt, long pants, gloves, and safety glasses. Wear a P, N, or R-95 dust respirator when dealing with quartz sand (moving bags, pouring, mixing, and putting bags in trash).	2	
	7c. Back or muscle strain due to improper load or lifting techniques	8	7c. Do not lift anything over 50 lbs. without assistance (partner or appropriate mechanical device). Use proper lifting techniques, lift with legs, keep back straight, and carry object close to body.	4	

Task Hazard Analysis

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found.
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On-Site Edits:					

Additional Notes:

Task Hazard Analysis

Task Name: Error! Reference source not found.

Control #: Error! Reference source not found.

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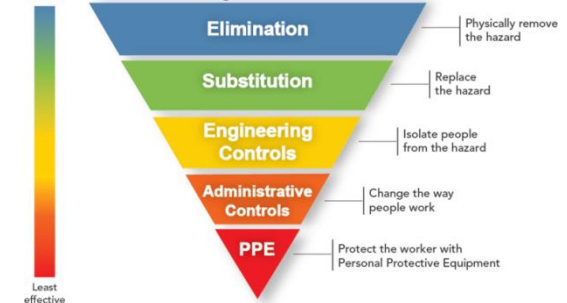
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Hierarchy of Controls



- ▶ **Most hazards need more than one control**
- ▶ **What should you do? Stack your controls**
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Worker Sign On

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Printed Name	Signature
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Visitors review task hazards and acknowledge understanding

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Task Hazard Assessment

Task Name: Oversight of Utility Clearance

Project Name:	Former Grand Dry Cleaners Site	Client:	NYSDEC	Date:	10/15/2024
Permits Required? (list):	None	Work Location:	175 West Union Street, Newark, NY 14513		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	<input type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses <input checked="" type="checkbox"/> HiVis Vest <input checked="" type="checkbox"/> Safety Toe Boots <input checked="" type="checkbox"/> Gloves: <u>Leather</u> <input type="checkbox"/> Hearing Protection <input type="checkbox"/> Other: _____
Tools & Equipment:	Utility clearing equipment, hand tools, marker flags for utility locations.

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>	Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk (initial)	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	Risk (final)
1. Mobilize equipment and personnel to site.	<ul style="list-style-type: none"> Driving hazards Distracted driving Parking hazards – Striking objects Fire 	12	<ul style="list-style-type: none"> Inspect vehicles for defects and complete inspection form. Implement safe driving practices to prevent transportation incidents. Secure all loads, including equipment, within the cab. Do not operate vehicles in unsafe conditions (e.g., on steep slopes, in deep mud). Use of handheld devices while driving is prohibited. Use devices when vehicle is parked. When reversing, use caution and a spotter, if available. Use care when parking off pavement, and do not park over tall grass as the grass may catch fire from the hot vehicle exhaust. 	4
On-Site Edits:				
2. Evaluate area for hazards (continuous for entire duration of task).	<ul style="list-style-type: none"> Struck by hazards – Vehicle movement Contact with utilities Overhead hazards Slips, trips, and falls, Heat/cold stress Biological hazards 	12	<ul style="list-style-type: none"> Ensure all site personnel have received the necessary site-specific safety and awareness training. Familiarize yourself with site entrances and exits. Complete AECOM's checklist S3NA-331-FM1, <i>Underground Utilities & Subsurface Installation Clearance Checklist</i>, if applicable. Utilities in the work area should be cleared by completing the appropriate survey prior to drilling operations. Utilize the "buddy system" when working on-site. Always use caution when on-site and don Level D PPE minimum. 	4

Task Hazard Assessment

Task Name: Oversight of Utility Clearance

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Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>	Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	Risk <i>(final)</i>
	<ul style="list-style-type: none"> • UV exposure • Extreme weather • Fire 		<ul style="list-style-type: none"> • Check the area for potential overhead utility/power lines and obstructions such as trees. Before moving a rig onto a location, confirm the height of the equipment with the driller/Competent Person. Make sure that the equipment is a minimum safe approach distance from power lines as outlined in AECOM's SH&E SOP S3AM-322-PR1, <i>Overhead Lines</i>. Use caution and wear a high-visibility reflective safety vest when working near active roads or around heavy equipment. • Observe and identify area for hazards; Ensure that pathways are clear and free of obstruction prior to initiating work; practice good housekeeping. • Assess weather conditions and begin heat and cold stress monitoring, if applicable. Apply and reapply sunscreen as necessary. • Avoid contact with insects, poisonous plants, and other animals. Conduct frequent checks for bites and other signs of insect or plant exposure. • In the case of severe weather, conditions should be monitored, and precautions taken to protect personnel. In storms, seek immediate shelter and lightning within 10 miles. Do not resume work until 30 minutes have passed since last strike. • Provide portable fire extinguishers in all field vehicles and inspect monthly. 	
On-Site Edits:				
3. Mark locations of utilities and other locations, as necessary	<ul style="list-style-type: none"> • Slips, trips, and falls • Ergonomics • Heat/cold stress • Cuts/abrasions – Improper use of hand tools • Compressed gases • UV exposure • Biological hazards • Chemical exposure 	8	<ul style="list-style-type: none"> • Make sure you have good, solid footing and that walking/working surfaces are as clean and dry as possible. • Always use caution when on-site and don Level D PPE minimum. • Keep work areas free of debris. • Be cautious in wet and muddy conditions. Take the time to find a safe route. • When possible, alternate hands to avoid repetitive use. Do not strain when collecting point measurements. Use arms and shoulders; do not twist your back. • Stay well hydrated, taking water breaks as necessary. • Work/rest regimens shall be adjusted during hot weather. • Assess weather conditions and begin heat and cold stress monitoring, if applicable. Apply and reapply sunscreen as necessary. • Inspect equipment prior to use. Use tools for their intended use only. 	4

Task Hazard Assessment

Task Name: Oversight of Utility Clearance

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

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			<ul style="list-style-type: none"> • Use repellents and proper clothing for protection against insects including mosquitoes and ticks. • Use appropriate lifting techniques when handling heavy tools or instruments. • Avoid walking through dense foliage. • Position body upwind when applying spray marking paint. • Use biodegradable, non-hazardous spray marking paint. • Store spray marking paint in an area away from any other equipment that may crush or puncture the cans. 	
On-Site Edits:				
4.				
On-Site Edits:				
5.				
On-Site Edits:				

Additional Notes:

Task Hazard Assessment

Task Name: Oversight of Utility Clearance

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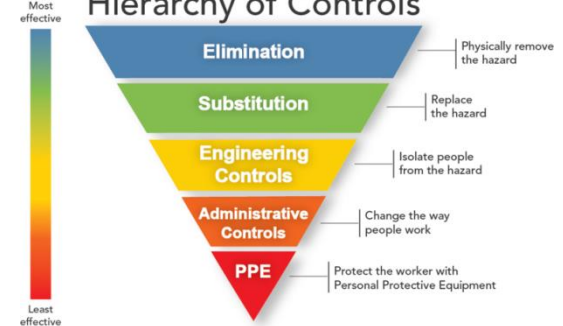
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Worker Sign On

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Printed Name	Signature
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Task Hazard Assessment

Task Name:	Portable Generator Operation	Control #:	01-01-08-03
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Project Name:	Former Grand Dry Cleaners Site	Client:	NYSDEC	Date:	10/15/2024
Permits Required? (list):		Work Location:	175 West Union Street, Newark, NY 14513		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	<input type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses <input type="checkbox"/> HiVis Vest <input checked="" type="checkbox"/> Safety Toe Boots <input checked="" type="checkbox"/> Gloves: _____ <input type="checkbox"/> Hearing Protection <input checked="" type="checkbox"/> Other: _____				
Tools & Equipment:	Spill kit	Fire extinguisher	Eye wash and rinse water		

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!					
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>	Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk (initial)	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	Risk (final)	
1. Selecting proper generator and electrical connections	1a. Inadequate power for needs	6	1a. Verify that the generator will provide sufficient wattage to safely operate the equipment you need.	2	
	1b. Overheating/fire of electrical cords	6	1b. Select a UL rated 3 pronged heavy- duty outdoor construction rated extension cord with proper wire gauge to handle the load.	2	
	1c. Lack of sustainability causing fire hazards	8	1c. When long term power is needed, evaluate alternative sources for sustainability.	4	
On-Site Edits:					
2. Familiarize yourself with generator hazards and prevention measures	2a. Not recognizing the potential hazards associated with a generator (fires, sprains/strains, electric shock, etc.)	12	2a. Read Owners Manual!	2	
On-Site Edits:					
3. Load and unload generator	3a. Sprains, strains, exertion, pinch points	10	3a. Stretch and flex before attempting to load or unload. Know the weight of the generator and your personal ability. Use assistance. Be aware of hand placement.	6	
	3b. Burns to hands from hot parts	6	3b. Always allow a generator to cool completely before attempting to load/unload.	2	

Task Hazard Analysis

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found.
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REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!						
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any ‘Stop Work’ triggers.</i>	Risk <i>(final)</i>	
On-Site Edits:						
4.	Position & setting up generator	4a. Carbon monoxide poisoning & entrainment of Carbon monoxide gas into adjacent buildings/structures	15	4a. NEVER OPERATE A GENERATOR INDOORS. Direct generator exhaust away from personnel and work area. Know the symptoms of Carbon Monoxide poisoning including headache, nausea, dizziness, fatigue and shortness of breath. Leave area immediate if symptoms are experienced. Set generator away from doors, windows, and potential entrainments sources such as air intakes, HVAC systems, etc.	4	
		4b. Electric shock	12	4b. Verify that generator is grounded using a grounding rod and that it is equipped with a Ground Fault Circuit Interrupter.	4	
		4c. Nearby materials catching fire	8	4c. Position generators away from flammable/combustible materials. Routinely inspect all areas where generators are positioned to verify that area is kept clear of combustible materials.	4	
		4d. Noise-related hearing loss	6	4d. Position generator as far away as possible from workers. Use barriers to deflect noise where possible.	2	
On-Site Edits:						
5.	Inspect generator and check fluids	5a. Fires from malfunction	9	5a. Inspect the generator for any signs of damage, fuel or oil leaks, etc.	3	
		5b. Mechanical failure from low oil	8	5b. Verify that oil is at appropriate level and appears clean	4	
On-Site Edits:						
6.	Fuel generator	6a. Fires from fueling	12	6a. Allow generator to cool for a minimum of 30 minutes after operation before refueling. Keep a portable ABC fire extinguisher in the fueling area. No open flames allowed within 50' of fueling operations.	4	
		6b. Fuel spills	8	6b. Store fuel in an ANSI approved container of no more than 5 gallons Have a spill kit available in case of spills. Fuel and store fuel in a secondary containment.	8	
		6c. Splash of fuel to eyes/face	6	6c. Wear safety glasses when fueling. Have eyewash and clean rinse water available in case of splash.	6	

Task Hazard Analysis

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found.
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REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!					
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	Risk <i>(final)</i>
On-Site Edits:					
7.	Starting and operating generator	7a. Electric shock from improper use 7b. Exertion/strain/sprain from pull starting	12 4	7a. Do not start a generator when it is raining or when you are wet. Verify that generator is equipped with a GFCI. Inspect all equipment to be attached to the generator including tools & electrical cords prior to attaching to the generator. 7b. Pull cord start generators can be difficult to start, especially if cord is old or gummy. Make sure pull cord is in good condition upon inspection. Get an electric – start generator if possible.	4 2
On-Site Edits:					
8.	Periodic maintenance	8a. Fires and mechanical failure from inadequate maintenance	6	8a. Verify ongoing inspection and scheduled maintenance for owned and leased equipment. The maintenance schedule should be presented in the Owner's Manual but routinely should include oil and spark plug change, air filter replacement, ensuring the battery is properly charged and that battery connections are cleaned, the equipment is started every 30 days or so, and that it is drained of fuel when not in use.	4
On-Site Edits:					

Additional Notes:

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Task Hazard Analysis

Task Name: Error! Reference source not found.

Control #: Error! Reference source not found.

All Employees:

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Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

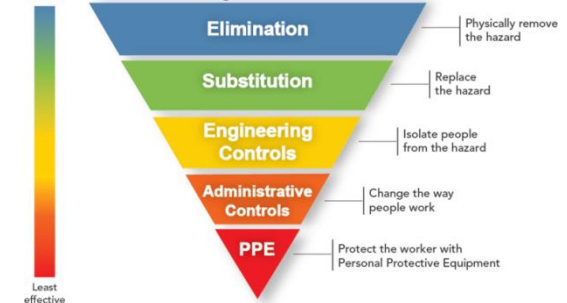
Use **4-Sight**, AECOM's last minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

- ▶ **What am I about to do?**
- ▶ **What can go wrong?**
- ▶ **What can be done to make it safer?**
- ▶ **What have I done to communicate the hazards?**

For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories



Hierarchy of Controls



- ▶ **Most hazards need more than one control**
- ▶ **What should you do? Stack your controls**
- ▶ **PPE can NEVER be your only means of protection**

Worker Sign On

I participated in the on-site review and fully understand the content of this Task Hazard Assessment.

Printed Name	Signature
1. Supervisor:	
2.	
3.	
4.	
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Visitor Acknowledgement

Visitors review task hazards and acknowledge understanding

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Submit a new THA for addition to the DCSA THA Library or send THA improvement suggestions to DCSA.THA.Library@AECOM.com
Include a copy of the new THA or a photo of the THA modifications as appropriate.

Task Hazard Assessment

Task Name:	Site Walk – Construction/Demolition Site	Control #:	01-01-10-01
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Project Name:	Former Grand Dry Cleaners Site	Client:	NYSDEC	Date:	10/15/2024
Permits Required? (list):		Work Location:	175 West Union Street, Newark, NY 14513		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	<input checked="" type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses <input checked="" type="checkbox"/> HiVis Vest <input checked="" type="checkbox"/> Safety Toe Boots <input checked="" type="checkbox"/> Gloves: <u>leather</u> <input checked="" type="checkbox"/> Hearing Protection <input type="checkbox"/> Other: _____
Tools & Equipment:	

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>	Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk (initial)	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	Risk (final)
1. Plan the site walk	1a. Not having proper PPE 1b. Inappropriate vehicle for site 1c. Inadequate materials/supplies 1d. Lack of site escort if needed 1e. Inclement weather	4 4 4 4 6	1a. Determine what the basic PPE requirements are in advance and have available or know that they will be available to you to borrow once on site. 1b. Determine what type of vehicle is needed for site conditions (4-wheel drive, truck or car). 1c. Determine what materials and supplies you must bring versus what is available on site such as insect spray, sunscreen, drinking water, food, etc. 1d. Prearrange trip in advance where possible, determine who will be meeting you on site and when. 1e. Plan for the anticipated weather conditions. Check the predicted weather for the worksite prior to departing. Reschedule site visit if severe weather such as lightning storms, sleet/ice storms, blizzards, etc., are predicted.	4 4 4 4 6
On-Site Edits:				
2. Arriving at site	2a. Parking in inappropriate areas subjecting you and/or vehicle to construction hazards	6	2a. Know where you are supposed to park prior to arrival or check in at site so that you do not subject yourself or your vehicle to site hazards such as construction vehicle traffic, wet/muddy conditions, poor walking surfaces, etc.	2
On-Site Edits:				

Task Hazard Analysis

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found.
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REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!					
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>		Risk <i>(initial)</i>	
		Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>		Risk <i>(final)</i>	
3. Walking Site/Observing Work	3a. Biological hazards	4	3a. There are many different types of biological hazards that can be encountered on a work site. These include ticks, spiders, mosquitoes, chiggers, poisonous or other noxious plants, alligators, bears, small mammals, bird droppings, small mammals, snakes, etc. Consult S3AM-313-PR1 and the multiple attachments to determine the biological hazards that may be present and the mitigation measures for each.	2	
	3b. Feral & wild animals	4	3b. Do not attempt to pick up, handle, or otherwise handle stray or wild animals such as dogs, cats, raccoons, squirrels, etc., no matter how tame they may appear.	2	
	3c. Heat stress	6	3c. Know the signs and symptoms of heat stress (refer to the procedure S3AM-113-PR1 for information. Have adequate drinking water available and drink frequently. Arrive at the site well hydrated and physically fit.	3	
	3d. Cold stress	6	3d. Know the health concerns associated with working in cold weather including hypothermia, frost bite, etc. (see S3AM-112-PR1). Dress in layers and take warming breaks.	4	
	3e. Sunburn	6	3e. Have sunblock available and apply and reapply as per directions. Avoid direct solar exposure when possible. Seek breaks in shaded areas.	3	
	3f. Slips/trips/falls	6	3f. Be aware of walking surfaces at all times, wear footwear with good tread and ankle support, use handrails where available, avoid walking in muddy or wet areas when possible, identify and mark or have removed any obstructions that may be present in predicted walking paths.	4	
On-Site Edits:					
4. Leaving the site	4a. Transporting biological hazards into vehicle	4	4a. Inspect self for ticks before entering vehicle. If it possible that clothing and personal items such as jackets, backpacks, lunch bags, and so on have been exposed to poisonous plant oils or may harbor ticks or other insects, bag such items until they can be appropriately treated.	2	
	4b. Hitting object when leaving	6	4b. Before moving the vehicle, perform a 360° walk around of the vehicle to verify that no changes have been made that may impact exit.	4	
On-Site Edits:					

Task Hazard Analysis

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5.		5a.		5a.	
On-Site Edits:					
6.		6a.		6a.	
On-Site Edits:					
7.		7a.		7a.	
On-Site Edits:					

Additional Notes:

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Task Hazard Analysis

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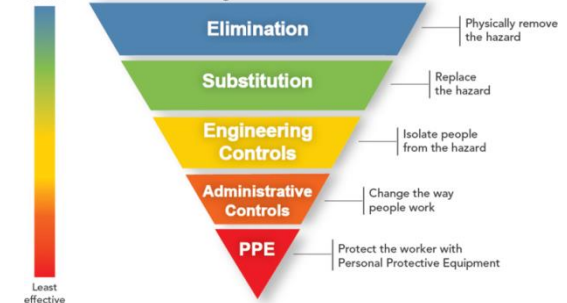
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Hierarchy of Controls



- ▶ **Most hazards need more than one control**
- ▶ **What should you do? Stack your controls**
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Task Hazard Assessment – DCSA

Task Name:	Error! Reference source not found. Click here to enter text.	Control #:	Error! Reference source not found. Click here to enter text.
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Project Name:	Northeast Alloys and Metals, Inc.	Client:	NYSDEC	Date:	10/10/2024
Permits Required? (list):		Work Location:	2145 Dwyer Avenue, Utica, NY 13501		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	<input checked="" type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses <input checked="" type="checkbox"/> HiVis Vest <input checked="" type="checkbox"/> Safety Toe Boots <input checked="" type="checkbox"/> Gloves: _____ <input type="checkbox"/> Hearing Protection <input type="checkbox"/> Other: _____
Tools & Equipment:	

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!					
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>		Risk <i>(initial)</i>	
Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>		Risk <i>(final)</i>			
1.		1a.			
On-Site Edits:					
2.		2a.			
On-Site Edits:					
3.		3a.			

Task Hazard Assessment – DCSA

Task Name: Error! Reference source not found. Click here to enter text.

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REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact. Identify any 'Stop Work' triggers.</i>	Risk <i>(final)</i>
On-Site Edits:					
4.		4a.		4a.	
On-Site Edits:					
5.		5a.		5a.	
On-Site Edits:					
6.		6a.		6a.	
On-Site Edits:					
7.		7a.		7a.	
On-Site Edits:					

Task Hazard Assessment – DCSA

Task Name:	Error! Reference source not found. Click here to enter text.	Control #:	Error! Reference source not found. Click here to enter text.
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Additional Notes:

Task Hazard Assessment – DCSA

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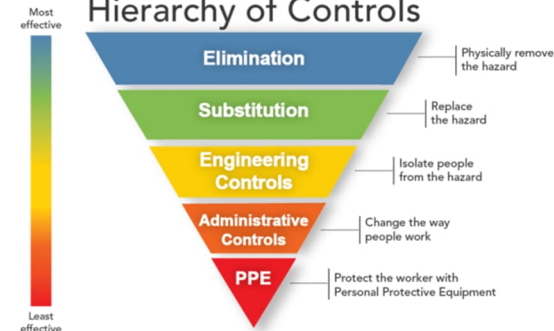
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Task Hazard Assessment – DCSA

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Include a copy of the new THA or a photo of the THA modifications as appropriate.

Americas

Daily Tailgate Meeting

S3AM-209-FM5

Instructions: Conduct meeting prior to sending crews to individual tasks. Require attendance of all AECOM employees and subcontractors. Invite personnel from simultaneous operations for coordination purposes. Review scope of work and briefly discuss required and applicable topics. **This meeting is a daily refresher, not a full orientation.** Task-specific discussions associated with Task Hazard Assessment (THA) follow this meeting at the task location immediately before individual task is started.

AECOM Supervisor Name:

Phone Number:

AECOM SH&E Rep. Name:

Phone Number:

Meeting Leader:

Date:	Project Name/Location:	Project Number:
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Today's Scope of Work:

Muster Point Location:	First Aid Kit Location: In Vehicle	Fire Extinguisher Location: NA	Spill Kit Location: NA
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1. Required Topics	2. Discuss if Applicable to Today's Work
<input checked="" type="checkbox"/> Fitness for Duty requirements, all sign in / sign out <input checked="" type="checkbox"/> Required training (incl. task specific) completed and current <input checked="" type="checkbox"/> SH&E Plan onsite - understood, reviewed, signed by all (incl. scope, preplanning hazard assessments / risk registers, controls, procedures, requirements, etc.) <input checked="" type="checkbox"/> Task Hazard Assessments (THAs) are to be reviewed and completed for each task immediately prior to conducting <input checked="" type="checkbox"/> STOP WORK Right & Responsibility- all task changes/changed conditions re-assess with THA <input checked="" type="checkbox"/> Requirement to report to supervisor any injury, illness, damage, near miss, unsafe act / condition <input checked="" type="checkbox"/> Emergency Response Plan – including muster point, first aid kit, fire extinguisher, clinic/hospital location <input checked="" type="checkbox"/> Personal Protective Equipment (PPE) - Required items per hazard assessments in good condition / in use by all <input checked="" type="checkbox"/> Equipment/machinery inspected (documented as required) and in good condition - operators properly trained/certified <input checked="" type="checkbox"/> Work area set up and demarcation/ barricades in place to protect workers, site staff, and the public <input checked="" type="checkbox"/> Required checklists/records available, understood (describe): <input checked="" type="checkbox"/> Lessons Learned / SH&E improvements (describe):	<input checked="" type="checkbox"/> <input type="checkbox"/> Check <input checked="" type="checkbox"/> as reviewed or mark <input type="checkbox"/> as not applicable <input type="checkbox"/> <input type="checkbox"/> Biological/ Chemical / Electrical Hazards <input type="checkbox"/> <input type="checkbox"/> Ergonomics - Lifting, Body Position <input type="checkbox"/> <input type="checkbox"/> Lock Out/ Tag Out Short Service Employees - visual identifier and mentor/ oversight assignment <input type="checkbox"/> <input type="checkbox"/> Simultaneous/ Neighbouring Operations <input type="checkbox"/> <input type="checkbox"/> Slip/ Trip/ Fall Hazards <input type="checkbox"/> <input type="checkbox"/> Specialized PPE Needs <input type="checkbox"/> <input type="checkbox"/> Traffic Control <input type="checkbox"/> <input type="checkbox"/> Waste Management/ Decontamination <input type="checkbox"/> <input type="checkbox"/> Weather Hazards / Heat Stress / Cold Stress <input type="checkbox"/> <input type="checkbox"/> Subcontractor Requirements (e.g., JHAs, THAs, procedures, reporting, etc.) <input type="checkbox"/> <input type="checkbox"/> Work Permits / Plans required (e.g., Fall Protection, Confined Space, Hot Work, Critical Lifts, etc.); in place, understood (identify/attach): <input type="checkbox"/> <input type="checkbox"/> Other Topics (describe/attach): <input type="checkbox"/> <input type="checkbox"/> Client specific requirements (describe):

3. Daily Check Out by Site Supervisor	
Describe incidents, near misses, observations or Stop Work interventions from today:	Describe Lessons Learned/ Improvement Areas from today:

The site is being left in a safe condition and work crew checked out as fit unless otherwise specified as above.

Site Supervisor Name	Signature	Date Time (at end of day / shift)
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Worker Acknowledgement / Sign In Sign Out sheets applicable to this meeting are on reverse and, if applicable, attached.

Daily Tailgate Meeting (S3AM-209-FM5)

Revision 9 January 15, 2019

PRINTED COPIES ARE UNCONTROLLED. CONTROLLED COPY IS AVAILABLE ON COMPANY INTRANET.

All employees:

- **STOP WORK** if concerned / uncertain about safety / hazard or additional precaution is not recorded on the THA.
- **Be alert and communicate any changes in personnel or conditions at the worksite to the supervisor.**
- **Reassess task, hazards, & mitigations on an ongoing basis; amend the THA if needed.**

SITE WORKERS (including AECOM Contractors and Subcontractors): Your signature below means that you understand:

- * The requirement to participate in creating, reviewing, & updating hazard assessments (THA) applicable to your task(s).
- * The hazards & control measures associated with each task you are about to perform.
- * The permit to work requirements applicable to the work you are about to perform (if it includes permitted activities).
- * That no tasks or work is to be performed without a hazard assessment.
- * Your authority & obligation to "Stop Work" intervene, speak up/ listen up.

Your initials (right columns) certify that you arrived & departed fit for duty, & have reported all incidents/near misses; meaning:

- * You are physically and mentally fit for duty and have inspected your required PPE to ensure satisfactory condition.
- * You are not under the influence of any type of medication, drugs, or alcohol that could affect your ability to work safely.
- * You are aware of your responsibility to immediately report any illness, injury (regardless of where or when it occurred), or impairment/fatigue issue to the AECOM Supervisor.
- * You signed out as fit / uninjured unless you have otherwise informed the AECOM Supervisor.

Print Name & Company	Signature	Initials & Sign In Time	Initials & Sign Out Time
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit

(Attach additional Site Worker sign-in/out sheets if needed) Identify number of attached sheets: _____

SITE VISITOR / SITE REPRESENTATIVE

Name	Company Name	Arrival Time	Departure Time	Signature



Discuss as Applicable and Modify THA as Needed	Severity				
Probability	5 - Catastrophic	4 - Critical	3 - Major	2 - Moderate	1 - Minor
5 - Frequent	25	20	15	10	5
4 - Probable	20	16	12	8	4
3 - Occasional	15	12	9	6	3
2 - Remote	10	8	6	4	2
1 - Improbable	5	4	3	2	1

Risk Rating (Probability x Severity)	Risk Acceptance Authority
1 to 4 (Low)	Risk is tolerable, manage at local level
5 to 9 (Medium)	Risk requires approval by Operations Lead/Supervisor & Safety Manager
10 to 25 (High)	Risk requires the approval of the Operations Manager & Safety Director

Severity – Potential Consequences				
	People	Property Damage	Environmental Impact	Public Image/Reputation
Catastrophic	Fatality, Multiple Major Incidents	>\$1M USD, Structural collapse	Offsite impact requiring remediation	Government intervention
Critical	Permanent impairment, Long term injury/illness	>\$250K to \$1M USD	Onsite impact requiring remediation	Media intervention
Major	Lost/Restricted Work	> \$10K to \$250K USD	Release at/above reportable limit	Owner intervention
Moderate	Medical Treatment	> \$1K to \$10K USD	Release below reportable limit	Community or local attention
Minor	First Aid	<= \$1K USD	Small chemical release contained onsite	Individual complaint

Probability		
Frequent	Expected to occur during task/activity	9/10
Probable	Likely to occur during task/activity	1/10
Occasional	May occur during the task/activity	1/100
Remote	Unlikely to occur during task/activity	1/1,000
Improbable	Highly unlikely to occur, but possible during task/activity	1/10,000

Using the Matrix:

1. Identify basic steps of the task and associated hazards.
2. Calculate the initial risk rating.
3. Identify control measure to eliminate or reduce the hazard's risk and calculate the residual risk rating.
4. If the risk rating (after controls are implemented) cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin.

Attachment B

Applicable AECOM SHE Procedures



Attachment B: Applicable AECOM SHE Procedures

Hazard/ Activity (Note: Text in this column links to procedure)		Applicable Procedure	Hazard / Activity (Note: Text in this column links to procedure)		Applicable Procedure
<input type="checkbox"/>	Abrasive Blasting	S3AM-335-PR1	<input type="checkbox"/>	Highway and Road Work	S3AM-306-PR1
<input type="checkbox"/>	Aerial Work Platforms	S3AM-323-PR1	<input type="checkbox"/>	Hoists Elevators and Conveyors	S3AM-343-PR1
<input type="checkbox"/>	All-Terrain Vehicles	S3AM-319-PR1	<input type="checkbox"/>	Hot Work	S3AM-332-PR1
<input type="checkbox"/>	Blasting and Explosives	S3AM-336-PR1	<input type="checkbox"/>	Ladders	S3AM-312-PR1
<input checked="" type="checkbox"/>	Bloodborne Pathogens	S3AM-111-PR1	<input type="checkbox"/>	Lockout Tagout	S3AM-325-PR1
<input type="checkbox"/>	Cofferdams	S3AM-344-PR1	<input type="checkbox"/>	Machine Guarding Safe Work Practice	S3AM-326-PR1
<input checked="" type="checkbox"/>	Cold Stress	S3AM-112-PR1	<input type="checkbox"/>	Marine Safety and Vessel Operations	S3AM-333-PR1
<input type="checkbox"/>	Compressed Air Systems & Testing	S3AM-337-PR1	<input checked="" type="checkbox"/>	Material Storage	S3AM-316-PR1
<input type="checkbox"/>	Compressed Gases	S3AM-114-PR1	<input type="checkbox"/>	Mine Site Activities	S3AM-341-PR1
<input type="checkbox"/>	Concrete Work	S3AM-338-PR1	<input type="checkbox"/>	Mining Operations	S3AM-345-PR1
<input type="checkbox"/>	Confined Spaces	S3AM-301-PR1	<input checked="" type="checkbox"/>	Non-Ionizing Radiation	S3AM-121-PR1
<input checked="" type="checkbox"/>	Corrosive Reactive Materials	S3AM-125-PR1	<input checked="" type="checkbox"/>	Overhead Lines	S3AM-322-PR1
<input type="checkbox"/>	Cranes and Lifting Devices	S3AM-310-PR1	<input type="checkbox"/>	Powder-Actuated Tools	S3AM-327-PR1
<input type="checkbox"/>	Demolition	S3AM-339-PR1	<input type="checkbox"/>	Powered Industrial Trucks	S3AM-324-PR1
<input type="checkbox"/>	Diving (scientific and commercial)	S3AM-334-PR1	<input type="checkbox"/>	Radiation	S3AM-120-PR1
<input checked="" type="checkbox"/>	Drilling, Boring & Direct Push Probing	S3AM-321-PR1	<input type="checkbox"/>	Railroad Safety	S3AM-329-PR1
<input type="checkbox"/>	Electrical Safety	S3AM-302-PR1	<input type="checkbox"/>	Respiratory Protection	S3AM-123-PR1
<input type="checkbox"/>	Excavation	S3AM-303-PR1	<input type="checkbox"/>	Scaffolding	S3AM-311-PR1
<input type="checkbox"/>	Fall Protection	S3AM-304-PR1	<input type="checkbox"/>	Steel Erection	S3AM-340-PR1
<input checked="" type="checkbox"/>	Flammable and Combustible Liquids	S3AM-126-PR1	<input type="checkbox"/>	Temp. Floors, Stairs, Railings, Toe-boards	S3AM-342-PR1
<input type="checkbox"/>	Gauge Source Radiation	S3AM-122-PR1	<input checked="" type="checkbox"/>	Underground Utilities	S3AM-331-PR1
<input checked="" type="checkbox"/>	Hand and Power Tools	S3AM-305-PR1	<input type="checkbox"/>	Underground Work	S3AM-330-PR1
<input checked="" type="checkbox"/>	Hazardous Waste Operations	S3AM-117-PR1	<input checked="" type="checkbox"/>	Wildlife, Plants and Insects	S3AM-313-PR1
<input checked="" type="checkbox"/>	Heat Stress	S3AM-113-PR1	<input checked="" type="checkbox"/>	Working Alone	S3AM-314-PR1
<input checked="" type="checkbox"/>	Heavy Equipment	S3AM-309-PR1	<input type="checkbox"/>	Working On and Near Water	S3AM-315-PR1
<input type="checkbox"/>	High Altitude	S3AM-124-PR1			

1.0 Purpose and Scope

- 1.1 The purpose of this document is to establish policies and procedures for operation of AECOM-owned, rented, or leased vehicles, client or customer-owned vehicles, and personal vehicles used by AECOM employees.
- 1.2 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content. Policies and procedures related to the operation of commercial motor vehicles are in addition to this procedure; refer to *S3AM-320-PR1 Commercial Motor Vehicles*.

2.0 Terms and Definitions

- 2.1 **AECOM Business** – Any activity that is performed in the name of AECOM. This includes, but is not limited to, vehicle travel between work locations, client sites, meeting locations as well as driving performed as a part of work-related travel (e.g., driving to and from airports, hotels, train stations). AECOM business does not include driving that is a part of a daily routine commute from home to an AECOM location.
- 2.2 **Authorized Driver** – AECOM employees who receive manager approval following evaluation of driver criteria to drive and maintain an AECOM-owned, leased or rented vehicle, a client or customer-owned vehicle, or a personal vehicle operated in the course of conducting AECOM business. Authorized Drivers shall maintain a current driver's license with full privileges applicable to the vehicle to be operated. There are three categories of Authorized Drivers;
 - Professional (AECOM employee who operates a commercial motor vehicle. Please refer to *S3AM-320-PR1 Commercial Motor Vehicles*).
 - Hired (Employee's specific AECOM role is to drive employees in a normal street vehicle, which may or may not require commercial licensing by the applicable authorities. This category does not include busses or vans with a capacity of more than 12 people.).
 - General (Driving is required as a part of the employee's job duties. This includes driving AECOM-owned, leased, or rented vehicles, client or customer-owned vehicles, or personal vehicles on AECOM business).
- 2.3 **Collision** – Any incident in which a motor vehicle that (whether in motion, temporarily stopped, or parked) makes contact with another vehicle or pedestrian, or results in property damage and/or bodily injury, regardless of who was injured, what property was damaged, or who was responsible.
- 2.4 **Commercial Motor Vehicle (CMV)** – Any self-propelled or towed motor vehicle used for AECOM business (e.g., to transport passengers or property) when the vehicle is one of the following:
 - Has a gross vehicle weight rating (GVWR) or gross combination weight rating equal to or greater than the weight specified by the applicable jurisdiction (e.g., U.S. ≥ 10,001 pounds [4,536 kilograms]); or
 - Is designed or used to transport more than the number of passengers specified by the applicable jurisdiction, including the driver, for compensation; or
 - Is designed or used to transport more than the number of passengers specified by the applicable jurisdiction, including the driver, and is not used to transport passengers for compensation; or
 - Is used in transporting hazardous material in quantities ≥ 1,001 pounds (454 kilograms) combined total weight at any time.
 - Refer to *S3AM-320-PR1 Commercial Motor Vehicles* for additional information.

- 2.5 **Distracted Driving** – An activity that takes the driver's attention away from the primary task of driving.
- 2.6 **Driving Under the Influence (DUI)/Driving While Intoxicated (DWI)** – The operation of a vehicle while under the influence of alcohol, drugs, medications, or other substances capable of inducing an altered mental state and/or impairing physical and mental judgments, such that the influence of the substances produces impairment in violation of the applicable governmental laws.
- 2.7 **Fatigue** – A general term used to describe the experience of being “sleepy”, “tired” or “exhausted”. The effect of fatigue is both physiological and psychological and can severely impair a driver's judgement. Fatigue can cause lapses in concentration which could prove fatal. Fatigue is not just a problem for drivers on long trips, as drivers can also suffer from fatigue on short trips.
- 2.8 **Incident** – For the purposes of this procedure, a vehicle collision or other event where personal injury or property damage occurs, or where a citation is issued while the employee is on AECOM business. This may also include acts of theft, vandalism, and criminal mischief.
- 2.9 **Journey Management** – A process for planning and executing necessary journeys safely.
- 2.10 **Local Laws** – Signs, postings, laws, regulations, ordinances and codes applicable for the jurisdiction in which the motor vehicle is being operated.
- 2.11 **Motor Vehicle Report (MVR) / Driver's Abstract** – A listing of the tickets (violations), incidents collision for an individual driver over a period of time (e.g., 3 years, 5 years) provided by a state or provincial authority such as the Department of Motor Vehicles.
- 2.12 **Personal Vehicle** – A motorized vehicle owned or leased by an employee.
- 2.13 **Portable Electronic Device** – A mobile electronic device that is used to receive or communicate voice, email, internet, and/or public media. The device requires user interaction (typing, dialing, reading, keying, etc.) that distracts the motor vehicle operator. Example devices include, but are not limited to:
 - Mobile Communication Devices (MCD)
 - Mobile/Cellular phones
 - Two-way Radios
 - Personal Data Assistant (PDA)
 - iPads, iPods, or other tablet models
 - Computers
 - Global Positioning System (GPS) receivers
- 2.14 **Spotters** – Extra personnel that may provide guidance when maneuvering in close and/or complex situations in order to avoid the occurrence of an incident.
- 2.15 **Task Hazard Analysis (THA)** – A tool for evaluating work activities for the purpose of:
 - Identifying the SH&E hazards and risks associated with the activity being performed;
 - Identifying and implementing control measures to eliminate or reduce hazards and risks; and,
 - Evaluating the effectiveness of control measures and making modifications as needed.

3.0 References

- 3.1 AECOM Global Travel Policy
- 3.2 RS2-001-PR Firearms Standard
- 3.3 S3AM-003-PR1 SH&E Training
- 3.4 S3AM-004-PR1 Incident Reporting, Notifications & Investigation
- 3.5 S3AM-009-PR1 Fatigue Management
- 3.6 S3AM-010-PR1 Emergency Response Planning

- 3.7 S3AM-209-PR1 Risk Assessment & Management
- 3.8 S3AM-314-PR1 Working Alone
- 3.9 S3AM-319-PR1 All-Terrain Vehicles
- 3.10 S3AM-320-PR1 Commercial Motor Vehicles

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 Manager / Supervisor

- Confirming employees are informed of the provisions of this procedure and related vehicle procedures.
- Providing a copy of this procedure to an employee who will be driving an AECOM-owned, leased or personal vehicle for AECOM business.
- Allowing employees to designate time to complete required driving safety training, vehicle inspections and related activities.
- Assigning driving tasks to authorized employees only.
- Selecting and providing vehicles for use by authorized employees that are appropriate for the planned working conditions and environment.
- Supporting employees in the reporting of vehicle incidents per *S3AM-004-PR1 Incident Reporting, Notifications & Investigations*, including the entry of the incident into the on-line incident management system (e.g., IndustrySafe).
- Confirm notification of AECOM Human Resources and Counsel upon receipt by an employee of a legal summons associated with a moving violation related to the use of a company vehicle.

4.1.2 Employee

- Follow this procedure and applicable laws while operating a vehicle.
- Complete assigned driver safety training based on the training matrix and any additional training assessments developed at the business group. Refer to *S3AM-003-PR1 SH&E Training, including S3AM-003-FM1 SH&E Training Matrix*.
- Report to the Manager / Supervisor if the vehicle selected is not appropriate for the working conditions and environment.
- Report to the Manager / Supervisor if the employee is inexperienced in operating the type of vehicle assigned.
- Report to the Manager / Supervisor if the employee is inexperienced in driving in the type of working conditions and environment assigned.
- Review the completed Task Hazard Assessment and complete journey management. If required, document the Journey Management Plan using *S3AM-005-FM1 Journey Management Plan* or equivalent.
- Immediately report vehicle incidents per *S3AM-004-PR1 Incident Reporting, Notifications & Investigations*, including the entry of the incident into the on-line incident management system (e.g., IndustrySafe).
- Notify the appropriate Manager / Supervisor and SH&E Manager upon receipt of a legal summons associated with a moving violation related to the use of a company vehicle.
- Immediately report a change or limitation(s) to his/her Driver's License to the appropriate AECOM Human Resources representative or his/her Manager / Supervisor.

- Conducting a pre-operational inspection of the vehicle for damage or deficiencies and reporting discovered deficiencies affecting the safe operation of the motor vehicle to the appropriate authority (e.g., supervisor, rental car agency, etc.).

4.1.3 SH&E Manager

- Maintaining and updating training resources for vehicle and driver safety.
- Providing guidance.
- Assisting operational leaders with determining the risk incurred by the use of motor vehicles.
- Assist in the incident investigation and review process.

4.2 General Procedures and Practices

- 4.2.1 Only Authorized Drivers are to operate a motor vehicle (rental, personal, client or customer-owned, or AECOM-owned/leased) while on AECOM business.
- 4.2.2 Drivers must comply with AECOM's *Global Travel Policy* and applicable laws, and employ safe driving practices. (NOTE: *Individual state, provincial, and local laws vary.*) Refer to *S3AM-005-ATT1 Authorized Driver Safety Practices*.
- 4.2.3 Authorized Drivers shall confirm their operating license is on their person, and valid registration and insurance is maintained with the respective vehicle prior to operation.
- 4.2.4 All local laws including, signs, postings, regulations, ordinances, and codes applicable for the jurisdiction in which the motor vehicle is being operated shall be adhered to.
- 4.2.5 At-risk driving behavior by AECOM employees shall be identified and managed accordingly.
- 4.2.6 Authorized Drivers must be at least 18 years of age (noncommercial license) or 21 years of age (commercial license) and have a current driver's license for the appropriate class of vehicle (unless more stringent requirements are established by the leasing/renting agency). Employees with conditional licenses are prohibited from operating vehicles on AECOM business.
- 4.2.7 If an Authorized Driver receives a citation resulting in their license being suspended, has his/her driver's license revoked, or is otherwise unauthorized to drive, he/she shall notify the appropriate AECOM Human Resources representative or his/her Manager prior to start of the following work day. Failure to do this may result in disciplinary action up to and including termination.
- 4.2.8 The office to which the vehicles are registered is liable for any damages to the vehicle being operated by an Authorized Driver.
- 4.2.9 Seat belts are to be worn by the occupants. The number of passengers shall not exceed the manufacturer's specifications for the vehicle.
- 4.2.10 The vehicle may not move until all passengers have fastened their restraints in the proper manner (e.g., lap belt secured and shoulder harness placed over the shoulder). Vehicles are not to be operated or used by AECOM employees if seatbelts are not included as part of the vehicle's safety equipment.
- 4.2.11 The vehicle's engine is to be turned off during refueling. Smoking or cellular phone use is not allowed while refueling.
- 4.2.12 Motorcycles may not be operated on AECOM business unless the following requirements are met:
 - Specific approval is provided by the Supervisor with concurrence from the SH&E Manager.
 - A hazard analysis is completed.
 - Required training and license is in place.
 - Headlights or daytime running lights will be used when the vehicle is in operation.
 - A Class 2 or 3 safety vest and appropriate helmet shall be worn while operating a motorcycle.

- 4.2.13 When practical, drivers should travel during daylight hours and avoid driving during adverse weather conditions. Drivers should also inform colleagues of their travel itinerary including destination and anticipated departure and arrival times.
- 4.2.14 Fire arms and weapons are not permitted in AECOM-owned, leased or rented vehicles insured by AECOM. Firearms and weapons in personal vehicles are subject to the laws and regulations of the respective local, provincial, state, territory, federal and region and/or country. Refer to the *RS2-001-PR1 Firearms Standard*.
 - Exceptions to this standard may exist where there is a credible and demonstrated risk to AECOM employees or assets, or when knives or weapons are required as part of the work activity. Under such circumstances, the exception must be approved by the Chief Resilience Officer, and must strictly adhere to the procedures set forth by the Global Resilience Group.
- 4.2.15 Vehicles are to be selected based on the nature of planned use. In some working conditions, specialized vehicles, such as four-wheel drive and higher clearance vehicle, may be required to confirm safe travel. These specialized vehicle requirements/specifications shall be identified in the project specific SH&E Plan and/or THA.
- 4.2.16 Vehicles are to be maintained according to manufacturer's specifications and the applicable environmental and operating factors (e.g. winterized with appropriate fluids, winter tires installed, appropriate coolant for hot climates, etc.).
- 4.2.17 Vehicles are to be outfitted with the appropriate support equipment based on the THA or client vehicle specifications. Support equipment may include, but is not limited to, cones, rotating warning lights, warning flags, vehicle identification (magnetic door signs or similar), wheel chocks, cargo nets, and rollover protection.
- 4.2.18 Drivers are to operate vehicles in a manner that avoids situations where backing is necessary. Whenever possible and as permitted, reverse parking of all vehicles while on business is required. A spotter shall be used when backing of trucks and heavy equipment presents a risk of collision.
- 4.2.19 Non-AECOM drivers (those other than AECOM employees [e.g., subcontractors, joint venture partners, clients, etc.]) are prohibited from operating an AECOM company owned, leased or rented vehicle unless the activity is specifically agreed to in the applicable contract and only if the use of the vehicle is consistent with the terms of the contract.
- 4.2.20 Authorized drivers required to operate vehicles with special hazards (e.g., trucks carrying fuel cells, vehicles used to tow trailers, vehicles with limited visibility, etc.) will be thoroughly briefed on the hazards and control measures necessary for safe operation of the vehicle. The local AECOM operation will maintain documentation of the briefing.
- 4.2.21 Define specific vehicle travel routes and parking areas at field sites through the use of fencing, cones, or other markings.
- 4.2.22 When a vehicle will be left unattended without an authorized driver in the driver's seat, the vehicle must be turned off, placed into park (or gear for manual transmissions), and the emergency brake set. When parked on a grade, the wheels or tracks of mobile equipment shall be either chocked or turned into a bank.
- 4.3 Distracted Driving
 - 4.3.1 Distractions while driving are a major cause of incidents. Distractions include the use of cellular phones (including texting), eating, drinking, smoking, and engaging in intense conversations. AECOM Authorized Drivers must exercise proper control of the vehicle at all times, including the management of possibly distracting actions and behaviors.
 - 4.3.2 The use of portable electronic devices that may distract the driver while driving is prohibited. This includes cell phones, two-way radios and other items whether hand-held or hands-free. Electronic devices include, but are not limited to, all mobile phones pagers, iPods, MP3s, GPS units, DVD players, tablets laptops and other portable electronic devices that can cause driver distraction.

- Employees shall not use a personal or company mobile communication devices (MCD) while driving any vehicle on AECOM business.
 - Employees shall not use a company MCD while driving a personal vehicle.
 - Driving includes the time spent in traffic or while stopped at red lights or stop signs.
- 4.3.3 GPS units and devices (e.g., smart phones, tablets) used for navigation may only be used if factory installed or secured to the vehicle with a bracket that allows the driver to view the image without having to take their eyes off the road. Note: windshield mounting brackets are not permitted in many jurisdictions, with dashboard mounts being acceptable. Consult jurisdictional requirements.
- 4.3.4 Electronic devices shall be setup for operation prior to commencing driving activities and shall not be changed by the driver while driving.
- 4.4 Impairment
- 4.4.1 Impairment can take many forms ranging from fatigue, to the use of prescription medication or alcohol (even small amounts), to the abuse use of illegal and legal drugs and alcohol. AECOM employees shall not drive in an impaired condition.
- 4.4.2 AECOM employees are prohibited from being under the influence of alcohol or drugs or improperly using medication in a way that could diminish, or raise questions concerning, an employee's ability to perform at his or her best while performing services for or on behalf of AECOM. Operation of vehicles while under the influence may void insurance coverage.
- 4.4.3 Drivers/operators will not drive or operate vehicles while under the influence of medications when told by a physician, another healthcare provider, or the manufacturer (e.g., instructions on the label) the medication could render the activity unsafe.
- 4.4.4 AECOM employees are prohibited from operating a vehicle if they are experiencing signs and symptoms of fatigue. Employees should stop work and rest before driving. No employee should operate a vehicle if they have worked 14 consecutive hours within a 24 hour period. Refer to *S3AM-009-PR1 Fatigue Management*.
- 4.5 Journey Management
- 4.5.1 When practical, alternatives to road travel should be evaluated including teleconferencing/video conferencing, the use of public transportation or carpooling.
- 4.5.2 Journey management is a process for planning and executing necessary journeys safely and may or may not be documented. Review the completed THA and complete the journey management process. If required, document a Journey Management Plan (JMP) using *S3AM-005-FM1 Journey Management Plan* or equivalent. The journey management process includes the following steps:
- Determining if the trip is necessary.
 - Evaluating alternative safer modes of transport.
 - Evaluating the potential to combine journeys with others.
 - Planning the trip.
 - Select the safest and most efficient route. Confirm compliance with any site specific specified routes, route rules, or restrictions.
 - Confirm route planning factors in fatigue management. Refer to *S3AM-009-PR1 Fatigue Management*.
 - Review road conditions and potential hazards associated with the route.
 - Review weather conditions and forecast.
 - If applicable, review *S3AM-314-PR1 Working Alone*.
 - Confirm Emergency Response Plan includes procedures to be taken in the event of a collision or vehicle incident.
 - Allow for adequate travel time.
 - Inform others of destination, estimated time of arrival and routing.

- 4.5.3 Drivers who are to undertake trips in excess of 250 miles (400 km) each way, drive in remote or hazardous areas, or when otherwise deemed necessary, shall develop and document a JMP. This plan typically includes the route, location of route hazards, timing, rest periods and locations, communications, emergency response and security arrangements.
- 4.5.4 Drivers are responsible for developing the JMP and coordinating with the applicable parties identified in the plan.

4.6 Driver Safety Training

Authorized drivers shall have a current driver's license for the appropriate class of vehicle (unless more stringent requirements are established by the leasing/renting agency).

Driver safety training is to be assigned based on the risks posed with the work environment, driver type and vehicle type, using the training matrix and any additional training assessments developed at the business group level. Refer to *S3AM-003-PR1 SH&E Training, including S3AM-003-FM1 SH&E Training Matrix*. A determination of training type is at the discretion of the Manager / Supervisor, with the following guidance applied.

- 4.6.1 All Authorized Drivers (Professional, Hired, and General Drivers) shall be trained in this procedure; *S3AM-005-PR1 Driving*.
- 4.6.2 All Authorized Professional Drivers shall be trained in *S3AM-320-PR1 Commercial Motor Vehicles*.
- 4.6.3 Vehicle / Driver Safety Training
 - Recommended for all employees who drive on behalf of AECOM (Professional, Hired and General Drivers).
 - This may be completed online (e.g., AECOM University – Driver Safety).
 - Recommended to be completed within 1 month of the Authorized Driver's hire date.
- 4.6.4 Defensive Driver (online) Training
 - Recommended for all Authorized Drivers (Professional, Hired, and General Drivers) who are assigned an AECOM company owned, leased or rented vehicle for a significant period of time with the expectation that the employee utilizes the vehicle on a regular basis for AECOM business.
 - It is recommended that authorized drivers who have completed web-based defensive driver training or equivalent also complete a refresher every three years.
 - Defensive Driver training is available online through AECOM University (e.g., Alert Driving Basic, Alert Driving Skills) or one of the following AECOM-approved training resources:
 - The National Safety Council
 - Alert Driving
- 4.6.5 Defensive Driver (hands-on) Training
 - Recommended for all Authorized Professional Drivers and Authorized Hired Drivers.
 - Recommended for Authorized General Drivers who drive in remote locations, hazardous environments (such as refineries, ports, terminals etc.), at-risk drivers, and when required by clients.
 - Defensive Driver hands-on training is provided through an AECOM-approved training resource, such as Smith Systems.
 - Hands on defensive driver training may be required as a result of an incident or negative Motor Vehicle Report.
- 4.6.6 Driver Retraining
 - Drivers involved in repeated motor vehicle incidents, incidents of sufficient severity or concern, or drivers identified as at-risk through review of their Motor Vehicle Report/Driver Abstract may

be retrained or, as applicable, subject to disciplinary action and refused the right to drive on behalf of AECOM.

- Retraining programs will be implemented at the discretion of the Supervisor and SH&E Manager.
- Employees eligible to continue driving shall be subject to a driver retraining program that may include any of the above programs or other training programs appropriate for the type of driving the employees performs.

4.6.7 Special Vehicles and Driving Conditions

- Vehicles such as All-Terrain Vehicles (ATVs), four wheel drive vehicles, motorized carts, snowmobiles, box vans and trailers (towing) require specialized training and supervision. For ATVs, Refer to *S3AM-319-PR1 All-Terrain Vehicles* for additional information.
- Use of these types of vehicles is limited to AECOM projects, therefore training and qualification programs for drivers will be project specific. The Manager / Supervisor shall work with the SH&E Manager to tailor training to the specific needs of the project.

4.7 Personal Vehicles (additional requirements)

- 4.7.1 The requirements of this procedure apply to the use of a personal vehicle for AECOM business. Additional requirements are set forth in the *AECOM Global Travel Policy*.
- 4.7.2 Personal vehicles driven by Authorized Drivers for business use must satisfy the jurisdiction's registration and inspection requirements and may not be modified beyond manufacturer's specifications.

4.8 Rental Vehicles (additional requirements)

- 4.8.1 The requirements of this procedure apply to the use of a rental vehicle for AECOM business. Additional requirements are set forth in the *AECOM Global Travel Policy*.

4.9 Requirements for Authorized Drivers

- 4.9.1 Review the *S3AM-005-ATT1 Authorized Driver Safety Practices* for specifics.
- 4.9.2 Drivers are not to permit unauthorized persons to operate an AECOM-owned/leased/rented vehicle.
- 4.9.3 All Authorized Drivers shall perform a walk-around inspection of the vehicle prior to operation.
- 4.9.4 Pre-operation vehicle inspections shall be performed and documented by all Authorized Professional Drivers and all Authorized Hired Drivers. A sample vehicle inspection checklist is provided in *S3AM-005-FM2 Vehicle Inspection Checklist*.
- 4.9.5 Vehicles with deficiencies that affect or could potentially affect the safe operation of the vehicle shall be removed from service and promptly repaired as necessary to permit safe vehicle operation.
- 4.9.6 As applicable, arrange for and/or coordinate with appropriate AECOM personnel to facilitate preventive maintenance services for the vehicle. Maintain it in sound mechanical condition, as per the manufacturer's recommendations provided in the owner's manual.
- 4.9.7 Do not operate the vehicle if unsafe maintenance conditions exist that would likely result in vehicle damage or personal injury. This applies to vehicles owned or leased by AECOM and to personally-owned vehicles used for AECOM business. Escalate other maintenance issues for correction to appropriate authority (e.g., manager, rental car agency, supervisor, etc.).
- 4.9.8 Transport only persons on AECOM related business or those persons receiving transportation as a prescribed service. Only drive vehicles in conditions for which the driver has the appropriate training and experience.
- 4.9.9 AECOM-owned, rented, or leased vehicles are for official business use only and are not to be used for personal activities. Exceptions to this requirement can be made only with the specific written approval of the Manager of the office or location the vehicle is registered to.

- 4.9.10 Smoking (including the use of e-cigarettes) and chewing tobacco is not permitted in AECOM-owned, leased or rented vehicles.
- 4.9.11 Drivers are responsible for damage caused by abuse of the vehicle.
- 4.9.12 Secure the vehicle when left unattended.
- 4.9.13 Securing loads in the inside and outside compartments of the vehicle.
 - Do not rely on weight/shape of load alone. Always use a cargo net, straps, containers or other mechanical device when necessary to confirm load is secure.
 - Mark loads that extend the beyond the end of truck, trailer or similar edge with a red warning flag of at least 16 square inches.
 - Red lights will be utilized at night to mark loads that extend the beyond the end of truck, trailer or similar edge.
- 4.9.14 Do not modify existing equipment (warning sounds, backing alarms etc.) or install aftermarket equipment including toolboxes, truck caps, specialty lights, or towing equipment) without approval from the Manager of the office or location the vehicle is registered to and AECOM Procurement Department.
- 4.10 Emergency Preparedness
 - 4.10.1 AECOM-owned or leased vehicles are to have a “Safety Kit” that contains a first-aid kit, portable fire extinguisher, safety triangle, and two reflective safety vests. If not available, contact the Manager / Supervisor or SH&E Manager to determine how to obtain a kit.
 - 4.10.2 The following suggested items should be kept in vehicles used for AECOM business in remote project locations:
 - First aid kit, appropriate to the work and crew size, or per regulations.
 - Fire extinguisher, safety triangle, and safety vest.
 - Emergency equipment (e.g., flares, flashlight, blanket, drinking water, etc.) based on conditions.
 - Means of communication (cell phone, radio or satellite phone), extra batteries or a charger.
 - 4.10.3 To the extent possible, employees should refrain from changing tires or making repairs to vehicles in the field.
 - A road side assistance service should be identified for vehicles used for AECOM business in advance travel.
 - If changing tires or making repairs to vehicles is necessary in the field, assessment of hazards shall be completed and all applicable safe procedures and manufacturer’s specifications shall be followed.
 - 4.10.4 Specific emergency procedures are to be identified in the applicable Emergency Response Plan, JMP or the THA. Refer to *S3AM-010-PR1 Emergency Response Planning*.
- 4.11 Vehicle Incidents
 - 4.11.1 Vehicle incidents are to be reported and managed in accordance with *S3AM-004-PR1 Incident Reporting, Notifications and Investigation* regardless of how minor the incident might be.
 - 4.11.2 The Employee(s) involved in a collision shall follow the below guidelines:
 - Assess the situation to confirm everyone is safe, and remove any vehicle occupants from harm’s way. Call, or have someone else call 911 immediately, if necessary.
 - As appropriate, remain at the scene of a collision to contact the police. Ask another motorist to call the police if necessary; never leave the scene of a collision.

- As applicable, provide (if requested) to police and the other driver(s) the liability insurance information. Obtain the officer's jurisdiction, name, and badge number and a copy of the police report.
 - As applicable, consider moving the vehicle out of the traffic flow if it is safe to do so, the vehicle is operational, and/or no further damage to the vehicle can occur.
 - Do not operate a damaged vehicle if its safety is questionable, its operating condition is illegal by applicable laws or its condition is such that further damage would likely result from its operation.
 - Turn on the vehicle's flashers to warn other motorists.
 - Obtain:
 - Names, phone numbers, and addresses of owner(s), driver(s), and occupants of the other car(s) involved.
 - Other party's insurance company's name, address, phone number, policy number, and insurance agent.
 - Names, phone numbers, and addresses of all witnesses.
 - Photographs of the accident scene when safe to do so.
 - Cooperate with AECOM Counsel if the incident results in unresolved risks or third party claims, or if the employee receives a summons, complaint or other legal documents relating to a traffic incident.
 - **DO NOT ADMIT LIABILITY, AGREE TO PAY FOR DAMAGE OR SIGN A DOCUMENT RELATED TO AN INCIDENT EXCEPT AS REQUIRED BY LAW.**
 - Statements made in haste or anger may be legally damaging.
 - If contacted by a third party, do not answer any questions. Immediately report this contact to the Manager / Supervisor and/or Legal Counsel
 - Employees shall report the incident to AECOM's Global Travel Department. If the incident involved a third party, the driver is responsible for obtaining a copy of the police report and providing to global travel
- 4.11.3 Employees must cooperate with the incident investigation team during any investigation of an incident meeting the investigation protocol.
- 4.11.4 Vehicle repairs shall be conducted at the authorization of the Manager / Supervisor.
- 4.12 Drug and Alcohol Testing
- 4.12.1 Testing for Alcohol and/or Drugs procedures shall be administered in accordance with the applicable policy and procedures. Refer to *S3AM-019-PR1 Substance Abuse Prevention*.
- 4.12.2 In the event that a police/regulatory officer responding to a vehicle incident administers field and/or laboratory impairment testing AECOM reserves the right, as permitted, to obtain copies of such testing results for inclusion in the incident report and consideration in a subsequent incident investigation.
- 4.13 Driving Privileges, Citations and Violations
- 4.13.1 A violation of this vehicle safety standard is subject review by the appropriate AECOM Human Resources representative and may be subject to disciplinary action, up to and including termination. The applicable Manager / Supervisor will review all incidents involving AECOM-owned, rented, or leased vehicles.
- 4.13.2 Citations and violations which occur while driving for AECOM business are to be reported as a vehicle incident in accordance with *S3AM-004-PR1 Incident Reporting, Notification & Investigation* within 24-hours. Incidents will be investigated as appropriate.
- 4.13.3 The AECOM Manager responsible for the employee, in consultation with the appropriate AECOM Human Resources representative, may suspend the privilege to operate vehicles on AECOM business due to noncompliance with the AECOM Vehicle and Driver Safety Program, involvement

in a motor vehicle incident, or resulting citations or other legal actions associated with motor vehicle violations.

4.13.4 The employee's driving privileges will be suspended for any of the following:

- Accidents or legal action involving alcohol or drug use (e.g., driving under the influence).
- Driving without a license.
- Hit-and-run driving or leaving the scene of an accident.
- Unauthorized use of AECOM vehicles (e.g., using an AECOM vehicle for moving personal items, carrying passengers who are not associated with work activities, etc.).

4.13.5 The employee's driving privileges may be suspended for any of the following:

- Two or more at-fault accidents involving the same Authorized Driver within a 12-month period.
- Multiple complaints from other employees or members of the public about driving performance.
- Any accident caused by an AECOM Authorized Driver where damages exceed \$2,500.
- Failure to comply with the distracted driving requirements.
- Gross misconduct or violation of policy.

4.13.6 An Authorized Driver's driving privileges may be reinstated as follows:

- For any suspension resulting from law enforcement agency legal action involving drugs and alcohol on the part of the former Authorized Driver, driving privileges may be reinstated only by concurrent agreement of the Vice President of SH&E for the applicable Business Group and Human Resources Manager.
- For those Authorized Driver's privilege suspensions that are not related to driving under the influence of drugs or alcohol, privileges may be reinstated with concurrent agreement by the AECOM Manager, the SH&E Manager, and Human Resources Manager upon completion of required remedial training.

4.13.7 Disciplinary action may include the following:

- Loss of AECOM driving privileges.
- Disciplinary warning.
- Termination.

4.13.8 The employee is personally responsible for payment of fines for moving violations and parking citations incurred while driving a vehicle on AECOM business and for reporting such incidents to his/her Manager / Supervisor. The Manager is responsible for notifying Counsel.

4.13.9 If an Authorized Driver receives a citation resulting in the license being suspended from driving or has his/her driver's license revoked, he/she is required to notify his/her Manager / Supervisor prior to start of the following work day. Failure to do so may result in disciplinary action up to and including termination.

5.0 Records

5.1 Documentation of employee training completed shall be retained in accordance with *S3AM-003-PR1 SH&E Training*.

5.2 As applicable, completed *S3AM-005-FM2 Vehicle Inspection Checklists* and/or *S3AM-005-FM1 Journey Management Plans* shall be retained in project files.

6.0 Attachments

6.1 [S3AM-005-ATT1 Authorized Driver Safety](#)

6.2 [S3AM-005-FM1 Journey Management Plan](#)

6.3 [S3AM-005-FM2 Vehicle Inspection Checklist](#)

Authorized Driver Safety

S3AM-005-ATT1

1.0 Before Vehicle Operation

- 1.1 Learning and practicing good driving habits will help reduce the chance of a traffic collision. Learning to properly scan surroundings will improve hazard awareness and avoidance. With correct driving habits, errors can be significantly reduced and incident response time can be decreased.
- 1.2 All Authorized Drivers shall perform a walk-around inspection of the vehicle prior to operation.
 - 1.2.1 Authorized Drivers should use the "Get Out And Look" (GOAL) method before placing a vehicle in motion. Drivers are to make a 360-degree (360°) walk around of the vehicle immediately before placing vehicle into motion in order to determine whether there are hazards or possible obstructions in the proposed path of travel. Drivers are to clear the area of people and objects before placing the vehicle in motion. A check will also be performed to confirm overhead and side clearances are adequate. The following are recommended best practices:
 - Placement of cones on the right side of the front and rear of vehicle upon parking and retrieved during the 360° GOAL walk-around.
 - In lieu of cones, place GOAL magnets on the right side of the hood and truck/tailgate of the vehicle upon parking. The GOAL magnets should then be retrieved during the 360° GOAL walk around just prior to moving the vehicle again.
 - Place a GOAL sticker on the driver side door window as a reminder to get out and look.
 - 1.2.2 Pre-operation vehicle inspections shall be performed and documented by all Authorized Professional Drivers and all Authorized Hired Drivers. A sample vehicle inspection checklist is provided in *S3AM-005-FM2 Vehicle Inspection Checklist*.
- 1.3 Drivers shall be familiar with applicable client rules and regulations when on the client's sites. The employee may, for example, be required to leave their keys in the ignition with the vehicle turned off or to display a vehicle pass. When parking, it is recommended that employees back the vehicle into the parking space.
- 1.4 Drivers must be trained, competent and in possession of a current driver's license that is valid to the jurisdiction and the vehicle driven. Any additional certification required given the particular vehicle and equipment transported must also be current (e.g. air brake certificate).
- 1.5 Execute proper travel planning to avoid being in a rush, traveling during peak traffic hours, and traveling through high traffic volume areas. Utilize the *S3AM-005-FM1 Journey Management Plan* as appropriate.
- 1.6 All drivers must be involved in a task hazard assessment applicable to the task(s) undertaken (may exclusively be the driving task or may include the driving task).
- 1.7 Confirm current insurance and registration is maintained with the vehicle and any equipment being towed. License plates must be clean.
- 1.8 As applicable, check all safety equipment (e.g. First Aid Kit, Fire Extinguisher, Flares, Triangles, Reflective Vest, etc.).
- 1.9 As applicable, check for survival gear and equipment. Emergency kits should include blankets, food, water, flashlight, extra batteries, a method of communication and a heat source such as a candle.
- 1.10 When accessing any pickup truck box, staff will: step up into the box to avoid excess reaching and strain and; use three point contact getting in and out of the truck box (i.e., avoid jumping off the tailgate).
- 1.11 Confirm no items are hanging from the rear view mirror that could obstruct vision.
- 1.12 Adjust mirrors to confirm optimal visibility.

2.0 Vehicle Operation – General

- 2.1 Be vigilant of differences between trucks and small cars related to blind spots, turning radius, and required overhead and undercarriage clearances.
- 2.2 It is a personal responsibility of the driver to operate a vehicle safely and in compliance with regulations (e.g. Cargo Securement, Traffic, Dangerous Goods, etc.).
- 2.3 Confirm compliance with applicable traffic legislation, driver regulations, and rules (e.g. commercial driver hours of service, state / provincial highway acts, municipal bylaws, private road/property owner rules, site specific rules, etc.).
- 2.4 All vehicle occupants shall wear seatbelts at all times.
- 2.5 Keep reflectors, lights and windows (inside and out) clean.
- 2.6 Window cleaner should be on hand for cleaning the interior of the windows as well as headlights that have become obscured due to road spray or slush.
- 2.7 A shovel and a supply of sand or gravel can help to extract a stuck vehicle that does not have traction.
- 2.8 Maintain good housekeeping practices and confirm items and loaded materials are secured from movement on both the interior (e.g. cab, glove box, etc.) and exterior (e.g. box, flat deck, etc.) of the vehicle.
- 2.9 Conduct en-route inspections as required to check cargo securement.
- 2.10 Pulling Over
 - 2.10.1 Pull the vehicle off the road to a safe location as required by the applicable jurisdiction (e.g. rest stops, a side road, an unused approach):
 - If, in the ongoing assessment of road and weather conditions, it has been concluded that travel is no longer safe (i.e. heavy rain, sleet), and wait until conditions allow for safe travel.
 - To review or adjust navigation equipment and check cargo securement.
 - To check telephone messages, text messages or to take notes.
 - For interval breaks, to stretch and if fatigued (try to take a break every two hours).
 - To manage and eliminate driver distractions.
 - 2.10.2 If it is necessary to park a vehicle on the shoulder of an active roadway, park as far off the road as possible, and turn on the four-way indicators (hazard lights) prior to leaving the vehicle. Use cones or other warning devices, and wear a high visibility traffic vest.
 - 2.10.3 Observe extra caution in and around emergency and construction zones.
 - 2.10.4 Avoid unattended rest areas, when possible, and especially at night.
 - 2.10.5 If the vehicle breaks down, attempt to get to a secured location. Call police or roadside assistance as appropriate.
 - 2.10.6 Contact the police to help those with car trouble instead of stopping to assist.
 - 2.10.7 When possible, employees should have a car mechanic or roadside assistance change or repair a flat tire. If the Driver or passenger must change a tire, the Driver and passenger must adhere to the manufacturer's specifications and observe the proper lifting technique and safety procedures. Proper lifting is addressed in *S3AM-104-PR1 Manual Material Handling*.
 - 2.10.8 When parking or leaving a vehicle, the following procedures must be followed:
 - Engage the transmission in park (automatic transmission) or first gear (standard transmission).
 - Shut off the engine.

- Set the parking brake.
- Remove the ignition keys, and lock the vehicle.

2.10.9 If work (e.g., surveying) is required alongside an active road, park the vehicle behind the area of work to provide a barrier against out-of-control vehicles.

2.11 Backing Up

2.11.1 Keep reverse motion to a minimum as the most common incidents involve backing up.

2.11.2 Whenever possible, vehicles should be parked in a manner that prevents the driver from backing (reversing) upon departure. For example, the vehicle should be backed into a parking spot or drivers should select a parking spot that allows them to “pull” through” so that the vehicle is facing the direction of departure.

2.11.3 Confirm the area behind the vehicle is clear prior to and while reversing a vehicle.

2.11.4 All vehicles with limited visibility operated around workers or on a construction site:

- Should have an audible back-up alarm installed that functions automatically when the vehicle is put into rear motion; or
- Shall be backed up only when a signaler communicates that it is safe to do so.
- If a vehicle is not equipped with an audible back-up alarm, the operator shall sound the vehicle horn twice to indicate intention to back vehicle up.

2.11.5 Confirm compliance with applicable traffic legislation regarding backing up (i.e. Texas – An operator may not back the vehicle on a shoulder or roadway of a limited-access or controlled-access highway; Ontario – No driver of a vehicle shall back the vehicle upon the roadway or shoulder of any highway divided by a median strip on which the speed limit is in excess of 80 km/h; etc.).

2.11.6 Take the time to become acquainted with the area the vehicle is to be backed into.

2.11.7 Inspect the area to be backed into (i.e. walk around it by foot, identify obstructions and possible hazards).

2.11.8 Line up as straight as possible with intended final position prior to backing equipment or vehicle up.

2.11.9 If the area is congested with people or equipment a signaler SHALL be used.

2.11.10 Before putting the vehicle into motion, decide:

- The method of communication (hand signals, two-way radios or other means).
- If hand signals are going to be used, confirm both the driver and signaler agree on signals to be used.
- If two-way radios are being used confirm there is continuous voice contact between the signaler and driver. If there is nothing being transmitted on the two-way radio the driver shall STOP the vehicle.

2.11.11 While backing up:

- Confirm there is constant visual contact with the signaler when the vehicle is in motion if using hand signals.
- If driver loses eye contact with the signaler at ANY time, the driver shall STOP the vehicle until eye contact is regained. The exception is where the communication between the signaler and driver is conducted by two-way radio.
- When possible, the signaler shall stand on the driver’s side of the vehicle during motion.

- The signaler must always keep a safe distance from the vehicle or equipment and never stand directly in the path of motion. Refer to Safe Work Practice – Red Zone.
- While backing up using a signaler, the driver must confirm that the vehicle radio (not to be confused with two-way radio) is off and the windows are down (if possible) to avoid distraction and to be able to hear outside of the vehicle.
- If the driver notices anything out of the ordinary (despite what the signaler is directing) the driver will STOP the vehicle or equipment and assess the situation.
- If at any time the safety of any person or property is at risk, including that of the signaler, the signaler shall signal the driver to STOP the vehicle IMMEDIATELY.
- Any person (other than the signaler) can direct the driver to STOP the vehicle or equipment and the driver must take that as a valid direction to STOP.

3.0 If Vehicle is to be Left Unattended

- 3.1 Turn the ignition off, remove the key and set the emergency brake (if parked on an incline).
- 3.2 Lock and secure the vehicle.
- 3.3 Secure equipment and property in a locked trunk or tool chest.
- 3.4 Do not leave keys in an unattended vehicle.

4.0 Defensive Driving

- 4.1 Demonstrate an effective and positive driving attitude.
- 4.2 Use road courtesy, expect the unexpected and be patient. Do not rush or drive aggressively.
- 4.3 Follow and obey regulations.
- 4.4 Do not make sudden lane changes and always use signal lights.
- 4.5 Be Visible – Be seen by all other drivers, pedestrians, cyclists and others using or crossing the road:
 - 4.5.1 Avoid driving in blind spots of other vehicles.
 - 4.5.2 Confirm vehicle lights are on, working and clean before and during travel.
 - 4.5.3 Confirm the vehicle's horn works and use it as necessary to warn others.
 - 4.5.4 Tapping the vehicle brakes may provide a visible alert for following vehicles.
 - 4.5.5 Confirm adequate distance to enable passing of other motorists safely.
- 4.6 If it is necessary to turn a vehicle around, confirm that the operation is conducted safely and according the applicable traffic legislation and rules.
- 4.7 Always operate a vehicle within operator driving limitations. Do not be enticed by others to exceed driving capability for any reason. When behind the wheel, drivers must be in control of all driving related situations.
- 4.8 Maintain awareness of all objects in the immediate circle of influence. Whenever possible, stay well clear of other vehicles, machinery, equipment and pedestrians.
- 4.9 Scan Ahead – Check the path of travel for obstacles and other vehicles:
 - 4.9.1 Utilize three driving monitoring zones (should not be confused with safe following distances):
 - Action Zone (approximately 4 to 6 seconds in front of the vehicle) – activity in this zone generally requires immediate reaction by the driver.

- Planning Zone (at least 15 seconds in front of the vehicle) – look ahead to visually identify if there is slowing traffic or another type of road hazard ahead or to the side. Do not drive behind vehicles that block visibility.
 - These zones may require enlarging based on speed and driving environment (e.g. traffic congestion, weather, etc.).
- 4.9.2 Get the big picture and look for hazards (other motorists, pedestrians, cyclists, road debris, etc.).
- 4.9.3 Moving eyes every 2 seconds can help to avoid fixating on any one object. Check rear view mirror every 5 to 8 seconds and any time braking.
- 4.9.4 Read and obey traffic signage and controls.
- 4.9.5 Use high beam head lights when possible.
 - Use low beam headlights when following closely behind other vehicles or when approaching and meeting oncoming traffic.
 - Use low beam headlights in fog or heavy snow.
- 4.9.6 Wear appropriately tinted sunglasses to improve visibility in sunny conditions. Do not wear sunglasses at night and, if wearing at dusk or dawn, confirm the tint is of the type that improves and does not hinder visibility.
- 4.10 Keep a Space Cushion:
 - 4.10.1 Maintain a space cushion around the vehicle to improve the potential of avoiding a collision. Create an out by monitoring the space in front, behind and to each side of the vehicle, leaving enough area as a cushion to enable evasive action if needed.
 - 4.10.2 Maintain a minimum of 2 seconds plus 1 second for every 10 feet (3m) of vehicle length between the vehicle driven and the vehicle ahead:
 - Pick a marker on the road ahead, such as a road sign or pole.
 - Count "one thousand one, one thousand two".
 - When the front of the driven vehicle reaches the marker, stop counting.
 - If the marker is reached before "one thousand two," increase the space cushion.
 - Add more time (space) in poor driving conditions.
 - Add more time (space) if the vehicle operated is heavily loaded.
 - Add more time (space) if the vehicle ahead is smaller and lighter and may stop more quickly than the vehicle operated.
 - 4.10.3 When stopped behind another vehicle leave 1 vehicle length between the vehicle driven and the vehicle ahead.
 - 4.10.4 Do not travel in a traffic cluster. Manage the space to the front, left and right of the vehicle driven.
 - 4.10.5 Fog, heavy rain, snow, slush or wind require speed and distance between vehicles to be adjusted accordingly.
- 4.11 Recognize and Anticipate Hazards:
 - 4.11.1 Exercise increased caution at night, dawn and dusk.
 - 4.11.2 When driving at night look to the right of the on-coming headlights and not directly head-on.
 - 4.11.3 Identify changing road hazards or conditions.
 - 4.11.4 Identify changing weather or driving conditions:

- 4.11.5 Light rain and heat can draw oil to the surface of asphalt creating slippery driving conditions.
- 4.11.6 Heavily rain soaked roads can result in a vehicle hydroplaning / aquaplaning.
- 4.11.7 Fluctuating cold temperatures may produce ice.
 - Open hilltops may become icy due to blowing snow accumulating and freezing on the road.
 - Shaded areas, such as overpasses and bridges, will freeze first and dry out last. These locations are prone to black ice.
 - Be aware that black ice may be very difficult to spot. Darker, glossy spots may indicate black ice.
- 4.11.8 At dawn or dusk, the low sun can create a significant visibility hazard.
- 4.11.9 Be aware of changing conditions (i.e. traffic patterns, accidents, traffic lights, other vehicles).
- 4.11.10 Watch for large loads or slow moving agricultural equipment:
 - Exercise extreme caution, provide extra room and pass only if it is safe to do so.
 - Be aware that large loads or heavy equipment cannot stop as quickly as smaller vehicles and require a longer stopping distance.
 - Never pull directly in front of these vehicles after passing or merging, but leave adequate space to confirm safe operation.
 - Signal well in advance of any intended maneuver to give large vehicles additional time to react.
- 4.11.11 Avoid travelling in the blind spots of other vehicles or mobile equipment.
- 4.11.12 Scan road and shoulders for wildlife and pedestrians:
 - Animals may travel in groups. Maintain heightened awareness when spotting one.
 - Leave plenty of room when driving around an animal on or near the road – a frightened animal may run in any direction.
 - Honk in a series of short bursts to make animals move out of the way.
 - Avoid *swerving* for wildlife as this could result in veering into oncoming traffic.
- 4.12 Reduce Speed:
 - 4.12.1 Adjust speed to accommodate traffic flow and patterns.
 - 4.12.2 Adjust speed to all weather pattern changes (Rain/Hydroplaning, Ice & Frost/Traction Loss, and Restricted Visibility).
 - 4.12.3 Adjust speed in response to inconsistent road surfaces.
 - 4.12.4 Reduce speed when required by law, in construction zones and school and playgrounds.
 - 4.12.5 Safely and appropriately reduce speed upon observing any hazard to increase reaction time.
 - 4.12.6 Always be prepared to brake at an intersection.
 - 4.12.7 Always come to a full stop at uncontrolled railway intersections and verify it is safe to proceed.
 - 4.12.8 Make eye contact with other motorists at intersections (particularly uncontrolled intersections) before proceeding.
 - 4.12.9 Never assume other motorists are following and obeying road rules.
 - 4.12.10 Keep to the right of the road or in the right-hand lane on multi-lane roads unless turning left or passing another vehicle.
 - 4.12.11 Confirm driving practice and vehicle position allow for a defensive or avoidance maneuver.

4.13 Eliminate Distractions

- 4.13.1 Confirm appropriate time is taken to become acquainted with an unfamiliar vehicle prior to driving.
- 4.13.2 Do not operate a vehicle if preoccupied, agitated or have existing health issues that could potentially pose a safety issue.
- 4.13.3 Do not operate a vehicle if under any form of impairment (i.e. fatigue, alcohol, drugs, etc.).
- 4.13.4 Remain engaged. Do not succumb to boredom, complacency, or allow the focus to drift from the driving task.
- 4.13.5 Remain focused on driving defensively and follow any given direction when passing an accident scene.
- 4.13.6 Avoid any activity that requires moving a hand from the steering wheel (e.g. changing radio stations, handing articles to passengers, etc.).
- 4.13.7 Do not engage in activities that may distract from the driving task (e.g. operating navigation systems, ridding the cab of an insect, etc.).
- 4.13.8 Do not engage in eating or drinking that may distract from the driving task.
- 4.13.9 The use of electronic devices that may distract the driver while driving is prohibited. This includes cell phones, two-way radios and other items whether hand-held or hands-free (a simple text message sent while travelling at highway speed results in an operator's eyes being off the road for the length of a football field).

5.0 Road Rage

- 5.1 Road rage is a dangerous driving situation that can occur and should be avoided whenever possible, but NEVER instigated. Do not get drawn into a confrontation. Avoid any confrontational eye contact or gestures.
- 5.2 The driver should be aware of the vehicles around them, paying frequent attention to the vehicle's mirrors.
- 5.3 Get out of the way if safely possible, even if the other motorist is speeding. The other driver may be dealing with an emergency situation.
- 5.4 Unless it is necessary to use the horn as an alert, do so sparingly.
- 5.5 If followed after an on-the-road encounter, drive to a public place or to the nearest police station and seek assistance.
- 5.6 Attempt to note the offender's license plate number and write it down as soon as it is safe to do so and the vehicle is not in motion.
- 5.7 Report any aggressive driving to the police immediately. This action may aid in preventing further occurrences by the same driver.

6.0 Winter Driving

- 6.1 Clear snow from exterior vehicle surfaces.
- 6.2 Do not cruise control on icy roads.
- 6.3 Accelerate and brake gently to reduce skids or spinouts.
- 6.4 Wear winter clothing that does not restrict movement, vision or hearing.
- 6.5 Where required, have snow chains for the vehicle and be familiar with their installation.
- 6.6 Use extra caution while driving during hazardous winter conditions.
- 6.7 Avoid sudden changes of speed or direction to reduce possibility of skidding.

- 6.8 Drivers should leave extra distance between their vehicle and the vehicle ahead of them. Stopping on ice takes approximately eight times the distance that it takes on dry pavement.
- 6.9 Carry suitable warm clothing and emergency equipment during the winter months. Temperatures can plunge rapidly.
- 6.10 Be aware of icy patches on the road bridges and intersections that are especially prone to icing.
- 6.11 Be familiar with the skid control procedures for the type of vehicle being driven (e.g., front, rear or four-wheel drive).

7.0 Gravel Roads and Remote Locations

- 7.1 Prior to driving on a road with an assigned radio frequency, the passenger will test the two-way radio to confirm that the proper radio frequency is set, and that the transmission is being received clearly by other traffic. The passenger will operate the two-way radio.
- 7.2 Drivers will maintain appropriate speed for the road conditions.
- 7.3 Headlights will be used when operating the vehicle.
- 7.4 Drivers will respect the understood road protocol, drive defensively and respect intersections.
- 7.5 4WD options will be utilized at the discretion and comfort level of the driver. If road conditions are questionable even for 4WD use, the road will not be traveled and either another route found or the job postponed until road conditions improve.

8.0 Off-road

- 8.1 If inexperienced, seek supervisory advice and training.
- 8.2 Vehicles should only be driven off roads after other available options (e.g., use of ATV's, etc.) have been considered.
- 8.3 Prior to driving off-road, check to see that the vehicle is in good operating condition and tires are properly inflated.
- 8.4 Realize the limitations of the vehicle and do not become over confident.
- 8.5 Seat belts should be kept fastened and loose objects in the vehicle securely fastened to prevent them from becoming projectiles in the event of a sudden stop.
- 8.6 Drive according to the ground conditions.
- 8.7 Speed and power are normally not required in rough off-road driving.
- 8.8 Learn to read the surrounding terrain. Monitor the ground conditions ahead of the vehicle -- it is essential to know what to expect in light of the road conditions.
- 8.9 When slowly traversing difficult areas of soft ground, try to keep the vehicle in motion.
 - 8.9.1 Once stopped it is far more difficult to get the vehicle going again.
 - 8.9.2 If the vehicle becomes stuck, do not spin the wheels, as they will only dig in further or deeper until the vehicle chassis rests on the ground.
 - 8.9.3 Try to slowly back the vehicle in its own tracks, as these have been previously compressed by the vehicle. In most cases this will be successful. If not, place appropriate material (e.g., wooden planks, mats, branches, etc.) under the wheel to improve traction.
- 8.10 Before driving over rough terrain, the terrain should be inspected on foot first.
- 8.11 When climbing hills in the vehicle travel straight up or down.
 - 8.11.1 Be aware of what is on the other side of the hill prior to climbing.

- 8.11.2 At the base of the hill the driver should apply more power. Ease up on the power while approaching the top and before going over the crest.
- 8.11.3 If the vehicle stalls on the ascent, back straight down the hill in reverse.
- 8.11.4 For downhill travel in a vehicle with manual transmission, always use the lowest appropriate gear, and do not disengage the clutch to allow the vehicle to coast. If the vehicle is equipped with an automatic transmission, use low range and the lowest drive setting.
- 8.11.5 DO NOT drive a hill at an angle this increases the risk for a roll-over incident.
- 8.11.6 DO NOT attempt to climb a very steep hill if there is doubt the vehicle can successfully climb the hill.
- 8.12 When driving through water, consider the maximum wading depth of the vehicle.
 - 8.12.1 The air intake must always be kept clear of water.
 - 8.12.2 Driving through water should always be done slowly to keep the bow wave low.
 - 8.12.3 In addition, slow speed prevents a hot engine from suffering tension cracks by sudden contact with cold water.
 - 8.12.4 Check the brakes after leaving the water.
- 8.13 Prior to returning to the road, do a vehicle inspection to confirm the vehicle is road worthy.

9.0 Towing

- 9.1 Conduct a pre-start inspection of the equipment to be towed.
- 9.2 Only hook-up equipment, using a signaler to do so, that has been verified as safe for transport.
- 9.3 Confirm the hitching equipment of the vehicle and that of the equipment to be towed are compatible.
- 9.4 Always inspect the hitch for defects and to confirm it is securely closed (e.g. safety pin in place, safety chains hooked up using the "crossed" or "cradle" method, locking devices on hooks).
- 9.5 Confirm light cord is plugged in and any emergency braking devices are hooked up. Verify all lights are in working order.
- 9.6 Conduct a brake test prior to travelling.
- 9.7 Confirm speed of travel does not exceed the manufacturer's specification for the equipment towed.
- 9.8 Maintain awareness of total dimensions of the vehicle plus the equipment towed. Adjust driving accordingly (i.e. widen turning radius, increase distance between vehicles).

Americas

Journey Management Plan

S3AM-005-FM1

Project:		Journey Management Plan Identifier # (optional):	
Project Specific Requirements:			
Journey Management Plan – Minimum – required for trips > 250 miles / 400 kilometers (one way) and as identified in the project specific requirements.			
1. Driver and Passenger Information			
Driver Name:		Driver Training Completed:	
Passengers:			
2. Vehicle Information			
Company Owned <input type="checkbox"/>		Rental / Leased <input type="checkbox"/>	Personal <input type="checkbox"/>
Vehicle Type/Description/Registration No.:			
3. Trip Information			
What is the purpose of the trip?		Estimated distance:	
Single Trip: <input type="checkbox"/> Reoccurring Trip: <input type="checkbox"/> / / to / /			
<i>This Journey Management Plan is to be assessed and reviewed prior to each trip.</i>			
Have alternate modes of travel (telepresence, public transportation, air, train) been evaluated? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Has a Safe Work Plan or Task Hazard Assessment been completed and attached? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA			
Destination 1:			
Departure Date:	Time:	Arrival Date:	Time (ETA):
Destination 2:			
Departure Date:	Time:	Arrival Date:	Time (ETA):
Destination 3:			
Departure Date:	Time:	Arrival Date:	Time (ETA):
Destination 4:			
Departure Date:	Time:	Arrival Date:	Time (ETA):
4. Special Conditions / Hazards (Check all that may apply)			
<input type="checkbox"/> Night Driving <input type="checkbox"/> Weather <input type="checkbox"/> Road Conditions (e.g., construction, ice, snow) <input type="checkbox"/> Rush Hour/Heavy Traffic <input type="checkbox"/> Long Driving / Fatigue <input type="checkbox"/> Potential for distraction		<input type="checkbox"/> Rugged Terrain (4 x 4) <input type="checkbox"/> Large Vehicles <input type="checkbox"/> Animals <input type="checkbox"/> Towing (e.g., trailer) Other	
Additional Conditions / Hazards Details:			
Weather forecast:			
5. Contact Information			
Traveler No. 1 (Driver) - Name:		Phone No:	
Traveler No. 1 (Driver) - Personal Contact Name:		Phone No:	
Traveler No. 2 - Name:		Phone No:	
Traveler No. 2 - Personal Contact Name:		Phone No:	
Traveler No. 3 - Name:		Phone No:	

Traveler No. 3 - Personal Contact Name:		Phone No:
Manager - Name:		Phone No:
Check-In Contact - Name:		Phone No:
Alternate Check-In Contact - Name:		Phone No:
Destination Contact (if applicable) - Name:		Phone No:
Other (description)	Name:	Phone No:
Other (description)	Name:	Phone No:
6. Route of Travel		
Route of travel (insert map or give detailed route directions):		
Is the return route of travel the same? <input type="checkbox"/> Yes <input type="checkbox"/> No		
7. Check-In Procedure		
<ul style="list-style-type: none"> • Check-In Interval - • Advise Manager and any other applicable personnel of travel plans and supply with a copy of this form (including attachments) • Confirm availability of Manager or Check-In Contact. Confirm check-in interval with Manager or Check-In Contact. • Discuss with contacts the possibility of travel within a cell phone "dead zone". • Advise Manager or Check-In Contact of departure. • Call Manager or Check-In Contact upon arrival at destination (e.g. worksite, office, home). • If multiple destinations, the process is repeated. 		
7.A Missed Check-In Procedure for Manager		
<ul style="list-style-type: none"> • Attempt to call traveler(s) using contact number(s) listed above. • Contact traveler's personal contact listed above. • If unsuccessful, discuss options with Manager, Check-In Contact (is anyone nearby who can be sent out along the route to destination, how much daylight remains, etc.?). • Call 911 or local police. 		
8. Emergency Planning		
AECOM Supervisor	Name:	Phone Number:
AECOM Manager	Name:	Phone Number:
Roadside Service:		
Emergency: 911 or equivalent	Incident Reporting:	
9. Approvals: All Journey Management Plans shall be reviewed and acknowledged by the driver and the driver's manager / supervisor. Copies of the form shall remain with the driver and the manager / supervisor for the duration of the journey. (Electronic copies are acceptable).		
Driver's Signature:		
Manager or Supervisor	Name:	Signature:

Housekeeping

S3AM-013-PR1

1.0 Purpose and Scope

- 1.1 This procedure provides AECOM's basic housekeeping requirements for offices and work sites, as well as establishes personal hygiene and sanitation standards for housekeeping.
- 1.2 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.

2.0 Terms and Definitions

- 2.1 None

3.0 References

- 3.1 S3AM-208-PR1 Personal Protective Equipment

4.0 Procedure

- 4.1 Roles and Responsibilities

- 4.1.1 **Managers / Supervisors**

- Implementation of this procedure at all AECOM sites and offices.
- Confirm inspections are performed at appropriate intervals.
- Confirm the building Property Manager maintains leased facilities effectively.

- 4.1.2 **SH&E Managers**

- Monitor, assess, and report on housekeeping when visiting AECOM sites.

- 4.1.3 **Employees**

- Report any areas of concern to their Manager / Supervisor for prompt resolution.
- Maintain office locations that are free from debris, clutter, and slipping or tripping hazards.

- 4.2 General Housekeeping

- 4.2.1 All aisles, emergency exits, fire extinguishers, etc., will be kept clear (a minimum of three feet / 0.9 meters of either side) of material storage (temporary and permanent) at all times.

- 4.2.2 Areas in front of electrical panels will be kept clear and free of debris and materials storage for a minimum distance of 36 inches, or approximately 0.9 meters.

- 4.2.3 All work areas shall be kept clean to the extent that the nature of the work allows.

- 4.2.4 Spills shall be promptly cleaned up and resulting waste will be disposed of properly.

- 4.2.5 Storage areas will be maintained in an orderly manner at all times. When supplies are received, the supplies will be stored properly.

- 4.2.6 At all times, work areas will be kept free of debris and unused materials, tools and equipment that may affect the safety of employees and visitors.

- 4.2.7 All sharps, and sharp objects, shall be stored and/or guarded in a manner that prevents injury.

- 4.2.8 Recyclable material, debris and trash will be collected and stored in appropriate containers (e.g., recycle bins, plastic trash bags, garbage cans, roll-off bins) prior to disposal or recycling.

- 4.2.9 Containers maintained outdoors shall be provided with lids that are kept closed. Contents shall be removed at appropriate intervals (e.g. garbage weekly, garbage daily in areas with wildlife, monthly recyclable cardboard, etc.).
- 4.2.10 Take positive control measures for protection against vermin, insects, and rodents.
- 4.3 Smoking, Eating, and Drinking
 - 4.3.1 Eating and drinking will be permitted in designated areas. These areas shall be located away from the work zone.
 - 4.3.2 Operate and maintain food dispensing facilities established by AECOM in compliance with applicable health and sanitation regulations.
 - 4.3.3 Buildings housing food dispensing facilities shall be floored completely, painted, well lighted, heated, ventilated, fly proof, and sanitary. Equip doors and windows with screens.
 - 4.3.4 Microwave ovens shall be used for food only.
 - 4.3.5 Use refrigerators designated for food storage for food only (i.e., no chemical or samples storage).
 - 4.3.6 Hand washing stations shall be available nearby for employees entering the eating and smoking areas.
 - 4.3.7 Smoking will be permitted only in areas:
 - Designated in compliance with applicable local laws, regulations, legislation and ordinances;
 - Not in the immediate vicinity of work-related activities or designated eating and drinking areas.
 - Free of fire hazard;
 - That will not contaminate indoor areas and HVAC systems. Specifically, there shall be no smoking within 5 metres (16 feet) around doorways, windows, air vents, and HVAC intakes and equipment; and
 - Supervisors will designate each smoking area giving primary consideration to those employees who do not smoke.
 - 4.3.8 Employees involved in the performance of certain activities will not be permitted to smoke, eat, drink, or use smokeless tobacco, except during breaks (e.g., HAZWOPER-controlled work areas).
 - 4.3.9 Site employees will first wash hands and face after completing work activities which involve potential exposure or contact with hazardous substances and prior to eating or drinking.
- 4.4 Water Supply
 - 4.4.1 Water will be available for use on all AECOM sites and will comply with the following requirements:
 - Potable Water:
 - An adequate supply of drinking water will be available for site staff consumption.
 - Potable water can be provided in the form of approved well or city water, bottled water, or drinking fountains.
 - Water coolers and water dispensers shall be maintained in a sanitary condition and filled only with potable water.
 - Where drinking fountains are not available, individual use cups will be provided as well as adequate disposal containers. Do not use common drinking cups.
 - Potable water containers will be properly identified in order to distinguish them from non-potable water sources.
 - Laboratory-test drinking water obtained from streams, wells, or other temporary sources in accordance with applicable regulations, or often enough to ensure it is suitable for consumption. Maintain records of testing reports and results.

- Non-potable Water:
 - Non-potable water will not be used for drinking purposes.
 - Non-potable water may not be used for hand washing or other personal hygiene activities but may be used for other types of cleaning activities.
 - All containers/supplies of non-potable water used will be properly identified and labelled as such.

4.5 Toilet Facilities

- 4.5.1 Clean and sanitary toilet facilities in good repair will be available for site and office staff and visitors. For locations without flush toilets readily available, one of the following shall be provided:
- Chemical toilets.
 - Combustion toilets.
 - Recirculation toilets.
- 4.5.2 A minimum of one toilet will be provided for every 20 site staff, with separate toilets maintained for each sex, except where there are less than five total staff on site or in an office.
- 4.5.3 Where toilet facilities will not be used by women, urinals may be provided instead of water closets in accordance with jurisdictional regulations.
- 4.5.4 Provisions for toilet facilities shall be considered as being met when mobile crews or employees working at normally unattended work locations have transportation immediately available (within 4 minutes travel time) to nearby toilet facilities.
- 4.5.5 Toilets shall be constructed so that the interior is lighted, by artificial or natural light, adequate ventilation is provided, and all windows and vents are screened.
- 4.5.6 A means for washing hands shall be provided next to or near toilet areas.
- 4.5.7 Release sanitary sewage into sanitary sewer lines or to other proper disposal channels.

4.6 Washing Facilities

- 4.6.1 Hand and Face: As applicable to the individual's potential exposure or contact with hazardous substances, site staff will wash hands and face after completing work activities and prior to breaks, lunch, or completion of workday.
- 4.6.2 Personal Cleaning Supplies: Cleaning supplies at all AECOM sites will consist of soap, water, and disposable paper towels or items of equal use/application (e.g., anti-bacterial gels, wipes, etc.).

4.7 Work Areas

- 4.7.1 Worksites which store chemical or environmental samples in refrigerators will clearly label the refrigerators that no food or beverages permitted and will locate refrigerators and sample coolers used for temporary sample storage, away from any food areas.
- 4.7.2 Every work area shall be maintained, so far as practicable, in a dry condition. Where wet processes are used, drainage shall be maintained and platforms, mats, or other dry standing places shall be provided, where practicable, or appropriate waterproof footwear shall be provided.
- 4.7.3 Protruding objects or placement of materials on paths or foot traffic areas creates the risk of slips, trips, falls, and puncture wounds. Employees shall eliminate slip, trip, and fall hazards where reasonably practicable.
- 4.7.4 At no time will debris or trash be intermingled with waste PPE or contaminated materials.

4.8 Break Areas and Lunchrooms

Site staff will observe the following requirements when using break areas and lunchrooms at AECOM sites:

- 4.8.1 All food and drink items will be properly stored when not in use.

- 4.8.2 Food items will not be stored in personal lockers for extended periods in order to prevent the potential for vermin infestation.
- 4.8.3 Perishable foods will be refrigerated whenever possible.
- 4.8.4 All waste food containers will be discarded in trash receptacles.
- 4.8.5 All tables, chairs, counters, sinks, and similar surfaces will be kept clean and free of dirt, waste food, and food containers at all times.
- 4.8.6 All ice dispensing machines for beverages shall be hands free/touchless design to prevent bacterial contamination (no ice scoops or ice bins permitted, closed beverage containers can be stored in portable ice coolers but the ice may not be used in the beverage).
- 4.8.7 Refrigerators used to store food items will be maintained at 40 degrees Fahrenheit (4 degrees Celsius) and emptied of all unclaimed food items weekly. Refrigerators used to store food will be labelled as such so that only food and drinks are stored within the refrigerator.
- 4.8.8 Routine cleaning of refrigerators will also be performed on a regular basis.
- 4.9 Change Rooms and Sleeping Facilities
 - 4.9.1 Heated and ventilated change rooms shall be provided for changing, hanging, and/or drying clothing for operations subjecting employees to prolonged wetting or contact with hazardous materials.
 - 4.9.2 Temporary sleeping quarters shall be heated, ventilated, lighted, and clean with all doors and windows screened.
 - 4.9.3 Keep clean and sanitary, and periodically disinfect bunkhouses, bedding, and furniture.
- 4.10 Office Areas

Office areas are to be kept neat and orderly. The following general rules apply to prevent injuries and to maintain a professional workplace appearance.

 - 4.10.1 All waste receptacles shall be lined with a plastic trash bag to avoid direct contact with waste during disposal. Employees shall use gloves when handling waste and may use a compaction bar to compress waste when necessary.
 - 4.10.2 Keep file and desk drawers closed when not in use to avoid injuries. Open only one file drawer at a time to prevent tipping of file cabinets. Nothing should be stored on top of high filing cabinets without adequate support.
 - 4.10.3 Telephone cords, electrical cords, wastebaskets, open file cabinets, and other ground-level hazards shall be managed in a manner that protects employees from tripping and obstruction hazards.
 - Electrical cords and computer/phone cables will be bundled and stored.
 - Cord covers should be used to protect temporary extension cords (used for presentations etc.) where they could be a tripping hazard.
 - Small electrical appliances shall not be plugged into portable extension cords.
 - Multiple appliances amperage should not exceed the circuit load limits.
 - 4.10.4 Electrical appliances shall not be used in wet areas unless the circuit is equipped with ground fault circuit interrupters (GFCI).
 - 4.10.5 File cabinets, desk drawers, safes, and other doors shall be fitted with handles or other hardware to protect employees from pinch points.
 - 4.10.6 All materials shall be stored in a manner that prevents tipping of storage furniture (e.g. book shelves, file cabinets) and inadvertent falling of overhead material.

- 4.10.7 Do not stack excessive amounts of papers or other material on shelves to reduce possibility of shelf overload or falling items.
- 4.10.8 Workstations should be tidied, as a minimum, at the end of each day.
- Paperwork that is not currently needed should be filed appropriately
 - Refrain from storing items on the floor as they may become falling or tripping hazards.
- 4.10.9 In public areas of the office:
- Maintain chairs in good repair.
 - Keep rugs clean, in good repair, and free of tripping hazards.
 - Clean up spills immediately.
 - Pick up objects that may have been left on the floor by others.
 - Report loose carpeting, damaged flooring, or other obstructions that are present in walkways.
- 4.10.10 Broken or damaged office furniture and equipment shall be removed from service. Office equipment shall be repaired and serviced by qualified personnel or contractors.

5.0 Records

- 5.1 None

6.0 Attachments

- 6.1 [S3AM-013-FM1](#) [Housekeeping Inspection](#)

Americas

Housekeeping Inspection

S3AM-013-FM1

Building or Location: _____

Inspection Conducted by: _____ **Date:** _____

Check Yes, No, or NA for Not Applicable.

General Site Housekeeping

- | | | | | |
|----|--|------------------------------|-----------------------------|-----------------------------|
| 1. | Exits, emergency equipment, and electrical panels unblocked? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 2. | Equipment, materials, supplies properly stored and, as applicable, secured (e.g. chocked)? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 3. | Drawers closed when not in use? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 4. | Equipment, including desks and chairs, in good repair? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 5. | Storage areas free from the accumulation of materials that constitute trip hazards? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 6. | Recyclable material, debris and trash collected and stored in appropriate containers? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 7. | Scrap materials and other debris removed from work area? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 8. | Combustible scrap and debris removed by safe means at regular intervals? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 9. | Oily rags removed at the end of the day and stored in metal cans with tight fitting lids? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |

Visibility

- | | | | | |
|-----|--|------------------------------|-----------------------------|-----------------------------|
| 10. | Worksite and, as applicable, halls, stairways and walkways are well lit? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 11. | Well-designed light switches are present in areas where walkways are not always lighted? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 12. | Dust, smoke or steam does not create poor visibility? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 13. | Glare from floodlights or windows does not create poor visibility in work areas? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |

Stairs

- | | | | | |
|-----|---|------------------------------|-----------------------------|-----------------------------|
| 14. | Handrails are tight and at the proper level? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 15. | Handrails extend past the top and bottom step? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 16. | White or yellow strips are painted on the first and last step for better visibility? (recommendation only). | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 17. | Steps are not rough or defective? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 18. | Stair treads are wide enough and risers consistently spaced? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 19. | Stairs are free of obstructions? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |

Floor Conditions

- | | | | | |
|-----|---|------------------------------|-----------------------------|-----------------------------|
| 20. | Floors of every workroom are clean, and so far as possible, in a dry condition? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 21. | Floors are not oily, overly waxed, or polished. | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 22. | Where wet floors or processes are present, proper drainage and false floors, mats, or other dry standing places are provided? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 23. | Floor surfaces finished with non-slip coatings where spills are likely? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 24. | Floors and passageways are free from protruding nails, splinters, holes, or loose boards? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 25. | Floors are free of holes and depressions? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 26. | Aisles or pathways are wide enough for easy passage and for carrying objects (48 inches is recommended)? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 27. | Ramps are covered with non-slip surfaces or matting? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |

28. Carpets or rugs free from loose or frayed edges that may catch boots or shoes? ☐ Yes ☐ No ☐ NA
29. Extension cords, air hoses and cables removed from walkways, or otherwise managed to prevent trip hazards? ☐ Yes ☐ No ☐ NA
30. Pathways free from boxes, containers, machine parts, or other tripping hazards? ☐ Yes ☐ No ☐ NA

Ground Conditions

31. Trip hazards are not present? ☐ Yes ☐ No ☐ NA
32. Fall hazards are not present? ☐ Yes ☐ No ☐ NA
33. Holes or changes in ground elevation are either filled or guarded? ☐ Yes ☐ No ☐ NA
34. Muddy or icy walkways are provided with traction material (e.g. sand, gravel) to reduce slipping? ☐ Yes ☐ No ☐ NA

Equipment

35. Vehicle steps are free from debris or obstructions and of adequate size, and surface placement for safe dismounting? ☐ Yes ☐ No ☐ NA
36. Hand grips or ladders are free from debris or obstructions and adequate for getting into and out of equipment? ☐ Yes ☐ No ☐ NA
37. Ladders have been checked for damage and removed from service if found unsafe? ☐ Yes ☐ No ☐ NA

Chemicals

38. Chemicals are properly stored to minimize a potential spill? ☐ Yes ☐ No ☐ NA
39. Spill cleanup materials are available and appropriate for the type of potential spill? ☐ Yes ☐ No ☐ NA

Smoking, Eating and Drinking

40. Smoking permitted in designated areas only? ☐ Yes ☐ No ☐ NA
41. Designated smoking area appropriately placed? ☐ Yes ☐ No ☐ NA
42. Appropriate and clean eating and drinking areas designated away from work areas? ☐ Yes ☐ No ☐ NA
43. Food and drink items properly stored? ☐ Yes ☐ No ☐ NA
44. Potable water identified and readily available? ☐ Yes ☐ No ☐ NA

Sanitation

45. Appropriate cleaning supplies available and properly stored? ☐ Yes ☐ No ☐ NA
46. Hand and face washing facilities available and maintained with adequate supplies? ☐ Yes ☐ No ☐ NA
47. Adequate toilet facilities available and maintained with sufficient supplies? ☐ Yes ☐ No ☐ NA

Identify areas that need attention and describe the corrective actions to be implemented:

I certify that the above inspection was performed to the best of my knowledge and ability, based on the conditions present.

Signature

Date

Manual Lifting

S3AM-014-PR1

1.0 Purpose and Scope

- 1.1 This procedure provides the requirements for AECOM employees to use when performing manual materials handling activities (e.g., lifting/handling of items or materials).
- 1.2 This procedure applies to all staff for AECOM Americas-based operations and any other entity and its personnel contractually required to comply with this document's content.

2.0 Terms and Definitions

- 2.1 **Manual Materials Handling (MMH)** – Moving or handling things by lifting, lowering, pushing, pulling, carrying, holding, or restraining.
- 2.2 **Team Handling** – Team handling occurs when more than one person is involved during the lift.

3.0 References

- 3.1 None

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 Manager

- Administer the procedure, provide resources as required and provide direction on proper lifting/handling techniques.
- Ensure material handling activities are monitored and facilities assessed to ensure compliance with the procedure and proactively identify and correct hazardous conditions.
- Ensure the proper reporting and investigations of any incidents, including those associated with manual material handling.
- Ensure this procedure and any associated or applicable documents are reviewed as part of an investigation and revised as required to prevent future incidents.

4.1.2 SH&E Manager

- Ensure material handling activities are monitored and facilities assessed to ensure compliance with the procedure and proactively identify and correct hazardous conditions.
- Assist in identifying activities with a high potential for lifting/handling strains and injuries as well as the associated mitigation strategies.
- Ensure employee training on proper lifting/manual materials handling techniques.
- Assist in any investigations of incidents, including those associated with manual material handling.

4.1.3 Employees

- Complete training appropriate to their anticipated manual material handling tasks.
- Review and follow any additional procedures or instructions applicable to the task at hand.

4.2 Mechanical / Engineered Controls

- 4.2.1 Whenever possible, new operations should be evaluated to engineer out hazards before work processes are implemented.

- 4.2.2 Mechanical equipment or assistance such as hand carts, dollies, carts, come-alongs, conveyors, rollers, or if appropriate, pallet jacks, skid steers, or telehandlers, are preferable to be used whenever possible rather than the employee physically moving materials.
 - 4.2.3 Mechanical assistance will be of proper size and height, have wheels sized for the terrain, and be designed to prevent pinching or undue stress on joints.
 - 4.2.4 Mechanical equipment or assistance shall be inspected and appropriately maintained. Defective equipment shall be tagged, removed from service, and repaired or replaced.
 - 4.2.5 Objects to be moved will be secured to prevent falling and properly balanced to prevent tipping.
 - 4.2.6 Material handling tasks should be designed to minimize the weight, range of motion, and frequency of the activity.
 - 4.2.7 Alter the task to eliminate the hazardous motion and/or change the position of the object in relation to the employee's body—such as adjusting the height of a pallet or shelf.
 - 4.2.8 Work methods and stations should be designed to minimize the distance between the person and the object being handled.
 - 4.2.9 Confirm well-lit and clear paths of travel.
 - 4.2.10 High-strength push-pull requirements are undesirable, but pushing is better than pulling. Material handling equipment should be easy to move, with handles that can be easily grasped in an upright posture.
 - 4.2.11 Workbench or workstation configurations can force people to bend over. Corrections should emphasize adjustments necessary for the employee to remain in a relaxed upright stance or fully supported seated posture. Bending the upper body and spine to reach into a bin or container is highly undesirable. The bins should be elevated, tilted, or equipped with collapsible sides to improve access.
 - 4.2.12 Repetitive or sustained twisting, stretching, or leaning to one side are undesirable. Corrections could include repositioning bins and moving employees closer to parts and conveyors
- 4.3 Administrative Controls
- 4.3.1 Task hazard assessment (THA) must include manual material handling, its associated hazards and the appropriate actions to take to eliminate or reduce the identified risks.
 - 4.3.2 Stage materials close to the applicable work area to minimize carrying distances.
 - 4.3.3 When significant, sustained lifting work is required, it is desirable to rotate employees to spread the work load among several people and thereby avoid fatigue.
 - 4.3.4 Rotation is not simply performing a different job, but is performing a job that utilizes a completely different muscle group from the ones that have been overexerted.
 - 4.3.5 All employees exposed to manual handling hazards shall be trained by competent persons on the hazards associated with manual material handling, and the safe lifting and handling of loads applicable to their anticipated manual handling tasks.
 - 4.3.6 Employees shall not manually handle materials in excess of their personal lifting limit, with no personal lifting limit exceeding 50 pounds (22.7kg).
 - Manual handling weight limits may decrease from 50 pounds (22.7kg) depending upon several variables. Refer to *S3AM-014-ATT1 Recommended Weight Limit Calculations*.
 - This restriction should also be applied to a team handling or a buddy lift (item lifted by the team should be no more than 50 pounds [22.7kg]). Should one lifter fail, the remaining worker would bear 100% of the load weight.

4.4 Training

4.4.1 Employees who may have MMH as part of their duties are required to receive training that includes the following topics:

- Methods to avoid unnecessary physical stress and strain during MMH operations.
- Signs and symptoms of musculoskeletal injuries and reporting requirements.
- Methods to maintain personal awareness of what the individual can comfortably handle without undue strain.
- Instruction on the proper use of lifting equipment.
- Recognition of potential hazards and how to prevent or correct them.

4.4.2 This training must be completed prior to an employee being assigned to a task that involves MMH activities.

4.4.3 Assistance with training or training materials is available through the Safety, Health and Environment staff.

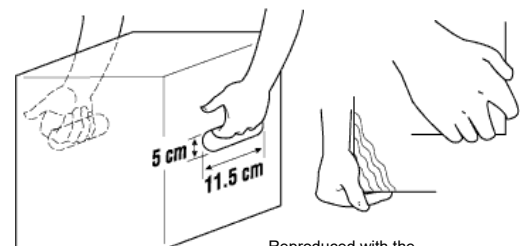
4.5 General Handling

4.5.1 Before Performing a Lift:

- Check to see if mechanical aids such as hoists, lift trucks/dollies, or wheelbarrows are available.
- Confirm that, based on personal physical capabilities and medical limitations, that the load can be lifted without overexertion. Get help with heavy or awkward loads.
- Confirm that the load is “free” to move.
- Do not lift loads if personal health issues or doctors recommendations prevent it.
- Manual handling weight limits may decrease depending upon several variables. Refer to *S3AM-014-ATT1 Recommended Weight Limit Calculations*.
- Do not manually handle loads if unsure of personal limitations on what load can be handled safely.
- Check that the planned destination and travel path of the load is free of obstacles, personnel and debris.
- Confirm that the travel path and the planned destination of the load are clear of obstacles and debris. Grease, oil, water, litter, and debris can cause slips and falls.
- Particular handling and lifting techniques are needed for different kinds of loads or materials being handled (for example, compact loads, small bags, large sacks, drums, barrels, cylinders, and sheet materials like metal or glass). See additional guidance in this procedure.

4.5.2 Gripping the Load

- Whenever possible, utilize hand holds or other lifting attachments on objects being handled.
- Use the “hook grip” on loads with cut-out handholds.
- Curl fingers around the edge.
- Do not hold the load with fingertips. The palm grip is much more secure; grip the load with the palm of the hand and fingers.
- Use containers with handles located more than halfway up the side of the container.
- Use the “ledge grip” to handle regularly shaped objects without handles.



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- Use vacuum lifters to handle sheet materials or plates.
- Hold the object with hands placed diagonally.

4.5.3 General Lifting Guidelines

- Prepare for the lift by warming up muscles. Frequently re-energize muscles throughout the course of the work.
- Avoid lifting immediately after prolonged sitting or inactivity.
- Confirm personal protective equipment is appropriate to the hazards (e.g. safety toed boots, appropriate gloves, etc.).
- Stand close to the load and face the intended direction of travel.
- Ensure good body balance. Feet should be shoulder width apart, with one foot beside and the other foot behind the object that is to be lifted.
- Bend the knees; do not stoop. Keep the back straight, but not vertical. There is a difference. The neck should be in a natural position with eyes forward.
- Engage (tighten/flex) abdominal muscles. Use legs to start the load moving and continue pushing up with the legs. This makes full use of the strongest set of muscles.
- Keep the arms and elbows close to the body while lifting smoothly without jerking.
- To lower the object, bend the knees. Do not stoop. To deposit the load on a bench or shelf, place it on the edge and push it into position. Confirm that your hands and feet are clear when placing the load.

4.5.4 Carrying/Holding Guidelines

- Manual carrying is an inefficient way of transporting materials in the work place. Where possible, reduce or eliminate manual carrying tasks.
- Never carry a load above the shoulders.
- Do not twist the body while carrying the load. To change direction, shift foot position and turn the entire body.
- Watch direction of travel!
- Carry an object close to the body using both hands. The optimal carry zone should have the elbows at a 90 degree angle with elbows tight to the body. One-handed carries are awkward and tend to unbalance the body.
- Do not carry objects that are so large they will obstruct visibility.
- Do not change grips on an object while carrying or holding an object. Rest the object on a secure surface prior to changing grip.
- If an object is of a size, shape, or mass that it requires two people to carry, use two people of similar size and physique.
 - Ensure the item lifted and carried by the team weighs no more than 50 pounds (22.7kg). Remember manual handling weight limits may decrease from 50 pounds (22.7kg) depending upon several variables. Refer to *S3AM--014-ATT1 Recommended Weight Limit Calculations*.
 - Two-person lifts should be planned and coordinated before performing the lift.
 - Lift the item in unison.
- Avoid carrying objects on stairs, particularly where the line of sight may be obstructed or the object can interfere with leg movement. All travel on stairs requires use of a handrail at all

times, so only carry objects that can be safely handled with one hand. Always maintain handrail contact when carrying an object up or down stairs.

4.6 Specific Handling - Pushing/Pulling Guidelines

- 4.6.1 Check the condition of the floor, ground, or other surface prior to pushing or pulling an object across it.
- 4.6.2 Be aware of the "break out" force of the object; this is the force at which a push or pull overcomes the frictional force between the surface and object. Adjust lower body posture to have a solid base in order to avoid losing balance when this point is reached.
- 4.6.3 Get assistance when moving or guiding a large load.
- 4.6.4 Where possible, always push rather than pull a load.
- 4.6.5 When possible push at waist height not shoulder height. The force capability at shoulder height is 50% less than at waist level.
- 4.6.6 Casters or wheels on carts should be at least 6 inches (15.24 centimeters) diameter for heavier loads in order to exercise adequate control on rough or inclined surfaces. Tire materials should be suitable for the surface of travel.
- 4.6.7 Never load the cart or load-carrying device in such a manner that visibility is obstructed in the path of travel.
- 4.6.8 When pushing or pulling an object on an inclined surface, ensure control of the load and direction of travel before proceeding. Obtain additional support to control the load if necessary.
- 4.6.9 Never leave carts or loads in an area that will present a hazard to other workers. Make sure carts or transport devices are secured in position before leaving them unattended.

4.7 Specific Handling – Square or Rectangular Objects

- 4.7.1 Place one foot slightly in front of the other.
- 4.7.2 Squat as close to the object as possible.
- 4.7.3 Grasp one of the top corners away from the body and the opposite bottom corner closest to the body.
- 4.7.4 Tilt the object slightly away from the body, tilt forward at the hips, keep the back straight.
- 4.7.5 Test to confirm that the object is loose from floor and will lift without snagging.
- 4.7.6 Straighten the legs, keeping the spine straight, pull the object into the body, and stand up slowly and evenly without jerking or twisting.
- 4.7.7 If turning or change of direction is required, turn with feet without twisting the torso and step in the direction of travel.
- 4.7.8 To set an object down, reverse the sequence, being sure not to trap the bottom hand between the object and the surface on which the object is set.



4.8 Specific Handling – Cylindrical Objects

- 4.8.1 When lifting/moving round or cylindrical objects, the objects should be rolled wherever possible.
 - Check the integrity of drums of gas cylinders before handling. Confirm lids or caps are secured prior to moving.
 - Rolling must be controlled by chute, tagline, or other means of limiting acceleration.

- Workers must not be positioned downhill from rolled objects.
- Use of the legs for pushing and tagline control of rolled objects must be stressed.

4.8.2 Cylindrical objects, such as drums that must remain upright, are to be handled manually by slightly tilting the object, using the legs for control, and balancing the object on the bottom edge. The handler then walks besides the object, with the object tilted toward the body, positioning the hands on the top edge away from the body and moving so they do not cross, thus maintaining balance and a steady, controlled, forward motion. Motion must be controlled so that ceasing to walk and moving the hands will stop forward motion.

4.8.3 Use carts or trucks to transport cylinders. Never attach a lifting or moving device to the cap or lid.

4.8.4 Use two people to transport a cylinder if carts cannot be used. Use lifting straps to improve grip.

4.9 Specific Handling – Bags and Sacks

4.9.1 The best way to handle a bag depends on its size, weight, and how far it is to be carried. When lifting, remember to:

- Straddle the end of the bag.
- Bend the hips and knees.
- Keep the back straight.
- Grasp the bag with both hands under the closer end. Keep elbows inside the thighs.



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- Lean forward, straightening the knees to set the bag upright.
- Readjust the straddle position moving feet closer to the bag.
- Readjust the grasp, with one hand clasping the bag against the body and the other hand under the bag.
- Stand up by thrusting off with the back leg and continuing in an upward and forward direction.
- Thrust the bag up with the knee while straightening the body. If possible place the bag on an intermediate platform to enable the grip / grasp to be readjusted.
- Put the bag on the shoulder opposite the knee used to thrust the bag up.
- Stabilize the bag on the shoulder.
- Move off without bending sideways.

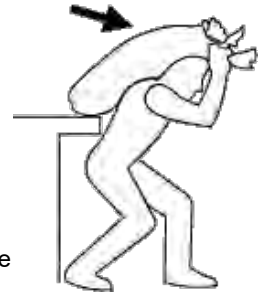
4.9.2 Avoid unloading a bag from the shoulder directly to floor level. Use an intermediate platform or get help from a co-worker, remember to:

- Stand close to the platform.
- Place one foot in front of the platform.
- Bend hips and knees.
- Keep the back straight.
- Ease the bag off the shoulder and put it upright on the platform.
- Pull the bag slightly over the edge of the platform.
- Stand close to the platform with the bag touching the chest.
- Clasp the bag against the body with one hand, the other hand holding bottom of the bag.
- Step back.
- Bend hips and knees, keeping back straight.

- Ease the bag onto the floor.

4.9.3 Bulkier sacks are easier to carry on a worker's back. The worker is to lift the sack to his/her back from a platform:

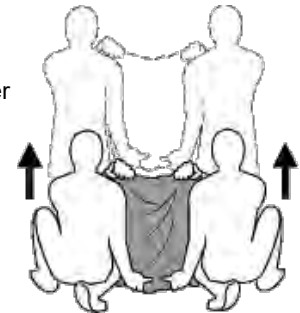
- Move the sack to the edge of the platform.
- Put back against the sack.
- Grasp with both hands on the upper corners of the sack.
- Ease the sack onto the back, bending hips and knees before taking the weight.
- Keeping the back straight, stand up, straighten hips and knees and stabilize the sack.
- Move away without bending sideways.



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4.9.4 Two-person handling of a sack:

- Position one person on either side of the sack.
- Squat with one foot balancing behind the sack.
- Keeping the back straight, grasp with the outer hand on the upper corner of the sack and the other hand holding the bottom of the sack.
- On one person's command:
 - Stand up and straighten the hips and knees.
 - Move toward the intended location.
 - Put the sack in its intended location.



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4.10 Specific Handling – Sheet Materials

4.10.1 When lifting sheet materials:

- Stand close to the pile of sheets in a walking stance.
- Grasp sheet firmly at the midpoint of its long side with the closer hand.
- Pull sheet up and toward the body.
- Change grip using the other hand and put fingers on top of the sheet.
- Pull sheet up to the vertical position and to the side until one half is off the pile.
- Grasp the lower edge of the sheet with the free hand and support the hand by placing it on your knee.
- Stand up without bending or twisting body.

4.10.2 Whenever moving sheet materials, be cognizant of wind conditions.

4.10.3 To carry sheets (drywall, glass, metal, etc.):

- Use drywall carts or sheet hand trucks to carry sheet materials.
- Get help from another person where carts are not available.
- Apply carrying handles for manual carrying.
- Always use gloves and carrying handle for glass and other materials with sharp edges.

4.10.4 Use team lifting and carrying where other solutions are inappropriate.

- Remember that the combined strength of the team is less than the sum of individual strength. The item lifted by the team should be no more than 50 pounds (22.7kg).

- Select team members of similar height and strength and assign a leader to the team.
- Determine a set of commands to be used such as "lift," "walk," "stop," and "down." Make sure that everyone knows what to do when they hear the command.
- Follow the commands given by the team leader.
- Practice team lifting and carrying together before attempting the task.

4.11 Material Storage

- 4.11.1 Store materials at a convenient height.
- 4.11.2 Leave the lowest shelf unused if necessary.
- 4.11.3 Use vertically mobile shelves or elevating platforms to avoid bending and overhead reaching.
- 4.11.4 Use bin racks for storing small items.
- 4.11.5 Store heavy and frequently used materials between knee and shoulder height; preferably waist height.
- 4.11.6 Do not store materials at floor level.
- 4.11.7 Use hand trucks with elevating devices in storage and loading areas.
- 4.11.8 Use trucks with a tilting device to avoid bending.

5.0 Records

- 5.1 None

6.0 Attachments

- 6.1 [S3AM-014-ATT1 Recommended Weight Limit \(RWL\) Calculations](#)

Americas

Recommended Weight Limit (RWL) Calculations

S3AM-014-ATT1

This lifting equation, developed by the National Institute for Occupational Safety and Health (NIOSH), takes into account the weight of an object plus several other variables in lifting tasks that contribute to the risk of injury. For example, if the situation requires frequent lifts or lifting loads far away from the body, there is an increased risk of injury. Under these conditions, the weight limit would be reduced from a baseline weight or "load constant" (LC) to a recommended weight limit (RWL). A "load constant" (LC) of 23 kg (about 51 pounds) has been established by NIOSH as a load that, under ideal conditions, is safe for 75% of females and 90% of males. More information on the NIOSH Lifting Equation can be found on the Centers for Disease Control and Prevention website.

To calculate the RWL, you must first measure or assess several variables related to the lifting task. The six variables that are considered in determining the RWL are:

- The horizontal distance (H) the load is lifted (distance of hands from midpoint between ankles),
- The starting height of the hands from the ground (V),
- The vertical distance of lifting (D),
- The time between lifts or frequency of lifting (F),
- The angle of the load in relation to the body (e.g., straight in front of you or off to the side, A), and
- The quality of the grasp or handhold based on the type of handles available (hand-to-load coupling, C).

Each of these variables is then assigned a numerical value (multiplier factor) from look-up charts. The equation includes six multiplier factors to calculate the RWL:

$$RWL = LC \times HM \times VM \times DM \times FM \times AM \times CM$$

Where LC is the load constant (23 kg) and other factors in the equation are:

- HM, the "Horizontal Multiplier" factor,
- VM, the "Vertical Multiplier" factor,
- DM, the "Distance Multiplier" factor,
- FM, the "Frequency Multiplier" factor,
- AM, the "Asymmetric Multiplier" factor, and
- CM, the "Coupling Multiplier" factor.

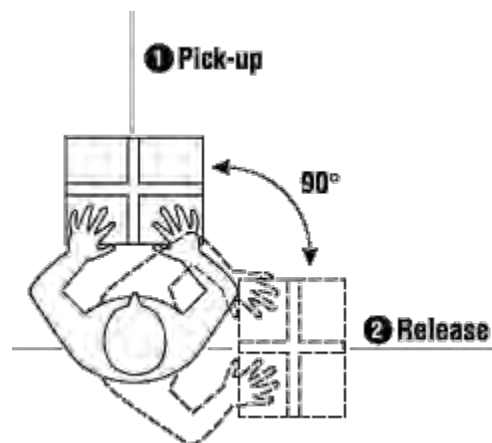
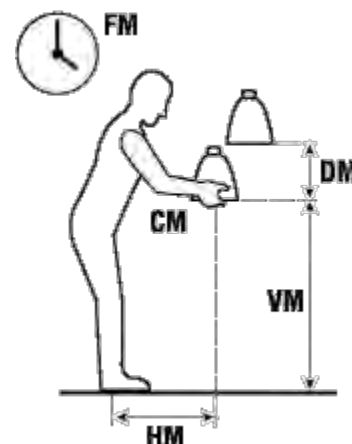
Horizontal Multiplier is the distance the object is from the body. Measure (in centimeters) the distance from in between the person's ankles to their hands when holding the object. Write down this number. Next, look up the number on the accompanying chart and find the matching "multiplier factor". Use this factor in the lifting equation.

Vertical Multiplier is measured as the starting point of the lift and is the distance in centimeters of the hands up from the ground. Measure this distance and use the number to determine which value to use on the chart.

Distance Multiplier is the number of centimeters the load travels up (or down) from the starting position. Measure this distance and use the number to determine which value to use on the chart.

Frequency Multiplier is how often the lift is repeated within a certain time period. You need to determine if the lift is done while standing or stooping, for more or less than one hour (in total time for the shift), and how much time there is for rest between lifts.

Asymmetric Multiplier measures if the body must twist or turn during the lift. This measurement is done in degrees (with 360° being one complete circle).



Coupling Multiplier determines the "coupling" or type of grasp the person has on the container. It rates the type of handles as good (handles), fair (make-shift cut outs in cardboard boxes) or poor. You also need to know if the lift is done in a standing or stooping position.

When these multipliers are placed into the equation, determine the RWL. If the weight of the object to be lifted exceeds the RWL, the task is considered to be dangerous. Assess the relevant factors which contribute most to the risk (the lower the factor, the more it contributes to the risk) and redesign the handling task.

The lifting equation only applies in certain situations. It does not apply in situations where a person is lifting (or lowering):

- With one hand,
- For over 8 hours,
- While seated or kneeling,
- In a restricted work space,
- Objects that are unstable (such as buckets or containers of liquids),
- While pushing or pulling,
- With wheelbarrows or shovels,
- With high speed motion (faster than about 30 inches/second or 76 centimeters/second),
- Extremely hot or cold objects or in extreme temperatures, or
- With poor foot/floor coupling (high risk of a slip or fall).

This equation applies to most workers for:

- Two-handed lifting,
- Comfortable lifting postures, and
- Comfortable environments and non-slip floorings.

FACTORS USED IN RWL CALCULATIONS

Horizontal Multiplier (HM): Horizontal distance (H, in cm) from the midpoint between the ankles to the hands while holding the object.

H = Horizontal Distance (cm)	HM Factor
25 or less	1.00
30	0.83
40	0.63
50	0.50
60	0.42

Vertical Multiplier (VM): The vertical distance (V, in cm) of the hands from the ground at the start of the lift.

V = Starting Height (cm)	VM Factor
0	0.78
30	0.87
50	0.93
70	0.99
100	0.93
150	0.78
175	0.70
>175	0.00

Distance Multiplier (DM): The vertical distance (D, in cm) that the load travels.

D = Lifting Distance (cm)	DM Factor
25 or less	1.00
40	0.97
55	0.90
100	0.87
145	0.85
175	0.85
>175	0.00

Asymmetric Multiplier (AM): The twisting angle (A) of the body while lifting, measured in degrees.

A = Angle (degrees)	AM Factor
90°	0.71
60°	0.81
45°	0.86
30°	0.90
0°	1.00

Frequency Multiplier (FM): The frequency (F) of lifts and the duration of lifting (in minutes or seconds) over a work shift.

F = Time Between Lifts	FM Factor			
	Lifting While Standing		Lifting While Stooping	
	One Hour or Less	Over One Hour	One Hour or Less	Over One Hour
5 min	1.00	0.85	1.00	0.85
1 min	0.94	0.75	0.94	0.75
30 sec	0.91	0.65	0.91	0.65
15 sec	0.84	0.45	0.84	0.45
10 sec	0.75	0.27	0.75	0.27
6 sec	0.45	0.13	0.45	-
5 sec	0.37	-	0.37	-

Coupling Multiplier (CM): The quality of grasp (or coupling, C) classified as good, fair or poor and depends on the body position (either standing or stooping).

C = Grasp	CM Factor	
	Standing	Stooping
Good (handles)	1.00	1.00
Fair	1.00	0.95
Poor	0.90	0.90

Bloodborne Pathogens

S3AM-111-PR1

1.0 Purpose and Scope

- 1.1 Define the AECOM procedures for eliminating and/or controlling occupational exposure to Bloodborne Pathogens on AECOM projects and activities.
- 1.2 A written Exposure Control Plan shall be developed and implemented during all AECOM operations where there is a reasonable potential for occupational exposure of AECOM employees and/or subcontractors to bloodborne pathogens as a regulated waste.
- 1.3 This procedure's requirements apply to all AECOM Americas employees and operations and any other entity and its personnel contractually required to comply with this document's content. Any jurisdictional requirements exceeding those identified in this procedure shall be met when conducting work in the given jurisdiction.

2.0 Terms and Definitions

- 2.1 **Blood** – Human whole blood; human blood components such as plasma or platelets; and human blood products such as clotting factors.
- 2.2 **Bloodborne Pathogens (BBP)** – Pathogenic microorganisms that are present in human blood and that can infect and cause disease in persons who are exposed to blood containing these pathogens including but not limited to hepatitis B virus (HBV), human immunodeficiency virus (HIV), hepatitis C, malaria, syphilis, babesiosis, brucellosis, leptospirosis, arboviral infections, relapsing fever, human T-lymphotropic virus Type I, and viral haemorrhagic fever (Ebola).
- 2.3 **Exposure Control Plan (S3AM-111-ATT1)** – A plan that addresses the requirements applicable to specific AECOM projects and activities designed to eliminate or minimize employee exposure. The Exposure Control Plan shall be incorporated into the location specific SH&E Plan and shall be accessible to all employees. The Exposure Control Plan shall include:
 - Exposure determination.
 - The schedule and method of implementation for:
 - Methods of compliance;
 - Hepatitis B Vaccination;
 - Post exposure Evaluation;
 - Communications of Hazards to employees; and
 - Record Keeping.
 - Documentation methods for exposure incidents, to include:
 - Routes of exposure; and
 - The circumstances for which and exposure incident occurred.

Note: In the State of California this plan shall also address exposures to airborne pathogens.
- 2.4 **SH&E Plan** – A document prepared for a specific project or program that details the hazards, precautions, emergency planning, medical, and training requirements for that project or program.
- 2.5 **Occupational Exposure (Exposed)** – Reasonably anticipated skin, eye mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties. Employees will be considered to be potentially exposed, even though they are using the universal precautions specified for the project or program.

- 2.6 **Other Potentially Infectious Materials (OPIM)** – Body fluids and tissues including: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, amniotic fluid, saliva, and any other body fluid that is visibly contaminated with blood. When it is difficult or impossible to differentiate between body fluids, all body fluids should be treated as if they are potentially infectious.
- Note: In the State of California airborne pathogens are also considered infectious materials.*
- 2.7 **Regulated Waste** – (1) liquid or semi-liquid blood or other potentially infectious materials; (2) contaminated items that would release blood or other potentially infectious materials in a liquid or semi-liquid state if compressed; (3) items that are caked with dried blood or other potentially infectious materials and are capable of being released during handling; (4) objects contaminated with blood that can pierce the skin; and (5) pathological and microbiological wastes containing blood or other potentially infectious materials.
- 2.8 **Source Individual** – An individual, typically one who has been injured, whose blood or saliva has come in contact with another individual, typically one who has rendered first aid or Cardio Pulmonary Resuscitation (CPR) to the injured party.
- 2.9 **Universal Precautions** – All body fluids and materials potentially contaminated by body fluids will be considered to be infectious unless the fluids were from the person performing the clean up or decontamination activities. All employees coming in contact with another person's body fluids shall assume that the fluids are infectious and shall wear prescribed Personal Protective Equipment.

3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-004-PR1 Incident Reporting, Notifications & Investigation
- 3.3 S3AM-017-PR1 Injury & Illness Recordkeeping
- 3.4 S3AM-128-PR1 Medical Screening & Surveillance
- 3.5 S3AM-208-PR1 Personal Protective Equipment
- 3.6 S3AM-209-PR1 Risk Assessment & Management

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 Occupational Health Manager

- Will review and maintain all medical records generated as a result of post-exposure follow-up and maintain all medical records related to the follow-up.
- Will, where appropriate, consult with AECOM's local medical providers about follow-up recommendations.

4.1.2 SH&E Manager

- Will review project / program-specific Exposure Control Plans (normally part of the SH&E Plan) prior to the initial mobilization, at least annually for continuing projects or programs, and whenever necessary to reflect modified tasks or procedures that affect occupational exposure to bloodborne pathogens.
- Will consult with the Occupational Health Manager regarding all bloodborne pathogens exposure incidents.
- Will maintain training records and post-exposure follow-up information.
- Will confirm that site-specific training is conducted for all employees working at sites where regulated wastes were disposed or for employees who may be occupationally exposed while working at a facility that handles regulated wastes.

- Will confirm the Hepatitis B vaccine is made available to all employees with a potential occupational exposure (e.g. paramedic, medical laboratory employee, etc.).
- Will review all incident reports and arrange for post-exposure follow-up with AECOM's local medical provider.
- Will offer recommendations on how to prevent an incident from recurring.

4.1.3 **Manager**

- See that all recommendations made by the SH&E Manager are implemented.
- Support the SH&E Manager in their efforts to prevent occupational and non-occupational exposures to bloodborne pathogens.

4.1.4 **Employee**

- Use all PPE and universal precautions required to prevent exposure to infectious materials.
- Follow the exposure control methods outlined in their Exposure Control Plan.
- Report potential exposure incidents to their Supervisor or Manager immediately.

4.2 Potential Exposure Situations

4.2.1 There are a few activities within AECOM where potential occupational exposures to blood or other potentially infectious materials are of concern. These activities may include:

- Investigations of properties that received regulated wastes.
- Site visits or audits at Treatment Storage and Disposal facilities where medical waste is handled.
- Site visits or audits at medical or health care facilities.
- The provision of first-aid or cardiopulmonary resuscitation (CPR) to AECOM, subcontractor, or client personnel (if the action is part of the employee's occupations duties [e.g. paramedic] and not provided as a voluntary action).

4.2.2 Although AECOM does offer first-aid and CPR training to its employees on a regular basis, providing such aid is often on a voluntary basis and not directed by AECOM. As such, potential exposures may not be considered occupational exposures within the context of the OSHA Bloodborne Pathogens Standard. Site-specific Exposure Control Plans shall differentiate voluntary first-aid duties from occupational exposures as a component of the exposure determination. Refer to *S3AM-209-PR1 Risk Assessment & Management*.

4.3 Unforeseen Exposure Situations

4.3.1 Occasionally, potentially infectious material is encountered during a activity where none was expected; when this happens, the work shall be stopped, employee training conducted, and an exposure control plan prepared prior to resuming activities with potential exposures.

4.4 Employee Training

4.4.1 All personnel who will work on projects or programs which involve potential contact with regulated wastes will be required to attend a training class prior to the start of the project or program and annually for continuing projects or programs. Refer to *S3AM-003-PR1 SH&E Training*. The specific requirements and provisions of the written Exposure Control Plan shall be provided to each AECOM Employee and subcontractor assigned to work at the program / project.

4.4.2 Either of the following two sources of employee training will be used by AECOM to educate Employees on the hazards of exposure to bloodborne pathogens:

- The local chapter of the American Red Cross or other recognized training provider.
- AECOM's in-house training program.

4.4.3 Training sessions will review the following:

- Requirements of OSHA's Bloodborne Pathogens Standard or equivalent, applicable jurisdictional requirements.
- Review of AECOM's Bloodborne Pathogen Procedure (this document).
- Situations within AECOM that may involve exposure to bloodborne pathogens.
- Bloodborne diseases and symptoms of disease.
- Means of transmission.
- Work practice controls to reduce risk.
- Use of personal protective equipment to reduce risk.
- Incident reporting.
- AECOM's Post-Exposure Medical Follow-Up Procedures:

4.4.4 When contracting for CPR and first-aid training sessions, AECOM will request that each session include a section on the hazards associated with exposure to bloodborne pathogens and protective measures that shall be followed when administering first aid, CPR, or other emergency medical care. At the end of the session, Employees will be provided with a copy of this procedure. This procedure will be reviewed and a question-and-answer session will be conducted at the end of the presentation.

4.4.5 If the training provider cannot provide such training, AECOM will conduct a Blood Borne Pathogen training session prior to the start of the first aid or CPR class.

4.4.6 AECOM has and will have little control over employees who have not received AECOM provided first aid or CPR training, but who choose to perform Good Samaritan acts. Any Employee who does perform a Good Samaritan act that results in exposure to blood or other potentially infectious materials will, however, be provided with post-exposure medical follow-up as described in this procedure.

4.5 Personal Protective Equipment

4.5.1 All body fluids and materials potentially contaminated by body fluids will be considered to be infectious. All Employees coming in contact with another person's body fluids shall assume that the fluids are infectious and shall wear prescribed personal protective equipment (PPE), refer to *S3AM-208-PR1 Personal Protective Equipment*.

4.5.2 The use of PPE to prevent exposure is more appropriate for the types of occupational and non-occupational exposures Employees might encounter than is the use of engineering or work practice controls that are more effectively instituted in medical care or laboratory facilities where employees are actually handling blood and other potentially infectious materials.

4.5.3 PPE such as Tyvek coveralls, shoe covers, and gloves will be provided to all field team members involved in site activities where regulated wastes may be present. Site-specific PPE requirements will be identified in the written Exposure Control Plan. The same type of PPE will also be available, if it is deemed necessary, for Employees involved with activities at TSD facilities that handle regulated wastes.

4.5.4 PPE will be provided to affected Employees at no cost.

4.6 Universal Precautions Kits

4.6.1 In those work areas where there is the potential for exposure to infectious materials, a universal precaution kit shall be readily available. The kit shall permit the clean-up, neutralization, transportation, and disposal of up to 1 litre of blood or body fluids. The kit shall contain the following items at a minimum:

- Safety shield/mask combination
- Liquid proof apron
- Medical-grade vinyl/nitrile gloves
- Liquid solidifier/deodorizer
- Pickup scoop with scraper
- Red biohazard waste bag with tie
- Germicidal solution with dry wipe
- Antimicrobial hand wipe
- ID tag
- Instructions for use

4.7 Personal Hygiene

- 4.7.1 Special provisions will be made so that hand washing facilities are available on-site for sites that are known to be contaminated with regulated wastes. Alcohol wipes will be available in the event that hand washing facilities are not immediately available.
- 4.7.2 To reduce the potential for infection, if skin contact with blood or other potentially infectious materials occurs, the exposed area should be washed with non-abrasive soap and water as soon as possible. Hand washing will also help to prevent the transfer of contamination from the hands to other areas of the body or other surfaces that may be contacted later. Even when protective gloves are worn, hands should be washed with non-abrasive soap and running water as soon as possible after the gloves are removed.
- 4.7.3 The use of an alcohol wipes should not be relied upon as the primary means of personal hygiene. Hands should be thoroughly washed with soap and running water as soon as possible.
- 4.7.4 If mucous membranes, such as the eyes, come in direct contact with blood or other potentially infectious materials, the area should be washed or flushed with water as soon as possible and reported immediately.

4.8 Reporting Exposure Incidents

- 4.8.1 All incidents in which an employee has been exposed to blood or other potentially infectious materials shall be reported to the employee's Supervisor and to the SH&E Manager immediately. An IndustrySafe on-line report shall be completed in accordance with *S3AM-004-PR1 Incident Reporting, Notifications & Investigation*. After reviewing the report, the SH&E Manager will provide recommendations, when appropriate, for preventing recurrence of the incident.

4.9 Medical Follow-Up to Exposure Incidents

- 4.9.1 Once notified, the SH&E Manager will in turn discuss the incident with AECOM's Occupational Health Manager and/or medical provider and make arrangements for an evaluation, refer to *S3AM-128-PR1 Medical Screening & Surveillance*. Prompt medical attention is important in the event of an exposure incident. If the incident occurs in the field, the Employee will either be asked to visit the local hospital or, if he/she chooses, return immediately to the office to visit AECOM's local medical provider.
- 4.9.2 An attempt will be made to test the affected employee, and if applicable, the source individual's blood, for bloodborne pathogens. No testing will be performed without the written consent of the exposed Employee or the source individual. If initially, the exposed Employee or the source individual does not consent to HIV serological testing, but does consent to HBV serological testing, AECOM will make provisions with the local medical provider to preserve the blood sample for at least 90 days in the event that after counselling efforts, the Employee voluntarily consents to HIV testing.

- 4.9.3 AECOM will rely on the professional judgment of its Occupational Health Manager and/or local medical providers in the event of an exposure incident. Evaluations and follow-up procedures will be provided according to the recommendations of the United States Public Health Service (USPHS), World Health Organization, or other Public Health organization in Canada and other countries in the Americas current at the time these evaluations and procedures take place. Minimally, a post-exposure evaluation and follow-up will include the following elements:
- Documentation of the route(s) of exposure
 - Circumstances under which the exposure incident occurred
 - Identification and documentation of the source individual in the case of first aid or emergency medical treatments
 - Collection and testing of source individuals and exposed employee's blood for HBV and HIV serological status as soon as feasible and upon consent
 - Post-exposure vaccination when medically indicated, as recommended by the USPHS
 - Counselling, if necessary
 - Evaluation of reported illnesses
- 4.9.4 Any and all follow-up recommendations offered by the physician will be immediately instituted by the SH&E Manager with the guidance of the Occupational Health Manager and/or the local medical provider and at no cost to the affected Employee. Repeat testing, counselling, and follow-up, if recommended, will also be provided at no cost to the Employee. AECOM will rely on the Occupational Health Manager and/or the local medical provider to provide counselling to Employees concerning infection status, including results of and interpretation of medical tests and advising the Employee about the protection of personal contacts.
- 4.9.5 All medical providers shall submit to AECOM's Occupational Health Manager and the affected Employee a written opinion of the post-exposure evaluation within 15 days of the completion of the evaluation.
- 4.9.6 All medical records generated as a result of the post-exposure evaluation will be retained in the office of the Occupational Health Manager, and as applicable AECOM's medical services provider, under lock and key and will be maintained with the strictest confidentiality. Refer to *S3AM-017-PR1 Injury & Illness Recordkeeping*.
- 4.10 Hepatitis Vaccination
- 4.10.1 Prior to performing site visits or field investigations where regulated wastes are stored, processed, or known to have been disposed of, AECOM will consult with the Occupational Health Manager and/or the local medical providers to determine if a hepatitis A or B vaccination is appropriate given the site conditions and the proposed scope of work. Where possible the first Hepatitis B vaccinations will be given prior to working at sites with known, potential occupational exposures.
- 4.10.2 Although AECOM does offer first-aid and CPR training to its Employees on a regular basis, providing such aid is often voluntary and not as a specified job duty of an Employee. As such, potential exposures may not be considered occupational within the context of the government Bloodborne Pathogens Standard. Pre-exposure hepatitis vaccinations will not typically be offered for voluntary roles.
- 4.10.3 Post-exposure hepatitis vaccination will be offered to Employees involved in an exposure incident within 24 hours of possible exposure.
- 4.10.4 The vaccinations discussed above shall be provided to Employees at no cost if required by the exposure determination.

4.11 Housekeeping

- 4.11.1 Other than through the provision of first aid or CPR, there is no potential for occupational exposure to blood or other potentially infectious materials within any of the AECOM offices. Therefore, the housekeeping requirements and requirements for warning signs and labels contained in the OSHA Bloodborne Pathogens standard are not applicable to our office operations.
- 4.11.2 When working at a site where regulated wastes have been disposed of, the specific housekeeping and warning sign requirements will be prescribed by the client and/or in the site-specific HASP.
- 4.11.3 When working at a client's facility, AECOM will review the facilities plan for compliance with all the requirements of the Bloodborne Pathogens Standard and will observe all housekeeping requirements, wear required PPE, and acknowledge all warning signs and labels as specified in the client's plan. If the client does not have an effective plan, AECOM will prepare a plan as part of the written Exposure Control Plan.

4.12 Regulated Waste Generated by AECOM

- 4.12.1 Any regulated waste generated by AECOM as a result of first aid activities or clean-up of potentially infectious material will be collected in sealed, watertight containers and disposed of according to the Host Employer's BBP program or disposed of through a permitted regulated waste facility.
- 4.12.2 Disposal manifests shall be maintained in accordance with local or governmental regulations.

4.13 Material Decontamination

- 4.13.1 Any areas or equipment that are contaminated by potentially infectious material will be decontaminated using a 10% solution of household bleach. Utilize appropriate personal protective equipment to control exposure to the bleach (e.g. safety goggles, gloves, etc.). Refer to *S3AM-208-PR1 Personal Protective Equipment*.

4.14 Procedure and Plan Review

- 4.14.1 All Exposure Control Plans for projects or programs extending over one year shall be reviewed annually by the SH&E Manager and affected Employees.

5.0 Records

- 5.1 Each SH&E Manager will maintain records and provide copies of the records to the Occupational Health Manager, related to bloodborne pathogens in accordance with the provisions of the standard and *S3AM-017-PR1 Injury & Illness Recordkeeping*.
- 5.2 Records maintained in accordance will include bloodborne pathogens exposure incidents, post-exposure follow-up, vaccination status, and training for all Employees with potential occupational exposure.
- 5.3 Employee medical and training records required by this procedure shall be provided upon request for examination and copying to the Employee, to anyone having written consent of the subject employee, or to State, Province, or Federal Occupational Safety and Health regulatory agencies.

6.0 Attachments

- 6.1 [S3AM-111-ATT1 Bloodborne Pathogens Exposure Control Plan](#)
- 6.2 [S3AM-111-FM1 Hepatitis B Vaccination Declination](#)

Bloodborne Pathogens Exposure Control Plan

S3AM-111-ATT1

1.0 Introduction

Employees are at risk for exposure to and possible transmission of infectious diseases each time they are in contact with blood or body fluids. Bloodborne pathogens are microorganisms present in human blood and other body fluids that can cause serious disease in humans and include, but are not limited to Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), and Human Immunodeficiency Virus (HIV). Therefore, this exposure control plan (ECP) has been established to ensure that employees are effectively informed concerning potential workplace health hazards, and that protective measures necessary to eliminate or minimize bloodborne exposure incidents are used whenever possible.

2.0 Exposure Determination

2.1 The Medical Screening Evaluation form will be used to evaluate which employees may incur occupational exposure to blood or other potentially infectious materials when performing routine tasks and procedures. Refer to *S3AM- 128-PR1 Medical Screening & Surveillance*. These exposure determinations will be made without regard to the use of personal protective equipment, and regardless of exposure frequency.

2.1.1 The employees in the following job classifications may have occupational exposure to bloodborne pathogens, and are covered by this program:

- Occupational health nurse
- Paramedics
- Registered nurses
- Designated first aid providers (providing first aid identified as part of the employee's occupational duties and not a voluntary action)
- Medical laboratory employees
- Janitorial workers in medical facilities and clinics.

2.1.2 Tasks and procedures that may expose the above employees to bloodborne pathogens include:

- Treating cuts, abrasions, and burns
- Cleaning contaminated environmental surfaces
- Administering cardiopulmonary resuscitation (CPR).

3.0 Exposure Control

3.1 "Universal precautions" are a required method of control to prevent exposure to blood and body fluids. This term refers to the concept that all human blood and certain human body fluids are treated as if known to be infectious for HIV, HBV, HCV, and other bloodborne pathogens, regardless of the perceived risk status of another individual. Universal precautions apply to blood, other body fluids containing visible blood, semen, and vaginal fluids. Universal precautions do not apply to feces, nasal secretions, saliva, sweat, tears, sputum, urine, and vomitus unless they contain visible blood. Although these fluids have an extremely low or nonexistent risk for bloodborne pathogens, they are a potential source for other infectious diseases, and precautions shall also be followed when these body fluids are present.

3.2 Engineering and Work Practice Controls

3.2.1 The following engineering controls will be in place in all areas of occupational exposure:

- Containers for disposable contaminated sharps shall be puncture-resistant, labeled a biohazard, leak-proof, and have a closable top.

- Containers for storage, transport, or shipment of blood or other potentially infectious materials, regulated waste, and contaminated laundry will be labeled with the biohazard symbol and site address, and have a securely closing lid.
- Engineering controls will be reviewed and maintained on a regular basis to ensure effectiveness.

3.2.2 The following work practice controls (administrative and personal protective equipment) shall be strictly followed to minimize exposure, and isolate or remove bloodborne pathogens from the workplace:

- Accessible handwashing facilities. If soap and running water are not available, an antiseptic hand cleaner in conjunction with clean paper towels or antiseptic towelettes are acceptable temporary alternatives to running water. When this alternative method is used, employees shall wash their hands with soap and running water as soon as feasible.
- Personal protective equipment (PPE) will be provided at no cost to the employee, and will be chosen based on the anticipated exposure to blood. PPE is considered appropriate if it does not permit blood or other potentially infectious materials to reach or pass through clothes, skin, or mucous membranes of the eyes or mouth under normal conditions of use, and for the duration of time the equipment will be used. PPE shall be readily accessible and will be removed prior to leaving the work area.
- Disposable single-use gloves shall be used as a protective barrier in all situations in which contact with body fluids is anticipated. Gloves of the correct size will be provided. Disposable gloves will not be washed or disinfected for reuse, and will be replaced between employees, and if they become torn or punctured. Gloves are especially important if the employee has cuts, abraded skin, chapped hands, or dermatitis.
- Liquid-impermeable gowns, boots, and masks, in combination with eye-protective devices such as goggles and shatterproof glasses with solid-side shields or chin-length face shields, shall be worn whenever splashing, spraying, or spattering of blood droplets or body fluids can be reasonably anticipated.
- Disposable pocket mask ventilation devices shall be provided in all first aid kits and used to avoid mouth-to-mouth contact during emergency cardiopulmonary resuscitation.
- Examples of Recommended PPE (depending on task, more PPE may be needed).

<u>Task</u>	<u>Gloves</u>	<u>Gown</u>	<u>Mask</u>	<u>Goggles</u>
Bleeding control w/ minimal bleeding	Yes	No	No	No
Bleeding control w /spurting blood	Yes	Yes	Yes	Yes
Cardiopulmonary resuscitation	No	No	Yes	No
Decontamination/clean-up	Yes	No	No	No
Medical laboratory activities	Yes	Yes	Yes	Yes

3.2.3 Eating, drinking, smoking, applying cosmetics, and handling of contact lenses is prohibited in work areas where there is a reasonable likelihood of occupational exposure. Food and drink cannot be kept in refrigerators, freezers, shelves, cabinets, or on counter tops where blood or body fluids are present.

3.2.4 Contaminated needles and other sharps shall not be bent or recapped unless a one-handed technique is used. They shall be disposed of in an appropriate sharps container.

3.2.5 All regulated biohazardous waste will be placed in a waste receptacle that has designated red biohazard bags and a closable top controlled by a foot peddle. When full, the bags shall be removed with gloved hands, tied off, and placed in a biohazard shipping carton, to be held for pick-

up. If any biohazard bag appears to be leaking, it shall be double-bagged. The waste will be incinerated per federal, provincial/territorial/state regulations.

3.3 Housekeeping

- 3.3.1 Universal precautions shall be used when cleaning or decontaminating any surface or equipment that may be contaminated. Appropriate PPE shall be used for protection during decontamination.
- 3.3.2 All contaminated environmental work surfaces such as countertops or floors will be cleaned according to regulatory requirements or with a household bleach solution diluted 1:10 with water directly following contamination with blood or body fluids.
- 3.3.3 Instruments such as tweezers, bandage scissors, and thermometers shall be disposable rather than reusable equipment, and shall be disposed of in an appropriate manner.
- 3.3.4 Broken, contaminated glassware shall not be picked up directly with the hands. It shall be cleaned up using a mechanical means such as a brush and dustpan or tongs.

4.0 Hepatitis B Vaccination

- 4.1 Within 10 working days of placement, all employees assigned to tasks with potential occupational exposure to bloodborne pathogens shall be offered the Hepatitis B vaccination at no cost to the employee, unless the employee has had a previous Hepatitis B vaccination series, antibody testing reveals the employee is immune, or the vaccine is contraindicated for medical reasons. Further, this vaccination series shall be made immediately available to employees who have an occupational exposure, whether as a result of their assigned tasks, or occurring from an incidental contact.
- 4.2 The local occupational medical facility used for routine medical surveillance will administer the vaccinations.
- 4.3 Employees who decline the Hepatitis B vaccine shall sign a copy of the waiver form located at the end of this Work Instruction. The signed waiver will be stored in the employee's medical record with the Occupational Health Manager. Employees may initially decline the vaccination, but may decide to take them at a later date, while still covered under this plan. The vaccinations will be made available to the employee at that time.
- 4.4 Employees choosing to take the vaccination series will sign a consent form at the occupational clinic prior to receiving the injections, and are advised to read the package insert regarding the efficacy, safety, method of administration, and benefits of the vaccine. Employees may also ask questions directly of the Medical Service Provider or local occupational physician. Employees are not required to participate in a prescreening program (to determine immunity) before receiving the vaccinations. If a routine booster of Hepatitis B vaccine is recommended by the U.S. Public Health Service at a future date, such booster dose(s) will be made available to affected employees.

5.0 Post-Exposure Incident Evaluation And Follow-Up

- 5.1 All occupational bloodborne pathogen exposures shall be reported to the HSE representative and Occupational Health Manager immediately after initial decontamination first aid is accomplished. Following the report of an exposure incident, a confidential medical evaluation with an occupational physician will be arranged as soon as possible, ideally no later than 1 to 2 hours after the incident has occurred. In some jurisdictions, depending on applicable workers' compensation law, employees may choose treatment from their personal physician. A copy of the OSHA Bloodborne Pathogen Standard, if applicable to the jurisdiction, will be provided if the physician does not have a copy. A written incident report shall be completed as soon as possible, fully describing the incident.
- 5.2 First aid protocol for treatment immediately after an exposure incident:
 - 5.2.1 Lacerations, punctures, and abrasions should be washed under cool running water for at least 5 minutes, allowing free bleeding. Cleanse area well with soap or iodine solution. Apply sterile dressing as needed. Give tetanus booster if indicated (7 to 10 years since last booster).

- 5.2.2 Ocular exposure requires irrigation of the eye with water or sterile normal saline solution for 15 minutes.
- 5.2.3 Mucous membrane exposure requires rinsing mouth with ½ strength 3 percent hydrogen peroxide for 30 seconds, four separate and consecutive times.
- 5.3 Confidential Medical Evaluation
 - 5.3.1 The treating occupational physician will receive documentation of the routes of exposure, the circumstances surrounding the incident, and identification of the source individual (the individual the employee was exposed to). The blood of the source individual will be tested if possible, and after consent is obtained. When legally permissible, results of the source individual's tests will be made available to the exposed employee, with the exposed employee informed about the applicable laws and regulations concerning the disclosure of the identity and infectivity of the source individual.
 - 5.3.2 Testing of the exposed employee's blood, if consented to (the employee may consent to baseline blood collection, but may request that the sample not be tested for HIV for up to 90 days, if at all), is recommended.
 - 5.3.3 Post-exposure medical treatment will be offered in accordance with the current recommendations of the U.S. Public Health Services. This may include, but is not limited to:
 - A series of HIV post-exposure blood tests
 - Hepatitis B vaccination and/or Hepatitis B immune globulin
 - HIV post-exposure prophylactic medications
 - Evaluation of acute febrile illnesses following exposure
 - Employee counseling concerning precautions to take during the period after the exposure incident, and information on signs and symptoms of potential illnesses.
- 5.4 Healthcare Professional's Written Opinion
 - 5.4.1 The Occupational Health Manager shall obtain and provide the employee with a copy of the evaluating physician's written opinion within 15 days of the completion of the medical evaluation. A copy will be maintained in the employee's confidential medical record. The written opinion shall be in accordance with the requirements of the OSHA Bloodborne Pathogens Standard indicating that the employee has been informed of any medical conditions resulting from exposure that require further evaluation or treatment. All other findings or diagnoses shall remain confidential and will not be included in the report.

6.0 Hazard Communication

- 6.1 Fluorescent red or orange-red warning labels bearing the universal biohazard symbol and the legend BIOHAZARD shall be firmly affixed to all containers (e.g., waste cans, sharps containers, and refrigerators) used for the storage or shipment of blood or other potentially infectious materials.
- 6.2 All employees designated to perform tasks involving occupational exposure shall receive bloodborne pathogens training at the time of initial assignment to the job. This training will be given during working hours and at no cost to employees. Refresher courses will be provided annually (within 1 year of previous training), and if new tasks or procedures are implemented. Material appropriate in content and vocabulary to education level, literacy, and language of the employees shall be used for all required training.
- 6.3 Training will include: making accessible a copy of the regulatory text of the standard and explanation of its contents, general discussion on bloodborne diseases and their transmission, exposure control plan, engineering and work practice controls, personal protective equipment, Hepatitis B vaccine, response to emergencies involving blood, how to handle exposure incidents, the post-exposure evaluation and follow-up program, signs/labels/color-coding, and question and answer time with the trainer.

7.0 Exposure Incident Investigation

- 7.1 The SH&E Manager will review the circumstances of any exposure incident to determine corrective actions. The incident report will include:
- 7.1.1 Engineering controls in use at the time
 - 7.1.2 Work practices followed
 - 7.1.3 A description of any equipment being used
 - 7.1.4 A description of the work being performed
 - 7.1.5 PPE that was used at the time of the incident
 - 7.1.6 Date, time, and location of the incident
 - 7.1.7 Employee's training.
- 7.2 An incident report shall be completed within four hours of the incident and entered into AECOM's on-line incident reporting system (e.g., IndustrySafe) in accordance with *S3AM-004-PR1 Incident Reporting, Notifications & Investigations*. A copy of this incident report will be forwarded to the Occupational Health Manager, who will evaluate what follow-up actions should be addressed, including if revisions need to be made to the Exposure Control Plan.

8.0 Recordkeeping

- 8.1 The Occupational Health Manager will be responsible for establishing and maintaining accurate, confidential workers' compensation medical records for each employee with occupational exposure for the duration of employment plus 30 years, in accordance with OSHA 29 CFR 1910.1020 – Access to Employee Exposure and Medical Records.
- 8.2 The SH&E Manager will be responsible for maintaining the bloodborne pathogens training class records for at least 3 years from the date of training. The records will include the date of the training class, a summary of the class contents, the names of the qualified instructors, and the names and job titles of personnel attending the training.
- 8.3 Employee medical records shall be made available to employees (or their designated representative) with written consent by the employee within 15 working days of request.
- 8.4 An exposure incident will be evaluated by the Occupational Health Manager and SH&E Manager to determine if the case meets OSHA's Recordkeeping Requirements (29 CFR 1904).

Americas

Hepatitis B Vaccination Declination**S3AM-111-FM1**

I understand that due to my occupational exposure to blood or other potentially infectious materials, I may be at risk of acquiring Hepatitis B virus (HBV) infection.

I have been given the opportunity to be vaccinated with Hepatitis B vaccine, at no charge to myself; however, I decline Hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring Hepatitis B, a serious disease.

If, in the future, I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with the Hepatitis B vaccine, I can receive the vaccine series at no cost to me.

Name:

Date:

Witness:

Date:

Cold Stress

S3AM-112-PR1

1.0 Purpose and Scope

- 1.1 To protect employees from the severest effects of cold stress (hypothermia) and cold injury and to identify exposures to cold working conditions under which it is believed nearly all employees can be repeatedly exposed without adverse health effects.
- 1.2 This procedure applies to all AECOM Americas based employees and operations, and any other entity and its personnel contractually required to comply with this document's content, working outdoors in damp and cool (below 50 degrees Fahrenheit [°F] or 10 degrees Celsius [°C]) conditions or anytime temperatures are below 32°F or 0°C.

2.0 Terms and Definitions

- 2.1 **Cold Stress** – The production of physiological effects due to cold temperatures and/or wind chill.
- 2.2 **Equivalent Chill Temperature (ECT)** – Also known as Wind Chill (see below).
- 2.3 **Frostnip** – Superficial cooling of tissues without cellular destruction.
- 2.4 **Frostbite** – Freezing of tissue, resulting in tissue destruction.
- 2.5 **Hypothermia** – Condition of reduced core body temperature to 95°F (35°C) resulting in loss of dexterity, loss of mental alertness, collapse, and possible death.
- 2.6 **Wind Chill** – The combined effect of air temperature and wind. Also expressed as "equivalent chill temperature" (ECT), wind chill is defined as heat loss resulting from the effects of air temperature and wind velocity upon exposed skin.

3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-128-PR1 Medical Screening & Surveillance Program
- 3.3 S3AM-208-PR1 Personal Protective Equipment
- 3.4 S3AM-314-PR1 Working Alone
- 3.5 S3AM-315-PR1 Working On or Near Water
- 3.6 S3AM-333-PR1 Marine Safety & Vessel Operations

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 Manager

- Ensuring the safety of employees on their project sites, consistent with regulatory standards.
- Implement cold stress prevention measures as applicable at each work site.
- Develop/coordinate a work-warning regimen, as applicable.
- Confirm cold stress hazard assessments/evaluations were completed for the planned activities.
- Assign employees physically capable of performing the assigned tasks. Consider acclimation to cold weather when evaluating employee capability.

- Confirm employees are properly trained to recognize the symptoms of cold stress.

4.1.2 **Safety, Health and Environment (SH&E) Manager**

- Conduct/support cold stress assessments/evaluations.
- Conduct/support incident investigations related to potential cold stress-related illnesses.
- Assist project teams develop appropriate work-warming regimens.
- Provide cold stress awareness training.

4.1.3 **Supervisor**

- Identify the tasks that may be most impacted by cold stress and communicate the hazard to the assigned employees.
- Confirm that employees have been trained on the recognition of cold stress-related illnesses.
- Confirm that adequate supplies of warm fluids/drinks are readily available to employees.
- Confirm that a warm/sheltered rest area is available, as applicable.
- Conduct cold stress monitoring, as applicable.
- Implement the work-warming regimen.
- Confirm that first aid measures are implemented once cold stress symptoms are identified.
- Confirm that employees are physically capable of performing the assigned tasks and are not in a physically compromised condition.

4.1.4 **Employee**

- Observe each other for the early symptoms of cold stress-related illnesses.
- Maintain an adequate intake of available fluids.
- Report to work in a properly rested condition.
- Report all suspected cold stress-related illnesses.

4.2 **Requirements**

- 4.2.1 Carefully plan work anticipated to be performed in cool or cold conditions. If possible, heavy work should be scheduled during the warmer parts of the day or when the wind is most calm. Include costs in project budgets for specialized equipment and supplies needed to complete the field activities.
- 4.2.2 Staff working in extreme cold (wind chill or ECT below 10°F or -12°C) shall not work alone. The Buddy System shall be utilized to keep an eye on each other and to watch for signs of cold stress. Refer to *S3AM-314-PR1 Working Alone*. Watch for symptoms and signs of hypothermia.
- 4.2.3 Monitor weather forecasts and weather conditions such as ambient temperature, wind speed, and precipitation. Use observations prior to entering and while in the field to ensure appropriate protections are in place:
- If possible, move the work to a warm location.
 - If possible and as applicable, erect shelters or screens around the work area.
 - If possible, heat the work area.
 - If possible, adjust schedule according to the cold conditions, work level and worker acclimatization.
 - Implement a work-warming regimen by taking breaks out of the cold. As applicable, consult *S3AM-112 ATT1 Temperature Thresholds* to determine wind chill and work-warming schedule.
 - Take frequent short breaks in warm dry shelters to allow your body to warm up. Limit time of exposure to the cold. If shelter is not readily available, consider supplying temporary shelters.

- Provide assistance to prevent body heat loss, such as:
 - Providing appropriate sources of heat (e.g. warm packs, portable heaters, etc.).
 - Use of insulating materials on equipment handles when temperatures drop below 30°F (-1°C).

4.2.4 All staff working in extreme cold or snow conditions should understand the following guidelines for preventing and detecting hypothermia and frostbite; refer to *S3AM-112-ATT2 Symptoms & Treatment*:

- Ensure appropriate PPE requirements are established and adhered to.
- Avoid exhaustion or fatigue because energy is needed to keep muscles warm.
- Because prolonged exposure to cold air or to immersion in cold water at temperatures even well above freezing can lead to dangerous hypothermia, whole-body protection shall be used.
- Eat high calorie snacks to help maintain body metabolism.
- Confirm extra blankets or sleeping bags are on-site.
- Drink plenty of warm liquids. It is easy to become dehydrated in cold weather.
- Avoid caffeine and alcohol, which can act as diuretics. Alcohol consumption, depending upon quantity, can dilate blood vessels enhancing body heat loss or constrict blood vessels decreasing heat delivery to extremities.
- NEVER IGNORE SHIVERING. Persistent or violent shivering is a clear warning that you are on the verge of hypothermia.
- If you experience frost bite or hypothermia, find shelter and warmth and contact a medical practitioner if symptoms persist, refer to *S3AM-128-PR1 Medical Screening & Surveillance*.

4.3 Training

Before they begin work in a cold environment, employees that might be exposed to cold stress will be informed of the potential for cold stress and how to prevent cold stress. Employees that have not had the training within the twelve prior months shall repeat the training before exposure to cold stress, refer to *S3AM-003-PR1 SH&E Training*. Employees potentially exposed to cold stress will receive training including, but not limited to:

- 4.3.1 Sources of cold stress, the influence of protective clothing, and the importance of acclimatization.
- 4.3.2 How the body loses heat.
- 4.3.3 Recognition of cold-related illness symptoms.
- 4.3.4 Cold stress preventative/corrective measures including, but not limited to:
 - Weather monitoring.
 - Proper eating and drinking practices.
 - Work-warming schedules and proper re-warming techniques.
 - Buddy system.
 - Safe cold work practices appropriate to the work that is to be performed.
 - Proper use of cold environment personal protective clothing.
- 4.3.5 The harmful effects of excessive alcohol consumption in a cold stress environment.
- 4.3.6 The hazards associated with unstable snow or ice build ups.
- 4.3.7 First aid procedures for symptoms related to cold stress.

4.4 Personal Protective Equipment (PPE)

Wearing the right clothing is crucial to avoiding cold stress. The type of fabric also makes a difference. Cotton loses its insulation value when it becomes wet. Wool, on the other hand, retains its insulation even when wet. Adequate insulating dry clothing will be required in air or wind chill temperatures below 40 °F (4.4°C)

All PPE will comply with the requirements of *S3AM-208-PR1 Personal Protective Equipment* and consider the following requirements:

- 4.4.1 Wear at least 3 layers of clothing to help prevent cold stress. It is important to preserve the air space between the body and the outer layer of clothing to retain body heat.
 - Wear a middle layer of down, wool, or similar materials to provide insulation.
 - Avoid cotton, especially blue jeans.
 - Wear an outer layer to break the wind and allow some ventilation (e.g., Gortex® or nylon)
 - Do not wear tight clothing. Loose clothing allows better ventilation.
- 4.4.2 Wear proper clothing, including head coverings and gloves or mittens for cold, wet, and windy conditions.
- 4.4.3 Wear a hat or hardhat liner. Up to 40 percent of body heat can be lost when the head is left exposed.
- 4.4.4 Use insulated footwear with adequate traction to prevent slips and falls.
- 4.4.5 Wear insulated boots or other insulated footwear, and insulated gloves to help reduce the chance of frostbite.
- 4.4.6 Keep a change of dry clothing available in case work clothes become wet.
- 4.4.7 Eye and face protection for employees employed outdoors in a snow and/or ice-covered terrain should be supplied.
 - Sunglasses (with UVA and UVB protection) and sunscreen should be used when there is a persistent combination of snow and direct sun.
 - Special safety goggles to protect against blowing ice crystals and ultraviolet light and glare (which can produce temporary conjunctivitis and/or temporary loss of vision) should be required when there is an expanse of snow coverage causing a potential eye exposure hazard.
 - Ensure face guards are used to protect skin in cold, windy conditions, including riding on an unshielded vehicle.

4.5 General Cold Stress Prevention Measures

- 4.5.1 In order to prevent hypothermia:
 - Wear appropriate clothing and PPE as determined by the weather conditions.
 - When active, ventilate excess heat by opening or removing outer layers of clothing to avoid sweating.
 - Start with the mitten or gloves, unless protection from ice, snow, or cold metal surfaces is needed.
 - Next remove head gear and neck wrappings.
 - Then coats/parkas should be opened at the waist and sleeves.
 - Finally, layers of clothing should be taken off.
 - When resting or tired, or colder conditions are encountered, add additional layers of clothing/ close outer layers in the reverse of the above order, or get out of the cold. Have a sweet drink but do not indulge in heavy eating.

- Garments worn to keep out rain and spray should also allow water vapor to escape.
- Take advantage of heat from the sun and stay out of the wind as much as possible.
- Have available emergency shelter providing protection from wind and rain and insulation from the ground.
- Replace wet clothing. If wet clothing cannot be replaced, then cover it with a layer of non-breathing material to prevent evaporation. Place an insulation layer over this non-breathing material.
- Get adequate rest; conserve energy.
- Get adequate nutrition to replenish energy stores; rest after meals.
- Drink adequate fluids to avoid dehydration.
- If any project / location staff member shows signs of hypothermia, stop and treat him/her.

4.5.2 In order to prevent frost bite:

- Dress to prevent hypothermia and protect the feet and hands.
- Avoid obstruction of circulation by, for example, tight boots or tightly fitting clothing.
- Avoid nicotine (particularly cigarettes) and do not consume alcohol.
- Keep ears and nose covered and out of the wind.
- Frostbite of the corneas of the eyes can be prevented by protective goggles.
- Adopt a “buddy system” of constantly watching the faces of others in the party for white skin tissue, which is evidence of frostbite (frostnip).
- Practice constant personal vigilance for signs of trouble in one’s own fingers and toes; when in doubt, investigate thoroughly before it is too late.

4.5.3 Adequate, insulating dry clothing that will help maintain core temperatures above 96.8°F (37°C) shall be provided to employees if work is performed in air temperatures below 40°F (4.4°C). Wind chill cooling rate and the cooling power of air are critical factors. The higher the wind speed and the lower the temperature in the work area, the greater the insulation value of the protective clothing required.

4.5.4 An Equivalent Chill Temperature (ECT) chart relating the actual dry bulb air temperature and the wind velocity is presented in *S3AM-112-ATT1 Temperature Thresholds*. Unless unusual or extenuating circumstances exist, cold injury to other than hands, feet, and head is not likely to occur without the development of the initial signs of hypothermia. Superficial or deep local tissue freezing will occur only at temperatures below 32°F (0°C) regardless of wind speed. However, older employees, those with circulatory problems and those with previous cold injuries require special precautionary protection against cold injury. The use of extra insulating clothing and/or a reduction in the duration of the exposure period are among the special precautions that should be considered.

4.5.5 Continuous exposure of skin should not be permitted when the air speed and temperature results in an ECT of –25°F (-32°C) or below.

4.5.6 At air temperatures of 40°F (4.4°C) or less, it is imperative that employees who become immersed in water or whose clothing becomes wet be immediately removed from the cold environment, provided a change of clothing, and be treated for hypothermia.

4.5.7 If the air velocity at the job site is increased by wind, draft, or artificial ventilating equipment, the cooling effect of the wind should be reduced by shielding the work area or by wearing an easily removable windbreak garment.

4.5.8 Adequate protection, such as general ventilation, shall be incorporated into any warming shelter design to prevent carbon monoxide poisoning.

- 4.5.9 Operation of internal combustion or similar devices within warming shelters is prohibited.
- 4.5.10 If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work should be modified or suspended until adequate clothing is made available or until weather conditions improve.
- 4.5.11 Walking and working surfaces shall be cleared of ice and snow to prevent slips and falls.
- 4.5.12 Confirm that employees carry fire starter materials if working in remote areas.
- 4.5.13 Supplies such as PPE, fuels, enclosures, de-icing, traction aids, warm drinks, and batteries will be specified by the SH&E Manager and/or the Manager and made available. These supplies will be inspected at least weekly during cold weather projects and replaced when necessary.
- 4.6 Cold Stress Prevention Measures for the Hands
 - 4.6.1 Special protection of the hands is required to maintain manual dexterity for the prevention of accidents including, but not limited to the following:
 - If fine work is to be performed with bare hands for more than 10 to 20 minutes in an environment below 60°F (15°C), special provisions should be established for keeping the employees' hands warm. For this purpose, warm air jets, radiant heaters (fuel burner or electric radiator), or contact warm plates may be utilized. Metal handles of tools and control bars should be covered by thermal insulating material at temperatures below 30°F (-1° C).
 - If the air temperature falls below 60°F (15°C) for sedentary work, 40°F (4.4° C) for light work, or 20°F (-6°C) for moderate work, and fine manual dexterity is not required, employees should use gloves.
 - 4.6.2 To prevent contact frostbite, employees should wear anti-contact gloves:
 - When cold surfaces below 20°F (-6°C) are within reach, each employee should be warned to prevent inadvertent contact by bare skin.
 - If the air temperature is 0°F (-18°C) or less, employees should protect their hands with mittens or appropriate gloves. Machine controls and tools for use in cold conditions should be designed so that they can be handled without removing the mittens or gloves.
 - Ensure an adequate supply of dry gloves is available to replace wet gloves.
 - 4.6.3 Provisions for additional total body protection are required if work is performed in an environment at or below 40°F (4.4°C). The employees should wear cold protective clothing appropriate for the level of cold and physical activity.
 - 4.6.4 Additional Cold Stress Prevention Measures:

For work practices at or below 10°F (-12°C) ECT, the following will apply:

 - The employee should be under constant protective observation (buddy system or supervision).
 - The work rate should not be so high as to cause heavy sweating that will result in wet clothing. If heavy work is being performed, rest periods should be taken in heated shelters and opportunities to change into dry clothing should be provided.
 - New employees should not be required to work full time in the cold during the first days of employment until they become acclimated to the working conditions and required protective clothing. Refer to *S3AM-112-ATT1 Temperature Thresholds* for guidance.
 - The weight and bulkiness of clothing should be included in estimating the required work performance and weights to be lifted by the employee.
 - The work should be arranged in such a way that sitting still or standing still for long periods is minimized. Unprotected metal chair seats should not be used. The employee should be protected from drafts to the greatest extent possible.

- 4.6.5 Employees handling evaporative liquid (gasoline, alcohol, or cleaning fluids) at air temperatures below 40°F should take special precautions to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling. Special note should be taken of the particularly acute effects of splashes of “cryogenic fluids” or those liquids with a boiling point that is just above ambient temperature.
- 4.6.6 Trauma sustained in freezing or subzero conditions requires special attention, because an injured employee is predisposed to cold injury. Special provisions should be made to prevent hypothermia and freezing of damaged tissue in addition to providing for first aid treatment.

4.7 Hypothermia in Water

- 4.7.1 Loss of body heat to the water is a major cause of deaths in boating and working near water incidents. Often the cause of death is listed as drowning; however, the primary cause is often hypothermia. It should also be noted that alcohol lowers the body temperature around 2 to 3 degrees by dilating the blood vessels. Do not drink alcohol around cold water. The following table shows the effects of hypothermia in water:

WATER TEMPERATURE	EXHAUSTION	SURVIVAL TIME
32.5°F (0°C)	Under 15 minutes	Under 15 to 45 minutes
32.5 to 40°F (0 to 4°C)	15 to 30 minutes	30 to 90 minutes
40 to 50°F (4 to 10°C)	30 to 60 minutes	1 to 3 hours
50 to 60°F (10 to 16°C)	1 to 2 hours	1 to 6 hours
60 to 70°F (16 to 21°C)	2 to 7 hours	2 to 40 hours
70 to 80°F (21 to 27°C)	3 to 12 hours	3 hours to indefinite
Over 80°F (27°C)	Indefinite	Indefinite

- 4.7.2 Some points to remember when water is a potential hazard:

- Wear a personal flotation device when drowning is a potential hazard. Refer to *S3AM-315-PR1 Working On or Near Water*, and *S3AM-333-PR1 Marine Safety & Vessel Operations*.
- If the water is less than 50°F (10°C), wear a wet suit or dry suit for work in water (e.g., wading, or if a significant potential to fall in water exists).
- While in the water, do not attempt to swim unless to reach nearby safety. Unnecessary swimming increases the rate of body heat loss. Keep the head out of the water. This will increase survival time.
- Keep a positive attitude about rescue. This will increase chances of survival.
- If there is more than one person in the water, huddling is recommended to conserve body heat.

- 4.7.3 If an employee or equipment is to work on ice and the water beneath the ice is or may be more than 3¼ feet (1m) deep at any point:

- Test the ice prior to commencing to ensure it will support the load to be placed on it. Ongoing testing may be necessary.
- If there is any risk of falling through the ice employees must wear personal protective equipment that will ensure buoyancy and protect against hypothermia at all times while on the ice.

4.8 Work-Warming Regimen

- 4.8.1 If work is performed continuously in the cold at an equivalent chill temperature (ECT) at or below 19°F (−7°C), heated warming shelters (tents, cabins, rest rooms, etc.) should be made available nearby. The employees should be encouraged to use these shelters at regular intervals; the frequency will depend on the severity of the environmental exposure. Refer to *S3AM-112-ATT1 Temperature Thresholds* for guidance.

- 4.8.2 The onset of heavy shivering, minor frostbite (frostnip), the feeling of excessive fatigue, drowsiness, irritability, or euphoria are indications for immediate return to the shelter.
- 4.8.3 When entering the heated shelter, the outer layer of clothing should be removed and the remainder of the clothing should be loosened to permit sweat evaporation or a change of dry work clothing provided.
- 4.8.4 A change of dry work clothing should be provided as necessary to prevent employees from returning to the cold environment with wet clothing.

5.0 Records

- 5.1 Exposure assessments will be documented in the location's files.

6.0 Attachments

- 6.1 [S3AM-112-ATT1 Temperature Thresholds](#)
- 6.2 [S3AM-112-ATT2 Symptoms & Treatment](#)

Americas

Temperature Thresholds

S3AM-112-ATT1

1.0 Purpose and Scope

- 1.1 The following Tables 1 and 2 give apparent temperatures (wind chill or equivalent chill temperature [ECT]) for various combinations of wind and air temperature, as well as guidelines to the danger of skin exposure.

Table 1. Wind Chill Chart (C)

Actual Temp (°C)	Wind Speed in km/hour									
	8	16	24	32	40	48	56	64	72	80
	Ambient Temperature (°C)									
0	-2	-8	-11	-14	-16	-17	-18	-19	-19	-20
-5	-7	-14	-18	-21	-23	-25	-26	-27	-28	-28
-10	-12	-20	-25	-28	-31	-33	-34	-35	-36	-36
-15	-18	-26	-32	-35	-38	-40	-42	-43	-43	-44
-20	-23	-32	-38	-43	-46	-48	-50	-51	-52	-52
-25	-28	-38	-45	-50	-53	-56	-57	-59	-59	-60
-30	-33	-45	-52	-57	-61	-63	-65	-67	-67	-68
-35	-39	-51	-59	-64	-68	-71	-73	-75	-75	-76
-40	-44	-57	-65	-71	-75	-79	-81	-83	-83	-84
-45	-49	-63	-72	-78	-83	-86	-89	-90	-91	-92
-50	-54	-69	-79	-85	-90	-94	-96	-98	-99	-100

Note: A. Little Danger: if less than one hour of exposure to dry skin.

B. Danger: Exposed flesh freezes within one minute.

C. Great Danger: Flesh may freeze within 30 seconds.

Source: *2014 Threshold Limit Values (TLV™) and Biological Exposure Indices (BEI™) booklet; published by ACGIH, Cincinnati, Ohio.

Table 2. Equivalent Chill Temperature Chart (F)

Estimated Wind Speed (mph)	Actual Temperature Reading (°F)									
	50	40	30	20	10	0	-10	-20	-30	-40
	Equivalent Chill Temperature (°F)									
Calm	50	40	30	20	10	0	-10	-20	-30	-20
5	48	37	27	16	6	-5	-15	-26	-36	-47
10	40	28	16	4	-9	-24	-33	-46	-58	-70
15	36	22	9	-5	18	-32	-45	-58	-72	-85
20	32	18	4	-10	-25	-39	-53	-67	-82	-96
25	30	16	0	-15	-29	-44	-59	-75	-88	-104
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109
35	27	11	-4	-20	35	-51	-67	-82	-98	-113
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116
Wind speeds >40 mph have little additional effect	LITTLE DANGER				INCREASING DANGER			GREAT DANGER		
	Trenchfoot and immersion foot may occur at any point on this chart.									

- 1.2 How fast a person's body cools in cold weather depends on: air temperature, wind speed, heat of the sun, and work being done.
- 1.2.1 The following Table 3 provides guidelines for establishing periods of work to warming break periods based on ambient temperature and wind speed for workers wearing dry clothing.
- 1.2.2 Notes following the Table take into account additional factor such as physical exertion, whether workers are acclimatized, etc.

Table 3. Work-Warming Schedule Guidelines

Air Temp. (Sunny Sky) °F	No Noticeable Wind		5 mph Wind (8 km/h)		10 mph Wind (16 km/h)		15 mph Wind (24 km/h)		20 mph Wind (32 km/h)		25 mph Wind (40 km/h)		Air Temp. (Sunny Sky) °C
	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	
above 5°	Normal Work Schedule		Normal Work Schedule		Normal Work Schedule		Normal Work Schedule		Normal Work Schedule		Normal Work Schedule		above -15°
5° to -1°											100 min	2	-15° to -17°
0° to -4°											100 min	2	75 min
-5° to -9°							100 min	2	75 min	2	55 min	3	-21° to -22°
-10° to -14°					100 min	2	75 min	2	55 min	3	40 min	4	-23° to -25°
-15° to -19°					100 min	2	75 min	2	55 min	3	40 min	4	30 min
-20° to -24°	100 min	2	75 min	2	55 min	3	40 min	4	30 min	5	Cease Work	-29° to -31°	
-25° to -29°	75 min	2	55 min	3	40 min	4	30 min	5	Cease Work	Cease Work		-32° to -34°	
-30° to -34°	55 min	3	40 min	4	30 min	5	Cease Work	Cease Work				-35° to -37°	
-35° to -39°	40 min	4	30 min	5	Cease Work	Cease Work						-38° to -39°	
-40° to -44°	30 min	5	Cease Work	Cease Work								-40° to -42°	
-44° & below	Cease Work											Cease Work	Cease Work

Modified from ACGIH 2014 Threshold Limit Values for Chemical Substances and Physical Agents.

- Note 1: Schedule describes the maximum continuous duration of work and number of 10-15 minute breaks to be observed during any 4-hour work period and assumes that period will be followed by an extended warm-up period (e.g., lunch). Allowed breaks should be taken in a warm environment.
- Note 2: Schedule applies to moderate to heavy work performed by acclimated workers wearing appropriate layered clothing. For light to moderate work apply the schedule for conditions one step lower. For unacclimated workers apply the schedule for conditions two steps lower. These modifications are additive.
- Note 3: For work under 25%–50% overcast/clouds, apply the schedule for conditions one step lower. For work at night or under greater than 50% overcast/clouds, apply the schedule for conditions two steps lower. These modifications are additive with any applicable modifications from Note 2.

Note 4: For wind speeds in excess of 25 mph (40 km/h), cease all nonemergency work when temperatures fall below 5°F (-21°C).

Note 5: When the work involves riding on an unshielded vehicle or some other activity that generates wind, the number of breaks should be increases appropriately.

Note 6: If effective protection against the wind can be provided by shields or screens, work modifications or measures, then the work warm-up schedule for “No Noticeable Wind” would apply.

Note 7: If reliable weather reports are not available, use the following as a guide to estimate wind velocity:

- A 5 mph (8 km/h) wind will move a light flag
- A 10 mph (16 km/h) wind will fully extend the flag
- A 15 mph (24 km/h) wind will raise a newspaper sheet
- A 20 mph (32 km/h) wind will produce blowing and drifting snow.

Symptoms & Treatment

S3AM-112-ATT2

1.0 Cold Stress-related Illnesses

1.1 Frostbite

- 1.1.1 Frostbite is a localized cold injury characterized by freezing of the tissues with ice crystal formation. There are several degrees of damage. Frostbite can be categorized into:
- **Frost Nip or Initial Frostbite:** (1st degree frostbite) Characterized by blanching or whitening of skin.
 - **Superficial Frostbite:** (2nd degree frostbite) Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient. Blistering and peeling of the frozen skin will follow exposure.
 - **Deep Frostbite:** (3rd degree frostbite) Tissues are cold, pale, and solid; extremely serious injury with possible amputation of affected area.
- 1.1.2 Frostbite injury is almost always limited to the upper and lower extremities (finger and toes) or to such appendages as the ears, nose or cheeks.
- 1.1.3 Conditions conducive to frostbite include sub-zero temperatures, hypothermia, dehydration, obstruction of the blood supply to the extremities (by constricting clothing, especially on the feet or at the wrists or ankles), contact with cold metal, contact with organic liquids (such as gasoline or solvents that have been left outdoors in sub-zero temperatures), use of substances that cause vasoconstriction (such as smoking tobacco), or other injury or shock.
- 1.1.4 Frostbite can occur without hypothermia when the extremities do not receive sufficient heat. Frostbite occurs when there is freezing of the fluids around the cells of the affected tissues.
- 1.1.5 Contact by the skin with tools or other metal objects below 20°F (-7°C) may result in contact frostbite.
- 1.1.6 The first symptom of frostbite is an uncomfortable sensation of coldness and pain, followed by numbness. There may be tingling, stinging, or cramping. Ongoing symptoms of frostbite include:
- Sudden and complete cessation of cold or discomfort in affected fingers or toes, often followed by a pleasant feeling of warmth;
 - Subsequently the only symptom may be the absence of any sensation in the frozen part;
 - Paleness in the affected tissues;
 - Firm or hard tissues; and
 - Purple tissue, if a large area, such as an entire hand or foot, is frostbitten.
- 1.1.7 If exposure occurs in temperatures that are below freezing (32°F or below), frostbite or trench foot (immersion foot) may accompany or complicate the symptoms of hypothermia. Frostbite is the freezing of living tissues with a resultant breakdown of cell structure. Symptoms due to frostbite may include, but is not limited to:
- Superficial redness of the skin;
 - Slight numbness;
 - Blisters;
 - Obstruction of blood flow (ischemia);
 - Blood clots (thrombosis); and
 - Skin discoloration due to insufficient oxygen in the blood (cyanosis).

- 1.1.8 Frostbite may occur if the skin comes into contact with objects with a surface temperature below freezing, such as metal tool handles. Trench foot is caused by continuous exposure to cold combined with persistent dampness or immersion in water. Injuries in this case include permanent tissue damage due to oxygen deficiency, damage to capillary walls, severe pain, blistering, tissue death, and ulceration.
- 1.1.9 Additionally, cold exposures may either induce or intensify vascular abnormalities. These include chilblain (a swelling or sore), Raynaud's disease, acrocyanosis (blueness of hands and feet) and thromboangiitis (inflammation of the innermost walls of blood vessels with accompanying clot formation). Workers suffering from these ailments should take particular precautions to avoid chilling.

1.2 Hypothermia

- 1.2.1 Hypothermia is a lower than normal body temperature that occurs when outer cold cools the body faster than the body can produce heat to stay warm. When this situation first occurs, blood vessels in the skin constrict in an attempt to conserve vital internal heat. Hands and feet are the first affected.
- If the body continues to lose heat, involuntary shivers begin. This is the body's way of attempting to produce more heat, and it is usually the first real warning sign of hypothermia.
 - Further heat loss produces speech difficulty, confusion, loss of manual dexterity, collapse, and finally death.
- 1.2.2 Hypothermia can be caused by exposure to wind, cold, and/or moisture. The combination of wind, cold, and moisture can be deadly. Wet clothes or immersion in cold water greatly increases the hypothermia risk. The progressive clinical presentation of hypothermia is described in the table below.

Condition	Core Body Temp.	Signs/Symptoms	Treatment
Mild Hypothermia	99 – 97 F 37 – 36 C	Normal, shivering may begin	Seek dry shelter; replace wet clothing, insulate whole body and head, avoid sweating, use external warmth (bath, fire) only if core above 95 degrees F, give warm sweet drinks and food.
	97 – 95 F 36 – 35 C	Cold sensation, goose bumps, unable to perform complex tasks with hands, shiver can be mild to severe, hands numb.	
Moderate Hypothermia	95 – 93 F 35 – 34 C	Intense shivering, muscle in-coordination becomes apparent, movements slow and labored, stumbling pace, mild confusion may appear alert.	Avoid exercise and external warmth, gently rest; give warm sweet drinks and calories, internal warming via warm moist air, monitor pulse and breathing.
	93 – 90 F 34 – 32 C	Violent shivering persist, difficulty speaking, sluggish thinking, amnesia starts to appear, gross muscle movements sluggish, unable to use hands, stumbles frequently, signs of depression, withdrawn.	
Severe Hypothermia	90 – 86 F 32 – 30 C	Shivering stops, exposed skin blue or puffy, muscle coordination very poor, inability to walk, confusion, incoherent/irrational behavior, but may be able to maintain posture and appearance of awareness.	Medical emergency, give nothing by mouth, wrap in an insulated blanket, avoid rapid rewarming, transfer to hospital immediately.
	86 – 82 F 30 – 28 C	Muscle rigidity, semiconscious, stupor, loss of awareness of others, pulse and respiration rate decrease, possible heart fibrillation.	
	82 – 78 F 28 – 25.5 C	Unconscious, heart beat and respiration erratic, pulse may not be palpable.	
	78 – 75 F 25.5 – 24 C	Pulmonary edema, cardiac and respiratory failure, death. Death may occur before this temperature is reached.	

- 1.2.3 Early warning signs of hypothermia:
- Feeling of being cold and tired;
 - Heavier breathing and increased pulse rate;
 - Tendency to keep moving (e.g., stamping feet, rubbing hands, continued walking/pacing);
 - Goose bumps, holding arms tightly wrapped around the body, hunching of shoulders, and
 - Shivering.
- 1.2.4 Hypothermia damages both the body's internal temperature mechanisms (hypothalamus) and the peripheral mechanisms to prevent heat loss (vasoconstriction and perspiration.) These effects may last up to three years after the initial hypothermia episode. Symptoms of hypothermia may include, but are not limited to:
- Pain in the extremities;
 - Severe shivering and numbness;
 - Low core body temperature;
 - Drowsiness and muscular weakness;
 - Apathy;
 - Mental confusion;
 - Loss of consciousness;
 - Shock, and
 - Decreasing pulse and breathing rate.

2.0 Recommended Treatment for Cold Stress-related Illnesses

2.1 Frostbite

- 2.1.1 Wrap the victim in woollen blanket and keep dry until he or she can be brought inside.
- 2.1.2 Remove the victim from the cold environment.
- 2.1.3 Do not rub, chafe, or manipulate frozen parts.
- 2.1.4 Place the victim in warm water (102°F to 105°F) and make sure the water remains warm. Test the water by pouring it on the inner surface of your forearm. Never thaw affected body parts if the victim has to go back out into the cold; refreezing can cause significant tissue damage.
- 2.1.5 Do not use hot water bottles or a heat lamp, and do not place the victim near a hot stove.
- 2.1.6 Do not allow the victim to walk if his or her feet are affected.
- 2.1.7 Have the victim gently exercise the affected parts once they are thawed.
- 2.1.8 Seek immediate medical attention for thawing of serious frostbite.

2.2 Hypothermia

- 2.2.1 Bring the victim into a warm room or shelter as quickly as possible.
- 2.2.2 Give artificial respiration and stop any bleeding, if necessary.
- 2.2.3 If the victim cannot be moved (spinal injury, etc.), carefully place newspapers, blankets, or some other insulation between the victim and the ground.
- 2.2.4 Remove all wet clothing.
- 2.2.5 Provide an external heat source, because the body cannot generate its own heat. Wrap the victim in prewarmed blankets, place him or her in the liner of a portable hypothermia treatment unit, put the torso (not the extremities) into a tub of warm water, or use body-to-body contact to rewarm the body core. These measures will slowly reopen the peripheral circulation, minimizing the possibility

of after-shock or after-drop (the flowing of cooled, stagnated blood from the limbs to the heart), which may cause ventricular fibrillation, cardiac arrest, or death.

- 2.2.6 Do not allow the victim to sleep.
- 2.2.7 Give warm, sweet drinks. Do not give alcohol or pain relievers.
- 2.2.8 Keep the victim still. Do not try to walk.
- 2.2.9 Do not rub numb skin.
- 2.2.10 Get medical attention as soon as possible.

Heat Stress

S3AM-113-PR1

1.0 Purpose and Scope

- 1.1 Establishes a Heat Illness Prevention Program to guide employees in preventing heat illness, recognition of the symptoms of heat stress-related illnesses and in taking the appropriate corrective action.
- 1.2 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.

2.0 Terms and Definitions

- 2.1 **Acclimated** – Employees who have developed physiological adaptation to hot environments characterized by increased sweating efficiency, circulation stability, and tolerance of high temperatures without stress. Acclimatization occurs after 7 to 10 consecutive days of exposure to heat and much of its benefit may be lost if exposure to hot environments is discontinued for a week.
- 2.2 **Chemical Protective Clothing (CPC)** – Apparel that is constructed of relatively impermeable materials intended to act as a barrier to physical contact of the Employee with potentially hazardous materials in the workplace. Such materials include Tyvek® coveralls (all types) and polyvinyl chloride coveralls and rain suits.
- 2.3 **Heat Cramps** – A form of heat stress brought on by profuse sweating and the resultant loss of salt from the body.
- 2.4 **Heat Exhaustion** – A form of heat stress brought about by the pooling of blood in the vessels of the skin and in the extremities.
- 2.5 **Heat Rash** – A heat-induced condition characterized by a red, bumpy rash with severe itching.
- 2.6 **Heat Stress** – The combination of environmental and physical work factors that constitute the total heat load imposed on the body.
- 2.7 **Heat Stroke** – The most serious form of heat stress, which involves a profound disturbance of the body's heat-regulating mechanism.
- 2.8 **Sunburn** – Caused by unprotected exposure to ultraviolet radiation present in sunlight that is damaging to the skin (Refer to *S3AM-121-PR1 Non-Ionizing Radiation*). The injury is characterized by red painful skin, blisters, and/or peeling.
- 2.9 **Unacclimated** – Employees who have not been exposed to hot work conditions for one week or more or who have become heat-intolerant due to illness or other reasons.

3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-004-PR1 Incident Reporting, Notifications & Investigation
- 3.3 S3AM-010-PR1 Emergency Response Planning
- 3.4 S3AM-121-PR1 Non-Ionizing Radiation
- 3.5 S3AM-208-PR1 Personal Protective Equipment
- 3.6 S3AM-209-PR1 Risk Assessment & Management

4.0 Procedures

4.1 Roles and Responsibilities

4.1.1 Managers

- Evaluate the need for heat illness prevention measures and incorporate as appropriate into the Safe Work Plan or Task Hazard Analysis.
- Allocate sufficient resources for the management of heat illness in the field including the provision of water, a shaded break area, and sufficient schedule to allow for breaks.

4.1.2 Safety, Health and Environment (SH&E) Manager

- Provide heat illness awareness training.
- Assist in developing appropriate work-rest schedules.
- Conduct/support incident investigations related to potential heat stress-related illnesses.

4.1.3 Supervisor

- Identify those tasks that may be most impacted by heat stress and communicate the hazard to the assigned Employees.
- Confirm that Employees have been trained on the recognition of heat illness.
- Confirm that this procedure, along with any applicable Safe Work Plan and/or Task Hazard Analysis (and heat exposure control plan that may be contained therein) are made available to affected Employees.
- Confirm that adequate supplies of appropriate fluids are readily available to Employees.
- Confirm that a proper rest area is available.
- Conduct heat illness monitoring, as applicable.
- Implement the work-rest schedule.
- Confirm that first aid measures are implemented once heat stress symptoms are identified.
- Confirm personnel are physically capable of performing the assigned tasks and are not in a physically compromised condition.
- Report all suspected heat illnesses.

4.1.4 Employee

- Observe each other for the early symptoms of heat illnesses.
- Maintain an adequate intake of available fluids.
- Be familiar with heat stress hazards, predisposing factors, and preventative measures.
- Report to work in a properly vested and hydrated condition.
- Report all suspected heat stress-related illnesses.

4.2 Restrictions

- 4.2.1 The Buddy System is required when working in high heat conditions; Employees shall not work alone.
- 4.2.2 Employees shall not be exposed to levels exceeding those specified for the given work level and work-rest regimen as listed in *S3AM-113-ATT1 Heat Stress – Temperature Thresholds*.
- 4.2.3 Clothing corrections shall be applied in accordance with the tables provided in *S3AM-113-ATT1 Heat Stress – Temperature Thresholds*.

4.3 Exposure Controls

4.3.1 It shall be determined whether Employees are or may be exposed to hazardous heat levels. The Supervisor shall:

- Conduct a heat stress assessment to determine the potential for hazardous exposure of Employees. Assessment shall include, but not limited to:
 - Ambient temperature.
 - Amount of sunshine (cloudy, clear). Refer to *S3AM-121-PR1 Non-Ionizing Radiation* additional direction concerning ultraviolet radiation exposures.
 - Other radiant heat sources (e.g. motor, fire, etc.).
 - Humidity.
 - Air flow.
 - Amount or type of physical labor being performed,
 - Physical condition of the Employees (e.g., acclimated/not)
 - Protective clothing in use.
 - Referral to *S3AM-113-ATT1 Heat Stress – Temperature Thresholds* to assist in determining whether hazardous heat exposures may exist.
- If potential for hazardous exposure is identified, the Supervisor shall develop and implement a heat stress exposure control plan within the Safe Work Plan and/or Task Hazard Analysis. Refer to *S3AM-209-PR1 Risk Assessment & Management*.

4.3.2 If Employees are or may be exposed, the Supervisor shall implement engineering controls (e.g., shelters, cooling devices, etc.) to reduce the exposure of Employees to levels below those specified for the given work level and work-rest regimen as listed in *S3AM-113-ATT1 Heat Stress – Temperature Thresholds*.

4.3.3 If engineering controls are not practicable, the Supervisor shall reduce the exposure of Employees to levels below those listed in *S3AM-113-ATT1 Heat Stress – Temperature Thresholds* by providing administrative controls, including a work-rest cycle or personal protective equipment, if the equipment provides protection equally effective as administrative controls.

4.3.4 If Employees are or may be exposed, the Supervisor shall provide and maintain an adequate supply of cool, fresh, potable water close to the work area for the use of a heat exposed Employee. Water shall be provided (paid) by the project or program; if Employees purchase their own drinking water because water is not otherwise available on site, they shall be reimbursed.

4.3.5 If an Employee shows signs or reports symptoms of heat stress or strain, they shall be removed from the hot environment and treated by an appropriate first aid attendant on site, if available, or by a physician, refer to *S3AM-113-ATT2 Heat Stress – Symptoms & Treatment* for more specifics.

4.4 Heat Stress Planning

4.4.1 Heat stress can be a significant site hazard, especially for Employees wearing CPC. To prepare for emergency response planning, refer to *S3AM-010-PR1 Emergency Response Planning* procedure.

4.4.2 The project and site-specific heat related risks shall be identified. Appropriate prevention and control measures shall be developed and documented in the project's SH&E Plan or included as a supplement to the SH&E Plan (e.g., *S4[DCS]AM-113-FM1 Heat Illness Prevention Plan – DCS Americas*) and the Task Hazard Assessments (THA). Refer to the *S3AM-209-PR1 Risk Assessment & Management* procedure.

4.4.3 The heat a worker is exposed to may be a combination of air temperature, radiant heat, and humidity. The WBGT (wet-bulb globe thermometer) is a useful index of the environmental

contribution to heat stress. Because WBGT is only an index of the environment, the contributions of work demands, clothing, and state of acclimatization shall also be accounted for, as described in the following steps.

- Monitor ambient temperatures and conduct heat stress monitoring in accordance with the location specific SH&E Plan. Revise the heat stress monitoring and controls if there are any reports of discomfort due to heat stress.
- Monitor temperatures in each unique environment in which workers perform work (e.g., take WBGT measurements inside truck cabs for truck drivers, and take separate WBGT measurements in the outdoor area where field employees work, etc.). Follow manufacturer's instructions on proper use of the WBGT.
- Determine if individual workers are acclimatized or un-acclimatized. Full heat acclimatization requires up to 3 weeks of continued physical activity under heat-stress conditions similar to those anticipated for the work. Its loss begins when the activity under those heat-stress conditions is discontinued, or when there is a sustained increase in temperatures of 10 °F (5.6 °C) or more, and a noticeable loss occurs after 4 days. A worker can be considered acclimatized for the purpose of this procedure when they have been exposed to the site conditions (including level of activity) for 5 of the last 7 days.
- Determine the approximate workload of each worker or group of workers. The following examples (Table 1) can be used for comparison:

Table 1
Examples of Activities within Workload Categories

Categories	Example Activities
Resting	Sitting quietly
	Sitting with moderate arm movements
Light	Sitting with moderate arm and leg movements
	Standing with light work at machine or bench while using mostly arms
	Using a table saw
	Standing with light or moderate work at machine or bench and some walking about
Moderate	Scrubbing in a standing position
	Walking about with moderate lifting or pushing
	Walking on level at 3.5 miles/hr (6 km/hr) while carrying 6.6 lbs (3kg) weight load
Heavy	Carpenter sawing by hand
	Shoveling dry sand
	Heavy assembly work on a non-continuous basis
	Intermittent heavy lifting with pushing or pulling (e.g., pick-and-shovel work)
Very Heavy	Shoveling wet sand

- Determine the approximate proportion of work within an hour during a typical shift. Typically, the initial work schedule will be 60 minutes of work per hour (100 percent work) with a small break in the morning and afternoon, as appropriate, and a 30-minute lunch break mid-day.
- For workers wearing cloth coveralls (e.g., Nomex fire resistant clothing), add 3 to the measured WBGT. For impermeable clothing, such as Tyvek or Saranex, the WBGT procedures cannot be used. For these situations, workers should begin physiological monitoring as soon as the temperature in the work area exceeds 70°F (21°C).
- Use the collected information to develop appropriate work to rest schedules as detailed in *S3AM-113-ATT1 Heat Stress – Temperature Threshold*. Work-rest schedules and water provision shall be documented in the applicable SH&E Plan or supplementary Health Illness Prevention Plan and may be additionally documented using logs such as *S3AM-113-FM2 Daily Heat Illness Prevention Log*.

- 4.4.4 Given the work demands (light, moderate, heavy or very heavy), heat of the work environment, and such aspects as PPE in use, workload will be adjusted appropriately to allow for proper acclimation.
- This is the process by which the body "gets used to" hot work environments. This is achieved by slowly increasing workloads.
 - New and returning Employees (absent one week or more) who have not had time to acclimatize may be more susceptible to heat related illnesses, even in seemingly low risk heat exposures.
 - All Employees shall be allowed time to acclimatize in the event of a heat wave. All Employees assigned to a new process with additional heat exposures shall be allowed to acclimatize.
 - Minimize workload and gradually increase as tolerance is built up. Allow for more frequent breaks.
 - While acclimatization normally takes approximately 5 to 7 days, heightened monitoring of these Employees will be maintained for the first 14 days.
- 4.4.5 Employees shall be instructed in the recognition of heat stress symptoms, the first aid treatment procedures for severe heat stress, and the prevention of heat stress injuries. Employees shall be encouraged to immediately report any heat stress that they may experience or observe in fellow Employees. Supervisors shall use such information to adjust the work-rest schedule to accommodate such problems.
- 4.4.6 Wherever possible, a designated break area should be established in an air-conditioned space, or in shaded areas where air conditioning is impractical. The break area should be equipped to allow Employees to loosen or remove protective clothing, and sufficient seating should be available for all Employees. During breaks, Employees shall be encouraged to drink plenty of water or other liquids, even if not thirsty, to replace lost fluids and to help cool off. Cool water should be available at all times in the break area, and in the work area itself unless hygiene/chemical exposure issues prevent it.
- 4.5 Symptoms and Treatment
- 4.5.1 Refer to *S3AM-113-ATT2 Heat Stress – Symptoms & Treatment*.
- 4.5.2 Employees who exhibit ANY signs of significant heat stress (e.g., profuse sweating, confusion and irritability, pale, clammy skin) shall be relieved of all duties at once, made to rest in a cool location, and provided with large amounts of cool water.
- 4.5.3 Severe heat stress (heat stroke) is a life-threatening condition requiring immediate emergency medical care (e.g., call 911). Anyone exhibiting symptoms of heat stroke (slurred speech, unconsciousness, etc.) shall be taken immediately to the nearest medical facility. Steps shall be taken to cool the person during transportation (clothing removal, wet the skin, air conditioning, etc.).
- 4.6 Prevention
- 4.6.1 Requirements for working in extreme heat may be triggered by regulatory established criteria (e.g. CAL/OSHA requires high heat procedures when temperature equals or exceeds 95°F) or as a result of a hazard analysis assessing various contributory factors (refer to *S3AM-113-ATT1 Heat Stress – Temperature Thresholds*). Employees working in extreme heat or sun should understand and apply the following guidelines for preventing and detecting heat exhaustion and heat stroke.
- When possible, begin hydrating at least three days prior to working in high heat conditions.
 - Review the heat stress exposure control plan within the SH&E Plan, and/or Task Hazard Analysis.
 - If the supervisor is not immediately available confirm a reliable method of communication is in place to allow for contact with supervision. In the absence of cellular reception, a satellite phone or similar device may be required.

- Take frequent short breaks in areas sheltered from direct sunlight; eat and drink small amounts frequently.
- Try to schedule work for the coolest part of the day, early morning and evening.
- Avoid strenuous physical activity outdoors during the hottest part of the day.
- Avoid sudden changes of temperature. Refer to *S3AM-113-ATT1 Heat Stress – Temperature Thresholds*.
- Air out a hot vehicle before getting into it.
- Obtain medical direction if taking diuretics during hot weather (a lower dose may be necessary).
- When working in heat, drink 1 quart of water per hour of work.
- Avoid caffeine and alcohol as they increase dehydration.
- Monitor urine frequency and color to detect dehydration. Refer to the *S3AM-113-ATT3 Dehydration Chart*.
- The Buddy System is required when working in high heat conditions to enable effective communication and cross-observation for indications of heat stress.
- Initiate emergency response procedures when necessary, including contacting emergency medical services as appropriate and in accordance with the Emergency Response Plan.

4.6.2 Personal Protective Equipment

- Review the *S3AM-208-PR1 Personal Protective Equipment* procedure.
- Wear a hat and light-colored, loose-fitting clothing to reflect the sun.
- Apply sunscreen to exposed skin (SPF 30 or greater, follow directions on label).
- Wear sunglasses with UV protection.
- Pack extra water to avoid dehydration (try freezing water in bottles overnight to help keep the water cooler for longer during the day).

4.7 Work-Rest Schedule Practices

- 4.7.1 Intake of fluid will be increased beyond that which satisfies thirst, and it is important to avoid "fluid debt," which will not be made up as long as the individual is sweating.
- Two 8-ounce glasses of water should be taken prior to beginning work, then up to 32 ounces (1 quart) per hour during the work shift; fluid replacement at frequent intervals is most effective.
 - The best fluid to drink is water; liquids like coffee or soda do not provide efficient hydration and may increase loss of water.
 - If commercial electrolyte drinks (e.g., Gatorade) are used, the drink should be diluted with water, or 8 ounces of water should be taken with each 8 ounces of electrolyte beverage.
- 4.7.2 Additional salt is usually not needed and salt tablets should not be taken.
- 4.7.3 Fluids for drinking should be cool and fresh, but not cold.
- 4.7.4 Breaks will be taken in a cool, shaded location, and any impermeable clothing should be opened or removed.
- A relatively cool, shaded area shall be provided for breaks when working in hot environments. For hazardous waste sites, the rest area should be located in the support zone adjacent to the contamination reduction zone, situated so that part of it is in the decontamination area so workers can take breaks without going through full decontamination.

- If shade is not available, shaded areas shall be constructed. This same type of canopy can be set up to shade personnel performing various types of work in hot weather.
- Cooling measures other than shade (e.g., misting, air-conditioned break areas, air conditioned vehicles, etc.) can be used in lieu of shade provided it can be demonstrated that they are at least as effective in cooling employees.
- Employees should have access to these rest areas at break times and at any other time when suffering from heat illness or believing a preventive recovery period is needed.

4.7.5 Dry clothing or towels should be available to minimize chills when taking breaks.

4.7.6 Manual labor will not be performed during breaks, other than paperwork or similar light tasks.

4.7.7 Other controls that may be used include:

- Scheduling work at night or during the cooler parts of the day (6 am–10 am, 3 pm–7 pm).
- Erecting a cover or partition to shade the work area.
- Auxiliary cooling - wearing cooling devices beneath protective garments, but over any underclothing.
 - If cooling devices are worn, only physiological monitoring will be used to determine work activity.
 - These vests typically provide cooling via one of two methods: the use of ice or other frozen media, or the use of a vortex cooler. Each method has its advantages and disadvantages.
 - The frozen media vest requires a means for freezing the media, and the media (usually water or "blue ice") will melt, requiring replacement.
 - The vortex cooler tends to cool more uniformly. Instead of frozen media, this vest uses the expansion of compressed air to cool the wearer. The drawback is the compressed air requirement, but this is negated when the wearer is already using an airline respirator supplied by a compressor. A vortex cooler should not be supplied from air cylinders, as this will draw down the cylinders rapidly.
- Auxiliary cooling should be considered when the following conditions exist:
 - Ambient temperature over 80°F (26°C).
 - Workers are wearing impermeable garments (i.e., Tyvek, Saranex, Chemrel, etc.).
 - It is desirable to have long work shifts with minimum interruption.

4.8 Evaluating the Work-Rest Schedule's Effectiveness

4.8.1 Once a work-rest schedule is established, the Supervisor shall continually evaluate its effectiveness through observation of Employees for signs/symptoms of heat stress. Have workers assess themselves and their body's reaction to the heat and work conditions (self-assessment), and report any signs or symptoms of heat illness. These can include nausea or dizziness, heat cramps, extreme thirst, or very dark urine.

4.8.2 Measurement or physiological monitoring of each Employee's vitals (e.g., pulse, blood pressure, and temperature) can provide additional information in determining if the schedule is adequate. Refer to *S3AM-113-ATT1 Heat Stress – Temperature Thresholds* for additional guidance on when physiological monitoring should be conducted.

4.8.3 Frequency of physiological monitoring is increased or decreased depending upon such factors as worker fitness, acclimatization, temperature of the work environment, type of PPE, etc.

Based on the results of the physiological monitoring and on the workers' self-assessments, the work period may be adjusted as follows:

- The work period may be increased (generally, by 5- to 10-minutes intervals, up to a maximum of 4 hours) if the results of the first 2 hours of the physiological monitoring and the workers' self-assessments indicate that workers are recovering adequately (see below), and on the judgment of the SH&E Manager.
 - The work period shall be decreased if the results of the physiological monitoring and the workers' self-assessment indicate that workers are NOT recovering adequately (see below).
- 4.8.4 If physiological monitoring is conducted, the Employee and/or the SH&E Manager (or appropriate designate) shall measure and record body temperature and pulse rate as described below.
- 4.8.5 Monitor body temperature to determine if Employees are adequately dissipating heat build-up. Ear probe thermometers which are adjusted to oral temperature (aural temperature) are convenient and the preferred method of measurement. Determine work/rest regimen as follows:
- Measure oral body temperature at the end of the work period. Oral body temperatures are to be obtained prior to the employee drinking water or other fluids.
 - If temperature exceeds 99.6°F (37.5°C), shorten the following work period by 1/3 without changing the rest period.
 - If, at the next rest period, temperature still exceeds 99.6°F (37.5°C), the worker should not be allowed to continue work until repeated temperature measurements are in the acceptable range (i.e., less than 99.6°F). Do not leave the worker alone during the recovery time. Watch for signs of heat illness and be prepared to implement emergency response as necessary.
 - Do not allow a worker to wear impermeable PPE when his/her oral temperature exceeds 100.6°F (38.1°C).
- 4.8.6 At the start of the workday each Employee's baseline pulse rate (in beats per minute [bpm]) is determined by taking a pulse count for 15 seconds and multiplying the result by four or by using an automated pulse count device. Pulse rates can then be measured at the beginning of each break period and two minutes thereafter to determine if the rest period allows for adequate recovery.
- Take the radial (wrist) pulse as early as possible in the rest period and determine the worker's heart rate in beats per minute. The heart rate is determined by counting the pulse for ten seconds and multiplying the number by 6 to get the beats per minute. Record this as P1.
 - Wait 2 minutes and repeat the pulse measurement. Record this as P2.
 - If P1 is greater than or equal to 110 beats per minute (bpm) and if (P1 – P2) is less than or equal to 10 bpm (indicating that workers are not recovering adequately), shorten the next work cycle by 1/3 without changing the rest period.
 - At the next rest period, if P1 is still equal to or greater than 110 bpm, and if (P1 – P2) is still less than or equal to 10 bpm, shorten the following work cycle by 1/3 without changing the rest period.
 - At the third rest period, if P1 is still equal to or greater than 110 bpm and (P1 – P2) is still less than or equal to 10 bpm, the worker should not be allowed to continue work until repeated pulse measurements are in the acceptable range (i.e., P1 is less than 110 bpm and (P1 – P2) is greater than 10 bpm). Do not leave the worker alone during the recovery time. Watch for signs of heat illness and be prepared to implement emergency response as necessary.
- 4.8.7 Use of an automated or similar blood pressure device will be used to assess each Employee's blood pressure at the beginning and end of each break period to determine if the rest period allows adequate cooling by applying the following criteria:
- If the blood pressure of an Employee is outside of 90/60 to 150/90, then the Employee will not be allowed to begin or resume work; extend the break period by at least five minutes, at the end of which blood pressure rates will be re-measured and the end-of-break criteria again applied.

4.8.8 All physiological monitoring of heat stress will be documented using *S3AM-113-FM1 Heat Stress Monitoring Log*.

4.9 Training

4.9.1 Employees and their Supervisors that may be exposed to the hazard will be trained and oriented to the hazard and the controls prior to work commencing.

4.9.2 Those Employees, including Supervisors, potentially exposed to heat stress will receive training, refer to the *S3AM-003-PR1 SH&E Training* procedure. Training will include, but is not limited to:

- Sources of heat stress (environmental and personal), influence of protective clothing, and importance of acclimatization;
- How the body handles heat and acclimatization;
- Recognition of heat-related illness symptoms;
- Preventative/corrective measures including, but not limited to;
 - Employees will be informed of the harmful effects of excessive alcohol consumption in the prevention of heat stress.
 - All Employees will be informed of the importance of adequate rest and proper diet in the prevention of heat stress.
- First aid procedures for heat stress-related illnesses; and
- Immediate reporting of any heat-related incident (injury, illness, near-miss), refer to the *S3AM-004-PR1 Incident Reporting, Notifications & Investigation* procedure.

5.0 Records

5.1 None

6.0 Attachments

6.1 [S3AM-113-ATT1 Heat Stress - Temperature Thresholds](#)

6.2 [S3AM-113-ATT2 Heat Stress - Symptoms & Treatment](#)

6.3 [S3AM-113-ATT3 Dehydration Chart](#)

6.4 [S3AM-113-FM1 Heat Stress Monitoring Log](#)

6.5 [S3AM-113-FM2 Daily Heat Illness Prevention Log](#)

6.6 [S3\[DCS\]AM-113-FM1 Heat Illness Prevention Plan – DCS Americas](#)

Heat Stress – Temperature Thresholds

S3AM-113-ATT1

1.0 Work-Rest Schedule

The prevention of heat stress is best performed through Supervisor observation of Employees and routine heat stress awareness training activities. However, it is also necessary to implement a work routine that incorporates adequate rest periods to allow Employees to remove protective clothing, drink fluids (vital when extreme sweating is occurring), rest and recover. The frequency and length of work breaks shall be determined by the Supervisor based upon the ambient temperature, amount of sunshine, humidity, the amount of physical labor being performed, the physical condition of the Employees (e.g., acclimated/not), and protective clothing being used.

1.1 Establishing a Work-Rest Schedule:

1.1.1 AECOM permits the use of either of two techniques to initially determine an appropriate daily work-rest schedule. These methods are:

- Wet Bulb Globe Thermometer (WBGT) Method: This method is preferred if a WBGT meter is available.
- Adjusted Temperature Method: This method should be used only if WBGT data is not available.

1.1.2 Either procedure will provide the Supervisor with a recommended routine; however, adjustments to this routine may be required to accommodate the specific daily conditions at the work site.

1.2 WBGT Work-Rest Schedule Guidelines:

1.2.1 If the measured WBGT is less than the action limit value, there is little risk of excessive exposure to heat stress, and work can continue.

- Continue to monitor ambient conditions with the WBGT. However, if there are reports of the symptoms of heat-related disorders, then the analysis of little risk should be reconsidered.
- If the measured WBGT is greater than the values in the following two tables, institute heat stress controls, including the associated work-rest cycle, and perform physiological monitoring as described in *S3AM-113-PR1 Heat Stress*.
- Because of the physiological strain associated with very heavy work among less fit workers regardless of WBGT, values are not provided in Table 1 or 2 for continuous work or 75% work – 25% rest regimen. Physiological monitoring should always be implemented under these conditions.

1.2.2 Table 1, the Non-CPC Activities WBGT Chart, is intended for use where personnel are not utilizing Chemical Protective Clothing (CPC). Where workers are required to utilize CPC, Table 2, the CPC Activities WBGT Chart, will be used.

1.2.3 WBGT readings are compared directly with the values of the applicable WBGT Chart for the applicable work rate (where light work corresponds to minimal physical activity besides standing/watching; very heavy work corresponds to significant, continuous physical labor) to determine the work-rest frequency.

Table 1. Non-CPC Activities WBGT Chart

Work-Rest Regimen	WBGT			
	Light Work	Moderate Work	Heavy Work	Very Heavy Work
Continuous Work	85°F (29.4°C)	81°F (27.2°C)	78°F (25.6°C)	
75% Work – 25% Rest	86°F (30°C)	83°F (28.3°C)	81°F (27.2°C)	
50% Work – 50% Rest	88°F (31.1°C)	85°F (29.4°C)	83°F (28.3°C)	81°F (27.2°C)
25% Work – 75% Rest	90°F (32.2°C)	87°F (30.6°C)	86°F (30°C)	85°F (29.4°C)

Modified from ACGIH's 2014 *Threshold Limit Values for Chemical Substances and Physical Agents*, for acclimatized workers.

Table 2. CPC Activities WBGT Chart

Work-Rest Regimen	WBGT			
	Light Work	Moderate Work	Heavy Work	Very Heavy Work
Continuous Work	74°F (23.3°C)	70°F (21.1°C)	67°F (19.4°C)	
75% Work – 25% Rest	75°F (23.9°C)	72°F (22.2°C)	70°F (21.1°C)	
50% Work – 50% Rest	77°F (25°C)	74°F (23.3°C)	72°F (22.2°C)	70°F (21.1°C)
25% Work – 75% Rest	79°F (26.1°C)	76°F (24.4°C)	75°F (23.9°C)	74°F (23.3°C)

Modified from ACGIH's 2014 *Threshold Limit Values for Chemical Substances and Physical Agents*, for acclimatized workers.

1.3 Humidex Based Work-Rest Schedule Guidelines

1.3.1 The Humidex method is a simplified way of protecting workers from heat stress. It is an equivalent scale intended to express the combined effects of warm temperatures and humidity. Humidex is used as a measure of perceived heat that results from the combined effect of excessive humidity and high temperature.

1.3.2 This method requires only a local air temperature and relative humidity value. Monitoring shall continue throughout the day for changing conditions. Identify a representative location where measurements can be taken. Measurements should be recorded at least hourly when ambient temperatures and 90°F (32°C) for personnel wearing normal permeable work clothes.

- **Step 1:** On the Humidex table below, look up the temperature on the left (Celsius is located below RH>) and the relative humidity (RH) on the top. Determine the Humidex value.

F	RH>	100%	95%	90%	85%	80%	75%	70%	65%	60%	55%	50%	45%	40%	35%	30%	25%	20%
108	42													55	52	50	48	46
106	41												55	53	51	48	46	44
104	40											55	53	51	49	47	45	43
102	39										55	53	51	49	47	45	43	41
100	38	Step 1 - Determine HUMIDEX VALUE								54	53	51	49	47	45	43	42	40
99	37								54	52	51	49	47	45	44	42	40	38
97	36					57	55	53	52	50	49	47	45	44	42	40	39	37
95	35				56	54	53	51	50	48	47	45	43	42	40	39	37	36
93	34		56	55	53	52	51	49	48	46	45	43	42	40	39	37	36	34
91	33	55	54	53	51	50	48	47	46	44	43	41	40	39	37	36	34	33
90	32	53	51	50	49	48	46	45	44	42	41	40	38	37	36	34	33	32
88	31	50	49	48	47	45	44	43	42	40	39	38	37	35	34	33	32	30
86	30	48	47	46	44	43	42	41	40	39	37	36	35	34	33	31	30	29
84	29	46	45	43	42	41	40	39	38	37	36	35	33	32	31	30	29	28
82	28	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
81	27	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
79	26	39	38	37	36	35	34	33	33	32	31	30	29	28	27	26	25	24
77	25	37	36	35	34	33	33	32	31	30	29	28	27	26	26	25	24	23

- **Step 2:** Place the Humidex value into the Heat Index Adjustment Table below. Determine the applicable adjustments based on the given work or task.

Heat Index Adjustment Table

Step 2 - Risk Factor Adjustment		
Write in value	What is the HUMIDEX value from the table in Step 1?	
Radiant Heat		Adjustment
	Working in full-sun	Add 2
	Working in ½ or partial sun or weak radiant heat source	Add 1
	Working near very hot equipment surfaces or processes	Add 2
Clothing: Pick One Only		
	Short/long sleeve shirt and pants – no overalls	None
	Overalls (e.g., Nomex suit)	Add 3
	Double layer overalls	Add 5
Stop	Impermeable clothing	Perform Physiological Monitoring
Acclimatization		
	Have been working at least 5 of last 7 days in heat stress conditions.	Subtract 4
Work Load & Miscellaneous Factors		
	Light Work (Standing, slow walking)	Subtract 2
	Medium Work (Walking about with moderate lifting or pushing)	None
	Heavy Work (Shoveling dry sand, carrying 50 lbs)	Add 2
	Very Heavy Work (Shoveling wet sand)	Add 3
TOTAL – Compare to Heat Index Response Plan		

- **Step 3:** Compare adjusted Heat Index Total to the Heat Index Response Plan table to obtain guidance for work/rest.

Heat Index Response Plan*

TOTAL NUMBER	Final Step 3 - HEAT INDEX Response
30-33	alert & information & water
34-37	warning & increase water
38-39	75% work - 25% rest & monitor for signs of heat stress
40-41	50% work - 50% rest & monitor for signs of heat stress
42-44	25% work - 75% rest & monitor for signs of heat stress
45+	Perform Physiological Monitoring

* Percent work and rest/recovery are on a per hour basis. Adjustments and subsequent work/rest cycle recommendations are rough guidelines only. No heat stress prediction scheme can replace monitoring of symptoms or a health care practitioners advice in the case of individuals with special medical conditions or predisposing circumstances for heat related illness. Always pay attention to the way workers are feeling. Recuperate if fatigued, nauseated, dizzy or thirsty,

1.4 Adjusted Temperature Work-Rest Schedule Guidelines:

This method can be utilized where WBGT data is not available, and requires only that the ambient temperature be known. Adjustment factors are applied to the ambient temperature to account for departures from ideal conditions (sunny conditions, light winds, moderate humidity and a fully acclimated work force). The adjustments will be made by addition or subtraction to the ambient temperature reading, or changes in table position, as indicated in Table 3. Adjustments are independent and cumulative, all applicable adjustments should be applied. The result is the Adjusted Temperature, which can be compared with the values in Table 4 for the applicable work rate (where light work corresponds to minimal physical activity besides standing/watching; very heavy work corresponds to significant, continuous physical labor) to determine the work-rest schedule.

Table 3. Temperature Adjustment Factors

Time of Day	
Before daily temperature peak ¹	+2°F (+1.11°C)
10 am – 2 pm (peak sunshine)	+2°F (+1.11°C)
Sunshine	
No clouds	+1°F (+0.56°C)
Partly Cloudy (3/8 – 5/8 cloud cover)	-3°F (-1.67°C)
Mostly Cloudy (5/8 – 7/8 cloud cover)	-5°F (-2.78°C)
Cloudy (>7/8 cloud cover)	-7°F (-3.89°C)
Indoor or nighttime work	-7°F (-3.89°C)
Wind (<i>ignore if indoors or wearing CPC</i>)	
Gusts greater than 5 miles per hour at least once per minute	-1°F (-0.56°C)
Gusts greater than 10 miles per hour at least once per minute	+2°F (+1.11°C)
Sustained greater than 5 miles per hour	-3°F (-1.67°C)
Sustained greater than 10 miles per hour	-5°F (-2.78°C)
Humidity (<i>ignore if wearing CPC</i>)	
Relative Humidity greater than 90%	+5°F (+2.78°C)
Relative Humidity greater than 80%	+2°F (+1.11°C)
Relative Humidity less than 50%	-4°F (-2.23°C)
Chemical Protective Clothing (CPC)	
Modified Level D (coveralls, no respirator)	+5°F (+2.78°C)
Level C (coveralls w/o hood, full-face respirator)	+8°F (+4.45°C)
Level C (coveralls with hood, full-face respirator)	+10°F (+5°C)
Level B with airline system (hooded chemical resistant clothing)	+9°F (+5.56°C)
Level B with SCBA (hooded chemical resistant clothing)	+9°F (+5.56°C) and right one column ²
Level A (totally encapsulating chemical protective suit)	+14°F (+7.78°C) and right one column
Other	Specified in the HASP
Miscellaneous	
Unacclimated work force	+5°F (+2.78°C)
Partially acclimated work force	+2°F (+1.11°C)
Working in shade	-3°F (-1.67°C)
Breaks taken in air conditioned space	-3°F (-1.67°C)

**For complete descriptions of Level A through D Protective Clothing refer to
Unites States 29 CFR 1910.120 Appendix B**

¹ This adjustment accounts for temperature rise during the day. If the temperature has already reached its daytime peak it can be ignored.

² Locate the proper column based on work rate, then move one column to the right (next higher work rate) before locating the corresponding adjusted temperature.

Table 4. Work-Rest Schedule Based on Adjusted Temperature

Work-Rest Regimen	Adjusted Temperature			
	Light Work	Moderate Work	Heavy Work	Very Heavy Work
No specified requirements	< 80°F (26.67°C)	< 75 (23.88°C)	< 70 (21.11°C)	< 65 (18.33°C)
15 minute break every 90 minutes of work	80°F – 90°F (26.67°C) - (32.22°C)	75 – 85 (23.88°C) - (29.44°C)	70 – 80 (21.11°C) - (26.67°C)	65 – 75 (18.33°C) - (23.88°C)
15 minute break every 60 minutes of work	>90 – 100 (32.22°C) - (37.77°C)	> 85 – 95 (29.44°C) - (35°C)	>80 – 85 (26.67°C) - (29.44°C)	>75 – 80 (23.88°C) - (26.67°C)
15 minute break every 45 minutes of work	>100 – 110 (37.77°C) - (43.33°C)	>95 – 100 (35°C) - (37.77°C)	>85 – 90 (29.44°C) - (32.22°C)	>80 – 85 (26.67°C) - (29.44°C)
15 minute break every 30 minutes of work	>110 – 115 (43.33°C) - (46.11°C)	>100 – 105 (37.77°C) - (40.55°C)	>90 – 95 (32.22°C) - (35°C)	>85 – 90 (29.44°C) - (32.22°C)
15 minute break every 15 minutes of work	>115 – 120 (46.11°C) - (48.88°C)	>105 – 110 (40.55°C) - (43.33°C)	>95 -100 (35°C) - (37.77°C)	>90 – 95 (32.22°C) - (35°C)
Stop Work	>120 (48.88°C)	>110 (43.33°C)	>100 (37.77°C)	>95 (35°C)

Note: Time spent performing decontamination or donning/doffing CPC should not be included in calculating work or break time lengths.

Work-rest schedules and water provisioning may be documented using logs such as *S3AM-113-FM2 Daily Heat Illness Prevention Log*.

Heat Stress – Symptoms & Treatment

S3AM-113-ATT2

1.0 Heat Illness Symptoms

1.1 The following are four stages of heat-related illness:

1.1.1 Heat Rash

Heat rash (prickly heat) may result from continuous exposure to heat or humid air. It appears as red papules (elevated skin lesion), usually in areas where the clothing is restrictive, and gives rise to a prickly sensation, particularly as sweating increases. It occurs in skin that is persistently wetted by un-evaporated sweat. The papules may become infected unless treated.

1.1.2 Heat Cramps

Heat cramps are painful muscle cramps caused by heavy sweating and inadequate electrolyte replacement due to over-exertion in extreme heat. Symptoms include:

- Muscle spasms; and
- Pain in the hands, feet, and abdomen.

1.1.3 Heat Exhaustion

Heat exhaustion is the next stage. Heat exhaustion occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Symptoms include:

- Cool, moist, pale, flushed or red skin;
- Heavy sweating;
- Headache;
- Nausea or vomiting;
- Dizziness;
- Exhaustion;
- Mood changes (irritable, or confused/can't think straight), and
- Fainting

The key here is that the victim is still sweating, so the cooling system is still working; it's just under severe stress. The body core temperature may be elevated, but not higher than 104°F (40°C). It is important to recognize and treat these symptoms as soon as possible, as the transition from heat exhaustion to the very hazardous heat stroke can be quite rapid.

1.1.4 Heat Stroke

Heat exhaustion can sometimes lead to heat stroke, the most serious form of heat stress, which can be fatal and requires emergency treatment. Heat stroke happens when body temperature regulation fails and body temperature continues to rise to critical levels, often to 105 degrees Fahrenheit (°F) (40.5 degrees Celsius [°C]) or higher. Immediate action must be taken to cool the body before serious injury and death occurs. Competent medical help must be obtained. Symptoms of heat stroke:

- Vomiting;
- Decreased alertness level or complete loss of consciousness;
- Slurred speech;
- High body temperature (sometimes as high as 105°F [40.5°C]);
- Red, hot, usually dry skin;
- Lack of or reduced perspiration;
- Skin may still be moist or the victim may stop sweating and the skin may be red, hot, and dry;

- Rapid, weak pulse or rapid, strong pulse;
- Rapid, shallow breathing;
- Nausea;
- Dizziness and confusion; and
- Coma.

2.0 Recommended Treatment for Heat Stress-related Illnesses

2.1 Heat Rash

2.1.1 Treatment for heat rash includes:

- Shower after work, dry off thoroughly, and put on clean, dry underwear and clothes;
- Try to stay in a cool place after work;
- If, in spite of this, you develop heat rash, contact WorkCare.

2.2 Heat Cramps

2.2.1 Treatment for heat cramps includes:

- Gently stretch the cramped muscle and hold the stretch for about 20 seconds, then gently massage the muscle. Repeat these steps if necessary;
- Take more frequent breaks and drink more water;
- Move victim to a cool place;
- Administer drinks of cool water;
- Apply manual pressure to cramped muscles;
- Once spasms disappear, you may return to work;
- Seek medical attention if symptoms are not alleviated or if more serious problems are indicated.

2.3 Heat Exhaustion

2.3.1 Treatment of heat exhaustion includes:

- Get out of the sun to a cool location and drink cool water, a little at a time;
- Remove or loosen tight clothing and elevate the feet;
- If you are nauseated or dizzy, lie down;
- Move the victim to a cool place, administer drinks of cool water and fan to cool;
- Seek medical attention immediately.


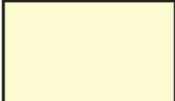




2.4 Heat Stroke

2.4.1 Treatment of heat stroke, or if a person's temperature exceeds 102°F (38.9 °C) includes:

- Call for immediate medical help and then try to lower the temperature as quickly as possible:
 - Apply cool (not cold) water the person's whole body, then fan the person;
 - Wrap in wet sheet;
 - If available, use cold packs under arms, neck, and ankles;
 - Body temperature is measured frequently, often constantly. To avoid overcooling, cooling is stopped when the body temperature is reduced to about 102°F (38°C);
- Do not give aspirin or acetaminophen to reduce the temperature;
- Treat as a true medical emergency. Seek medical help immediately;
- Protect from injury during convulsion;
- Ensure that the person's airway is open;
- Transfer to a medical facility immediately.

GUIDANCE TOOL FOR MONITORING DEHYDRATION

URINE COLORATION CHART

					
1	2	3	4	5	6
Target		Dehydration		Severe Dehydration	
CONTINUE DRINKING WATER TO MAINTAIN CURRENT HYDRATION LEVELS.		INCREASE WATER CONSUMPTION TO IMPROVE HYDRATION LEVELS, INCREASE BREAKS FREQUENCY, TAKE BREAKS IN A COOL SHADED AREA.		STOP WORK! FIND A SHADED AREA AND BEGIN TO DRINK COOL TO ROOM TEMPERATURE WATER SLOWLY AND STEADILY.	

PREVENTING DEHYDRATION

- Start hydrating at least 3 days prior to working in high heat conditions
- Always bring enough water to maintain hydration. CalOSHA requires consuming 1 quart per hour of your work shift - more may be needed

Note: This information is guidance only and should not supersede the recommendation or instruction of a personal physician or medical professional. Contact your physician or medical professional if you have a personal medical condition or take medication for a personal condition which may be adversely affected by dehydration. Urine color can be affected by medications, vitamins and or other personal health conditions.

Americas

Heat Stress Monitoring Log

S3AM-113-FM1

The purpose of this form is to monitor employees for heat illness when applicable. It is the responsibility of the Foreman or Supervisor-in-Charge to ensure that each person completes the required information.

Project Name:			Foreman/Supervisor:						Work/Rest Schedule¹: IN (min) OUT (min)							
Date:	Water Provided¹		Acclimated²		Initial Vitals³	Vital Signs and Time In/Out³			Celcius <input type="checkbox"/> / Farenheit <input type="checkbox"/> (select one)							
Employee Name	Yes	No	Yes	No	Vitals	In (P ₁)	Out (P ₁)	Vitals	In (P ₁)	Out (P ₁)	Vitals	In (P ₁)	Out (P ₁)	Vitals	In (P ₁)	Out (P ₁)
					P			P			P			P		
					BP			BP			BP			BP		
					Temp			Temp			Temp			Temp		
					P			P			P			P		
					BP			BP			BP			BP		
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					Temp			Temp			Temp			Temp		

- Each Employee should be provided a sufficient amount of water or sports drink before entering the hot zone. Drinks such as coffee and cola should be discouraged.
- An Employee is "acclimated" if he/she has worked in a hot environment for at least 5 - 7 consecutive days. If an Employee is acclimated, check "Yes." If an Employee is not acclimated, check "No" and reduce the "Min In" by 50 percent for that Employee until the 5 - 7 -day period is reached.
- "Vitals" refers to Employee vital signs (e.g., pulse [P], blood pressure [BP], body temperature [Temp], etc.). Initial vitals must be taken and recorded before the start of work and at each break period, or as specified in the Heat Stress Exposure Control Plan.

Heat Stress Monitoring Log (S3AM-113-FM1)

Revision 1 December 15, 2016

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*FOR COMPLETION BY SSO FORECASTED TEMP + ADJUSTMENT FACTORS (SEE TABLE BELOW) = ADJUSTED TEMP

Morning High Calculation: _____ + _____ = _____

Afternoon High Calculation: _____ + _____ = _____

Time of Day	
Before daily temperature peak ¹	+2°F (+1.11°C)
10 am – 2 pm (peak sunshine)	+2°F (+1.11°C)
Sunshine	
No clouds	+1°F (+0.56°C)
Partly Cloudy (3/8 – 5/8 cloud cover)	-3°F (-1.67°C)
Mostly Cloudy (5/8 – 7/8 cloud cover)	-5°F (-2.78°C)
Cloudy (>7/8 cloud cover)	-7°F (-3.89°C)
Indoor or nighttime work	-7°F (-3.89°C)
Wind (ignore if indoors or wearing CPC)	
Gusts greater than 5 miles per hour at least once per minute	-1°F (-0.56°C)
Gusts greater than 10 miles per hour at least once per minute	+2°F (+1.11°C)
Sustained greater than 5 miles per hour	-3°F (-1.67°C)
Sustained greater than 10 miles per hour	-5°F (-2.78°C)
Humidity (ignore if wearing CPC)	
Relative Humidity greater than 90%	+5°F (+2.78°C)
Relative Humidity greater than 80%	+2°F (+1.11°C)
Relative Humidity less than 50%	-4°F (-2.23°C)
Chemical Protective Clothing (CPC) ²	
Modified Level D (coveralls, no respirator)	+5°F (+2.78°C)
Miscellaneous	
Unacclimated work force	+5°F (+2.78°C)
Partially acclimated work force	+2°F (+1.11°C)
Working in shade	-3°F (-1.67°C)
Breaks taken in air conditioned space	-3°F (-1.67°C)

°F = degrees Fahrenheit °C = degrees Celsius

¹ This adjustment accounts for temperature rise during the day. If the temperature has already reached its daytime peak, it can be ignored.

² Refer to S3AM-113-ATT1 for addition Chemical Protective Clothing (Type C – A)

****Attach copy of receipts for water purchases**

Apply the adjusted temperature to the below table given the anticipated Workload to determine the appropriate Work-Rest Regimen code.

Code	Work-Rest Regimen	Adjusted Temperature			
		Light Work	Moderate Work	Heavy Work	Very Heavy Work
0	No specified requirements	< 80°F (26.67°C)	< 75°F (23.88°C)	< 70°F (21.11°C)	< 65°F (18.33°C)
1	15 minute break every 90 minutes of work	80°F – 90°F (26.67 - 32.22°C)	75 – 85°F (23.88 - 29.44°C)	70 – 80°F (21.11 - 26.67°C)	65 – 75°F (18.33 - 23.88°C)
2	15 minute break every 60 minutes of work	>90 – 100°F (32.22 - 37.77°C)	> 85 – 95°F (29.44 - 35°C)	>80 – 85°F (26.67 - 29.44°C)	>75 – 80°F (23.88 - 26.67°C)
3	15 minute break every 45 minutes of work	>100 – 110°F (37.77 - 43.33°C)	>95 – 100°F (35 - 37.77°C)	>85 – 90°F (29.44 - 32.22°C)	>80 – 85°F (26.67 - 29.44°C)
4	15 minute break every 30 minutes of work	>110 – 115°F (43.33 - 46.11°C)	>100 – 105°F (37.77 – 40.55°C)	>90 – 95°F (32.22 - 35°C)	>85 – 90°F (29.44 - 32.22°C)
5	15 minute break every 15 minutes of work	>115 – 120°F (46.11 - 48.88°C)	>105 – 110°F (40.55 - 43.33°C)	>95 -100°F (35 - 37.77°C)	>90 – 95°F (32.22 - 35°C)
SW	Stop Work	>120°F (48.88°C)	>110°F (43.33°C)	>100°F (37.77°C)	>95°F (35°C)

DCS Americas

Heat Illness Prevention Plan

S4[DCS]AM-113-FM1

Heat-Related Illness Prevention

Site/Project Name

Location

Month and Year prepared

DELETE BEFORE FINALIZING: This is a template intended to provide guidance for the development of site specific Heat Illness Prevention Plans required by the 2015 update to 8 CCR 3395) and should be modified to support site specific operations. This plan is intended to work in conjunction with a Health and Safety Plan (HASP), Safe Work Plan (SWP) or Task Hazard Analysis with an Emergency Action Plan.

Risk for a heat-related illness varies based upon work activities, personal protective equipment (PPE)/clothing selection, geographical locations, personal conditions and weather conditions. To reduce the potential of developing a heat-related illness, AECOM has developed a site-specific procedure incorporating:

- AECOM's SH&E Procedure for Heat Illness Preventions (S3AM-113_PR_Heat Stress),
- California Occupational Safety and Health Administration Heat Illness Prevention Standard (Title 8 of the California Code of Regulations, Section 3395), and
- **INSERT SWP, HASP, THA or supporting document**

1. Planning

This section may be replaced with an actual forecast or historic data related to location/seasonal temperatures.

The Site Safety Officer (SSO) and Field Supervisor shall verify the risk of heat-related illnesses based on:

- Weather forecasts,
- Planned work activities,
- Planned PPE, and
- Personal risk factors.

The SSO and Project Manager shall also ensure the appropriate equipment and resources are available to employees at risk of a heat-related illness. Examples of necessary equipment may include (but are not limited to):

- Potable water with replenishment supply;
- Drinking cups, insulated water bottles or other small sealable container;
- Sun protection (hats, long sleeves, sunscreen, sunglasses);
- Communication method (cell phone or similar);
- Shade;
- Reliable thermometer (a simple thermometer, like those available at hardware stores, can be used to measure the outdoor "dry bulb" temperature); and
- Cooling devices such as cooling vests or misters.

INSERT HISTORICAL WEATHER DATA OR FORECASTED CONDITIONS FOR DURATION OF PROJECT.

2. Water

2.1 Provision of Water

Employees shall have access to potable drinking water. The frequent drinking of water shall be encouraged by supervisors and field team members.

- Each employee shall be provided with a minimum 2 gallons of water per 8-hour shift, free of charge.

- All water shall be fresh, pure, potable, and cool (cooler than ambient temperature).
- Water will be located as close as possible to the work area.
- Water will be stored in an environment that will ensure a cool temperature and prevent contamination.
- Replenishment Procedures:

Update this section with site specific water replenishment procedures.

- **Fixed Site:** Replenishment water supply shall be located XXXXXXXX. Employees will have access to replenishment during working hours and may be/are required to report the date, time and quantity of water taken from the replenishment supply.
- **Mobile/Remote Work:** Mobile and remote employees may carry water bottles or smaller sealed container of water with them while they are working, and refill containers at the primary source (cooler or other designated source) during breaks or as needed.

Containers and refill frequency shall provide for a minimum of 1 quart of water to be consumed per hour while working. Water bottles or smaller sealed container do not need to be empty prior to refilling; water should always be immediately available to employees.

2.2 Dehydration Prevention

The 2006 Cal/OSHA Heat Illness Case Study showed that, although 90% of the worksites had drinking water at the site, 96% of the employees suffering from heat illnesses were dehydrated.


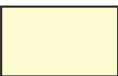




Dehydration occurs when the body loses too much fluid. This can happen when an employee stops drinking water and can be accelerated by work in hot or dry conditions. Not drinking enough fluids can cause muscle cramps, fainting and shock, which is a life-threatening condition.

Drinking water should increase with activity level. Dehydration can affect the body's ability to recognize thirst, so employees shall drink water on a time schedule.

In hot conditions, it is important that employees drink enough water that urination is required at least every 2 hours. Water is the best hydration fluid. If sports drinks are used, they should be diluted at least 50 percent with water prior to drinking. **Do Not Drink Distilled Water.**

Dehydration can be prevented by monitoring urine color and adjusting water intake accordingly. The following guidance was developed to aid employees in monitoring hydration levels. This tool can be downloaded from: [Hydration Chart](#).

GUIDANCE TOOL FOR MONITORING DEHYDRATION

URINE COLORATION CHART					
					
1	2	3	4	5	6
Target		Dehydration		Severe Dehydration	
CONTINUE DRINKING WATER TO MAINTAIN CURRENT HYDRATION LEVELS.		INCREASE WATER CONSUMPTION TO IMPROVE HYDRATION LEVELS, INCREASE BREAKS FREQUENCY, TAKE BREAKS IN A COOL SHADED AREA.		STOP WORK! FIND A SHADED AREA AND BEGIN TO DRINK COOL TO ROOM TEMPERATURE WATER SLOWLY AND STEADILY.	

PREVENTING DEHYDRATION

- Start hydrating at least 3 days prior to working in high heat conditions
- Always bring enough water to maintain hydration. CalOSHA requires consuming 1 quart per hour of your work shift - more may be needed

Note: This information is guidance only and should not supersede the recommendation or instruction of a personal physician or medical professional. Contact your physician or medical professional if you have a personal medical condition or take medication for a personal condition which may be adversely affected by dehydration. Urine color can be affected by medications, vitamins and/or other personal health conditions.

3. Access to Shade

This section may be replaced with a site-specific description of shade structures, locations. A map of these resources can also be included.

When temperatures **do not exceed 80 degrees Fahrenheit (°F) (26°Celsius [°C])**, access to shade for employee will be provided as needed, or as requested by employees. Timely access to shade will be provided upon an employee's request.

Shade is required when the temperature exceeds 80°F (26°C).

One or more shaded areas will be established at all times. Shade may require relocation to accommodate a moving work location.

The shaded area will either open to the air or be provided with ventilation or cooling (such as an air-conditioned vehicle). The amount of shade present shall be at least enough to accommodate the number of employees on a rest/recovery/meal/break period at any given time, so that they can sit in a normal posture fully in the shade without having to be in physical contact with each other.

The shaded area shall be located as close as practicable to the areas where employees are working, but no more than a 2.5-minute walk away. Access must be undeterred (free from obstacles or other barriers such as crossing traffic). The shaded area will be away from portable toilets, and in a clean, dry and otherwise hazard-free environment.

Examples of appropriate access to shade:

- Buildings, canopies, lean-tos, or other partial or temporary structures that are either ventilated or open to air movement.
- Trees and dense vines can provide shade that is superior to artificially provided shade and are accepted as compliant sources of shade as long as branches, thorns and the plant itself does not pose added harm to the employee.
- The interior of a vehicle may only be used to provide shade when the vehicle is air conditioned and the air conditioner is operating.

INSERT FIGURE OF SITE MAP WITH LOCATIONS OF SHADED BREAK AREAS.

4. Work-Rest Cycles and Breaks

It is necessary to implement a work routine that incorporates adequate rest periods to allow employees to remove protective clothing, drink fluids (vital when extreme sweating is occurring), rest and recover.

The frequency and length of work breaks will be determined based on the following considerations:

- Employees are allowed and encouraged to take a preventative cool-down rest in the shade when they feel the need to do so to protect themselves from overheating. The breaks will last for a minimum of 5 minutes and as long as needed to resolve any signs/symptoms of heat illness that are observed.
- The SSO may determine the timing of work breaks based upon the ambient temperature, amount of sunshine, humidity, the amount of physical labor being performed, the physical condition of the employees, and protective clothing being used. The following guidelines shall be used to determine frequency and duration of rest breaks:

4.1 Adjusted Temperature Method

This method requires only that the ambient temperature (in °F [°C]) be known. Adjustment factors are applied to the ambient temperature to account for departures from ideal conditions (sunny conditions, light winds, moderate, humidity and a fully acclimated work force). The adjustments should be made by adding or subtracting the ambient temperature reading, or changes in table position, as indicated in Table 4-1. Adjustments are independent and cumulative; all applicable adjustments should be applied. The result is the *Adjusted Temperature*, which can be compared with the values in Table 4-2 for the applicable work rate (where light work corresponds to minimal physical activity besides standing/watching; very heavy work corresponds to significant, continuous physical labor) to determine the work-rest frequency.

Table 4-1 Temperature Adjustment Factors

Time of Day	
Before daily temperature peak ¹	+2°F (+1.11°C)
10 a.m. – 2 p.m. (peak sunshine)	+2°F (+1.11°C)
Sunshine	
No clouds	+1°F (+0.56°C)
Partly Cloudy (3/8 – 5/8 cloud cover)	-3°F (-1.67°C)
Mostly Cloudy (5/8 – 7/8 cloud cover)	-5°F (-2.78°C)
Cloudy (>7/8 cloud cover)	-7°F (-3.89°C)
Indoor or nighttime work	-7°F (-3.89°C)
Wind	
Gusts greater than 5 miles per hour at least once per minute	-1°F (-0.56°C)
Gusts greater than 10 miles per hour at least once per minute	+2°F (+1.11°C)
Sustained greater than 5 miles per hour	-3°F (-1.67°C)
Sustained greater than 10 miles per hour	-5°F (-2.78°C)
Humidity	
Relative Humidity greater than 90%	+5°F (+2.78°C)
Relative humidity greater than 80%	+2°F (+1.11°C)
Relative Humidity less than 50%	-4°F (-2.23°C)
Chemical Protective Clothing (CPC)	
Modified Level D (coveralls, no respirator) ²	+5°F (+1.11°C)
Miscellaneous	
Unacclimated work force	+5°F (+2.78°C)
Partially acclimated work force	+2°F (+1.11°C)
Working in shade	-3°F (-1.67°C)
Breaks taken in air conditioned space	-3°F (-1.67°C)

°F = degrees Fahrenheit; °C = degrees Celsius

¹ This adjustment accounts for temperature rise during the day. If the temperature has already reached its daytime peak, it can be ignored.

² Refer to S3AM-113-ATT1 for addition Chemical Protective Clothing (Type C – A)

Table 4-2 Work-Rest Schedule Based on Adjusted Temperature

Work-Rest Frequency	Adjusted Temperature – °F (°C)			
	Light Work	Moderate Work	Heavy Work	Very Heavy Work
No Specified requirements	< 80°F (26.67°C)	< 75°F (23.88°C)	< 70°F (21.11°C)	< 65°F (18.33°C)
15-minute break every 90 minutes of work	80–90°F (26.67–32.2°C)	75–85°F (23.88–29.44°C)	70–80°F (21.11–26.67°C)	65–75°F (18.33–23.88°C)
15-minute break every 60 minutes of work	> 90–100°F (32.22–37.77°C)	> 85–95°F (29.44–35°C)	> 80–85°F (26.67–29.44°C)	> 75–80°F (23.88–26.67°C)
15-minute break every 45 minutes of work	> 100–110°F (37.77–43.33°C)	> 95–100°F (35–37.77°C)	> 85–90°F (29.44–32.22°C)	> 80–85°F (26.67–29.44°C)
15-minute break every 30 minutes of work	> 110–115°F (43.33–46.11°C)	> 100–105°F (37.77–40.55°C)	> 90–95°F (32.22–35°C)	> 85–90°F (29.44–32.22°C)
15-minute break every 15 minutes of work	> 115–120°F (46.11–48.88°C)	> 105–110°F (40.55–43.33°C)	> 95–100°F (35–37.77°C)	> 90–95°F (32.2–35°C)
STOP WORK	> 120°F (48.88°C)	> 110°F (43.33°C)	> 100°F (37.77°C)	> 95°F (35°C)

°F = degrees Fahrenheit; °C = degrees Centigrade

4.2 Procedures for Taking Breaks

- Breaks will be taken in a cool and/or shaded location, in an air-conditioned environment when possible. A shaded break area is required when temperatures are above 80 °F (26°C).
- Employees will be monitored by the supervisor or SSO and asked if he or she is experiencing symptoms of heat illness.
- Each employee should self-assess and assess their co-workers for sign/symptoms of a heat-related illness.
- Employees will be encouraged to remain in the shade.
- All breaks will last a minimum of 5 minutes in addition to the time needed to access the shade.
- Employees will not be ordered back to work until any signs or symptoms of heat illness have abated.
- Pulse rate information should be collected to verify the effectiveness of the break and work-rest cycle.
- Water will be available, and consumption encouraged in the break area.
- Manual labor will not be performed during breaks, other than paperwork or similar light tasks.

4.3 Evaluating the Work-Rest Schedule's Effectiveness

Once a work-rest schedule is established, the SSO must continually evaluate its effectiveness through observation of employees for signs/symptoms of heat stress. Measurement of each employee's pulse can provide additional information in determining if the schedule is adequate and is accomplished as follows:

Within the first minute of each rest period, each employee's heart rate (pulse) can be measured and compared to the following:

- Initial heart rate: 110 beats per minute (bpm) (28 beats every 15 seconds).

Each employee's heart rate must be measured again 3 minutes later and compared to the following:

- Recovery heart rate: 80 bpm (20 beats every 15 seconds).
- If both heart rate criteria are met, the subsequent work period may be increased by one-third, provided the temperature remains constant.
- If the initial heart rate is greater than 110 bpm, or the recovery rate is not less than 80 bpm, the subsequent work shift is decreased by one-third.

If cooling devices (e.g., cooling vest) are worn, only physiological monitoring will be used to determine work activity. Measurements for each employee can be recorded and tracked throughout the workday using the Heat Stress Monitoring Log provided in S3AM-113_PR_Heat Stress.

5. Emergency Services

A minimum of two workers trained in cardio-pulmonary resuscitation (CPR) and First Aid will be present on site for all activities that expose employees to temperatures greater than 80°F (27°C). **This is ideal, but may need to be adjusted for specific working conditions.**

Means of contacting Emergency Services shall be validated in areas where cell phone reception is limited, and alternate reliable means will be selected.

Emergency Services will be activated if severe heat illness (such as, but not limited to, decreased level of consciousness, staggering, vomiting, disorientation, irrational behavior or convulsions) is observed or suspected.

An employee that exhibits signs or symptoms of illness shall not be left alone without first aid or medical treatment to resolve symptoms.

Refer the Site-Specific Emergency Action Plan for specific emergency instructions in the Task Hazard Analysis (THAs), Safe Work Plan or Health and Safety Plan.

5.1 Acclimatization

All employees shall be closely observed by a supervisor or designee during a heat wave. For purposes of this section only, "heat wave" means any day in which the predicted high temperature for the day will be at least 80°F (27°C) and at least 10 °F (5 °C) higher than the average high daily temperature in the preceding 5 days.

An employee who has been newly assigned to a high heat area shall be closely observed by a supervisor or designee for the first 14 days of the employee's employment.

5.2 Training of Employees and Supervisors

All AECOM employees and supervisors shall receive training in the prevention of heat-related illnesses prior to starting work. Training will include:

- Environmental risk factors for heat illness, including added burden of heat load on the body caused by exertion, clothing and PPE;
- Personal Risk Factors for heat illness such as an individual's age, degree of acclimatization, health, water consumption, alcohol consumption, caffeine consumption, and use of prescription medications that affect the body's water retention or other physiological responses to heat;
- AECOM's S3AM-113_PR_Heat Stress and a review of the site-specific procedure in this Safe Work Plan, and associated THAs;
- Signs, symptoms and response measures for different types of heat-related illnesses;
- Procedure for stopping work and reporting signs and symptoms of a heat-related illness in themselves or other people on site;
- First aid measure for managing a case of heat illness;
- AECOM's procedure for responding to heat-related illnesses, including use of AECOM's Corporate Medical Provider (Work Care), and seeking emergency medical services (see the site-specific Emergency Action Plan);

- Obtaining accurate weather forecast and ambient temperature data;
- Access to potable water, the minimum recommended consumption rate (1 quart per hour), procedure for drinking (small quantities regularly throughout the day, increase intake for higher heat, increased workload or increased sweating);
- Provision of shade required when temperatures are greater than 80°F (27°C);
- Acclimatization;
- How to establish a work-rest cycle per S3AM-113_PR_Heat Stress; and
- Specific high heat (95°F [35°C]) procedures.

6. High Heat Procedures (>95° F)

The following procedures shall be implemented when the temperature equals or exceeds 95°F (35°C). These procedures shall include the following to the extent practicable:

- Ensuring that effective communication by voice, observation, or electronic means is maintained so that employees at the work site can contact a supervisor when necessary. An electronic device, such as a cell phone or text messaging device, may be used for this purpose only if reception in the area is reliable.
- Conduct a pre-shift meeting to review high heat procedures, encourage water consumption, and review the work-rest cycle and supplemental breaks.
- Employees shall be monitored for signs and symptoms through an effective means of observation, which may include:
 - For teams less than 20, monitoring by a supervisor or supervisor designee (SSO).
 - For teams larger than 20, monitoring via the Buddy System.
 - Regular communication through cell phone or radio of a lone worker.

Note: for Lone Worker scenario an alternate means of monitoring the worker must be devised.

- Reminders to drink plenty of water throughout the work shift shall be provided by the SSO or Site Supervisor or from peer to peer.
- Designate an employee that is authorized to call Emergency Services in the event of an emergency

7. Identifying and Responding to Sign and Symptoms

Heat stress can be a significant field site hazard, particularly for non-acclimated personnel working in the desert. Site personnel must be instructed in the identification of heat-stress symptoms of heat-related illnesses. Employees are required to immediately report any signs of symptoms that they may experience or observe in fellow employees. The guidance below in Table 7-1 will be used in identifying and responding to heat-related illness. Any employee exhibiting a sign or symptom of a heat-related illness shall receive appropriate first aid or medical care through the AECOM supervisor, and AECOM's Incident Reporting process.

Table 7-1 Identification and Treatment of Heat-Related Illness

Type of Heat-Related Illness	Description	First Aid
Dehydration	<p><i>96% of the employees suffering from heat illnesses were dehydrated.</i></p> <p>Dehydration results from in taking less water than your body is using (sweating). Dehydration results in reduced urine output, dark-colored urine, shriveled skin that doesn't "bounce back" when pinched, extreme thirst (not always), sleepiness, lack of sweat, dry skin, headache, constipation.</p>	<ul style="list-style-type: none"> • Stop work and move employee to shaded rest/break area. • Drink water, slowly and steadily. • Report to SSO, contact Safety Professional/Work Care for guidance on fluid intake and returning to work.
Heat Rash	<p>A heat rash occurs when sweat ducts become clogged and the sweat can't get to the surface of the skin. Instead, it becomes trapped beneath the skin's surface causing a mild inflammation or rash.</p>	<p>Avoid working in hot, humid weather, wear loose clothing made of breathable fabrics like cotton, use air conditioning, and keep the skin clean with frequent baths or showers to prevent sweat glands from becoming clogged. Change clothing that is wet or soiled.</p> <p>Heat rash can be treated by cleaning and cooling the area with cool water and applying an over-the-counter hydrocortisone cream. There is risk of infection from heat rash if sweat glands become infected. The signs of infection include pain, increased swelling, and redness that does not resolve. Pustules may form at the site of the rash. This infection occurs because bacteria have invaded the blocked sweat gland. Antibiotic treatment may be required. Chronic and recurrent heat rash may need to be treated by a health care practitioner or dermatologist (skin specialist).</p>
Mild Heat Strain	<p>The mildest form of heat-related illness. Victims exhibit irritability, lethargy, and significant sweating. The victim may complain of headache or nausea. This is the initial stage of overheating, and prompt action at this point may prevent more severe heat-related illness from occurring.</p>	<ul style="list-style-type: none"> • Provide the victim with a work break during which he/she may relax, remove any excess protective clothing, and drink cool fluids. • An air-conditioned spot is an ideal break location. • Once the victim shows improvement, he/she may resume working; however, the work pace should be moderated to prevent recurrence of the symptoms.
Heat Exhaustion	<p>Usually begins with muscular weakness and cramping, dizziness, staggering gait, and nausea. The victim will have pale, clammy moist skin and may perspire profusely. The pulse is weak and fast and the victim may faint unless they lie down. The bowels may move involuntarily.</p>	<ul style="list-style-type: none"> • Immediately remove the victim from the work area to a shady or cool area with good air circulation (<i>avoid drafts or sudden chilling</i>). • Remove all protective outerwear. • Call a physician. • Treat the victim for shock. (<i>Make the victim lie down, raise his or her feet 6–12 inches, and keep him/her cool by loosening all clothing.</i>) • If the victim is conscious, it may be helpful to give him/her sips of water. • Transport victim to a medical facility as soon as possible.

Type of Heat-Related Illness	Description	First Aid
Heat Stroke	<p>The most serious of heat illness, heat stroke represents the collapse of the body's cooling mechanisms. As a result, body temperature may rise to 104 degrees Fahrenheit or higher. As the victim progresses toward heat stroke, symptoms such as headache, dizziness, and nausea can be noted, and the skin is observed to be dry, red, and hot. Sudden collapse and loss of consciousness follows quickly, and death is imminent if exposure continues. Heat stroke can occur suddenly.</p>	<ul style="list-style-type: none"> • Immediately evacuate the victim to a cool/shady area. • Remove all protective outerwear and as much personal clothing as decency permits. • Lay the victim on his/her back with the feet slightly elevated. • Apply cold wet towels or ice bags to the head, armpits, and thighs. • Sponge off the bare skin with cool water. • The main objective is to cool without chilling the victim. • Give no stimulants or hot drinks. • Since heat stroke is a severe medical condition requiring professional medical attention, emergency medical help should be summoned immediately to provide on-site treatment of the victim and proper transport to a medical facility.

Hazardous Materials Communication

S3AM-115-PR1

1.0 Purpose and Scope

- 1.1 Provides a Hazard Communication Program so that AECOM employees are informed of the hazards of the chemicals to which they may be exposed in the course of their work by way of container labeling and other forms of warning, safety data sheets (SDS), and employee training.
- 1.2 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.
- 1.3 The program applies to the use of any hazardous substances which are known to be present in the workplace in such a manner that employees may be exposed under normal conditions of use or in a foreseeable emergency.
- 1.4 The program does not apply to general consumer products, for example, cleaners, printer toner, white out, etc.

2.0 Terms and Definitions

- 2.1 **Acute Effect** – An adverse effect on the human body with immediate onset of symptoms.
- 2.2 **Article** – A manufactured item: (1) which is formed to a specific shape or design during manufacture; (2) which has end use function(s) dependent in whole or in part upon its shape or design during end use; and, (3) which does not release or otherwise result in exposure to, a hazardous chemical, under normal conditions of use.
- 2.3 **Carcinogen** – Those chemicals appearing in any of the following reference sources are established as carcinogens for hazard communication purposes:
 - National Toxicology Program (NTP) Annual Report on Carcinogens.
 - International Agency for Research on Cancer (IARC) Monographs, Volumes 1-34. Note: The Registry of Toxic Effects of Chemical Substances published by NIOSH indicates whether a substance has been found by NTP or IARC to be a potential carcinogen.
- 2.4 **Chemical Name** – The scientific designation of a substance in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry or the system developed by the Chemical Abstracts Service.
- 2.5 **Chronic Effect** – An adverse effect on the human body with symptoms which develop slowly over a long period of time or which frequently recur.
- 2.6 **Combustible Liquid** – Any liquid having a flash point at or above 100°F (37.8°C) but below 200°F (93.3°C), except any mixture having components with flash points of 200°F (93.3°C), or higher, the total volume of which makes up 99% or more of the total volume of the mixture.
- 2.7 **Common Name** – Any designation or identification such as code name, code number, trade name or brand name used to identify a substance other than by its chemical name.
- 2.8 **Container** – Any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank or the like that contains a hazardous chemical. For purposes of this procedure, pipes or piping systems, and engines, fuel tanks, or other operating systems in a vehicle are not considered to be containers.
- 2.9 **Location** – Any separate and distinct AECOM office, laboratory or other company facility.
- 2.10 **Exposure** – Any situation arising from work operations where an employee may ingest, inhale, absorb through the skin or eyes or otherwise come into contact with a hazardous substance.
- 2.11 **Flammable** – A substance that falls into one of the following categories:

- 2.11.1 **Flammable Aerosol** – An aerosol that when tested by the method described in 16 CFR 1500.45, yields a flame projection exceeding 18 inches at full valve opening or flashback (a flame extending back to the valve) at any degree of valve opening.
- 2.11.2 **Flammable Gas** – A gas that at ambient temperature and pressure:
- Forms a flammable mixture with air at a concentration of 13% of volume or less; or
 - Forms a range of flammable mixtures with air wider than 12% by volume, regardless of the lower limit.
- 2.11.3 **Flammable Liquid** – Any liquid having a flash point below 100°F (37.8°C), except any mixture having components with flash points of 100°F (37.8°C) or higher, the total of which make up 99% or more of the total volume of the mixture.
- 2.11.4 **Flammable Solid** – A solid, including a powdered, granular or pasty mixture of a substance that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change or retained heat from manufacturing or processing or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard.
- Flammable Solids do not include blasting agents or explosives as defined in 8 CCR 5237(a).
- 2.12 **Flash Point** – Minimum temperature of a liquid at which it gives off sufficient vapors to form an ignitable mixture with the air near the surface of the liquid or within the container used.
- 2.13 **GHS** – The Globally Harmonized System of Classification and Labelling of Chemicals developed by the United Nations with the goal of an international system to define and classify the hazards of chemical products, and communicate health and safety information on labels and safety data sheets.
- 2.14 **Hazardous Chemical** – Those chemicals appearing in any of the following reference sources are established as hazardous chemicals for hazard communication purposes.
- 29 CFR Part 1910, Subpart Z, Toxic and Hazardous Substances, OSHA.
 - Hazardous Products Act, R.C.S. 1985, c. H-3, section 2, Canada.
 - For operations within the state of California, the list of hazardous substances prepared by the California Director of Industrial Relations pursuant to Labor Code Section 6382. The concentrations and footnotes, which are applicable to the list, shall be understood to modify the same substance on all other source lists or hazard determinations set forth in § 8 CCR 5194(d)(3)(B) and (d)(5)(D).
- 2.15 **Hazardous Substance** – A hazardous chemical or carcinogen, or a product or mixture containing a hazardous chemical or carcinogen provided that:
- 2.15.1 The hazardous chemical is 1% or more of the mixture or product or 2% if the hazardous chemical exists as an impurity in the mixture; or
- 2.15.2 The carcinogen is 0.1% or more of the mixture or product;
- 2.15.3 Manufacturers, importers and distributors will be relied upon to perform the appropriate hazard determination for the substances they produce or sell.
- 2.15.4 The following materials are not covered by the Hazard Communication Standard:
- Any hazardous waste as defined by the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 USC 6901 et seq.) when subject to regulations issued under that act by the Environmental Protection Agency.
 - Tobacco or tobacco products;
 - Wood or wood products. Note: Wood dust is not exempt since the hazards of wood dust are not “self-evident” as are the hazards of wood or wood products;
 - Consumer products (including pens, pencils, adhesive tape) used in the work place under typical consumer usage;
 - Articles (i.e. plastic chairs);

- Foods, drugs, or cosmetics intended for personal consumption by employees while in the work place;
- Foods, drugs, cosmetics in retail store packaged for retail sale; and
- Any drug in solid form used for direct administration to the patient (i.e., tablets or pills).

Hazardous substance shall be considered the equivalent term to 'controlled substance'.

- 2.16 **Hazardous Substance Inventory (HSI) / WHMIS Log** – A listing of all chemicals stored or used at an office or project site. Note that the list may be imbedded in a project Health and Safety Plan.
- 2.17 **Immediate Use** – Means that the hazardous chemical will be under the control of and used only by the person who transfers it from a labeled container and only within the work shift in which it is transferred.
- 2.18 **National Fire Protection Association (NFPA)** – The NFPA is a trade association that issues standards and codes concerning risks associated with fire. A system of categories has been established by NFPA standard 704; colors and numbers, to provide basic hazard information concerning hazardous materials. It enables firefighters and other emergency personnel to easily decide whether or not to evacuate an area or proceed with emergency control operations. The three principal categories of identification are Health, Flammability and Instability. A numerical range of "0 to 4" indicates the severity of the hazard. A "4" indicates the most severe and a "0" indicates a minimal hazard. Refer to *S3AM-115-ATT1 Pictograms & Sample Labels* for an example.
- 2.19 **Mixture** – Any solution or intimate admixture of two or more substances which do not react chemically with each other.
- 2.20 **Reactivity** – A measure of the tendency of a substance to undergo chemical reaction with the release of energy.
- 2.21 **SDS** – A Safety Data Sheet prepared pursuant to state and federal regulations, OSHA Form 174 and Canada regulations (Hazardous Products Act & Regulation).
- 2.22 **SDS Administrator** – The individual or group designated by the Office Manager (Operations) or Project Manager to maintain the location-specific inventory list or log and the SDS binder required if that location uses or stores hazardous substances.
- 2.23 **Solubility** – The ability of substance to blend and mix uniformly with another.
- 2.24 **Specific Gravity (density)** – Ratio of the weight of a substance to the weight of the same volume of another substance. As used in this directive, specific gravity or density refers to the weight of substance as compared to the weight of an equal volume of water.
- 2.25 **Vapor Density** – The weight of a vapor-air mixture resulting from the vaporization of a volatile liquid at equilibrium temperature and pressure conditions, as compared with the weight of an equal volume of air under the same conditions.
- 2.26 **WHMIS** – The Workplace Hazardous Materials Information System (WHMIS) is Canada's national hazard communication standard. The key elements of the system are cautionary labeling of containers of WHMIS "controlled products", the provision of safety data sheets (SDSs) and worker education and training programs.

3.0 References

- 3.1 Additional definitions can be found in the Globally Harmonized System of Classification and Labelling of Chemicals (GHS), Hazardous Material Regulations (HMR), the Transportation of Dangerous Goods (TDG) Regulations, and the International Air Transport Association (IATA) Dangerous Goods Regulation (DGR).
- 3.2 S3AM-003-PR1 SH&E Training
- 3.3 S3AM-117-PR1 Hazardous Waste Operations
- 3.4 S3AM-208-PR1 Personal Protective Equipment

3.5 S3AM-209-PR1 Risk Assessment & Management

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 SH&E Manager / SH&E Department

- Audit their regional offices to confirm that they maintain a location-specific Hazardous Substance Inventory (HSI).
- Audit their regional offices to confirm that if a location-specific HSI is required, that current SDSs are available for each substance listed on the HSI.
- Provide interpretation of SDSs and hazard information for GHS labels/WHMIS labels/NFPA labels and other information to assist in training employees.
- Provide hazard communication training to AECOM employees and file documentation related to this training (e.g. trainer name, date trained, brief description of training, etc.).
- Review SDS for adequacy of completion to meet the OSHA and Canadian standard and returning them to supplier, if necessary.

4.1.2 Manager / Site Safety Officer (SSO) / Supervisor

- Have an operations-specific, written hazard communication program which at least describes how the requirements of this Procedure and the US OSHA and Canadian Hazard Communication requirements for labels and other forms of warning, safety data sheets, and employee information and training will be met.
- Appoint an SDS administrator for their location if they store or use hazardous substances.
- Confirm, if required, that the SDS Administrator maintains an HSI for their location.
- Confirm that a copy of this Procedure and the site-specific SDS are available to all employees (and/or their designated representative). Employees shall be instructed in the location of this Procedure and the SDSs.
- Confirm that all employees (including new employees) under their supervision have received the appropriate training required by this procedure prior to assigning employees to tasks involving the use of, or potential exposure to, hazardous substances.
- Notify employees of hazardous substances covered by this procedure that are used in their work area.
- Determine the potential fire, toxic, or reactivity hazards which are likely to be encountered in the handling or utilization of a hazardous substance and will communicate this information to their affected employees, before any are permitted to work with it.
- Confirm that a current SDS (is replaced as new versions are issued) is available for each hazardous substance used, or potentially encountered, in the work areas or on the projects that are under their supervision.
- Confirm hazardous substances are properly labelled.
- Notify subcontractors (working for AECOM) of any hazardous substances that are used or stored by AECOM to which the subcontractor's employees may be exposed.
- Notify clients or property owner/operators of chemicals brought onto their property by AECOM or AECOM's subcontractors.
- Request SDSs from all subcontractor organization for the relevant chemicals they bring onto an AECOM controlled site.
- Access or obtain, and maintain copies of SDS from:

- The product manufacturer or supplier;
- All AECOM subcontractors bringing chemicals onto the project site; and
- The client, for all of the client's chemicals to which AECOM or AECOM subcontract employees are potentially exposed.

4.1.3 Employee

- Confirm that they have received appropriate hazard communication training prior to working with materials that fall under the procedure.
- Only work with materials for which they have been instructed on how to find an SDS and how to work with that material safely.
- Utilize the appropriate Personal Protective Equipment (PPE) and spill containment materials as per the SDS.
- Provide a copy of all SDSs received to the SDS Administrator at their facility.
- Verify that an SDS is available in their work area for each hazardous substance that they use.

4.2 General Procedure

- 4.2.1 Confirm that containers of hazardous substances that they use are properly labelled. All employees have a right to, and should, know the properties and potential hazards of substances to which they may be exposed.
- 4.2.2 Should AECOM assign employees that do not read and speak English to tasks with chemical exposures, communications will be provided in the language understood by that employee.

4.3 Employee Information and Training

- 4.3.1 Training of employees on hazardous substances in their work area shall be conducted:
- At the time of their initial assignment;
 - Whenever a new hazardous substance is introduced into their work area; and
 - According to jurisdictional requirements (e.g., GHS, WHMIS, etc.).
- 4.3.2 As a minimum, the training requirements apply to employees in the following job categories:
- All employees who perform field work that involves the use of, shipping / receiving of, or potential exposure to, hazardous substances covered under the OSHA Hazard Communication Standard and WHMIS; and
 - Laboratory Employees.
- 4.3.3 The Initial Training will provide instruction in the following:
- Methods and observations that may be used to detect the presence or release of a hazardous substance in the work area (such as personal monitoring, visual appearance or odor of hazardous substances being released, etc.);
 - The physical and health hazards of substances in the work area and measures and procedures AECOM has implemented to protect employees; and
 - The details of this hazard communication program, including an explanation of the labelling system and the SDS, and how he/she can obtain and use appropriate hazard information;
 - Any operations in their work area in which hazardous substances are present;
 - Location and availability of this written hazard communications program (this procedure);
 - Their right to personally receive information regarding hazardous substances to which they may be exposed;

- Their right to have their physician receive information regarding hazardous substances to which they may be exposed; and
- Any relevant jurisdictional regulation, such as an employee's right against discharge or other discrimination (in California) due to the employee's exercise of rights afforded pursuant to provisions of the California Hazardous Substances Information and Training Act.

4.3.4 Periodic Training and Training for Non-Routine Tasks

Additional training will be provided to employees who have received initial training whenever:

- A new hazardous substance is introduced into their work area;
- A new or significantly increased risk has been identified related to an existing hazardous substance (e.g. as identified in an updated SDS); and
- Non-routine tasks are performed, which will potentially result in exposure to hazardous substances, or exposure under circumstances, which were not addressed during initial training.

Supervisors, in coordination with their SH&E Manager, shall provide such training through an explanation of the information on the contents of the SDS for that substance.

When training their employees, supervisors shall explain:

- Any health hazards associated with use of the substance or mixture;
- Proper precautions for handling;
- Necessary personal protective equipment or other safety precautions to prevent or minimize exposure; and
- Emergency procedures for spills, fire, disposal, and first aid.

For most projects involving field work, this periodic training requirement will be facilitated through the implementation of the site specific SH&E Plan that has been developed for the project.

4.3.5 Documentation of Initial and Periodic Training

- All training required shall be documented at the time it is performed by having the employee sign a copy of a training attendance sheet.

4.4 Hazardous Waste Exemption

- #### 4.4.1
- In the U.S., hazardous wastes are excluded from the state and federal Hazard Communication standards. AECOM employees who handle or are otherwise exposed to hazardous wastes are covered by the requirements of the Resource Conservation and Recovery Act (RCRA) and other local waste related laws and regulations and the OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) standard at 29 CFR 1910.120 and *S3AM-117-PR1 Hazardous Waste Operations*.

4.5 Hazardous Substance Inventory and Chemical Usage

Establishment of a Specific Hazardous Substance Inventory (HSI) or WHMIS Log, as referenced or contained within the safe to work plan, refer *S3AM-209-PR1 Risk Assessment & Management*, shall include:

- #### 4.5.1
- If an AECOM location uses or stores additional hazardous substances, a location-specific HSI or WHMIS Log shall be maintained at that location.
- #### 4.5.2
- If it is determined that an office-specific HSI is needed, the Manager shall confirm that one is developed and maintained by someone appointed as the location's SDS Administrator.
- #### 4.5.3
- The HSI or WHMIS Log may be hard copy or managed through an electronic SDS management system.

4.5.4 The content of the HSI or WHMIS Log shall be updated as new hazardous substances are procured for, or removed from the location, and shall be verified by the SH&E Manager through regular inspections of the location.

4.5.5 In order to meet the 30-years-after-employment-termination record retention requirement, the office or project specific HSIs shall be managed as a permanent record.

Prior to using any chemical, a Task Hazard Analysis (THA) shall be completed by the employees assigned to use the chemical. The analysis will identify the hazards associated with the chemical (e.g. review the SDS to identify carcinogens or extremely hazardous chemicals), the tasks to be performed, and prescribe the Personal Protective Equipment (PPE) to be used, refer to *S3AM-208-PR1 Personal Protective Equipment*.

4.6 Safety Data Sheets (SDS)

4.6.1 Location-Specific SDS Inventory

- If it is determined that an AECOM location is required to maintain a location-specific inventory SDSs for the specific hazardous substances shall be maintained on file at that location.
- The SH&E Manager shall audit the local office or project for SDS request and maintenance and report deficiencies to the appropriate management level, as necessary, to confirm compliance with this procedure.

4.6.2 Field Project Sites and Client Facilities

- The Project Manager and/or the Site Safety Officer shall access or obtain, and maintain copies of SDS from:
 - The product manufacturer or supplier;
 - All AECOM subcontractors bringing chemicals onto the project site; and
 - The client, for all of the client's chemicals to which AECOM or AECOM subcontract employees are potentially exposed.

4.6.3 Employee Access to SDSs

SDSs should be maintained at the local location that uses that hazardous substance. Copies of this program and the SDS should be made available to the employee upon request to the office's SDS Administrator.

4.6.4 Field Access to SDSs

When hazardous substances are brought into the field, the user shall confirm that a copy of the SDS for that substance accompanies it and is available at the field location where it is to be used.

4.6.5 SDSs for AECOM Products

It is unlikely that AECOM activities would create a chemical for which a new SDS were needed. If such a chemical were created, the SH&E Department shall work with the appropriate operations groups to draft, review, and publish the new SDS.

4.6.6 Content of the SDS:

- Safety Data Sheets, previously referred to as Material Safety Data Sheets, will now require a 16-section format that is essentially the same as the ANSI standard for Hazardous Workplace Chemicals-Hazard Evaluation and Safety Data Sheets and Precautionary Labeling Preparation (ANSI Z400.1 & Z129.1 – 2010).
- Section 1, Identification includes product identifier; manufacturer or distributor name, address, phone number; emergency phone number; recommended use; restrictions on use.
- Section 2, Hazard(s) identification includes all information regarding the hazards of the chemical and the appropriate warning information associated with the hazards including classification, signal word, hazard statement, pictograms, and precautionary statement.

- Section 3, Composition/information on ingredients includes information on chemical ingredients; trade secret claims.
- Section 4, First-aid measures includes important symptoms/ effects, acute, delayed; required treatment.
- Section 5, Fire-fighting measures lists suitable extinguishing techniques, equipment; chemical hazards from fire.
- Section 6, Accidental release measures lists emergency procedures; protective equipment; proper methods of containment and cleanup.
- Section 7, Handling and storage lists precautions for safe handling and storage, including incompatibilities.
- Section 8, Exposure controls/personal protection lists OSHA's Permissible Exposure Limits (PELs); Threshold Limit Values (TLVs); appropriate engineering controls; personal protective equipment (PPE).
- Section 9, lists the physical and chemical properties of the hazardous substance.
- Section 10, Stability and reactivity lists chemical stability and possibility of hazardous reactions.
- Section 11, Toxicological information includes routes of exposure; related symptoms, acute and chronic effects; numerical measures of toxicity.
- Section 12, Ecological information
- Section 13, Disposal considerations
- Section 14, Transport information
- Section 15, Regulatory information
- Section 16, Other information, includes the date of preparation or last revision.

SDSs that do not contain this information shall be returned to the distributor or manufacturer to be updated.

4.6.7 Trade Secrets

Some hazardous substance suppliers may claim the information requested on SDSs is proprietary and not provide the information to AECOM.

When SDSs supplied to the SH&E Manager indicate that proprietary information has been withheld, the SH&E Manager will either obtain the necessary information to make a hazard assessment or reject the material for use within AECOM.

4.6.8 For Canadian operations, all relevant SDS shall be current (no more than 3 years old) and readily available (in French and English) for all hazardous materials.

4.7 Labeling

4.7.1 Containers of hazardous substances used or stored in each AECOM location shall be labeled, tagged or marked with the following information:

- Product name or Identifier;
- Hazard Pictogram;
- Signal Word;
- Physical, Health, Environmental Statements;
- Supplemental Information;
- Precautionary Measures and Pictograms;

- First Aid Statements;
- Name and Address of Company; and
- Telephone Number.

4.7.2 Refer to *S3AM-115-ATT1 Pictograms & Sample Labels*.

4.7.3 Labels on containers shall not be removed or defaced. Labels or other forms of warning shall be legible, in English and French (Canada), and prominently displayed on the container.

4.7.4 Formal and informal inspections shall include observing that hazardous materials are properly labeled.

4.7.5 Immediately replace lost or illegible labels provided the product can be conclusively identified. Any failure to have the appropriate labeling information on a container at any time, or illegible or missing labels will be cause to suspend use of the product until the product is conclusively identified and is properly labeled.

4.7.6 Carcinogen Labeling

Chemicals which have been indicated as positive or suspect carcinogens by either OSHA, ACGIH, the International Agency for Research on Cancer (IARC) (World Health Organization), or the National Toxicology Program (NTP) will be considered to be carcinogenic for purpose of the HCS.

4.7.7 Stationary Process Containers

If there is stationary process equipment within a work area (e.g., vessels, piping systems, etc.), signs, placards, pictograms, process sheets, batch tickets, operating procedures, or other such written materials may be used in lieu of fixed labels on the containers, as long as the alternative method conveys the appropriate hazard information. The written materials shall be readily accessible to the employees in the work area.

4.7.8 Portable Containers

Portable containers of hazardous substances need not be labelled when the substance is transferred from labelled containers and will be used immediately by the employee who performs the transfer, however the container shall still contain the product identifier (name). Immediate use means the container will remain in the employee's immediate possession and direct oversight until the container is fully emptied or contents are returned to a labelled container.

Containers of hazardous substances transferred from labelled containers and not intended for the immediate use of the employee performing the transfer shall be labelled with the chemical name and a hazard warning label meeting workplace label requirements in accordance with the OSHA Hazard Communication Standard or WHMIS (as applicable to the given jurisdiction).

4.8 Chemical Storage

4.8.1 Hazardous chemicals are to be stored in labeled containers with the lids securely closed using appropriate undamaged caps or lids. Confirm liners are in place if used.

4.8.2 Flammable and combustible materials shall be stored in fire impervious cabinets in designated stockroom areas. Chemicals shall be stored in compliance with instructions provided on their labels, SDS, or the manufacturer's specifications (e.g. compatibility with other substances, environmental conditions, etc.).

NOTE: Flammable gases or other compressed gases should not be stored in flammable material cabinets as these cabinets are not designed for containment of pressurized gases.

4.8.3 All hazardous chemicals shall be stored in a manner that prevents spillage and leakage from exposing people or the environment to the chemical.

4.8.4 Hazardous chemicals shall not be stored with foods or beverages. Food and beverages shall not be consumed in areas where hazardous chemicals are used or stored.

4.9 Chemical Use in Offices

4.9.1 In general, hazardous substances should not be taken into office areas, conference rooms, or break areas, contact the SH&E Manager for guidance if this general requirement is infeasible.

4.9.2 General exceptions to this rule are the following:

- Liquid paper;
- Toner;
- Cleaners;
- Isobutylene calibration gas; and
- pH calibration solutions for instruments.

4.9.3 Each office or location using or storing hazardous materials will develop a written office/ location-specific Hazard Communication/WHMIS Program.

4.9.4 If the local office decides to implement the requirements of the standard in any way that differs from this procedure, they shall verify the changes with the SH&E Manager, document the changes, and communicate the differences to all affected employees.

4.10 Canada-specific

4.10.1 Consumer products are exempt from supplier labels and SDS requirements. Some cleaning solvents may be packaged as consumer products and these shall be labeled in accordance with the Consumer Product Act requirements.

4.10.2 In addition to the labelling of storage containers in the workplace, the contents of process piping (including valves), process vessels and reaction vessels are required to be identified through the use of colour coding, labels, placards or other modes of identifications that shall be communicated to workers through training programs. It is important for employees to be aware of and understand Client labelling requirements for these types of process systems.

5.0 Records

5.1 HSI or WHMIS Logs shall be retained in project or office files for a minimum of 30 years or according to jurisdictional requirements.

5.2 Training documentation shall be retained in accordance with *S3AM-003-PR SH&E Training*.

6.0 Attachments

6.1 S3AM-115-ATT1 Pictograms & Sample Labels

Hazardous Waste Operations

S3AM-117-PR1

1.0 Purpose and Scope

- 1.1 Provides requirements for AECOM operations pertaining to hazardous waste and emergency response (HAZWOPER) services. In Canada and South America, there is no direct counterpart to HAZWOPER; however, as due diligence and in compliance with applicable duty of care/general duty clauses, staff working in Canada and South America will comply with this procedure as far as it aligns with the location's respective legislation.
- 1.2 Provides a procedure intended to address small incidental spills from work related equipment and supplies. For operations with bulk quantities of fuels, chemicals, oils, and for operations where AECOM is providing emergency response services for spills, the SH&E Manager or designee shall specify spill prevention and preparedness criteria including training, equipment, and proficiency.
- 1.3 To define appropriate procedures to decontaminate both equipment and personnel when exposure to hazardous chemicals or physical agents has occurred.
- 1.4 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.

2.0 Terms and Definitions

- 2.1 **Contamination Reduction Zone (CRZ)** – The transition area between the contaminated area and the clean area where decontamination activities occur.
- 2.2 **Decontamination** – The process of removing or neutralizing contaminants that have accumulated on personnel or equipment.
- 2.3 **Emergency Response** – A response effort by employees from outside the immediate release area or by other designated responders (e.g., mutual-aid groups, local fire departments, etc.) to an occurrence that results, or is likely to result, in an uncontrollable release of a hazardous substance or whenever a release requires that a federal, state, territorial or provincial agency be notified, such as:
 - A release at or above a reportable quantity (RQ) of a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) hazardous substance (40 CFR 302.8) is required to be reported to the National Response Center (NRC).
 - A release at or above provincial reporting thresholds, if any, or alternatively those specified under the Canadian Transportation of Dangerous Goods Act are reportable under the Canadian Environmental Protection to the respective provincial or territorial Environmental Regulatory Agency .
 - A hazardous chemical release at or above an RQ under the Emergency Planning and Community Right-to-Know Act (EPCRA) (Title III under the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 350-372) is required to be reported to state and local officials.
 - A release in violation of a facilities Spill Prevention, Control, and Countermeasure (SPCC) Plan (40 CFR 112).

Responses to incidental release of hazardous substances where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area or by maintenance personnel are not considered to be emergency responses within the scope of the HAZWOPER standard. Responses to releases of hazardous substances where there is no potential safety or health hazard are not considered to be emergency responses.

- 2.4 **Exclusion Zone (EZ)** – The area where contamination does or could occur.

- 2.5 **First Responder** – First responders are individuals who are likely to witness or discover a hazardous substance release, injury, fire, or other incident and who have been trained to initiate an emergency response sequence by notifying the proper authorities of the release. They would take no further action beyond first aid, initial control of the incident, and notifying the authorities and others of the incident.
- 2.6 **Hazardous Materials** – A hazardous material is any item or agent (biological, chemical, physical) that has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors. Additionally a hazardous material may be defined as any substance or chemical which is a "health hazard" or "physical hazard," including chemicals that are carcinogens, toxic agents, irritants, corrosives, sensitizers; agents that act on the hematopoietic system; agents that damage the lungs, skin, eyes, or mucous membranes; chemicals that are combustible, explosive, flammable, oxidizers, pyrophoric, unstable-reactive, or water-reactive; and chemicals that in the course of normal handling, use, or storage may produce or release dusts, gases, fumes, vapor, mists, or smoke that may have any of the previously mentioned characteristics. This may be caused when released by spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, disposing into the environment, by being transported or moved, and items or chemicals that are "special nuclear source" or by-product materials or radioactive substances.
- 2.7 **Hazardous Materials Specialist** – Hazardous materials specialists are individuals who respond with and provide support to hazardous materials technicians. Their duties parallel those of the hazardous materials technician; however, those duties require a more directed or specific knowledge of the various substances they may be called upon to contain. The hazardous materials specialist would also act as the site liaison with federal, state, local, and other government authorities in regards to site activities.
- 2.8 **Hazardous Materials Technician** – Hazardous materials technicians are individuals who respond to releases or potential releases for the purpose of stopping the release. They assume a more aggressive role than a first responder in that they will approach the point of release in order to plug, patch, or otherwise stop the release of a hazardous substance.
- 2.9 **Hazardous Waste** – Hazardous waste is waste that is dangerous or potentially harmful to our health or the environment. Hazardous wastes can be liquids, solids, gases, or sludge. They can be discarded commercial products, like cleaning fluids or pesticides, or the by-products of manufacturing processes. Hazardous waste are divided into:
- Listed wastes (<http://www.epa.gov/osw/hazard/wastetypes/listed.htm>);
 - Characteristic wastes (<http://www.epa.gov/osw/hazard/wastetypes/characteristic.htm>);
 - Universal wastes (<http://www.epa.gov/osw/hazard/wastetypes/universal/index.htm#wastes>); and
 - Mixed wastes;
 - Specific procedures determine how waste is identified (<http://www.epa.gov/osw/hazard/wastetypes/wasteid/index.htm>), classified, listed, and delisted.
- 2.10 **Health and Safety Plan (SH&E PLAN)** – A document prepared for each project that contains site-specific information including the Emergency Response Plan for the project.
- 2.11 **Incidental Releases** - A response to a spill or release of a hazardous substance (in quantities below its RQ) where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area using equipment and materials available to them at the time or the spill or release. Any spill or release that cannot be managed with the personnel, materials, and equipment at the site shall be considered an Emergency Response.
- Responses to releases of hazardous substances where there is no potential safety or health hazard (i.e., fire, explosion, or chemical exposure) are not considered to be emergency responses. Handling of incidental releases shall be in accordance with applicable standard operating procedures.

- 2.12 **Incident Command System (ICS)** – ICS is a standardized on-scene incident management concept designed specifically to allow responders to adopt an integrated organizational structure equal to the complexity and demands of any single incident or multiple incidents without being hindered by jurisdictional boundaries. In the ICS the first person responding to an incident becomes the Incident Commander and turns that title and duties over to more qualified responders as they arrive on scene.
- 2.13 **Incident Commander** – The Incident Commander (IC) is responsible for all aspects of the response, including developing incident objectives and managing all incident operations. The title and responsibilities are typically assumed by a qualified IC from the client or public sector.
- 2.14 **Support Zone (SZ)** – An uncontaminated zone where administrative and other support functions (e.g. first aid, equipment supply, emergency information, etc.) are located.

3.0 References

- 3.1 SR1-003-WI2 Disruptive Event Response Instruction
- 3.2 S3AM-003-PR1 SH&E Training
- 3.3 S3AM-004-PR1 Incident Reporting, Notifications & Investigation
- 3.4 S3AM-010-PR1 Emergency Response Planning
- 3.5 S3AM-012-PR1 First Aid
- 3.6 S3AM-017-PR1 Injury & Illness Recordkeeping
- 3.7 S3AM-127-PR1 Exposure Monitoring
- 3.8 S3AM-128-PR1 Medical Screening & Surveillance
- 3.9 S3AM-208-PR1 Personal Protective Equipment
- 3.10 S3AM-209-PR1 Risk Assessment & Management
- 3.11 S3AM-213-PR1 Subcontractor Management

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 Manager

- Enforces and supports the implementation of SH&E Plans, Location Specific Emergency Response Plans, and Spill Response Plans;
- Prepare or request a SH&E Plan for every AECOM project with Hazardous Waste Operations and Emergency Response Activities, refer to *S3AM-209-PR1 Risk Assessment & Management*;
- Verify that all personnel working on the project are qualified to perform the activities they are assigned (see HAZWOPER and Emergency Spill Response Training requirements below);
- Request client's emergency response procedures;
- Appoint a Site Safety Officer (SSO) with appropriate qualifications for the specific hazardous waste project;
- Confirm that the SSO for complex projects, such as those with complicated remediation activities, has no duties other than site safety and health of the field team;
- Confirm the communication of the location-specific emergency response plan details to all employees assigned to a field project;
- Authorize the procurement of the necessary decontamination supplies;

- Verify that the applicable decontamination steps are clearly defined in the approved SH&E Plan;
- Verify staff are appropriately trained to execute the defined decontamination procedures;
- Verify that adequate staffing is available to safely conduct the applicable decontamination steps;
- Confirm that the necessary communications equipment for the project is available;
- Confirm that incident investigations are performed as required and a report is filed. Refer to *S3AM-004-PR1 Incident Reporting, Notifications & Investigation*;
- During spill response, all AECOM emergency responders and their communications shall be coordinated and controlled through the Manager. The individual in charge shall implement the and shall be responsible for the following tasks:
 - Become the individual in charge at the incident until relieved by more qualified personnel;
 - Notify the appropriate agency, the AECOM incident Reporting line, and operations. Refer to *S3AM-117-ATT1 Spill Notification Numbers North America* for US and Canadian required notifications;
 - Designate a safety supervisor who is knowledgeable about the operations being implemented at the emergency response site and who will have specific responsibility to identify and evaluate hazards and to provide direction on the safety of operations for the emergency at hand. If the safety supervisor judges activities to be an Immediately Dangerous to Life or Health (IDLH) and/or to involve an imminent danger condition, the safety supervisor shall have the authority to alter, suspend, or terminate those activities. The safety official shall immediately inform the individual in charge of the ICS of any actions needed to be taken to correct these hazards at the emergency scene;
 - Identify all hazardous substances or conditions present and address as appropriate site analysis, use of engineering controls, maximum exposure limits, hazardous substance, and handling procedures;
 - Implement appropriate emergency operations. Refer to *S3AM-010-Emergency Response Planning*;
 - Limit the number of emergency response personnel at the emergency site;
 - Implement the buddy system in groups of two or more;
 - Confirm that the PPE worn is appropriate for the hazards to be encountered;
 - Implement appropriate decontamination procedures after emergency operations have terminated.
- Responsibility for the emergency response shall be transferred upon arrival of a more qualified AECOM Incident Commander or a Public Service Incident Commander.
- Confirm appropriate communications concerning an emergency event are initiated as per *S3AM-010-PR1 Emergency Response Planning* and *SR1-003-WI2 Disruptive Event Response Instruction*.

4.1.2 SH&E Manager or designee

- Provide technical guidance for:
 - The development and implementation of SH&E Plans and Emergency Response Plans;
 - The Incident Commander regarding the correct way to respond to the spill;
 - Project-specific Spill Response Plans when required;

- Prepare emergency action plans as part of project SH&E Plans and emergency reference sheets;
- Interface with the local emergency responders when necessary;
- Interface with clients regarding facility emergency response procedures;
- Decide whether AECOM or an outside emergency response company will clean up the spill;
- Report spills, as necessary, to state/provincial environmental agencies;
- Review the incident report and facilitate the post-response discussion;
- Review and revise this procedure as necessary based on recommendations from post-response discussions;
- Advise Managers and Supervisors on the necessary decontamination procedures for the known or reasonably anticipated chemical hazards and physical agents associated with the planned scope of work;
- Support the project team to verify that adequate protective measures are in-place (e.g. Engineering Controls, Administrative Controls, Personal Protective Equipment, etc.).

4.1.3 Site Safety Officer (SSO)

- Verify that a SH&E PLAN is available for the project and is reviewed prior to the commencement of site activities;
- Conduct pre-entry briefing and daily tailgate meetings and review facility, site-specific emergency procedures, and site specific decontamination procedures;
- Communicate the site-specific emergency response details to all employees assigned to a field project;
- Establish the designated site work zones (e.g., EZ, CRZ, SZ, etc.);
- Enforce the applicable decontamination steps as defined in the approved SH&E Plan;
- Initiate Stop Work and emergency response procedures as required;
- Account for all AECOM and subcontractor employees after site evacuation;
- Brief on-site and off-site responders in the event of an emergency;
- Conduct site-specific training on the applicable decontamination steps/procedures;
- Procure the necessary decontamination supplies and establishing the decontamination line;

4.1.4 Employees

- Maintain HAZWOPER training, or equivalent training as it relates to the given jurisdiction;
- Follow the SH&E Plan and emergency procedures prepared for the project;
- Initiate Stop Work if necessary;
- Initiate emergency response via verbal communications or the alarm system if first to encounter an emergency;
- Follow the defined decontamination steps as stated in the approved SH&E Plan;
- Follow precautions and safe handling practices to avoid spills;
- Alert Manager to any deteriorating hazardous materials containers within the office or project area;
- Report all spills and leaks to the Manager immediately;
- Secure the spill area as quickly as possible and prevent the migration of exterior spilled materials or substances to drains or other openings; and

- 4.1.5 **All personnel** (e.g., AECOM employees, general laborers, equipment operators, chemists, supervisors, etc.) performing activities at hazardous waste sites that expose or potentially expose them to hazardous wastes and health hazards are considered HAZWOPER site workers and shall meet the training and medical surveillance requirements specified in 29 CFR 1910.120(e) and (f), respectively. Additional training may be required based on site activities including related exposures and risks (e.g., confined space entry, excavations, fall protection, other materials [lead], etc.). These additional training requirements are to be outlined in the project- or site-specific SH&E Plan.
- 4.2 Project SH&E Documentation—SH&E Plan
- 4.2.1 The project SH&E documentation prepared for HAZWOPER activities is referred to as a site-specific SH&E Plan, and shall meet the requirements presented in 29 CFR 1910.120(b)(4).
- 4.2.2 A safety and health risk or hazard analysis for each on-site task that will be performed.
- 4.2.3 The required SH&E Plan elements include:
- A description of the work location, the site history, and a summary of any information available concerning site hazards (including both physical hazards and contamination conditions);
 - A summary of the work activities to be performed under AECOM's scope of activities;
 - Identified risks shall include both chemical and physical hazards to which personnel may be exposed during the conduct of the work task;
 - Protective measures for each work task to prevent or mitigate the potential hazards identified in the hazard analyses;
 - Personal protective equipment (PPE) requirements for each work task. Refer to *S3AM-208-PR1 Personal Protective Equipment*;
 - Frequency and types of air monitoring, personal monitoring, and environmental sampling techniques and instrumentation to be used;
 - Site control measures;
 - Decontamination procedures;
 - An emergency response plan, *S3AM-010-PR1 Emergency Response Planning*, addressing actions to be taken in the event of each type of credible incident that might result during the performance of planned work activities, including minor and major injuries, and chemical release and fire. Response plans shall address the means for coordinating the evacuation of all on-site personnel in the event of a catastrophic incident.
- 4.2.4 Responsibility for development of each AECOM SH&E Plan will be coordinated between the Manager and the SH&E Manager or SH&E Department designee as part of project initiation. Regardless of where the SH&E Plan is developed, it will be reviewed and approved by the SH&E Manager prior to submission to any agency outside of AECOM.
- 4.2.5 Contractors and Subcontractors
- The health and safety of the employees of any contractor or subcontractor who does not have a contract directly with AECOM, and for whom AECOM does not have contractual safety oversight, is the responsibility of that contractor or subcontractor. The contractor or subcontractor shall evaluate the hazards and potential hazards to their own employees and shall adhere to their own Health and Safety Plan;
 - Subcontractors who maintain a contract directly with AECOM shall comply with AECOM SH&E program requirements. Refer to *S3AM-213-PR1 Subcontractor Management*;
 - In addition, all AECOM subcontractors' Health and Safety Plans shall, at a minimum conform to the requirements of the AECOM SH&E Plan. The AECOM SH&E Plan does not, nor is it intended to, address procedures of contractors or subcontractors during their site activities.

4.3 Personnel Qualifications— Training and Medical Surveillance

4.3.1 HAZWOPER-qualified employees shall participate in the following medical surveillance and training requirements. Medical surveillance and SH&E training requirements are further described in *S3AM-128-PR1 Medical Screening & Surveillance* and *S3AM-003-PR1 SH&E Training* respectively.

4.3.2 Employees receiving initial and refresher responder training shall be issued a certificate indicating training competency. Copies of all training records shall be maintained in accordance with the *S3AM-003-PR1 SH&E Training*.

4.3.3 Medical Surveillance

- Specific HAZWOPER medical examination protocols have been developed by AECOM's Corporate Medical Provider (CMP) to meet the requirements of 29 CFR 1910.120(f). To be medically qualified to perform HAZWOPER work, employees receive the following medical examinations:
 - Initial (Baseline) Examination — The initial examination is part of pre-employment requirements and shall be completed (with results received) prior to the employee's start of work date;
 - Annual Examination — HAZWOPER-qualified employees will complete a medical examination once each year. Medical qualification expires on the anniversary date of the last examination completed. There will be no "grace period" exemptions beyond this date without the express approval of the Region SH&E Manager. At the recommendation of the SH&E Department, the CMP may approve an alternate examination frequency at periods of up to two years (biennial) in cases in which the worker's exposures to environmental contaminants are infrequent and typically well below any occupational exposure limits (e.g., senior management personnel);
 - Termination Examination — When reassigned to non-HAZWOPER duties or at the conclusion of employment at AECOM, HAZWOPER-qualified personnel will be provided with the opportunity to receive a termination medical examination;
 - Special Examinations — The SH&E Department and the CMP will jointly determine the need for special examinations because of:
 - Unusual exposure conditions; and
 - In response to possible overexposures.
- The CMP will determine the medical protocol elements for each of these examinations based on exposure information provided by the SH&E Department. The CMP will evaluate the results of each Employee's examination and will provide a written statement of medical clearance clearly stating medical compliance with the HAZWOPER regulatory standard (29 CFR 1910.120(f)) and approval of the Employee to perform unrestricted HAZWOPER activities. For initial and annual examinations, the CMP will also evaluate the Employee for the use of air purifying and supplied air respiratory protection. The written evaluation from these examinations will indicate the CMP's approval/limitations on the Employee's use of respiratory protection;
- If an Employee does not wish to participate in part or in the complete medical surveillance program, and is permitted by the given jurisdiction, the employee shall provide a written statement of refusal. Refer to *S3AM-128-PR1 Medical Screening & Surveillance*;

4.3.4 Training - HAZWOPER

All personnel assigned to work at a hazardous waste site, sampling at Treatment, Storage and/or Disposal Facilities (TSDFs), or are performing Remediation and Investigation Activities, shall participate in training meeting the requirements of 29 CFR 1910.120(e), or equivalent training as it relates to the given jurisdiction. All personnel shall have the following training:

- 40-hour initial Training — Before being assigned to a HAZWOPER site, AECOM Employees shall complete 40 hours of off-site training meeting the requirements of 29 CFR 1910.120(e)(3)(i). At the conclusion of training, personnel will receive a written certification of course completion, signed by the instructor, that indicates the course of instruction (40-hour HAZWOPER) and training dates. A copy of this certification shall be provided to the employee's SH&E Manager. Employees are responsible for maintaining their own copy of this certificate and for presenting it to the SSO when working on any HAZWOPER site;
- 3 days of on-the-job training — The Employee shall receive 3 days of actual supervision by a trained experienced supervisor;
- Refresher 8-Hour Training — To remain qualified to perform on-site HAZWOPER work activities, each AECOM Employee will complete 8 hours of HAZWOPER refresher training meeting the requirements of 29 CFR 1910.120(e)(8) at yearly intervals following completion of Initial 40-hour training. At the conclusion of training, personnel will receive a written certification of course completion, signed by the instructor, that indicates the course of instruction (8-hour HAZWOPER Refresher) and the training date. A copy of this certification shall be provided to the employee's SH&E Manager. Employees are responsible for maintaining their own copy of this certificate and for presenting it to the SSO when working on any HAZWOPER site;
- 8-hour Supervisor 8-Hour Training - any AECOM Employee acting in a management capacity for HAZWOPER activities (e.g., project manager, site safety officers, etc.), including oversight of subcontractor HAZWOPER activities, shall complete an additional 8 hours of HAZWOPER Supervisor training meeting the requirements of 29 CFR 1910.120(e)(4). Although this training is required only once, supervisors shall maintain their overall HAZWOPER qualification through annual completion of refresher training. At the conclusion of Supervisor 8-Hour Training personnel will receive a written certification of course completion, signed by the instructor that indicates the course of instruction and the training date. A copy of this certification shall be provided to the SH&E Manager. Employees are responsible for maintaining their own copy of this certificate and for presenting it to the SSO when working on any HAZWOPER site;
- 24-Hour HAZWOPER Training — Site support contractors and site visitors may qualify to substitute 24-hour HAZWOPER training in place of 40-hour training, as specified in 29 CFR 1910.120(e)(3)(ii). Personnel potentially qualifying for this alternative training include:
 - Site support personnel who will not work in any Exclusion Zone areas;
 - Subcontractors and site visitors whose duties will not entail significant exposure to site contaminants defined as not working in any areas where airborne contaminant concentrations exceed one-half of any applicable occupational exposure limit, and no contact or exposure to materials with site contaminant concentrations exceeding natural background levels. The SH&E Manager shall approve the substitution of 24-hour training for initial 40-hour training. Persons qualifying for 24-hour training shall provide written certification of course completion prior to beginning work on site. Persons completing 24-hour training shall complete 8 hours of annual refresher training at the required interval to maintain eligibility for on-site work and shall provide proof of this training (as necessary to demonstrate retraining) prior to beginning work on site.

Available Training Sources:

- On-site training provided by the SH&E Department;
- Outsourced training providers approved by the SH&E Department;

4.3.5 Training – Emergency Response

On an as-needed basis, if a project requires AECOM to provide a HAZMAT emergency response team, the following training requirements shall be met:

- Operations Level – a minimum of 8 hours of initial and refresher training for those responsible for acting defensively in the case of a release, attempting to contain the release from a safe distance;
- HAZMAT Technician – at least 24 hours of initial training and 8 hours of refresher training. They will participate in operations-level training and know how to implement the emergency response plan for the facility/site/project location;
- HAZMAT Specialist – at least 24 hours of initial training and 8 hours of refresher training. They will be trained in the same content as the HAZMAT Technician, as well as in how to develop a site safety and control plan;
- Incident Commander – will have at least 40 hours of training covering the Operations Level training and techniques for implementing the emergency response plan and directing the incident. They will be knowledgeable in relevant regulations. The Incident Commander will become the individual in charge of a site-specific incident command system and will coordinate and control communications with external agencies;

4.3.6 Subcontractor Personnel Training Records

Any subcontractor organization whose employees will support AECOM operations at a HAZWOPER site will:

- Provide the Manager with a copy of their written HAZWOPER medical surveillance and training program requirements. The elements of the program(s) shall be similar to those for AECOM's own program, as detailed above. Refer to *S3AM-213-PR1 Subcontractor Management*;
- Provide the Manager with written certification of a physician's approved medical clearance for each employee who will work on the site. Certification can be demonstrated by:
 - A copy of the physician's signed medical clearance for each employee (preferred); or
 - A letter identifying the medical status and clearance expiration date of every employee, signed by the company's safety director or an officer of the company.
 - A copy of the each employee's training certifications, which will include:
 - The initial 40-hour training certificate (24-hour training may be substituted with SH&E Manager approval);
 - The most current Refresher training certificate (shall be current within the previous one-year period);
 - A copy of the Supervisor training certificate for each person serving in a site supervisory capacity (e.g., project manager, site safety officers, etc.).

4.4 HAZWOPER and Spill Response Equipment

4.4.1 Specific HAZWOPER activity and spill response equipment shall be identified in the site specific SH&E PLAN. All AECOM offices and project sites that store chemicals at their location shall have the appropriate spill response equipment. Such equipment may include the following:

- Over-pack containers of varying capacities;
- Absorbent material such as vermiculite or commercially prepared, absorbent containing pillows, rolls, sheets, or booms;
- Acid and base neutralizing agents;
- Chemically resistant gloves for solvents, alcohols, and acids;
- Poly-coated Tyvek coveralls;
- Safety goggles;
- Respiratory protection;

4.4.2 Spill response equipment shall be placed adjacent to areas where chemicals are routinely handled, stored, and/or where shipments are received. Similar types of spill response equipment shall also be available in any AECOM vehicle or rented vehicle in which chemicals are being transported. Location of spill response equipment shall be selected to permit access outside of likely spill locations.

4.4.3 Spill Response Equipment for Field Programs

- The amount of chemicals being used during a field program will dictate the types and quantity of spill response equipment that is brought to the site;
- If several squirt bottles of decontamination solution are all that is being brought to a site, a few spill pillows and a one-gallon bucket (3.8 liters) may be sufficient to respond to a spill of these materials;
- If gallons of chemicals are being delivered to the site in drums or bulk tanks, a greater variety of spill response equipment will be needed. As indicated previously, during these types of field programs, a separate spill plan will be incorporated into the project or site specific SH&E Plan, and will provide a greater level of detail regarding the specific spill response effort for that field program. Refer to *S3AM-209-PR1 Risk Assessment & Management*;

4.5 Personal Protective Equipment (PPE) Ensembles

4.5.1 Defined HAZWOPER PPE ensembles are specified for general use on all AECOM HAZWOPER operations. The project SH&E Plan may specify modifications to these requirements to meet site-specific conditions. Refer also to *S3AM-208-PR1 Personal Protective Equipment* for additional information concerning PPE requirements.

4.5.2 Level D Ensemble

The Level D ensemble provides a minimal level of skin protection (primarily against physical rather than chemical hazards) and no respiratory protection. Level D PPE is the minimum work uniform to be used on HAZWOPER sites. Its use is appropriate when there is no significant potential for encountering hazardous substances or health hazards while working in controlled work areas.

Level D Equipment List:

- Hard hat;
- Eye protection;
- Safety-toe work boots;
- Shirts with sleeves and long pants (shorts are unacceptable for use); and
- Hearing protection (as required).

4.5.3 Modified Level D Ensemble

The Modified Level D ensemble provides moderate skin protection against contact with hazardous substances, but no respiratory protection. Its use is appropriate where there is a moderate-to-low potential for skin contact with known hazardous substances and health hazards, but no significant inhalation hazard is anticipated. The Modified Level D ensemble will consist of the Level D ensemble, supplemented by the addition of one or more of the following items:

Modified Level D Equipment List:

- Full faceshield;
- Plain (uncoated) disposable coveralls;
- Chemical-resistant disposable outer coveralls;

- Chemical-resistant outer gloves taped to outer coveralls;¹
- Chemical-resistant inner gloves; and¹
- Chemical-resistant safety-toe boots (taped to outer coveralls).

4.5.4 Level C Ensemble

The Level C ensemble provides moderate skin protection against contact with hazardous substances and moderate respiratory protection. Its use is appropriate where there is the potential for skin contact with known hazardous substances and health hazards, together with a limited and well-defined potential for exposure via inhalation.

Level C Equipment List:

- Full-face air-purifying respirator (APR) equipped with cartridge types as designated in the project SH&E PLAN;²
- Plain (uncoated) disposable coveralls;
- Chemical-resistant disposable outer coveralls;
- Chemical-resistant outer gloves taped to outer coveralls;³
- Chemical-resistant inner gloves;
- Hard hat;
- Safety-toe boots taped to coveralls; the use of boot covers (e.g., booties) or chemical-resistant boots may be specified; and
- Hearing protection (as required).

4.5.5 Level B Ensemble

The Level B ensemble provides both the highest level of inhalation exposure protection and considerable skin contact protection. Its use is appropriate where there are significant known or suspected hazardous substances and health hazards, involving both skin and inhalation exposure (up to and including Immediately Dangerous to Life or Health [IDLH] conditions) or where adverse atmospheric conditions cannot be mitigated by use of air purifying respirators (e.g. oxygen deficient atmospheres or chemicals with poor warning properties). The use of Level B PPE requires prior approval by the SH&E Manager.

Level B Equipment List:

- Supplied air respirator (SCBA or airline system with Grade D or better breathing air);
- Chemical-resistant disposable outer coveralls;
- Chemical-resistant outer glove taped to outer coveralls;³
- Chemical-resistant inner gloves;³
- Hard hat;
- Chemical resistant safety-toe boots taped to coveralls; and
- Hearing protection (as required).

¹ Selection of specific glove types/materials will be provided in the project SH&E Plan based on consideration of the contaminants and the physical conditions of the work.

² Selection of specific cartridges will be made by the SH&E Department (or Competent Person – Respiratory Protection as designated by the SH&E manager) based on contaminants present. A cartridge change-out frequency will also be specified in the SH&E based on the manufacturer's cartridge performance data.

³ Selection of specific glove types/materials will be provided in the project SH&E based on consideration of the contaminants and the physical conditions of the work.

4.5.6 Level A Ensemble

The Level A ensemble provides the highest level of both respiratory and skin protection, up to and including protection against skin contact with vapor-phase contaminants. The use of Level A PPE requires prior approval by the Americas SH&E Director.

Specific Level A ensemble components will be determined on a case-by-case basis by the SH&E Department.

4.6 Emergency Response Plans

- 4.6.1 A Location Specific Emergency Response Plan shall be developed and implemented to handle anticipated emergencies prior to performing emergency response operations. The plan shall be in writing and available for inspection and copying by employees, their representatives, and OSHA personnel. The plan shall be reviewed and approved by the SH&E Manager prior to issue.
- 4.6.2 AECOM'S *S3AM-010-PR1 Emergency Response Planning* shall apply and employees shall evacuate from the danger area whenever an emergency occurs, provided the associated contract does not require AECOM to provide emergency response services
- 4.6.3 AECOM Employees are not expected to take action or to participate in rescues or responses to chemical releases beyond the initial discovery of the release and immediate mitigation actions such as closing a valve, placing absorbents, and notifying the client and or public emergency response system (911).
 - If AECOM Employees are to participate in the response to a chemical release beyond the initial reaction, there shall be a contractual provision for this response and the Employees shall be specifically trained for this response;
 - This document is designed to provide guidelines on how to prepare a written plan that will confirm prompt and proper response to an emergency situation that arises during field investigations and to outline the duties of AECOM Employees during a field emergency and the associated training requirements.
- 4.6.4 Site specific SH&E plans that are prepared to comply with the HAZWOPER standard (29 CFR 1910.120) shall address emergency response. This standard specifically outlines the elements that shall be contained in an emergency response plan. However, the definition of emergency response, as written in 29 CFR 1910.120, focuses on emergencies involving the uncontrolled release of hazardous substances. Under 29 CFR 1910.120, an employer can opt to evacuate employees from the danger area when such an emergency occurs. AECOM does not expect its Employees to actively assist in the handling of uncontrollable chemical releases that may occur during the implementation of field programs. As such, and as provided by the HAZWOPER standard, AECOM is exempt from the emergency response plan requirements of the standard as long as it provides an emergency action plan within the SH&E PLAN that complies with 29 CFR 1910.38 (a). Therefore, all emergency response plans required under 29 CFR 1910.120 will be written to comply with 29 CFR 1910.38 (a).
 - There are two types of emergency situations that AECOM personnel shall be prepared for and that shall be addressed in the emergency response plan. These include:
 - Emergencies related to the operations of our clients at the facility where AECOM is working;
 - Emergencies related to our own on-site activities/investigations.
 - Employees are not to accept the role of Incident Commander without specific authority from the SH&E Manager and the Manager responsible for the project. Assuming the role of the Incident Commander requires training beyond the scope of this Procedure.

4.6.5 The HAZWOPER standard does not prohibit AECOM Employees from performing limited response activities.

- Appropriately trained AECOM Employees can provide voluntary First Aid services;
- AECOM Employees can provide response assistance by placing absorbent pillows or vermiculite around a small, contained spill that occurs during sampling efforts;
- Refer to Spill Response, Incidental procedures contained herein which describes the specific procedures that AECOM will follow when responding to an incidental chemical spill.

4.6.6 Field Project Preparation

- Every SH&E Plan that is prepared by AECOM will contain a Location Specific Emergency Response Plan in which the required elements of an emergency action plan will be addressed. Refer to *S3AM-010-PR1 Emergency Response Planning*;
- When AECOM is working at an operating facility, the emergency response procedures of the facility will be appended to the SH&E Plan or the Location Specific Emergency Response Plan;
- As a minimum, each emergency response plan shall contain the following topics as required by 29 CFR 1910.38 (a):
 - Procedures and contact information for reporting emergencies to public service responders and on-site (client or host employer) emergency control centers;
 - Pre-emergency planning and coordination with outside parties;
 - Emergency escape procedures and emergency escape route assignments;
 - Procedures to be followed by employees who remain to operate critical site operations before they evacuate;
 - Procedures to account for all employees after emergency evacuation is complete;
 - Rescue and medical duties for those employees who are trained to perform them;
 - Preferred means of reporting fires and other emergencies;
 - PPE to protect employees from expected exposures and potential exposures during an emergency;
 - Names of persons or departments who can be contacted for further information (i.e. emergency reference sheet);
 - Site security and control;
 - Availability of medical surveillance for workers who might have been exposed to chemicals, bloodborne pathogens, or other biological agents as a result of project work or emergency response;
 - Emergency medical treatment and first aid;
 - Emergency alerting and response procedures;
 - Critique of response and follow-up.
- In addition, each plan shall establish the specific alarm system that will be used on site to warn employees of an AECOM emergency. The chosen alarm signals should not conflict with alarm signals already in place at the facility.

4.6.7 Client Facility Emergency Response Procedures

- AECOM implements field programs on active properties, including manufacturing facilities. These facilities have typically developed an emergency response plan that is specific to facility-related emergencies. If AECOM is working at an operating facility, emergency procedures established by the facility shall be followed in the event of a facility catastrophe.

AECOM personnel shall be aware of and familiar with the alarm signals used at the facility to alert personnel to an emergency. AECOM personnel shall also know where to assemble in the event of a facility evacuation as the facility shall be able to account for all personnel, including subcontractors such as AECOM in the event of an evacuation.

- The first priority in AECOM's preparation of a project emergency action plan is to confirm that the responsibilities under the client's emergency response plan are fully understood. Because of the nature of their business, many of our clients have in-house fire brigades, medical staff, and hazardous materials teams that can assist AECOM in the event of an emergency related to our field activities. In many instances, our clients prefer or require that subcontractors seek emergency assistance through their facility first before calling outside responders to the site.
- A copy of the facility's procedures shall be made available to AECOM so that the information can be incorporated into the SH&E Plan or attached to the Location Specific Emergency Response Plan. If this information is not available to AECOM prior to arriving on site, the SSO shall meet with client representatives upon arrival to the facility to review procedures in the event of an emergency related to plant operations.

4.6.8 Escape Routes and Procedures

Although emergency evacuation procedures are included in AECOM's initial 40-hour HAZWOPER training, emergency procedures at each site will be different. Employees shall be instructed about the location specific emergency response plan. Updating training is required anytime escape routes or procedures change. An evacuation drill will be conducted for projects that are scheduled for one month or longer. Visitors and untrained employees shall not be allowed into the project area until they receive a safety briefing including evacuation alarms and procedures.

Prior to the commencement of on-site activities, the SSO shall determine how AECOM employees will evacuate each AECOM work area of the site:

- Two or more routes that are separate or remote from each other for each work area shall be identified. Multiple routes are necessary in case one is blocked by fire or chemical spill. These routes shall not overlap because, if a common point were obstructed, all intersecting routes would be blocked;
- Prominent wind direction should also be considered when designating escape routes and assembly areas. Escape routes and assembly areas should be upwind of the site whenever possible;
- Upon arrival to the site, the SSO shall verify that the selected routes are appropriate for evacuation. During an emergency, the quickest and most direct route should be selected. However, when working at an operating facility, the established escape routes of the facility should be used whenever possible;
- In the event of a facility-related emergency, all AECOM employees shall meet at the facility's assembly area so that the client can verify that AECOM has evacuated the property.

4.6.9 Alarm Signals

An emergency communication system shall be in effect at all sites.

- The most simple and effective emergency communication system in many situations will be direct verbal communications. However, verbal communications shall be supplemented any time voices cannot be clearly perceived above ambient noise levels and any time a clear line of sight cannot be easily maintained among all AECOM personnel because of distance, terrain, or other obstructions;
- Portable two-way radio communications may be used when employees shall work out of the line of sight of other workers;
- When it is necessary to supplement verbal communications, Employees shall be informed of the established emergency signals. The following emergency signals, or other appropriate signals, shall be implemented using handheld portable air horns, whistles, or similar devices.

Signals shall be capable of being perceived above ambient noise by all employees in the affected portions of the workplace:

- One Blast: General Warning—A relatively minor and localized, yet important, on-site event. An example of this type of an event would be a minor chemical spill where there is no immediate danger to life or health yet personnel working on the site should be aware of the situation so that unnecessary problems can be avoided. If one horn blast is sounded, personnel shall stop all activity and equipment on-site and await further instructions from the SSO;
- Three Blasts: Medical Emergency—A medical emergency for which immediate first aid or emergency medical care is required. If three horn blasts are sounded, all First Aid Providers should respond as appropriate. All other activity and equipment should stop and personnel should await further instructions from the SSO;
- Three Blasts Followed by One Continuous Blast: Immediate Threat to Life and Health — A situation that could present an immediate danger to life and health of personnel onsite. Examples include fires, explosions, large hazardous chemical release, severe weather-related emergencies, or security threats. If three horn blasts followed by a continuous blast are sounded, all activity and equipment shall stop. All personnel shall evacuate the site and meet in the designated assembly area where the SSO will account for all employees. The SSO will arrange for other emergency response actions if necessary. Information concerning the need to follow decontamination procedures during an emergency evacuation will be addressed in the Location Specific Emergency Response Plan;
- The SSO or his designate will acknowledge the distress signal with two short blasts on the air-horn or whistle;
- One Continuous Blast Following Any of the Above: All Clear/Return to Work — Personnel who sound the initial alarm are required to send an all clear signal when the emergency is over.

4.6.10 Accounting Method for All Employees after Evacuation

The SSO is responsible for determining that all AECOM employees have been successfully evacuated from the work area(s):

- It is the responsibility of each AECOM subcontractor to verify that all of its employees evacuated the site and to report this information to the SSO. All employees shall meet at the designated assembly area;
- A headcount is an acceptable way to determine complete evacuation when the field team is of a small size. The site log-in book or equivalent should be referenced when attempting to account for more than 10 people. In the event of a facility-related emergency, the SSO shall notify facility representatives that all AECOM employees and AECOM subcontract employees have successfully evacuated the work area(s);
- The SSO shall notify emergency responders if any employee is unaccounted for and where on the site they were last seen;
- In the event of a project-related emergency, the SSO will provide off-site emergency responders or on-site HAZMAT teams or fire brigades (Incident Commander) with all available knowledge about the emergency situation upon their arrival to the scene.

4.6.11 Employees Who Remain to Operate Critical Site Operations Before They Evacuate

All equipment and operations are required to cease in accordance with the established alarm signal procedures. The only exception will be related to health and safety:

- The SSO shall determine at the time of the emergency if health and safety will be jeopardized by immediate stoppage of any particular piece of equipment;

- If such a determination is made, personnel involved in critical operations shall be minimized. Once it is determined that the operation is no longer needed or the threat to the operators is imminent, operations will cease and the operators will immediately evacuate.

4.6.12 Rescue and Medical Response

- Only currently trained individuals will administer first aid, CPR or an AED. Refer to *S3AM-012-PR1 First Aid*.
- In the event of an incident, refer to material's SDS labels to confirm proper first aid is administered for the hazardous material and call the nearest Poison Centre or 911. Refer to *S3AM-012-PR1 First Aid*.
 - The American National Standards Institute (ANSI) Standard for Emergency Eyewash and Shower Equipment (ANSI Z358.1-1998) recommends that the affected body part shall be flushed immediately and thoroughly for at least 15 minutes using a large supply of clean fluid under low pressure. However, other references recommend a minimum 20-minute flushing period if the nature of the contaminant is not known. The flushing or rinsing time can be modified if the identity and properties of the chemical are known. For example, at least:
 - 5 minutes flushing time for mild irritants;
 - 20 minutes for moderate to severe irritants;
 - 20 minutes for non-penetrating corrosives;
 - 60 minutes for penetrating corrosives;
 - If irritation persists, repeat the flushing procedure.
- It is important to note that ingestion of any chemical is not likely to occur in the workplace. If ingestion does occur, evidence indicates that inducing vomiting is not necessary in most situations where there has been an occupational chemical ingestion.
 - Induction of vomiting should only be recommended if the chemical has very high, short-term (acute) toxicity, and medical follow-up is not readily available;
 - In these cases, first aiders should receive special training on how to safely and effectively induce vomiting in the appropriate circumstances.
- If the injury is life threatening, the Emergency Medical System (EMS) should be called (911). Depending on the procedures established for the project, the SSO would contact an emergency responder directly or notify the facility representatives for medical assistance;
- If the employee needs medical attention that cannot be provided on-site, the SSO shall escort the individual to the local hospital identified on the emergency reference sheet and shall remain with the person until release or admittance is determined. The escort will relay all appropriate medical information to the Manager and SH&E Manager.

4.6.13 On-site and Off-site Communications

Regardless of the size or location of AECOM's field projects, it is extremely important that both on-site and off-site communications be maintained so that in the event of an emergency employees can contact each other or place a phone call immediately with the appropriate responder(s).

A reliable and approved form of communication (e.g. two way radio, cell phone, etc.) is required when members of the field team are working in separate areas of the site and verbal communications are no longer effective because of distance. A communication device shall be available for each team that is working in a separate area of the site.

When AECOM is working at an occupied facility, a telephone may be accessible. When AECOM is working on abandoned properties or when there is no access to a phone, as appropriate, a cellular telephone, two-way radio, or satellite telephone shall be brought to the work location.

4.6.14 Preferred Means of Reporting

Employees shall immediately notify the Supervisor of incidents and emergencies, and report in accordance with *S3AM-004-PR1 Incident Reporting, Notification & Investigation*:

- Unless facility representatives specifically indicate that they prefer AECOM personnel to notify them first of an emergency, the SSO will directly contact the appropriate emergency responders listed on the Location Specific Emergency Response Plan;
- Additional communications within AECOM concerning an emergency event may be required as per *S3AM-010-PR1 Emergency Response Planning* and *SR1-003-WI2 Disruptive Event Response Instruction*;
- "Dangerous occurrences" shall be reported immediately to the police, employer, vehicle owner/lesser and the dangerous goods owner. Such events would include spills, bulk container damage, fire, explosion, and transportation accidents involving dangerous goods;
- Confirm and seek direction on external reporting requirements. Each jurisdiction has regulations governing the minimum quantities for reporting based on the type of product spilled or release refer to *S3AM-117-ATT1 Spill Notification Numbers for North America*;

Individuals who have knowledge of a spill, release, or unlawful discharge, shall notify authorities immediately. Reporting does not imply guilt or assign blame. The following details are to be reported:

- Location and time of spill;
- Description of circumstances leading to spill;
- Type and quantity of material or substance spilled;
- Details of any action taken at the site of the spill;
- Description of location of spill and immediately surrounding the area;
- Any additional information in respect of the spill that the Minister, Environmental Protection Officer or person designated by regulations requires.

4.6.15 First Responder

First responders shall have sufficient training or have had sufficient experience to objectively demonstrate competency in the following areas:

- An understanding of what hazardous substances are, and the risks associated with them in an incident;
- An understanding of the potential outcomes associated with an emergency;
- The ability to recognize the presence of hazardous substances and physical hazards in an emergency;
- An understanding of the role of the first responder;
- The ability to realize the need for additional resources and to make appropriate notifications to the communication center.

4.6.16 First Responder HAZWOPER Operations Level

First responders at the operations level are individuals who respond to releases or potential releases of hazardous substances as part of the initial response to the site for the purpose of protecting nearby persons, property, or the environment from the effects of the release:

- They are trained to respond in a defensive fashion without actually trying to stop the release; Their function is to contain the release from a safe distance, keep it from spreading, and prevent exposures;

- First responders at the operational level shall have received at least eight hours of training or have had sufficient experience to objectively demonstrate competency in the following areas in addition to those listed for the awareness level and the employer shall so certify:
 - Knowledge of the basic hazard and risk assessment techniques;
 - Know how to select and use proper personal protective equipment provided to the first responder operational level;
 - An understanding of basic hazardous materials terms;
 - Know how to perform basic control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available with their unit;
 - Know how to implement basic decontamination procedures;
 - An understanding of the relevant standard operating procedures and termination procedures;

4.6.17 Hazardous Materials Technician

Hazardous materials technicians shall have received at least 24 hours of training equal to the first responder operations level and in addition have competency in the following areas and the employer shall so certify:

- Know how to implement the employer's emergency response plan;
- Know the classification, identification, and verification of known and unknown materials by using field survey instruments and equipment;
- Be able to function within an assigned role in the Incident Command System, refer to *Federal Emergency Management Agency—FEMA: Incident Command System*;
- Know how to select and use proper specialized chemical PPE provided to the hazardous materials technician;
- Understand hazard and risk assessment techniques;
- Be able to perform advance control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available with the unit;
- Understand and implement decontamination procedures;
- Understand termination procedures;
- Understand basic chemical and toxicological terminology and behavior.

4.6.18 Hazardous Materials Specialist

Hazardous materials specialists shall have received at least 24 hours of training equal to the technician level and in addition have competency in the following areas and the employer shall so certify:

- Know how to implement the local emergency response plan;
- Understand classification, identification, and verification of known and unknown materials by using advanced survey instruments and equipment;
- Know the state or applicable jurisdictional emergency response plan;
- Be able to select and use proper specialized chemical PPE provided to the hazardous materials specialist;
- Understand in-depth hazard and risk techniques;
- Be able to perform specialized control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available;

- Be able to determine and implement decontamination procedures;
- Have the ability to develop a site safety and control plan;
- Understand chemical, radiological, and toxicological terminology and behavior.

4.7 Decontamination Procedures

- 4.7.1 When possible, all necessary steps shall be taken to reduce or minimize contact with chemicals and impacted materials while performing field activities (e.g., avoid sitting or leaning on, walking through, dragging equipment over, tracking, or splashing potential or known impacted materials).
- 4.7.2 All personal decontamination activities shall be performed with an attendant (buddy) to provide assistance to personnel that are performing decontamination activities. An attendant may not be required for Level D equipment removal and decontamination. Depending on specific site hazards, attendants may be required to wear a level of protection that is equal to the required level in the exclusion zone.
- 4.7.3 All persons and equipment entering the EZ shall be considered contaminated, and thus, shall be properly decontaminated prior to entering the SZ. No equipment, including personal protective equipment or contaminated clothing shall be taken or worn into the SZ.
- 4.7.4 Decontamination procedures may vary based on site conditions and nature of the contaminant. If chemicals or decontamination solutions are used, care should be taken to minimize reactions between the solutions and contaminated materials. In addition, personnel shall assess the potential exposures created by the decontamination chemical(s) or solutions. The safety data sheets shall be reviewed, implemented, and filed by personnel contacting the chemicals/solutions.
- 4.7.5 All contaminated personal protective equipment (PPE) and decontamination materials shall be stored and disposed of in accordance with site-specific requirements identified in the approved work plan.
- 4.7.6 For all Level A and B ensembles, adequate supplied air shall be available to allow the employee to safely complete all necessary decontamination steps.
- 4.7.7 Where decontamination procedures involving radioactive materials are required, the removable limits for both personnel and equipment will be specified by a Certified Health Physicist or Certified Industrial Hygienist in the project's approved Radiation Protection Plan or approved safety planning document.
- 4.7.8 Materials Needed to Decontaminate Personnel and/or Equipment
- The equipment required to perform decontamination may vary based on site-specific conditions and nature of the contaminant(s). The following equipment is commonly used for decontamination purposes:
 - Soft-bristle scrub brushes or long-handled brushes to remove contaminants;
 - Hoses, buckets of water or garden sprayers for rinsing;
 - Large plastic/galvanized wash tubs or children's wading pools for washing and rinsing solutions;
 - Large plastic garbage cans or similar containers lined with plastic bags for the storage of contaminated clothing and equipment;
 - Metal or plastic cans or drums for the temporary storage of contaminated liquids;
 - Paper or cloth towels for drying protective clothing and equipment; and
 - Poly or plastic sheeting to lay down and form the base for the CRZ, as well as to contain contaminants and decontamination fluids.

4.7.9 Personal Decontamination Steps

- The decontamination plan shall be in writing and shall specify the exact steps in either wet or dry decontamination or personnel exiting the EZ to the SZ. The decontamination plan shall also address respirator cartridge change out, SCBA bottle changes and equipment decontamination.

4.7.10 Decontamination Steps during a Medical Emergency

- If decontamination can be done:
 - Wash, rinse and/or cut off protective clothing and equipment.
- If decontamination cannot be done:
 - Wrap the victim in blankets, plastic sheeting, or rubber to reduce contamination of other personnel;
 - Alert emergency and offsite medical personnel to potential contamination;
 - Instruct them about specific decontamination procedures if necessary;

4.7.11 Equipment Decontamination Steps

- All equipment leaving the EZ shall be considered contaminated and shall be properly decontaminated to minimize the potential for exposure and off-site migration of impacted materials. Such equipment may include, but is not limited to: sampling tools, heavy equipment, vehicles, PPE (hoses, cylinders, etc.), and various handheld tools;
- All Employees performing equipment decontamination shall wear the appropriate PPE to protect against exposure to contaminated materials. The level of PPE may be equivalent to the level of protection required in the EZ. Other PPE may include splash protection, such as face-shields and splash suits, and knee protectors. Following equipment decontamination, Employees may be required to follow the proper personal decontamination procedures above;
- For larger equipment, a high-pressure washer may need to be used. Some contaminants require the use of a detergent or chemical solution and scrub brushes to confirm proper decontamination. Personnel operating a high pressure washer will be trained in the operation of the equipment and follow the manufacturer's operational instructions;
- For smaller equipment, use the following steps for decontamination:
 - Remove majority of visible gross contamination in EZ;
 - Wash equipment in decontamination solution with a scrub brush and/or power wash heavy equipment;
 - Rinse equipment;
 - Visually inspect for remaining contamination;
 - Follow appropriate personal decontamination steps outlined above.
- All decontaminated equipment shall be visually inspected for contamination prior to leaving the CRZ. Signs of visible contamination may include an oily sheen, residue or contaminated soils left on the equipment. All equipment with visible signs of contamination shall be discarded or re-decontaminated until clean. Depending on the nature of the contaminant, equipment may have to be analyzed using a wipe method or other means.

4.8 Employee Exposure Monitoring

- #### 4.8.1
- Explosive levels, oxygen levels, and airborne contaminants may present potential hazards to HAZWOPER personnel working within controlled work areas and to non-HAZWOPER workers and the general public present outside the controlled work areas.

- 4.8.2 As appropriate, exposure monitoring at HAZWOPER sites will be conducted to determine explosive and oxygen levels, monitor and control employee exposures to airborne contaminants, and to determine and regulate controlled work area boundaries (e.g., support zone, contamination reduction zone, and exclusion zone) for the protection of non-HAZWOPER workers and the general public.
- 4.8.3 Specific exposure monitoring requirements will be established in individual SH&E Plans. Refer to *S3AM-127-PR1 Exposure Monitoring*. All monitoring efforts using direct reading instruments and will remain part of the project file.
- 4.8.4 Work Area Exposure Monitoring
 - Work area exposure monitoring will include breathing zone readings for the maximum exposed worker(s);
 - Results will be used to determine adequacy of PPE (especially respiratory protection). Specific criteria for upgrade/downgrade will be established in the SH&E Plan.
- 4.8.5 Perimeter Exposure Monitoring
 - Perimeter air samples will be collected when the potential exists for airborne contaminants to migrate off-site and will be collected near the work zones when performing work at an active client facility. Refer to *S3AM-127-PR1 Exposure Monitoring*;
 - Perimeter exposure monitoring will be conducted at locations downwind from the project activities at a minimum (also upwind if the potential exists for offsite contamination to migrate onto the site).
- 4.8.6 Exposure results will be posted on site and explained in a safety briefing.
- 4.8.7 Employees will receive a written statement of results within 15 days of receipt from the laboratory.
- 4.8.8 Results of all personal exposure monitoring will be provided to the SH&E department for inclusion in the employee medical records, refer to *S3AM-017-PR1 Injury & Illness Recordkeeping*.

5.0 Records

- 5.1 All forms and documents generated during a HAZWOPER project will be maintained in the project file.
- 5.2 All medical screening and surveillance documentation shall be retained for 30 years.

6.0 Attachments

- 6.1 [S3AM-117-ATT1](#) [Spill Notification Number for North America](#)

Americas

Spill Notification Numbers for North America

S3AM-117-ATT1

Jurisdiction	Name	Phone
Within the United States		
National Response Center		1-800-424-8802
AECOM Incident Reporting Number		1-800-348-5046
Within Canada		
AECOM Incident Reporting Number		1-800-348-5046
Alberta	Environmental Service Response Centre	1-800-222-6514
British Columbia	Provincial Emergency Program	1-800-663-3456
Manitoba	Conservation Emergency Response Program	1-204-944-4888
New Brunswick	Canadian Coast Guard	1-800-565-1633
Newfoundland & Labrador	Canadian Coast Guard	1-800-563-9089
NWT & Nunavut	Spill Report Line	1-867-920-8130
Nova Scotia	Canadian Coast Guard	1-800-565-1633
Ontario	Spill Action Centre	1-800-268-6060
Prince Edward Island	Canadian Coast Guard	1-800-565-1633
Quebec	National Environmental Emergencies Center	1-866-283-2333
Saskatchewan	Spill Report Centre	1-800-667-7525
Yukon Territory	Spill Report Centre	1-867-667-7244

Hearing Conservation

S3AM-118-PR1

1.0 Purpose and Scope

- 1.1 Establishes procedures to confirm that personal noise exposure remains within acceptable limits and establishes the requirements of an acceptable hearing conservation program.
- 1.2 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.

2.0 Terms and Definitions

- 2.1 **ABC System** – The system used in Canada to classify hearing protectors on the basis of the attenuation provided by the hearing protection.
- 2.2 **Action Level** – May also be referred to as **Monitoring Level**. An eight-hour, time-weighted average established by the applicable jurisdiction, measured on the A-scale, slow response. Depending upon jurisdiction, this can vary anywhere from 74dBA to 85dBA, and may additionally be defined as 50% of the allowable noise dose. In the absence of a specified jurisdictional action level, 85dBA shall be used as the default action level.
- 2.3 **Attenuation** – The reduction of the sound level at the ears of a person wearing hearing protectors.
- 2.4 **Decibel (dB)** – Logarithmic unit of measurement of sound level.
- 2.5 **Established Exposure Limit** – The maximum regulatory noise exposure to which an individual may be exposed to for an 8- hour time weighted average (TWA).
 - This limit is referred to by different terminology depending upon the given jurisdiction (e.g. Permissible Exposure Limit (PEL), Contamination Limit, Occupational Exposure Limit (OEL), Threshold Limit Value (TLV), etc.).
 - Acceptable methods of adjusting this limit to correspond to a different exposure period (e.g. 10 hours) vary by jurisdiction.
- 2.6 **Standard Threshold Shift (STS)** – When one's hearing threshold has changed (relative to the baseline audiogram) an average of 10 dB or more at 2000, 3000, or 4000 Hz in either ear).
- 2.7 **Noise Reduction Rating (NRR)** – The measure, in decibels, of how well a hearing protector reduces noise (attenuation), as specified by the United States of America Environmental Protection Agency. It is a requirement in the USA that all hearing protectors have the NRR stamped on their packaging.
- 2.8 **Time-Weighted Average (TWA) Sound Level** – That sound level, which if constant over an 8-hour exposure, would result in the same noise dose as is measured.

3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-127-PR1 Exposure Monitoring
- 3.3 S3AM-128-PR1 Medical Screening & Surveillance

4.0 Procedure

- 4.1 Roles and Responsibilities
 - 4.1.1 **SH&E Manager**
 - Provide access to initial and refresher hearing conservation training.

- Inform employees of noise monitoring results when full-shift noise exposure is at or above the action level.
- Designate areas and tasks where employees' exposure is at or above the action level.
- Conduct noise monitoring and supervise noise surveys, as applicable, and support hazardous noise assessment/evaluation efforts.

4.1.2 **Manager**

- Implement the hearing conservation program.
- Confirm that a hazardous noise assessment/evaluation has been conducted.
- Confirm that a hazardous noise assessment/evaluation is conducted when a change in equipment, procedures, or personnel may increase employee exposure to noise.
- Implement engineering controls to reduce noise levels when such measures are considered feasible and when required by regulation.
- Purchase, monitor, and replenish for employees' use, a supply of hearing protection devices with a minimum Noise Reduction Rating (NRR) of 26 dBA, or of the appropriate classification for the applicable jurisdiction.
- Confirm that individuals included in the program receive training and that the training meets the criteria outlined in this program.
- Investigate and implement corrective action to all reports of non-conformance with this procedure, including reports of standard threshold shifts or employees' failure to wear hearing protectors in designated areas.
- Maintain an awareness of the noise levels in work areas for which he/she is responsible.
- Place warning signs in areas where sound levels would require the use of hearing protectors.
- Request that a hazardous noise assessment/evaluation be conducted when a change in equipment, procedures, or personnel may increase employee exposure to noise above action levels.
- Confirm that all employees are aware of the requirements for hearing protection for any designated area or task.
- Enforce the use of hearing protection by employees in designated areas and for designated tasks.

4.1.3 **Employee**

- Comply with the requirements of the Hearing Conservation program.
- Wear hearing protection devices in designated areas or for designated tasks.
- Inspect and maintain hearing protection devices.
- Report any suspected change in noise levels of work area to supervisor.
- Report any signs or symptoms experienced that could be the result of overexposure to noise to supervisor.
- Participate in audiometric testing and hearing protection training when required.

4.2 **General Requirements**

- 4.2.1 The requirements of this procedure apply to all locations/facilities/projects where employee noise exposure may equal or exceed the action level.
- 4.2.2 SH&E Plans and Task Hazard Assessments (THA) shall identify applicable hazards related to noise exposure. Identify established exposure limits and action levels specified by the applicable jurisdiction, or in the absence of specifications, an 8-hour TWA of 85 dBA.

- The below chart is intended to provide basic established exposure limits by jurisdiction. Please consult the applicable jurisdictional legislation to obtain further information and to verify accuracy.

	8hr TWA Established Exposure Limit (dBA)	8hr TWA Action Level (dBA)
OSHA	90	85
Canada - Federal	87	74
Alberta	85	85
British Columbia	85	82
Manitoba	85	80
New Brunswick	85	80
Newfoundland	85	85
Northwest Territories	85	80
Nova Scotia	85	85
Nunavut	85	85
Ontario	85	85
Prince Edward Island	85	85
Quebec	90	85
Saskatchewan	85	80
Yukon	85	80

- Acceptable methods of adjusting this limit to correspond to a different exposure period (e.g. 10 hours) vary by jurisdiction.
- 4.2.3 When processes or areas present noise exposures that are or could be at or above the action level identified for the given jurisdiction, monitoring and interpretation of results shall be undertaken by a trained and competent individual using approved equipment (sound level meters, sound dosimeters) to assess the hazard.
- 4.2.4 Resulting documentation (e.g. noise maps, results of the sound level survey data, etc.) will be posted at the location.
- 4.2.5 Noise assessments shall be repeated when there is any change in processes or equipment that could affect the noise level or the exposure duration.
- 4.2.6 Eliminate noise sources or reduce noise levels to the extent possible prior to implementing hearing protection PPE. Examples of controls that shall be considered include:
- Adding or replacing mufflers on motorized equipment.
 - Adding mufflers to air exhausts on pneumatic equipment.
 - Following equipment maintenance procedures to lubricate dry bearings and replace worn or broken components.
 - Isolating loud equipment with barriers.
 - Replacing loud equipment with newer and quieter models.
 - Using caution signs and Hearing Protection Required signs to designate noisy work areas.
 - Installing hearing protection device-dispensing stations at the entrance to noisy work areas.
- 4.2.7 Where practicable, a clearly visible warning sign shall be posted at every approach to an area in the workplace where the sound level regularly exceeds 85 dBA.

4.3 Hearing Protectors

- 4.3.1 Hearing protectors will be used in the event that administrative or engineering controls are either not effective or not feasible.
- 4.3.2 Selection of appropriate hearing protectors shall be based on actual or anticipated exposure levels, the attenuation provided by the device, and the manufacturer's information about the use and limitations of the device.
- 4.3.3 At a minimum, hearing protectors shall provide a level of protection that brings actual or anticipated exposure below the established exposure limit for the applicable jurisdiction. Additional information relative to hearing protector use is as follows:
 - The use of hearing protectors is required in any location where powered or motorized equipment, portable tools or any other noise source could reasonably be expected to exceed noise levels specified by the applicable jurisdiction, or in the absence of specifications, an 8-hour TWA of 85 dBA.
 - Hearing protection will be mandatory for all employees working in any area that has not been evaluated for noise exposure and the ambient noise level in the area is such that a raised voice is necessary to have a normal conversation with someone less than three feet (1 meter) away, and/or when within 25 feet (7.6 meters) of an operating piece of heavy equipment.
 - Hearing protection will be mandatory for all employees who work on or near heavy equipment unless personal dosimetry or other techniques have been used to document actual exposure.
 - Hearing protectors will be made available to all employees at no cost to the employees who may be exposed to noise levels specified by the applicable jurisdiction, or in the absence of specifications, an 8-hour TWA of 85 dBA.
 - Hearing protection will be mandatory for all employees exposed to 85 dBA for any period of time and who have experienced an STS.
 - Whenever information indicates that any employee's exposure may equal or exceed specified levels (or as applicable, an 8-hour TWA of 85 dBA), the manager will be responsible for enforcing the proper use of hearing protectors.
 - At least two types of hearing protectors shall be available to employees free of charge, and the type of hearing protector shall be suitable to the task and approved to the applicable jurisdiction.
 - Hearing protectors shall be used in accordance with manufacturer's specifications to effectively protect hearing. Refer to *S3AM-118-ATT1 Hearing Protection Guidelines*.
- 4.3.4 Evaluate the effectiveness of the hearing protectors chosen.
- 4.3.5 The manufacturer's assigned noise reduction rating (NRR) or attenuation for hearing protection devices can seldom be achieved in workplace conditions; therefore this rating shall be adjusted for real world conditions and use.
 - For devices with an NRR rating, subtract 7 from the NRR of the protector provided by the manufacturer. Divide this result by 2, and then subtract the remained from the observed "A" scale sound level measurement collected in the employee's work area (see Section 4.B). If this number is below 85, the hearing protectors are adequate for use in the work area.
- 4.3.6 Implement a hearing conservation program as applicable and in accordance with jurisdictional requirements

4.4 Training

- 4.4.1 All employees with potential exposure above the action levels applicable to their jurisdiction, or who otherwise utilize any type of hearing protector will participate in a hearing conservation training program. Refer to *S3AM-003-PR1 SH&E Training*.

- 4.4.2 The initial and subsequent annual hearing conservation training will address, at a minimum, the following topics:
- The effects of noise on hearing, recognizing hazardous noise, and symptoms of overexposure to hazardous noise.
 - When and/or where hearing protectors are required to be worn.
 - The purpose of hearing protectors.
 - The advantages, disadvantages, and effectiveness of various types of protectors.
 - Instructions on care and use of hearing protectors, including its limitations, proper fitting, inspection and maintenance and, if applicable, the cleaning and disinfection of the protector.
 - The purpose of audiometric testing, including an explanation of the test procedures.
 - Hearing Conservation Program requirements and responsibilities.
- 4.4.3 Hearing protection training is conducted annually for all affected employees or more frequently for employees who do not properly use hearing protectors or otherwise fail to comply with this policy.

4.5 Audiometric Testing

- 4.5.1 All AECOM personnel with exposure greater than the action level shall be enrolled in the medical surveillance program and undergo a baseline audiogram within 6 months of the first exposure (consult local jurisdiction for more stringent timelines).
- 4.5.2 Thereafter, annual audiograms will be compared with the baseline exam. Testing to establish a baseline audiogram will be preceded by 14 hours without exposure to noise, including noise exposure away from work. Hearing protectors may be used as a substitute for the requirement that a baseline audiogram will be preceded by 14 hours without exposure to noise.
- 4.5.3 Enrolled employees will receive audiograms during their exit physicals; refer to *S3AM-128-PR1 Medical Screening & Surveillance Program*.
- Audiometric tests will be performed by a person meeting the requirements specified by the applicable jurisdiction.
 - The medical surveillance provider will notify employees of the need to avoid high levels of non-occupational noise exposure during the 14-hour period immediately preceding the audiometric examination.
 - For multi-year projects, an annual audiogram will be obtained for each employee exposed at or above the level specified by the applicable jurisdiction, or in the absence of specifications, an 8-hour TWA of 85 decibels.
- 4.5.4 Each employee's annual audiogram will be compared to that employee's baseline audiogram to determine if the audiogram is valid, and if there is a standard threshold shift (STS).
- 4.5.5 When a Standard Threshold Shift (STS), as identified by the AECOM Medical Consultant, is noted between the last valid baseline and the annual audiogram, the following steps will be taken:
- A retest will be conducted within 30 days to confirm the STS. The employee will not be exposed to workplace/hobby noise for 14 hours or will be provided with adequate hearing protection prior to testing.
 - If the STS persists, ear protection will be evaluated and refitted, and may be upgraded to one with a greater NRR or classification. The hearing protection will have a minimum NRR of 26 dBA, or be of the appropriate classification for the applicable jurisdiction.
 - The employee will be counselled and AECOM will obtain information regarding the employee's possible noise exposure away from the workplace or existing ear pathology.
 - Qualified medical personnel will review the audiograms. This group will determine the need for a medical referral.

- The employee will be notified in writing by either the **SH&E Manager** or the AECOM Medical Provider of the STS, within 21 days of determination, or as required by the applicable jurisdiction.
 - The employee's supervisor will be notified of the shift in hearing threshold.
- 4.5.6 An employee who has experienced an STS shall comply with any recommendations made by medical personnel as they relate to the employees assigned work duties (e.g. dual hearing protection of earplugs and earmuffs).
- 4.6 Employee Monitoring
- 4.6.1 When information indicates that any employee's exposure may equal or exceed the applicable action level, the SH&E Manager shall develop and implement a site-specific monitoring program to identify employees for inclusion in the hearing conservation program and to enable the proper selection of hearing protectors. Refer to *S3AM-118-FM1 Site-Specific Hearing Conservation Program* and *S3AM-127-PR1 Exposure Monitoring*.
- 4.6.2 Noise surveys shall be conducted in a manner that reasonably reflects the exposure of the affected employees. Surveys shall be conducted under the supervision of an AECOM SH&E Manager. Refer to *S3AM-118-FM2 Sound Level Survey* and *S3AM-118-FM3 Noise Dosimetry Record*.
- 4.6.3 Sound-level meters and audio dosimeters used to determine employee exposure to noise sources shall be Type II (accurate to within +/- 2 dBA), operated in "slow" response, on the "A" scale, and be calibrated to factory guidelines (including periodic factory recalibration).

5.0 Records

- 5.1 Noise exposure measurement records, surveys and Site-Specific Hearing Conservation Plans will be retained at the project/facility for the duration of the project.
- 5.2 Audiogram records will be retained in the employee's medical records as per *S3AM-128-PR1 Medical Screening & Surveillance Program*.
- 5.3 Employee training session documentation will be retained in accordance with *S3AM-003-PR1 SH&E Training*.

6.0 Attachments

- 6.1 [S3AM-118-ATT1 Hearing Protection Guidelines](#)
- 6.2 [S3AM-118-FM1 Site-Specific Hearing Conservation Program](#)
- 6.3 [S3AM-118-FM2 Sound Level Survey](#)
- 6.4 [S3AM-118-FM3 Noise Dosimetry Record](#)

Hearing Protection Guidelines

S3AM-118-ATT1

Comparison of Hearing Protection	
Ear Plugs	Ear Muffs
Advantages: <ul style="list-style-type: none"> • small and easily carried • convenient to use with other personal protection equipment (can be worn with ear muffs) • more comfortable for long-term wear in hot, humid work areas • convenient for use in confined work areas • may be disposable (cleaning not necessary) 	Advantages: <ul style="list-style-type: none"> • less attenuation variability among users • designed so that one size fits most head sizes • easily seen at a distance to assist in the monitoring of their use • not easily misplaced or lost • may be worn with minor ear infections
Disadvantages: <ul style="list-style-type: none"> • requires more time to fit • more difficult to insert and remove • require good hygiene practices • may irritate the ear canal • easily misplaced • more difficult to see and monitor usage 	Disadvantages: <ul style="list-style-type: none"> • less portable and heavier • more inconvenient for use with other personal protective equipment • more uncomfortable in hot, humid work area • more inconvenient for use in confined work areas • safety or prescription glasses can reduce hearing protection by breaking the seal between the earmuff and the skin. • must be cleaned/decontaminated as necessary

1.0 Care and Use

- 1.1 Follow the manufacturer's instructions.
- 1.2 Inspect the earplugs prior to use. Dirty earplugs and insertion with dirty hands can result in ear infections. Moldable or foam earplugs should be discarded if dirty or the pliability has been lost
- 1.3 To correctly insert earplugs pull the ear up and back with the opposite hand in order to widen and straighten the ear canal. Foam earplugs should be compressed to insert deeply into the canal. Hold the plug in place until the foam expands to ensure optimal blockage. Confirm hair or clothing does not impede the fit.
- 1.4 Ensure the earmuff ear cushion seal around the ear is complete and is not compromised by hair, clothing or glasses. If equipped with a headband, the fit should be snug, but not so tight as to produce discomfort.
- 1.5 Check hearing protection regularly for wear and tear.
- 1.6 Replace ear cushions or plugs that are no longer pliable or cracked.
- 1.7 Hearing protection using head bands shall be replaced when the ear cushions are not kept snugly against the head, or semi-insert earplugs are not adequately held in place.
- 1.8 Disassemble ear muffs to clean.
- 1.9 Wash ear muffs with a mild liquid detergent in warm water, and then rinse in clear warm water. Sound-attenuating material inside the ear cushions must not get wet.
- 1.10 Use a soft brush to remove skin oil and dirt that can harden ear cushions.
- 1.11 Squeeze excess moisture from the plugs or cushions and then place them on a clean surface to air dry.
- 1.12 Store earplugs and earmuffs in a cool, dry and clean place.

Americas

Site-Specific Hearing Conservation Program

S3AM-118-FM1

Site (Project): _____ Location : _____

This program developed by:	Date:
Description of noise monitoring to be conducted (refer to S3AM-118-FM2 Sound Level Survey and S3AM-118-FM3 Noise Dosimetry Report) :	
Such monitoring will consist of (check those that apply): <input type="checkbox"/> Noise Dosimetry <input type="checkbox"/> Sound Level Meter Survey	

Monitoring

Specific instrumentation to be used is (make/model):

Make	Model

and will be calibrated at a frequency of _____ and documented in the _____.

Monitoring strategy is as follows (list all equipment and activities on site that may involve sound pressure levels above 80 dBA and an explanation of the strategy to document actual exposures):

Area/Equipment	Monitoring Strategy

Where areas or equipment are not clearly identified, all monitoring will be documented utilizing an illustrated layout (attach illustration developed for the specific site). Monitoring frequency will be in accordance with the strategy outlined above and when the following changes in site conditions/activities occur:

1.
2.
3.
4.
5.

Employee Notification

All site employees exposed above the regulated action level of _____ dBA will be notified of the monitoring results by (insert name/title) _____ at an interval not to exceed _____ after completion of monitoring.

Notification shall be written, with a copy to the SH&E Department. Documentation of employee notifications and corresponding signatures of notified employees will be kept in the site health and safety logbook/files.

Observation of Monitoring

All employees affected by the monitoring, or a designated employee representative, shall be given the opportunity to observe noise monitoring procedures. This will be achieved by:

Audiometric Testing Program and Requirements

AECOM employees who perform field activities where noise exposure above action levels is expected are required to participate in an audiometric testing program. Additionally, any subcontractors performing work on AECOM projects where noise levels exceeding action level will be required to provide documentation that they participate in an audiometric testing program that meets the applicable regulations. Documentation of participation in the testing program will be maintained by _____ and will be located at _____.

Hearing Protectors and Estimating Attenuation

A selection of suitable hearing protectors will be made available to all employees who are expected to have 8-hour TWA noise exposures above _____ dBA. The types anticipated to be available include:

Protection Type	Attenuation

Hearing protector attenuation will be evaluated by *(insert name/title)* for specific noise environments according to the following method prior to determining their suitability for use:

1.
2.
3.

The following employees will be required to wear hearing protectors during specific activities according to the results of site-specific monitoring conducted in accordance with this procedure. (This section can be completed after monitoring, if necessary).

Employee Name	Activity Type	Type of Protection

As applicable, hearing protectors will be properly fitted by _____ upon initial distribution to site workers.

Training in the use and care of hearing protectors shall be conducted by _____ during the initial site-specific health and safety training. Training contents shall meet the requirements set forth in this procedure and the applicable regulations.

Hearing protectors will be distributed by _____ from the storage location at the _____.

Access to Information and Training Materials

All information required by regulation to be made available to the employees will be posted by *(insert name / title)* _____ at the _____.

Local Occupational Health and Safety Regulations will also be kept on site.

Recordkeeping

Records required by AECOM's Hearing Conservation Program and Regulations shall be completed by _____ and shall be maintained at the _____ and placed on permanent file at the _____ for the minimum duration required by the standard. Employees can access their individual records by contacting _____.

All records required by this section will be transferred to any employee's successive employer if AECOM ceases to do business.

Approvals

Manager (print):

Signature: _____

Date: _____

SH&E Manager (print): _____

Signature: _____

Date: _____

Americas

Sound Level Survey

S3AM-118-FM2

Location: _____ **Date:** _____

Conducted By: _____

Sound Level Meter: _____ **Serial #:** _____

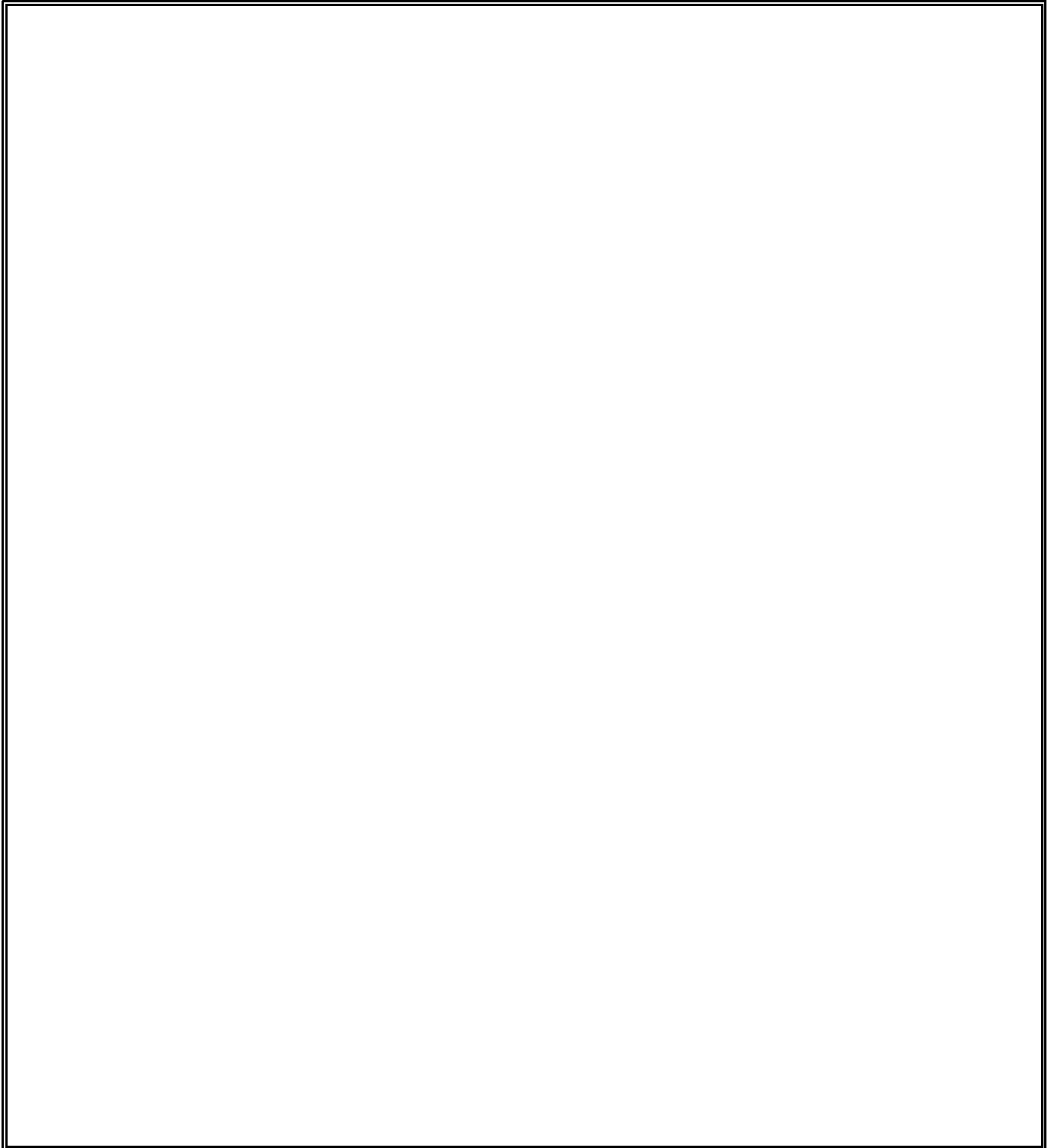
Calibrator Model: _____ **Serial #:** _____ **Class:** ☐ 1 ☐ 2

Battery Check Completed: ☐ **Date of Factory Calibration:** _____

[illegible]

Drawing of Equipment or Work Layout

Reference Numbers refer to the Test Numbers on Page 1



Americas

Noise Dosimetry Record

S3AM-118-FM3

Sample Identification

Sample #: _____ Date: _____
Employee Monitored: _____ Employee #: _____
Job: _____ Location: _____

Dosimeter Information

Model: _____ Serial # _____
Criterion Level (in dBA): _____ Threshold (in dBA): _____ Exchange Rate (in dBA): _____
Calibration (in dBA): _____ Initial _____ Final _____
Weighting: Fast ☐ Slow ☐

Calibrator Information

Model: _____ Serial #: _____ Class ☐ 1 ☐ 2
Battery Check Completed: ☐ Date of Factory Calibration: _____

Sample Information

Time On: _____ Time Off: _____ Total Run Time (in min): _____
Time Weighted Average (in dBA): _____ %Dose: _____ Est. %Dose: _____
Average Sound Level (L_{avg}): _____ Peak Sound Level (L_{pk}): _____
Maximum Sound Level (L_{max}): _____ Minimum Sound Level (L_{min}): _____

Workplace Conditions

Scheduled Hours per Shift: _____ Operations: Normal? ☐ Abnormal? ☐
Explain: _____

Hearing Protection: Type _____ % of Time Worn _____

Work Description/Comments

Sampled By: _____

Non-Ionizing Radiation

S3AM-121-PR1

1.0 Purpose and Scope

- 1.1 Provides the requirements and guidelines to control occupational and public exposure to non-ionizing radiation, including lasers and radiofrequency (RF), infrared (IR), and ultraviolet (UV) radiation.
- 1.2 This procedure applies to all AECOM Americas employees and operations, and any other entity and its personnel contractually required to comply with this document's content, except where local or governmental regulations are more stringent.

2.0 Terms and Definitions

- 2.1 **Controlled Environment** – An area where the occupancy and activity of those within is subject to control and supervision for the purpose of protection from radiation hazards.
- 2.2 **Hazard Distance** – Distance from a radiofrequency emitter at which the power density equals the Uncontrolled Environment Maximum Permissible Exposure Limit power density level as established by the latest edition of the ANSI C95.1.
- 2.3 **ANSI Z136.1 Safe Use of Lasers**– American National standard issued applicable to the safe use of lasers and laser systems emitting laser radiation in the wavelength range 180 nanometres to 1 millimetre. The standard defines the classification of lasers (Class 1, 1M, 2, 2M, 3R, 3B and 4) based on Accessible Emission Limit (AEL) and viewing conditions.
- 2.4 **Infrared (IR)** – Electromagnetic radiation having a wavelength just greater than that of the red end of the visible light spectrum but less than that of microwaves. Infrared radiation has a wavelength from about 800 nm to 1 mm, and is emitted particularly by heated objects
- 2.5 **Laser** – An acronym for Light Amplification by Stimulated Emission of Radiation.
- 2.6 **Maximum Permissible Exposure (MPE) Limits** – The level of exposure which is considered as the limit between safe and potentially harmful.
- 2.7 **Non-ionizing Radiation** – Any type of electromagnetic radiation that does not carry enough energy to ionize atoms or molecules. Examples include radiofrequency radiation, microwave radiation, ultraviolet radiation, visible light, infrared radiation, lasers, static electric and magnetic fields, etc.
- 2.8 **Radio frequency (RF)** – Any of the electromagnetic wave frequencies that lie in the range extending from around 3 kHz to 300 GHz, and includes frequencies used for communication signals (e.g. radio, cell-phone, etc.) or radar signals.
- 2.9 **Ultraviolet (UV)** – Electromagnetic radiation having wavelengths between that of ordinary, visible violet light that of x-rays. Ultraviolet radiation is made up of three types of rays; A (UVA), B (UVB), and C (UVC). UV radiation is present in sunlight, and also produced by electric arcs and specialized lights (e.g. mercury-vapor lamps, black lights).
- 2.10 **Uncontrolled Environment** – Locations where there is the exposure of individuals who have no knowledge or control of their exposure.

3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-120-PR1 Radiation
- 3.3 S3AM-128-PR1 Medical Screening & Surveillance
- 3.4 S3AM-208-PR1 Personal Protective Equipment

- 3.5 S3AM-209-PR1 Risk Assessment & Management
- 3.6 S3AM-325-PR1 Lockout Tagout
- 3.7 S3AM-332-PR1 Hot Work

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 Corporate SH&E Management System & Prequalification Manager

The SH&E Department will maintain this procedure and include it in the annual review of the AECOM Americas SH&E procedures.

4.1.2 SH&E Manager (or designee)

The SH&E Manager will provide technical guidance to projects that involve the use/survey of non-ionizing sources as well as identifying the proper controls to mitigate employee exposure to non-ionizing radiation sources, including UV radiation. In addition, SH&E Managers will:

- Review and approve all exposure plans, such as Non-Ionizing Radiation Protection Plans (NIRPP);
- Conduct non-ionizing radiation hazard assessments;
- Confirm applicable awareness training on non-ionizing radiation hazards is available to project teams. Refer to *S3AM-003-PR1 SH&E Training*;
- Authorize the use of a Class 3B and 4 lasers.

4.1.3 Manager

Managers are responsible for the overall safety and planning for a project. Managers are also responsible for:

- Verifying that the presence of non-ionizing radiation sources at project work sites are identified in the applicable SH&E Plan and Task Hazard Assessment (THA) prior to commencing field activities;
- Addressing and controlling potential non-ionizing radiation hazards through consultation with the SH&E Manager, subject matter experts (as appropriate), and/or development of a NIRPP;
- Verifying incident and injury reporting procedures are followed when a suspected overexposure to non-ionizing radiation, an incident of sunburn, or other excessive non-ionizing radiation exposure occurs in the workplace;
- Monitoring employee compliance with the requirements of this policy;
- Confirming employees complete non-ionizing radiation awareness training as directed by the SH&E Manager.

4.1.4 Employee

- Will not disturb or handle any non-ionizing radiation sources or work in any identified non-ionizing radiation hazard area (e.g., Controlled Environment) without appropriate training and safety procedures;
- Will work in accordance with all established manufacturer, client, and NIRPP requirements;
- Will identify both known and suspected non-ionizing radiation sources on the THA and report any change in site conditions related to non-ionizing radiation sources to the Manager;
- Will immediately notify the Manager of the presence or suspected presence of previously unidentified non-ionizing radiation sources in the workplace, and cease all work activities involving potential exposure to non-ionizing radiation until further direction is received;
- Will use suitable personal protective equipment to the non-ionizing radiation hazards.

4.2 Hazard Assessment

4.2.1 AECOM will identify and assess the hazards associated with work where the potential exists for employees to be exposed to laser radiation or other non-ionizing radiation sources, develop appropriate elimination and control measures, and document this in the location or project specific SH&E Plan.

- If routine exposures to laser radiation or other non-ionizing radiation sources are expected, an appropriate plan, such as a Non-Ionizing Radiation Protection Plan (NIRPP) should be developed. The plan (e.g. NIRPP) may be included in the location or project specific SH&E Plan;
- Consultation with subject matter experts may be necessary depending upon the extent, number, and type of non-ionizing radiation (e.g., Laser Safety Officer);
- Task specific hazards and associated controls shall also be identified in the respective THA;
- Refer to *S3AM-209-PR1 Risk Assessment & Management*.

4.2.2 In addition to the SH&E Plan, appropriate personal protective equipment will be identified and documented in the THA or other relevant hazard assessment documentation.

4.2.3 AECOM will develop and implement an appropriate NIRPP to control identified hazards where the potential to exceed the applicable Maximum Permissible Exposure (MPE) limits exist.

4.3 Laser Protection Requirements

4.3.1 Only qualified and trained employees will be assigned to install, adjust, and operate laser equipment for surveys, alignment/grade-checks, tunnel work, etc.

4.3.2 Laser equipment will bear a label to indicate maximum power output, ANSI class, and beam spread.

4.3.3 Looking into the primary beam is prohibited, and care will be taken to avoid looking at specular reflections of the beam, including those from lens surface work.

4.3.4 Where direct or reflected laser light greater than 0.005 watts (5 milliwatts) for $\geq \frac{1}{4}$ second exists, employees will be provided with laser safety goggles that will protect them for the specific wavelength of the laser and be of an optical density (OD) adequate for the energy involved. The laser safety goggles will be selected in accordance with the requirements of ANSI Z136.1-2014 (or the most current edition).

4.3.5 Operation of an ANSI Class 3B or 4 laser should be assessed for exposure hazards and whether medical surveillance is appropriate. Refer to *S3AM-128-PR1 Medical Screening & Surveillance*.

4.3.6 Use of an ANSI Class 4 laser requires the approval of the SH&E Manager.

4.3.7 All protective goggles will bear a label identifying the following data:

- The laser wavelength for which use is intended;
- The optical density of that wavelength;
- The visible light transmission.

4.3.8 Class 1 Lasers

- Safe for the unprotected eye and through optical instruments (prescription lenses, telescopes, beam reducers, etc.);
- Very low power lasers or enclosed lasers;
- MPE is never exceeded, even for very long exposure (hours), or with the use of optical instruments;
- Nominal Hazard Zone: none.

4.3.9 Class 1M Lasers

- Safe for the unprotected eye only, but potentially hazardous when optical instruments are used;
- Medium power lasers either collimated with a large beam or highly divergent;
- MPE can be exceeded when using optical instruments;
- Nominal Hazard Zone: none for the unprotected eye.

4.3.10 Class 2 Lasers

- Safe for unintended exposure, (less than 0.25 seconds) but hazardous when looking at for more than 0.25 seconds;
- Visible (wavelength of 400–700 nanometers) low power lasers;
- MPE is not exceeded provided the viewings are accidental only. MPE calculation assumes the blink reflex will stop the light after 0.25 second;
- Nominal Hazard Zone: none for accidental exposure.

4.3.11 Class 2M Lasers

- Safe for the unprotected eye when the exposure is unintended, (less than 0.25 seconds) but hazardous when looking at for more than 0.25 seconds or when optical instruments are used;
- Visible (wavelength of 400–700 nanometers) medium power lasers either collimated with a large beam or highly divergent;
- MPE is not exceeded provided the viewings are accidental only and only with unprotected eyes. MPE calculation assumes the blink reflex will stop the light after 0.25 seconds. Using optical instruments might bring the exposure above the MPE as well;
- Nominal Hazard Zone: none for accidental exposure to the unprotected eye.

4.3.12 Class 2M Lasers and Greater

- Areas where a Class 2M or higher, non-enclosed path laser beam is in use will be posted with standard laser-warning placards;
- Beam shutters or caps will be used, or the laser turned off, when laser transmission is not actually required. When the laser is left unattended for a period of time (e.g., >5 minutes), such as during the lunch hour, overnight, or at change of shifts, the laser will be turned off;
- Only mechanical or electronic means will be used as a detector for guiding the internal alignment of the laser. Aligning the laser with the unprotected eye is prohibited;
- The laser beam will not be directed at employees. Laser units will be set above or below the heads of employees;
- Employee exposure will be controlled to stay within the MPE limits specified in ANSI Z136.1-2014 (or the most current edition).

4.3.13 Class 3R Lasers

- Unsafe, except when handled carefully by experienced users. Accidental short exposure is considered as a small hazard;
- Low power lasers;
- MPE can be exceeded up to 5 times;
- Nominal Hazard Zone: hazard area for the eye, none for the skin.

4.3.14 Class 3B Lasers

- Unsafe without exception, laser safety goggles shall be worn within the nominal hazard zone. Focused lasers of this class are a potential fire hazard;

- Medium power lasers;
- MPE is exceeded more than 5 times. Skin MPE is not generally exceeded, except at focus;
- Nominal Hazard Zone: hazard area for the eye, none for the skin.

4.3.15 Class 4 Lasers

- Dangerous, Personal Protective Equipment (PPE) for eyes and skin shall be worn within the nominal hazard zone. Class 4 lasers are fire hazards as well. Diffuse reflections may be hazardous;
- High power lasers;
- Ocular and skin MPE are exceeded. Diffuse reflections exceed the MPE;
- Nominal Hazard Zone: hazard area for the eye and for the skin.

4.4 Radiofrequency Radiation Protection

4.4.1 Reduction in radiofrequency (RF) exposures can be accomplished through the implementation of appropriate administrative, work practice and engineering controls. Should routine occupational RF exposures be part of a project, a suitable plan shall be developed such as an NIRPP.

4.4.2 Generally, where RF emitters are identified, employees will:

- Remain outside any demarcated area where an RF hazard exists;
- Remain within the General Public exposure region;
- If the preceding requirements cannot be met or determined, AECOM will obtain a hazard assessment from the emitter's operator for controlling entity and provide it to the SH&E Manager for evaluation and determination of the relevant hazard mitigation measures.

4.4.3 If the above information is not available, an RF emitter survey will be required to assess the potential exposure hazards. An RF emitter survey shall be performed by an individual trained to effectively assess RF exposures.

4.4.4 Unless using an RF meter under the direction of an individual trained to effectively assess RF exposures, employees will not enter any area which is located within the RF hazard distance identified by the RF emitter survey. AECOM personnel may enter a controlled area if the emitter has been de-energized and locked-out using standard Lockout/Tagout procedures in accordance with *S3AM-325-PR1 Lockout Tagout*.

4.5 Infrared Radiation Protection

4.5.1 Infrared (IR) radiation may be encountered during furnace operations, pouring, casting, hot dipping, laser and high-intensity light sources, curing, annealing and plastic welding.

4.5.2 Performance of welding and oxygen/acetylene cutting operations (torch cutting, brazing, welding) involves the use of an exposed high-temperature flame. This flame produces infrared (IR) radiation and UV radiation at the welding location which can cause cataracts, skin cancer, and thermal burns to the welder or other persons located nearby.

4.5.3 Skin Protection

- Long sleeve, flame-resistant shirts and/or forearm length Nomex gloves will be worn;
- Leather welder's apron or equivalent protection;
- Long pants shall be worn during any hot work task;
- Welding screens shall be utilized where feasible to protect the general public or other unprotected employees.

4.5.4 Eye Protection

- A welder's helmet or goggles with the appropriate lens shade will be worn. Refer to

S3AM-208-PR1 Personal Protective Equipment.

4.6 Ultraviolet Radiation Protection

- 4.6.1 Broad-spectrum UV radiation is classified as a known human carcinogen. UV radiation can cause harmful effects from both chronic and acute exposures including reddening of the skin (regardless of skin tone), accelerated skin aging, and damage to the eyes (e.g., cataracts, retinal burns, or welder's flash), and sunburn. Employees may be exposed to UV radiation from natural sunlight or manmade sources such as germicidal lamps (e.g., UV groundwater treatment systems) and welding.
- 4.6.2 While not required, the completion of an exposure or UV risk assessment will assess the risk posed by UV at the site. Such an assessment can be included in the SH&E plan and as part of a Task Hazard Assessment (THA). Special consideration should be given to work activities at higher elevations as the intensity of UV exposures are significantly higher than at lower elevations. Typically, UV exposure can increase 4-5% for every 1000 feet ascended. Also, some medications (e.g., Tetracycline) can increase sensitivity to UV exposure.
- 4.6.3 Control measures will be implemented at a worksite according to the conditions and work performed.
- 4.6.4 Engineering Controls
- Operations producing IR or UV radiation may be segregated or separated from other operations (e.g. use of automated systems, walls, screens, etc.);
 - Employees will be encouraged to maximize use of the shade provided by trees, buildings, and other structures;
 - Where there is limited access to natural shade, fixed or portable shade structures will be provided where practical;
 - It is acknowledged that the provision of shade does not provide total protection from UV; therefore, it is recommended that outdoor workers adopt personal protection strategies such as protective clothing, sunscreen, and the wearing of hats in addition to using shade.
- 4.6.5 Administrative Controls
- Consideration will be given to the reorganization of outdoor work programs to reduce UV exposure including, but not limited to:
- Use of the UV Index to assess UV hazards;
 - Rescheduling work hours to enable workers to start earlier during May-September;
- The UV Index, shown in Table 1, can help employees be aware of the expected level of UV radiation exposure on any given day.

Table 1. UV Index

Exposure Category	Index Number	Sun Protection Messages
Low	< 2	Wear sunglasses on bright days. In winter, reflections off of snow can nearly double UV strength. If you burn easily, cover up and use sunscreen.
Moderate	3-5	Take precautions, such as covering up and using sunscreen.
High	6-7	Protection against sunburn is needed.
Very High	8-10	Take extra precautions. Unprotected skin will be damaged and can burn quickly.
Extreme	11+	Take all precautions. Unprotected skin can burn in minutes.

4.6.6 Personal Protective Equipment

Employees who work outdoors shall provide and utilize personal outer clothing (e.g. shirt and trousers) that meets the established general clothing requirements per *S3AM-208-PR1 Personal Protective Equipment*. For those circumstances where the outer clothing requirements exceed the general clothing requirements, AECOM will provide the necessary clothing. The selection of appropriate protective clothing will take into account both the need to block UV and the need to reduce the effects of heat.

- Protective Clothing
 - Full length trouser pants and shirts that cover shoulders at a minimum (where practical, the fabric will have a close weave);
 - Where possible, clothing will be lightweight, loose fitting and have a collar;
 - Clothing and head wear with a sun (UV) protection factor (SFP) is encouraged but not required.
- Secondary hazards such as fire resistance will be considered.
- Head, Face, and Neck Protection
 - Hats provide shade and the larger the brim the greater the amount of shade that is provided;
 - Full brim hard hats are recommended (for additional protection, neck flaps are recommended);
 - In circumstances where the wearing of a broad-brimmed hard hat causes difficulties due to its size, sunscreen and other protective measures will be used.
- Eye Protection
 - Wrap-around, close-fitting, large safety glasses will reduce the amount of UV and glare that may pass around the edges of the glasses (the color or darkness of the lenses does not indicate the level of UV protection; therefore, verification with the manufacturer should be performed);
 - Safety glasses shall provide the level of protection appropriate to the potential non-ionizing radiation hazard exposures;
 - For hot work activities that may produce ultraviolet radiation, eye protection shall utilize the proper welding shade.
- Sunscreen
 - Sunscreen does not offer complete protection against the sun and should always be used in conjunction with other protective measures;
 - A broad spectrum and water-resistant sunscreen with a SPF of 30+, or a rating of no less than three stars, will be provided;
 - Expiration dates on the sunscreen will be regularly checked to confirm it has not expired per the manufacturer's instructions;
 - Sunscreen should be placed in an easily accessible location and employees instructed on the correct application and use;
 - Sunscreen should be generously applied to all areas of exposed skin at least 20 minutes before going outside and reapplied every two hours, or as needed by the work conditions.

4.7 Non-ionizing Radiation Training Program

- 4.7.1 Employees will receive training where the need for non-ionizing radiation control measures has been identified in the SH&E Plan and if developed, the Non-Ionizing Radiation Protection Plan.

- 4.7.2 Awareness training on the applicable non-ionizing radiation source will be provided to employees prior to the start of work in the area where the hazard exists as well as when employees are required to enter non-ionizing radiation Controlled Environments. Training curricula will be determined by the SH&E Department.

5.0 Records

- 5.1 Training records shall be maintained in accordance with *S3AM-003-PR1 SH&E Training*. RF emitter surveys will be maintained in applicable project files.

6.0 Attachments

- 6.1 None

1.0 Purpose and Scope

- 1.1 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content where corrosive and/or reactive materials are used or stored.
- 1.2 The purpose of this procedure is to protect employees from the hazards of corrosive and reactive materials. This procedure considers a corrosive material as one that has a pH less than 2.0 (acid), or greater than 12.5 (base). A reactive material is a chemical that may be sensitive to shock, or may react with air or water depending upon its makeup.

2.0 Terms and Definitions

- 2.1 None

3.0 References

- 3.1 S3AM-115-PR1 Hazardous Materials Communication
- 3.2 S3AM-116-PR1 Hazardous Materials Shipping
- 3.3 S3AM-123-PR1 Respiratory Protection
- 3.4 S3AM-208-PR1 Personal Protective Equipment

4.0 Procedure

- 4.1 Implementation of this procedure is the responsibility of the Manager directing activities of the facility, site, or project location.
- 4.2 Appoint a responsible person who will:
 - 4.2.1 Inspect storage areas periodically.
 - 4.2.2 Monitor the quantity of corrosive and reactive materials on site, as well as that of incoming materials.
 - 4.2.3 Review work practices that involve corrosive and reactive materials.
- 4.3 Require that all employees working with corrosive or reactive materials, or who may be exposed to such materials, are trained in accordance with *S3AM-115-PR1 – Hazardous Materials Communication*.
- 4.4 Control the use of corrosive and reactive materials by AECOM personnel.
 - 4.4.1 Order only those materials and quantities that are needed to complete a job.
 - 4.4.2 Check incoming corrosive and reactive materials for proper labeling in accordance with *S3AM-115-PR1 Hazardous Materials Communication*.
 - Label materials, if needed, as they arrive on site.
 - Mark reactive materials containers with the date of receipt of the chemical.
 - 4.4.3 Check incoming corrosive and reactive materials for safety data sheets (SDS). If SDSs are not provided or are already on file, order them from the manufacturer, distributor, or vendor.
 - 4.4.4 Add incoming corrosive and reactive chemicals to the hazardous materials inventory, if not already present, following procedures set forth in *S3AM-115-PR1 Hazardous Materials Communication*.

- 4.4.5 Do not store any quantity of corrosive or reactive materials in an office (with the exception of limited quantities of consumer products). These materials are to be stored off site, or at an on-site laboratory or storage area.
- 4.5 Store corrosive and reactive materials as indicated in the MSDS:
 - 4.5.1 In a cool, dry environment, free from extremes of temperature and humidity.
 - 4.5.2 In a manner that separates them from other materials (including flammables and oxidizers) and from each other.
 - Separate acids and bases.
 - Separate reactive materials from acids and bases, and protect from contact with water.
 - 4.5.3 On materials that are acid-resistant (Teflon-coated, plastic, etc.) for small containers.
 - 4.5.4 Covered, not stacked on one another, on acid-resistant material for carboys (approximately 5 gallons/22 liters).
 - 4.5.5 On individual racks or securely blocked on skids, with closure (plug) facing upward to prevent leakage from drums.
- 4.6 Require that labeling and signage are in place.
 - 4.6.1 Label containers with the appropriate warning word to indicate the hazard, such as: DANGER; WARNING; CAUTION; CORROSIVE; OXIDIZER.
- 4.7 Use corrosive and reactive materials appropriately.
 - 4.7.1 Prior to use and in accordance with MSDS, safe-handling procedures shall be developed for each operation, and type and concentration of the chemical. In all cases, review the MSDS and product information before use.
 - 4.7.2 Follow *S3AM-208-PR1 Personal Protective Equipment* when working with or around corrosive and reactive materials. Review the MSDS for the chemical used to determine the specific type of PPE needed, to include at a minimum:
 - Chemical-splash goggles
 - Chemical-resistant gloves
 - Chemical-resistant apron
 - 4.7.3 Obtain medical care immediately in the event of:
 - Skin or eye exposure (e.g., splash) to corrosive liquids
 - Inhalation of vapors of corrosive liquids that cause respiratory discomfort.
 - 4.7.4 Require an eyewash station to be located in all areas where acids or bases are used. Safety showers shall be nearby if significant acid or base quantities are involved.
 - Place emergency eyewashes and showers in accessible locations that require no more than 10 seconds to reach, and are in a travel distance no greater than 25 feet (7.5 meters) from the hazard.
 - Keep the areas surrounding eyewashes and safety showers free of stored materials or debris at all times.
 - Mark emergency eyewashes and showers with a highly visible sign.
 - Require the area around emergency eyewashes and showers to be well lighted and visible.
 - Where portable eyewash units are used, a process shall be in place to change the water and clean the unit, as required by the manufacturer's instructions.
 - Require emergency showers and shower/eyewash combinations connected to a self-contained water supply to deliver a minimum 20 gallons (85 liters) per minute for 15 minutes.

- Require emergency showers and shower/eyewash combinations permanently connected to a potable water supply to deliver at least 30 gallons (127.5 liters) per minute continuously.
- Require emergency eyewashes to be capable of delivering to the eyes not less than 0.4 gallon (1.5 liters) per minute for 15 minutes.

- 4.8 Be prepared to clean up spills of corrosive and reactive materials.
 - 4.8.1 Have a written spill response plan in place before materials are stored on site.
 - 4.8.2 Have commercial spill kits available for cleanup of small quantities of materials. At a minimum, kits should contain appropriate protective clothing (including full-body suits, gloves, and boots) and spill control equipment (including absorbents, pillows, shovels, containers, etc.).
 - 4.8.3 Where necessary, confirm that appropriate respiratory protection equipment is provided to spill responders. For additional information, see *S3AM-123-PR1 Respiratory Protection*.
 - 4.8.4 Clean up or respond to spills promptly.
 - 4.8.5 Confirm that personnel responding to a spill have been trained in the hazards associated with the spilled material, as well as use of the spill control equipment, including PPE required for the task.
 - 4.8.6 Do not use combustible organic materials such as sawdust, excelsior, wood chips and shavings, paper, rags, or burlap bags to absorb or clean up spills.
- 4.9 Develop a waste management plan and procedures, including procedures for collection, storage, labeling, pick-up and transport, and final disposal.
- 4.10 Dispose of corrosive and reactive materials appropriately.
 - 4.10.1 Segregate organic acids, inorganic acids, and basic wastes.
 - 4.10.2 Contract hazardous waste disposal services should be obtained, as necessary, to dispose of waste materials. All waste shall be appropriately packaged for off-site transportation, if applicable.
 - 4.10.3 Wastes shall be marked, labeled, and shipped in accordance with regulatory requirements. For additional information, see *S3AM-116-PR1 Hazardous Materials Shipping*.
- 4.11 Inspect corrosive and reactive storage and use areas periodically.
 - 4.11.1 Inspect office, laboratory, and project settings quarterly.
 - 4.11.2 Use the inspection sheet provided as *S3AM-125-FM1 Corrosive & Reactive Materials Inspection* or equivalent, to inspect sites.

5.0 Records

The following information will be maintained in the location or project file:

- 5.1 Completed Corrosive and Reactive Material Inspection Sheets.
- 5.2 Worker Right-to-Know training documentation.
- 5.3 Written Spill Response Plan.
- 5.4 Waste Management Plan.
- 5.5 Documentation of training for spill response personnel.
- 5.6 Documentation of hazard communication training for personnel exposed to corrosive and/or reactive materials.

6.0 Attachments

- 6.1 [S3AM-125-FM1 Corrosive & Reactive Materials Inspection](#)

Americas

Corrosive & Reactive Materials Inspection

S3NA-125-FM1

Location: _____

Name of Inspector: _____

Date Inspected: _____

Labeling

1. Original containers are labeled with: ☐ Yes ☐ No ☐ NA
- Name of chemical
 - Signal word (e.g., DANGER; WARNING; CAUTION, etc.)
 - Manufacturer

Pre-Job Activities

2. Corrosives and reactives are stored in a cool, dry environment, free from temperature extremes ☐ Yes ☐ No ☐ NA
3. Corrosives and reactives are stored in their properly labeled original containers, cushioned against shock, and stored to prevent leaks ☐ Yes ☐ No ☐ NA
4. Corrosives are not stored in the vicinity of oxidizers ☐ Yes ☐ No ☐ NA
5. Hydrofluoric acid is stored only in acid-proof polyethylene- or ceresin-lined containers ☐ Yes ☐ No ☐ NA
6. Corrosives are stored on acid-resistant material ☐ Yes ☐ No ☐ NA
7. Chromic acid, nitric acid, perchloric acid, and potassium permanganate (all oxidizers) are stored separately from other corrosives and flammables ☐ Yes ☐ No ☐ NA

Handling

8. The following minimum required PPE is used when working with corrosives: ☐ Yes ☐ No ☐ NA
- Chemical splash goggles
 - Chemical resistant gloves
 - Chemical resistant apron
9. Bottles or carboys are opened slowly to guard from splashes. ☐ Yes ☐ No ☐ NA
10. The outside of the container is washed off with water after use to clean off any droplets of material. ☐ Yes ☐ No ☐ NA
11. An eyewash is located in all areas where corrosives are used. ☐ Yes ☐ No ☐ NA
12. An eyewash is: ☐ Yes ☐ No ☐ NA
- Within 25 feet (7.62 meters) or 10 seconds of travel ☐ Yes ☐ No ☐ NA
 - Marked with a highly visible sign ☐ Yes ☐ No ☐ NA
 - Well lit and visible ☐ Yes ☐ No ☐ NA
 - Working and delivering a minimum of 1.5 liters of water per minute for 15 minutes ☐ Yes ☐ No ☐ NA
13. Where substantial quantities of corrosives and/or reactives are stored, access to an emergency shower is available. ☐ Yes ☐ No ☐ NA
14. Spill control materials compatible with chemicals are available for emergency use. ☐ Yes ☐ No ☐ NA

Waste Disposal

15. Organic acid, inorganic acid, and basic waste are kept segregated. ☐ Yes ☐ No ☐ NA
16. Corrosive waste is disposed in accordance with regulatory and client requirements. ☐ Yes ☐ No ☐ NA
17. A waste management plan or procedure is in place. ☐ Yes ☐ No ☐ NA
18. Arrangements for waste collection, transport, and disposal are in place. ☐ Yes ☐ No ☐ NA

Comments: _____

Flammable & Combustible Liquids

S3AM-126-PR1

1.0 Purpose and Scope

- 1.1 This procedure applies to all AECOM Americas based employees and operations and any other entity and its personnel contractually required to comply with this document's content.
- 1.2 The purpose of this procedure is to provide information regarding the proper storage, handling, and work practices associated with flammable and combustible liquids.

2.0 Terms and Definitions

- 2.1 **Flashpoint** – The minimum temperature at which a liquid gives off vapor within a test vessel in sufficient concentration to form an ignitable mixture with air near the surface of the liquid. The flash point is normally an indication of susceptibility to ignition.
- 2.2 **Safety can** – Safety can: an approved container, of not more than 5 gallons (18.9 liters) capacity, having a spring-closing lid and spout cover and so designed that it will safely relieve internal pressure when subjected to fire exposure

3.0 References

- 3.1 S3AM-011-PR1 Fire Protection
- 3.2 S3AM-115-PR1 Hazardous Material Communication
- 3.3 S3AM-208-PR1 Personal Protective Equipment
- 3.4 S3AM-332-PR1 Hot Work

4.0 Procedure

- 4.1 Implementation of this standard is the responsibility of the AECOM manager directing activities of the facility, site, or project location.
- 4.2 Appoint a Responsible Person who will:
 - 4.2.1 Determine if flammable or combustible liquids are stored on-site. Flammable liquids and combustible liquids are classified or categorized differently by jurisdiction. As a general definition that aligns the different classifications or categories, flammable and combustible liquids are any liquid that has a flashpoint at or below 199.4°F (93°C). Refer to *S3AM-126-ATT1 Flammable & Combustible Liquid Classifications*.
 - 4.2.2 Inspect storage areas monthly.
 - 4.2.3 Monitor the quantity of flammable and combustible liquids on the site.
 - 4.2.4 Review work practices involving flammable and combustible liquids.
 - 4.2.5 Safety data sheets (SDS) for all hazardous substances, including flammable and combustible liquids, must be provided by vendors or subcontractors, and maintained on site. For more information, see *S3AM-115-PR1 Hazardous Material Communication*.
 - 4.2.6 Furnish portable fire extinguishers in such quantities, sizes, and types as needed for the special hazards of operation and storage. For more information, see *S3AM-011-PR1 Fire Protection*.
- 4.3 Control flammable and combustible liquids entering the site by ordering only those materials and quantities needed to complete a job.

4.4 Cylinders – General Use & Transport

- 4.4.1 Open and close cylinder valves using the appropriate tools provided by the cylinder supplier.
- 4.4.2 Remove regulators and replace caps before transporting cylinders.
- 4.4.3 Do not roll or drop cylinders. Transport cylinders in a vertical and secured positing using a cylinder basket, cylinder cart or other secure equipment.
- 4.4.4 Do not use cylinders if the cap cannot be removed by hand. Do not use tools (e.g., hammer) to loosen caps. Tag the cylinder “Do Not Use” and return the cylinder to a designated storage area to be returned to the cylinder supplier.

4.5 General Storage

- 4.5.1 Use only approved containers, tanks, and pumping equipment for storage and handling of flammable and combustible liquids. Use approved (UL or FM) metal safety cans (with spring-closing lid and spout cover, and optional flash-arresting screen) for the handling and use of flammable liquids in 1- to 5-gallon (3.8- to 18.9-liter) quantities. For additional information, see *S3AM-126-ATT1 Flammable & Combustible Liquid Classifications*.
- 4.5.2 Place all rags, waste, etc., soiled by combustible or flammable materials in tightly closed metal containers for daily disposal.
- 4.5.3 Take precautions, including proper ventilation, to prevent the ignition of flammable vapors. Sources of ignition include, but are not limited to: open flames; lightning; smoking; cutting and welding; hot surfaces; frictional heat; static, electrical, and mechanical sparks; spontaneous ignition; chemical reactions; and radiant heat.
- 4.5.4 Require approved personal protective equipment for all persons handling flammable or combustible liquids, as outlined by the appropriate SDS.
- 4.5.5 Train employees exposed to flammable or combustible liquids in the hazards of these materials; in their safe handling, use and disposal; in their protection from ignition sources; in the type, use, and placement of containers and cabinets; in the location of fire extinguishers; in the protection against toxic vapors; and in the procedures to follow in case of spill or fire.

4.6 Indoor Storage

- 4.6.1 Keep indoor storage of flammable liquids to a minimum. Do not store more than 25 gallons (95 liters) of flammable or combustible liquids outside of an approved storage cabinet.
- 4.6.2 Do not store flammable or combustible liquids in areas used for exits, stairways, or normally used for the safe passage of people.
- 4.6.3 Do not store more than of flammable and combustible liquids in a single flammable storage cabinet in excess of that specified by the applicable jurisdiction. Refer to *S3AM-126-ATT1 Flammable & Combustible Liquid Classifications*.
- 4.6.4 Do not store oxidizers and other reactive chemicals in flammable cabinets.
- 4.6.5 Up to three cabinets may be grouped together. Groups of cabinets must be separated by at least 100 feet (30.5 meters).
- 4.6.6 Conspicuously label all cabinets “Flammable — Keep Fire Away.”
- 4.6.7 Indoor flammable liquid storage rooms must conform to NFPA codes, including requirements regarding fire ratings, spill containment, maximum capacity, electrical classifications, and ventilation requirements.

4.7 Outside Storage

- 4.7.1 Maintain a minimum of 20 feet (6.1 meters) between flammable and combustible storage areas and any building.

- 4.7.2 Maintain a minimum distance of 50 feet (15.2 meters) between flammable and combustible storage areas and hot work activities. Refer to *S3AM-332-PR1 Hot Work*.
- 4.7.3 Grade the storage area in a manner to divert possible spills away from buildings, and curb or dike so as to contain entire volume of liquids and prevent spills from impacting soil or groundwater.
- 4.7.4 Keep the entire storage site free from accumulation of unnecessary combustible materials. Closely cut weeds and grass, and establish a regularly scheduled cleanup procedure for the whole area.
- 4.7.5 Maintain adequate access-ways to open-yard storage to allow access by fire-fighting equipment. Equipment that is blocking access must be manned at all times so that it may be readily moved if necessary.
- 4.8 Labeling and Signage
 - 4.8.1 Post a "NO SMOKING OR OPEN FLAME" sign in all areas where flammable and combustible materials are stored, handled, and processed.
 - 4.8.2 Require all containers and cylinders to be labeled with the contents and adequate hazard warnings per *S3AM-115-PR1 Hazardous Materials Communication*.
- 4.9 Use of Materials on Site
 - 4.9.1 Use flammable and combustible liquids in a manner that is consistent with the label and SDS for the product.
 - 4.9.2 Use only those amounts of materials needed for the job. Transfer of these materials to ready-to-use containers is encouraged.
 - 4.9.3 Use personal protective equipment stated on the product label and SDS. For additional information, consult *S3AM-208-PR1 Personal Protective Equipment*.
 - 4.9.4 For dispensing and/or fueling operations, ensure:
 - Signs are posted with instructions on the dispensing or fueling process.
 - Operators have been trained in the dispensing or fueling process.
 - Equipment being refueled has the engine shut off prior to fueling.
 - Smoking is prohibited in vehicle and equipment refueling areas.
 - Adequate protection is provided to safeguard dispensing pumps from physical damage from vehicles.
 - Dispensing nozzles have auto shut-off or self-closing valves and provisions for containing or controlling over-spillage.
 - Heating equipment installed in lubrication or service areas, where flammable liquids are dispensed, is of an approved type, and where feasible, is installed at least 8 feet (2.4 meters) above the floor.
 - Tank cars and trucks being loaded or unloaded and flammable storage tanks and systems are properly bonded and grounded.
 - Transfer of flammable liquids from one container to another is done only when containers are electrically interconnected (bonded).
 - Proper PPE is required during the dispensing or fueling process. For additional information, see *S3AM-208-PR1 Personal Protective Equipment*; and *S3AM-126-FM1 Flammable and Combustibles Inspection*.

4.10 Spill Control

- 4.10.1 Have a written spill response plan in place before materials are stored or used on site.
- 4.10.2 Have spill clean-up materials in the vicinity of the materials being stored.
- 4.10.3 Clean up or respond to spills promptly according to applicable local, state, and federal regulations. This may require notification of authorities if a Reportable Quantity (RQ) is exceeded.
- 4.10.4 Move leaking cylinder to a ventilated area away from ignition sources. Do not attempt to repair a leaking cylinder. Contact the cylinder supplier to determine proper response methods.

4.11 Disposal

- 4.11.1 Keep solvent waste and flammable liquids in fire-resistant, covered containers until they are removed from the worksite.
- 4.11.2 Do not place flammable or combustible waste in municipal garbage.
- 4.11.3 Do not pour flammable or combustible liquids down drains or onto the ground.
- 4.11.4 Dispose of flammable or combustible hazardous materials with a licensed and approved hazardous material disposal company.

4.12 Inspection

- 4.12.1 Inspect flammable and combustible storage and use areas on a monthly basis.
- 4.12.2 Use *S3AM-126-FM1 Flammable & Combustibles Inspection* or equivalent to inspect the storage areas.
- 4.12.3 Inspect cylinder regulators, gauges, valves, hoses and connections before use. Any damaged equipment shall be tagged out-of-service.

4.13 Training

- 4.13.1 Require that hazard communication training includes specific hazard information for the flammables and combustibles used.

4.14 Compliance

- 4.14.1 Review and comply with country and client/customer-specific requirements.

5.0 Records

5.1 The following information will be maintained in the project file.

- 5.1.1 Location of the SDS inventory.
- 5.1.2 Completed *S3AM-126-FM1 Flammable & Combustibles Inspection* or equivalent.

6.0 Attachments

- 6.1 S3AM-126-ATT1 Flammable & Combustible Liquid Classifications
- 6.2 S3AM-126-FM1 Flammable & Combustibles Inspection

Flammable & Combustible Liquid Classifications

S3AM-126-ATT1

NFPA 30, WHMIS Canada

Flammable Liquid	Flash Point	Boiling Point
Class 1A	< 73° F (22.8°C)	< 100° F (37.8°C)
Class 1B	< 73° F (22.8°C)	> 100° F (37.8°C)
Class 1C	> 73° F (22.8°C) < 100° F (37.8°C)	
Combustible Liquid		
Class 2	> 100° F (37.8°C) < 140° F (60°C)	
Class 3A	≥ 140° F (60°C) < 200° F (93.3°C)	
Class 3B	> 200° F (93.3°C)	

Do not store more than 25 gallons (95 liters) of Class 1A liquids in containers of flammable or combustible liquids outside of an approved storage cabinet.

Do not store more than 120 gallons (454 liters) of Class 1B, 1C, 2, or 3 liquids in containers of flammable and combustible liquids in a single flammable storage cabinet.

Maximum Allowable Size of Containers and Portable Tanks

Container Type	Flammable Liquids			Combustible Liquids	
	Class 1A	Class 1B	Class 1C	Class II	Class III
Glass or approved plastic	1 pint (0.5 liter)	1 quart (1 liter)	1.3 gallons (5 liters)	1.3 gallons (5 liters)	1.3 gallons (5 liters)
Metal (other than drums) or approved plastic	1.3 gallons (5 liters)	5.3 gallons (20 liters)	5.3 gallons (20 liters)	5.3 gallons (20 liters)	5.3 gallons (20 liters)
Safety cans	2.6 gallons (10 liters)	5.3 gallons (20 liters)	5.3 gallons (20 liters)	5.3 gallons (20 liters)	5.3 gallons (20 liters)
Metal drums (DOT specifications)	119 gallons (450 liters)	119 gallons (450 liters)	119 gallons (450 liters)	119 gallons (450 liters)	119 gallons (450 liters)
Approved metal portable tanks	793 gallons (3,002 liters)	793 gallons (3,002 liters)	793 gallons (3,002 liters)	793 gallons (3,002 liters)	793 gallons (3,002 liters)

OSHA 29 CFR 1910.106

Flammable Liquid	Flash Point	Boiling Point
Category 1	< 73.4° F (23°C)	< 95° F (35°C)
Category 2	< 73.4° F (23°C)	> 95° F (35°C)
Category 3*	> 73.4° F (23°C) < 140° F (60°C)	
Category 4**	>140°F (60°C) ≤199.4°F (37.8°C)	

* When a Category 3 liquid with a flashpoint at or above 100 °F (37.8 °C) is heated for use to within 30 °F (16.7 °C) of its flashpoint, it shall be handled in accordance with the requirements for a Category 3 liquid with a flashpoint below 100 °F (37.8 °C).

** When a Category 4 flammable liquid is heated for use to within 30 °F (16.7 °C) of its flashpoint, it shall be handled in accordance with the requirements for a Category 3 liquid with a flashpoint at or above 100 °F (37.8 °C).

Maximum Allowable Size of Containers and Portable Tanks

Container Type	Flammable Liquids			
	Category 1	Category 2	Category 3	Category 4
Glass or approved plastic	1 pint (0.5 liter)	1 quart (1 liter)	1 gallons (3.8 liters)	1 gallons (3.8 liters)
Metal (other than drums) or approved plastic	1 gallons (3.8 liters)	5 gallons (18.9 liters)	5 gallons (18.9 liters)	5 gallons (18.9 liters)
Safety cans	2 gallons (7.6 liters)	5 gallons (18.9 liters)	5 gallons (18.9 liters)	5 gallons (18.9 liters)
Metal drums (DOT specifications)	60 gallons (227 liters)	60 gallons (227 liters)	60 gallons (227 liters)	60 gallons (227 liters)
Approved metal portable tanks	660 gallons (2498 liters)	660 gallons (2498 liters)	660 gallons (2498 liters)	660 gallons (2498liters)

Not more than 60 gallons (227 liters) of Category 1, 2 and/or 3 flammable liquids or 120 gallons (454 liters) of Category 4 flammable liquids shall be stored in any one storage cabinet. Not more than three such cabinets may be located in a single storage area. Quantities in excess of this shall be stored in an inside storage room.

Storage of containers (not more than 60 gallons [227 liters] each) shall not exceed 1,100 gallons (4164 liters) in any one pile or area. Piles or groups of containers shall be separated by a 5-foot clearance. Piles or groups of containers shall not be nearer than 20 feet (6.1 meters) to a building.

Americas

Flammable & Combustibles Inspection

S3AM-126-FM1

Location Inspected: _____ Job No.: _____ Date: _____

Inspector Name: _____ Inspector Signature: _____

Fillable fields in the item description shall be completed with the applicable jurisdictional requirement.			
Storage Cabinets			
1.	Flammable cabinets do not obstruct room exits.	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> NA
2.	No more than _____ gallons (_____ liters) of flammable or _____ gallons (_____ liters) of combustible liquid are stored in a cabinet.	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> NA
3.	No more than three cabinets are located in a storage area.	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> NA
4.	Metal storage cabinets have self-closing doors.	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> NA
5.	Cabinets are labeled "FLAMMABLE – KEEP FIRE AWAY"	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> NA
Safety Cans			
6.	Safety cans are constructed of stainless steel, Monel, or tin.	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> NA
7.	Safety cans have a flame arrestor and spring-loaded cap on both the filling and pouring spouts.	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> NA
8.	Safety cans have a flame arrestor and spring-loaded cap on both the filling and pouring spouts.	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> NA
Drum & Drum Storage Areas			
9.	Drums are stored in a vertical position.	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> NA
10.	Bungs are closed when liquid is not being transferred.	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> NA
11.	Drums are shielded from the sun.	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> NA
12.	Funnels with installed flash arrestor are used when transferring flammable liquids into drums.	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> NA
13.	A minimum distance of 25 feet (7.6 meters) between a drum storage area and buildings is present.	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> NA
14.	A "NO SMOKING" sign is posted in the area.	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> NA
15.	An emergency spill kit is located near the drum storage area.	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> NA
16.	A 20-pound dry-chemical fire extinguisher is located no less than 10 feet (3 meters) or more than 50 feet (15 meters) from the storage area.	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> NA
Waste Cans			
17.	Combustible scrap, debris, and waste materials (oily rags, etc.) are stored in covered metal cans.	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> NA
18.	Waste cans are removed from the work area daily.	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> NA
19.	Waste cans have spring-loaded self-closing lids.	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> NA

Storage Rooms Designed Specifically For Flammable Materials			
20. Room construction meets NFPA fire-resistance requirements.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
21. A NO SMOKING sign is posted in the room.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
22. An emergency spill kit is located in the room.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
23. Rooms with automatic extinguishing systems have the following:			
• Noncombustible liquid-tight raised sills or ramps at least 4 inches (0.36 meters) in height.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
• Flooring at least 4 inches (0.36 meters) below the surrounding floor, or an open-grated trench that drains to a safe location.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
• Openings with approved self-closing fire doors.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
• Liquid-tight construction where the walls join the floors.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
• Shelving, racks, dunnage floor overlay, and other interiors with 1-inch wood.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
24. Rooms are ventilated by a gravity or mechanical exhaust system that:			
• Commences not more than 1 foot (0.3 meter) above the floor.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
• Is designed to provide for a complete change of air within the room at least six times per hour.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
• Is controlled by a switch located outside the door, with ventilating equipment and any light fixtures operated from the same switch.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
Flammable & Combustible Storage Areas Within Buildings			
25. At least one portable fire extinguisher rated not less than 20-B is located outside of but not more than 10 feet (3 meters) from the door opening into any room used for the storage of more than _____ gallons (_____ liters) of flammable or combustible liquids.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
26. Buildings or rooms are locked when not occupied.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
27. Exits, stairways, or passageways are not used for storing flammables and combustibles.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
28. No more than _____ gallons (_____ liters) of _____ liquids or _____ gallons (_____ liters) of _____ liquids are located in a room outside of a flammable storage locker or flammable storeroom.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
29. An aisle at least 3 feet (0.91meters) wide is maintained in storage areas.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
30. No more than those amounts needed for one day's use are stored in buildings under construction.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
Outside Storage of Flammable and Combustible Liquids			
31. At least one portable fire extinguisher having a rating of not less than 20-B is located not less than 25 feet (7.6 meters) or more than 75 feet (22.8 meters) from any outside flammable liquid storage area.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
32. For containers not more than _____ gallons each (_____ liters), no more than _____ gallons (_____ liters) in any one group are stored.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
33. Groups of containers are separated by 5-foot (1.52 meters) clearances.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
34. Groups of containers are more than 50 feet (15 meters) from buildings.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
35. Portable tanks (not exceeding _____ gallons [_____ liters] in capacity) are provided with emergency venting devices as specified by NFPA 30.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA

36. Storage areas are free of accumulation of weeds, debris, and other combustible materials not necessary to the storage.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
Storage Tanks			
37. Tanks have relief vents.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
38. Tank vents are not close to open flames, stacks, heating apparatus, or any other source of ignition.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
39. Tanks are double-walled or a dike, curb, or other suitable means is present to prevent the spread of leakage from tanks.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
40. Diked areas have a capacity equal in volume to at least that of the largest tank plus 10 percent of all other tanks in the enclosure.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
41. Provisions to drain off accumulations of ground- or rainwater or spills in diked areas.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
42. Tanks are vented outdoors and away from air intakes and windows.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
43. Impact protection, such as bollards or guard rails, is present for tanks located in areas susceptible to impacts from vehicles or other moving equipment.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
Dispensing of Flammable and Combustible Liquids			
44. Dispensing outlets for above-ground tanks with nationally listed automatic-closing valve, without a latch-open device.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
45. Dispensing systems are electrically bonded and grounded.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
46. Tanks, hoses, and containers of 5 gallons (19 liters) or less in metallic contact while transferring flammable liquids (grounding).	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
47. Electrically bonded systems are used for transferring flammable liquids in containers in excess of 5 gallons (19 liters).	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
48. Closed piping systems are used for drawing flammable liquids during transfer.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
49. Flammables and combustibles are drawn from a container or portable tank by use of gravity or through a pump using an approved self-closing valve.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
Liquefied Petroleum Gas – Refueling			
50. Equipment is shut down during refueling operations.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
51. Leather gloves and safety glasses are worn during refueling operations.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
52. Smoking and hot work is prohibited during refueling.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
53. Refueling occurs at least 25 feet (7.6 meters) from buildings.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
Oxidizers			
54. Oxidizers are stored separately from flammables.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
55. When oxidizers are shifted to a second container, the container is labeled with the appropriate warning labels.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
56. Secondary containers are compatible with oxidizers.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
57. Oxidizers are stored away from heat sources where the maximum temperature exceeds 100° F (37.8° C).	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
58. Chromic acid, nitric acid, perchloric acid, and potassium permanganate (all oxidizers) are stored separately from other corrosives and flammables.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA

Hand & Power Tools

S3AM-305-PR1

1.0 Purpose and Scope

- 1.1 This procedure provides the AECOM requirements for all manually operated hand and power tools and associated use, handling and storage. These requirements apply to tools provided by AECOM for employee use as well as tools provided by employees for use on AECOM work sites.
- 1.2 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.

2.0 Terms and Definitions

- 2.1 None

3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-118-PR1 Hearing Conservation
- 3.3 S3AM-208-PR1 Personal Protective Equipment
- 3.4 S3AM-302-PR1 Electrical Safety
- 3.5 S3AM-325-PR1 Lockout Tagout

4.0 Procedure

- 4.1 Roles and Responsibilities
 - 4.1.1 **Managers/Supervisors**
 - Ensure that all aspects of this procedure are followed and adhered to on all AECOM projects, sites and locations.
 - If a specific tool is not included in the work instructions related to this procedure, appropriate guidelines shall be established prior to work associated with that tool, including following manufacturer's recommendations.
 - Ensure compliance with applicable client requirements and restrictions regarding hand or power tools.
 - 4.1.2 **Safety, Health and Environment (SH&E) Manager**
 - Provide technical guidance and support as to this procedure and associated work instructions.
 - 4.1.3 **Employees**
 - Work only with tools for which they are appropriately trained and familiar with.
 - Follow manufacturer's recommendations for its use and never modify the equipment without first obtaining authorization from the manufacturer.
 - Comply with applicable client requirements and restrictions regarding hand or power tools.
- 4.2 Requirements
 - 4.2.1 Always conduct a task hazard assessment (THA) prior to work commencing and include the identified hazards associated with the anticipated tool use.

- 4.2.2 No employee shall use any hand or power tool, unless they are familiar with the use and operation of the equipment or have received specific instruction on its use and operation.
- 4.2.3 All tools will be used for which they were designed and in accordance with manufacturer's specifications. Do not use tools for jobs they are not intended for. For example, do not use a slot screw driver as a chisel, pry bar, wedge or punch or wrenches as hammers.
- 4.2.4 Use approved tools only. Never modify or use makeshift tools.
- 4.2.5 Do not apply excessive force or pressure on tools unless permitted by the manufacturer's specifications. This includes additional force by hammering with body weight, foot or other tools.
- 4.2.6 Keep surfaces and handles clean and free of excess oil and grease to prevent slipping.
- 4.2.7 Do not carry sharp tools (e.g. knife, chisel, screwdriver, etc.) in pockets; this practice may cause puncture wounds.
- 4.2.8 All tools shall be properly maintained. Clean, dry, lubricate and repair tools as applicable, and return to a suitable toolbox, room, rack, or other storage area upon completion of a job.
- 4.2.9 Ensure proper ergonomics principles are observed when using hand and power tools, such as but not limited to:
 - Avoid static and awkward positions when possible.
 - Move at intervals to reduce muscle fatigue.
 - Consider tools with a trigger strip, rather than a trigger button. This strip will allow the exertion of more force over a greater area of the hand that, in turn, will reduce muscle fatigue
 - Do not apply excessive force or pressure on tools.
 - If possible use tools with comfortable grips that are designed to allow the wrist to stay straight. Avoid using a bent wrist.
 - Choose hand tools that have a centre of gravity within or close to the handle.
 - Frequently used tools that weigh more than 1 pound (0.45 kilograms) should be counter-balanced.
 - Ensure proper body positioning when using a tool to prevent slips or falls in the event of unanticipated tool behaviour (slip, kickback, etc.). Avoid over-reaching.
 - Pull on tools such as a wrench or pliers whenever possible. Loss of balance is more likely when pushing if the tool slips. If pushing is necessary, hold the tool with an open palm.
 - Hand-arm vibration exposure is associated with the use of hand tools.
 - Reduce power to the lowest setting that can complete the job safely. This action reduces tool vibration at the source.
 - Consider the need for controls such as limiting time of use.
 - If safe to do so, adjust to a looser but stable grip, and use anti-vibration gloves.
 - Use of heavy tools such as jackhammers can cause fatigue and strains. Heavy rubber grips can reduce these effects by providing a secure handhold.
 - Do not increase a tool's leverage by adding sleeved additions (e.g. a pipe or snipe) to increase tool handle length.
- 4.2.10 Avoid placing fingers and hands in danger zones:
 - Ensure hands and fingers have sufficient clearance in the event the tool slips.
 - Ensure stability of the work-piece. Use work-piece holders (e.g. vise, chisel holder, etc.) whenever possible to prevent injury to hands or deflection of tool or work-piece.

- Use push sticks or guides when cutting or machining smaller material.
- 4.2.11 Secure tools when working from heights to prevent them from falling. Never leave tools on ladders, scaffolds, or overhead work areas when they are not in use.
- 4.2.12 Utilize good housekeeping practices to ensure tools do not present a tripping hazard.
- 4.2.13 Ensure no part of a tool extends over the edge of the bench top. Place sharp tools (e.g., saws, chisels, knives) on benches so that sharp points or edges face away from the edge.
- 4.2.14 When using saw blades, knives, or other tools, if possible direct the tools away from aisle areas and away from other employees working in close proximity.
- 4.2.15 Do not throw tools from place to place or from person to person, or drop tools from heights. Hand them, handle first, directly to other workers.
- 4.2.16 Use non-sparking and intrinsically safe tools in atmospheres with flammable or explosive characteristics and where highly volatile liquids, and other explosive substances are stored or used.
 - Iron or steel hand tools may produce sparks that can be an ignition source around flammable substances. Where this hazard exists, spark-resistant tools made of non-ferrous materials shall be used.
 - Electrical tools shall be identified as intrinsically safe.
- 4.2.17 If the task presents electrical hazards, worker must be competent and use the appropriate insulated tools to perform work that includes the risk of electrical shock. Cushioned grip handles do not protect against electrical shock.
- 4.2.18 The fluid used in hydraulic power tools must be an approved fire-resistant fluid and must retain its operating characteristics at the most extreme temperatures to which it will be exposed. The exception to fire-resistant fluid involves all hydraulic fluids used for the insulated sections of derrick trucks, aerial lifts, and hydraulic tools that are used on or around energized lines. This hydraulic fluid shall be of the insulating type.
- 4.2.19 All tools designed to accommodate guards must have the guard(s) in place when the tool is in use. Do not modify, remove, or disable any machine guards.
- 4.2.20 Do not allow loose clothing, long hair, loose jewelry, rings, and chains to be worn while working with power tools.
- 4.2.21 Make provisions to prevent tools from automatically restarting upon restoration of power. Refer to *S3AM-325-PR Lockout Tagout*.
- 4.3 Training
 - 4.3.1 Instruction in the proper use, safe handling, and maintenance of tools will be provided to employees unfamiliar with the tool.
 - Assess the employee's training needs as per *S3AM-003-PR1 SH&E Training* procedure.
 - Refer to the applicable work instructions associated with this procedure for any additional training specifics.
 - Training shall include applicable manufacturer's recommendations and guidelines.
 - 4.3.2 Employees shall demonstrate knowledge and competency in the use, safe handling and maintenance of the applicable tool prior to operation.
- 4.4 Personal Protective Equipment (PPE)
 - 4.4.1 Utilize basic PPE appropriate to the task; gloves, safety-toed boots, hard hats and safety glasses with side shields. Refer to *S3AM-208-PR1 Personal Protective Equipment*.
 - 4.4.2 Ensure lockout devices (padlocks, multiple lock hasps, tags) are utilized as necessary. Refer to *S3AM-325-PR Lockout Tagout*.

- 4.4.3 Ensure PPE is appropriate to the work and use additional PPE as required (e.g. mono-goggles, hearing protection, respiratory protection, etc.).
- Dual eye protection is required to be worn by any employee undertaking or within 3 ½ feet (1 meter) of a task that produces projected particles or material.
 - Head and face protection is recommended for employees working with pneumatic tools.
 - Noise hazard is associated with pneumatic and many other tools. Working with noisy tools such as jackhammers requires proper, effective use of appropriate hearing protection.
- 4.4.4 Screens shall also be set up to protect nearby workers from being struck by flying fragments around chippers, riveting guns, staplers, or air drills.
- 4.4.5 Refer to the applicable work instructions associated with this procedure for any additional specialized PPE.
- 4.5 Inspections
- 4.5.1 All tools must be inspected prior to each use.
- Any tool that is defective or has missing parts must not be used.
 - Every broken or defective tool must be tagged 'out of service' or 'do not use' and immediately removed from service.
 - Tagged tools will be returned to the supervisor for repair or replacement.
- 4.5.2 All tools must be inspected to manufacture's specifications and according to tool rests and guard adjustment tolerances. All tools will be inspected to ascertain that all safety devices are present and functioning properly. Refer to *S3AM-305-FM1 Hand & Power Tool Maintenance Inventory* and *S3AM-305-FM2 Hand & Power Tool Inspection Report*.

5.0 Records

- 5.1 None

6.0 Attachments

- 6.1 [S3AM-305-ATT1 Chainsaw](#)
- 6.2 [S3AM-305-ATT2 Circular Saw](#)
- 6.3 [S3AM-305-ATT3 Cut Off Saw](#)
- 6.4 [S3AM-305-ATT4 Handheld Grinder](#)
- 6.5 [S3AM-305-ATT5 Impact Wrench](#)
- 6.6 [S3AM-305-ATT6 Nail Gun](#)
- 6.7 [S3AM-305-ATT7 Dustless Vacuum](#)
- 6.8 [S3AM-305-ATT8 Power Drill](#)
- 6.9 [S3AM-305-ATT9 Pressure Washer](#)
- 6.10 [S3AM-305-ATT10 Reciprocating Saw](#)
- 6.11 [S3AM-305-ATT11 Sander](#)
- 6.12 [S3AM-305-ATT12 Knives](#)

- 6.13 [S3AM-305-ATT13 Clearing & Grubbing Equipment](#)
- 6.14 [S3AM-305-ATT14 Pneumatic Tools](#)
- 6.15 [S3AM-305-ATT15 Manual Hand Tools](#)
- 6.16 [S3AM-305-ATT16 Small Engines](#)
- 6.17 [S3AM-305-ATT17 Electric & Battery Hand Tools](#)
- 6.18 [S3AM-305-FM1 Hand & Power Tool Maintenance Inventory](#)
- 6.19 [S3AM-305-FM2 Hand & Power Tool Inspection Report](#)

Chainsaw

S3AM-305-ATT1

1.0 Objective / Overview

- 1.1 Available in a variety of types and capacities, chainsaws are one of the most powerful, yet dangerous cutting tools available.
- 1.2 Working safely with a chain saw includes proper training, good body mechanics and felling technique, well-maintained equipment, and protective clothing.

2.0 Hazards

- 2.1 Improper operation (kickback – sudden and violent reverse movement of the saw)
- 2.2 Hand/arm vibration
- 2.3 Noise
- 2.4 Flying/falling debris
- 2.5 Sharp, moving blade
- 2.6 Defective tool

3.0 Safe Operating Guidelines

- 3.1 Only approved operators are permitted to operate a chainsaw.
- 3.2 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT16 Small Engines* for additional guidelines.
- 3.3 Inspect saws prior to use and periodically during use:
 - 3.3.1 A sharp chainsaw is safer than a dull one. Worn chains shall be replaced immediately.
 - 3.3.2 Keep the saw clean, lubricated, and adjusted.
 - 3.3.3 Inspect and test the chain brake, chain catch, throttle lock, handles and guards, all nuts and bolts, spark arrestor, and muffler and air filter.
 - 3.3.4 The chain tension should be properly adjusted and the carburetor tuned. The idle must be correctly adjusted; the chain should not move when the saw is in the idle mode.
 - 3.3.5 Ensure the saw is fitted with an inertia break and hand guard.
 - 3.3.6 Ensure the saw is fueled with the appropriate fuel type.
 - 3.3.7 Do not operate a chain saw that is damaged or improperly adjusted, or is not completely and securely assembled. If a chainsaw is defective, remove it from service, and tag it clearly "Out of service for repair" or "Do Not Use". Replace damaged equipment immediately – do not use defective tools "temporarily." DO NOT ATTEMPT FIELD REPAIRS.
- 3.4 Never "drop start" the saw (the saw is held in the air with one hand on the handlebar and the other on the pull cord) as no control is provided to prevent rotation of the saw back toward the user.
- 3.5 Ensure an appropriately sized fire extinguisher or fire-fighting equipment is readily available.
- 3.6 A chainsaw is not only dangerous to the operator but also to surrounding persons. Do not allow others in the area when chainsaws are operated.
- 3.7 Never operate a chain saw when fatigued.

- 3.8 Make sure there are no nails, wire, or other imbedded material in the material to be cut that can cause flying particles or kickback.
- 3.9 Keep all parts of the body away from the saw chain when the engine is running.
 - 3.9.1 Keep the saw close to the body.
 - 3.9.2 Bend from the knees, not the waist. Improper lifting techniques and poor posture contribute to injuries.
 - 3.9.3 Always avoid standing on the log and making cuts with the saw between your legs; always cut with the saw to the outside of your legs.
 - 3.9.4 Always stand to one side of the limb to be cut, never straddle it.
 - 3.9.5 Never cut above chest height.
- 3.10 Determine where the tree/limb will fall prior to cutting.
 - 3.10.1 Start cutting only after a clear escape path has been made.
 - 3.10.2 Always ensure that personnel and equipment are not in the path of the falling tree/log, and that you have time to move away.
 - 3.10.3 If necessary, flag/or fence off the area to prevent entry.
- 3.11 Always keep in mind where the chain will go if it breaks; never position body or allow others in line with the chain.
- 3.12 Avoid operations that could result in kickback of the saw towards the operator.
- 3.13 Keep the chain out of the dirt, debris will fly, the teeth will be dulled and the chain life shortened.
- 3.14 Shut the saw off when carrying through brush or on slippery surfaces. The saw may be carried no more than 50 feet (15 meters) while idling.



Blade nose strikes another object



Improper starting of bore



Top or blade nose touches bottom or side of kerf during reinsertion

4.0 Personal Protective Equipment

- 4.1 Dual eye protection – safety glasses with side shields and a face shield
- 4.2 Chainsaw Chaps
- 4.3 Wear appropriate apparel. Long hair, loose or baggy clothing, ties, or jewellery can become caught in moving parts.
- 4.4 Safety toe work boots
- 4.5 Hardhat with lateral impact protection
- 4.6 Gloves providing impact, abrasion, cut, tear, & puncture resistance
- 4.7 Hearing Protection

Americas

Circular Saw

S3AM-305-ATT2

1.0 Objective / Overview

- 1.1 The circular saw is used in cutting wood products (e.g. plywood, construction lumber, etc.).
- 1.2 Safe measures for use include proper training, good body mechanics and operating technique, well-maintained equipment, and protective equipment.

2.0 Hazards

- 2.1 Kickback – Sudden and violent reverse movement of the saw
- 2.2 Noise
- 2.3 Flying debris
- 2.4 Sharp, moving blade (severe cuts)
- 2.5 Defective tool
- 2.6 Improper operation

**3.0 Safe Operating Guidelines**

- 3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT17 Electric & Battery Hand Tools* for additional guidelines.
- 3.2 Use sharp blades and ensure cracked and dull blades are removed from service. Dull blades cause binding, stalling and possible kickback.
- 3.3 Use the correct blade for the application and check for proper operation before each cut.
- 3.4 Check often to ensure that guards return to their normal position quickly. Never defeat the guard to expose the blade.
- 3.5 Portable circular saws having a blade greater than 2 inches (5.08 centimeters) in diameter must be equipped at all times with guards. An upper guard must cover the entire blade of the saw.
- 3.6 A retractable lower guard must cover the teeth of the saw, except where it makes contact with the work material. The lower guard must automatically return to the covering position when the tool is withdrawn from the work position.
- 3.7 Before starting a circular saw, be sure the power cord and extension cords are out of the blade path and are long enough to freely complete the cut. A sudden jerk or pulling on the cord can cause loss of control of the saw and a serious accident.
- 3.8 Secure the work being cut to avoid movement.
- 3.9 For maximum control, hold the saw firmly with both hands after securing the work piece.
- 3.10 Keep the upper and retracting lower blade guard and the motor free from dust.
- 3.11 Do not hold or force the retracting lower guard in the open position.
- 3.12 Do not over tighten the blade-locking nut.
- 3.13 Do not twist the saw to change, cut or check alignment.
- 3.14 Do not use a saw that vibrates or appears unsafe in any way.
- 3.15 Do not force the saw during cutting.
- 3.16 Do not cut materials without first checking for obstructions or other objects such as nails and screws.
- 3.17 Check frequently to be sure clamps remain secure.

- 3.18 Avoid cutting small pieces that can't be properly secured and material on which the saw shoe can't properly rest. Use a push stick or guide when cutting operation requires the hands of the operator to come close to the blade.
- 3.19 Do not overreach. Keep proper footing and balance.
- 3.20 When starting the saw, allow the blade to reach full speed before contacting the work piece.
- 3.21 Circular saws are designed for right-hand operation; left-handed operation will demand more care to operate safely.
- 3.22 Never place hand under or in front of the shoe or guard of the saw when operating.
- 3.23 Cut at the proper depth ($\frac{1}{4}$ inch / 0.64 centimeters) below work surface. Set the depth of the blade prior to use, when the saw is unplugged.

4.0 Personal Protective Equipment

- 4.1 Wear proper apparel for the task. Long hair, loose or baggy clothing, ties, or jewelry can become caught in moving parts.
- 4.2 Gloves that provide cut, abrasion and impact resistance.
- 4.3 Kickback apron as necessary.
- 4.4 Safety toed boots.
- 4.5 Safety glasses with side shields and faceshield.
- 4.6 Hearing Protection.

Cut Off Saw

S3AM-305-ATT3

1.0 Objective / Overview

- 1.1 Cut-off saws are high-speed cutting tools and very dangerous to operate. Therefore, it is very important to review the general safety rules, training, Personal Protective Equipment and procedures for working with portable cut off saws.
- 1.2 Cut off saws are used in a variety of activities (i.e. concrete, piping, metal, etc.).

2.0 Hazards

- 2.1 Noise
- 2.2 Flying debris
- 2.3 Sharp, moving blades (severe cuts)
- 2.4 Ignition sources (hot engine, sparks)
- 2.5 Hand/arm vibration
- 2.6 Kickback – Sudden and violent reverse movement of the saw

3.0 Safe Operating Guidelines

- 3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT17 Electric & Battery Hand Tools* or *S3AM-305-ATT16 Small Engines* for additional guidelines
- 3.2 In addition to inspecting the general tool prior to operation, inspect the abrasive wheel for cracks and chips and appropriate wheel type.
 - 3.2.1 If cracked or chipped, replace wheel before use.
 - 3.2.2 Do not use abrasive-type wheels for rough grinding.
- 3.3 Ensure the saw is started in accordance with manufacturer's specifications:
 - 3.3.1 Start the saw on firm ground or other solid surface in an open area.
 - 3.3.2 Never "drop start" the saw as in the above picture (the saw is held in the air with one hand on the handlebar and the other on the pull cord) as no control is provided to prevent rotation of the saw back toward the user.
- 3.4 Handling
 - 3.4.1 Hold the saw firmly with two hands when the engine is running, and whenever the blade is rotating until it comes to a complete stop.
 - 3.4.2 Carry the saw with engine stopped, muffler away from your body, while protecting the cutting wheel from striking the ground or other objects.
- 3.5 Cutting
 - 3.5.1 Clear the working area.
 - 3.5.2 Begin cutting at full throttle and continue at full throttle until the cut is finished.
 - 3.5.3 Avoid standing in a direct line with the cutting wheel.
 - 3.5.4 Use only downward pressure on the saw, as lateral pressure may cause the blade to break and shatter.

- 3.5.5 Do not change the direction of the cut once started, as this can also cause the blade to break and shatter.
- 3.5.6 Do not cut above shoulder height.
- 3.5.7 Avoid operating the saw if the terrain is wet and/or frozen.
- 3.5.8 Keep flammable and combustible materials away from saw while cutting.
- 3.5.9 Ensure an appropriate fire extinguisher or fire-fighting equipment is readily available.
- 3.6 Maintenance
 - 3.6.1 Shut off the engine and remove the spark plug wire before adjusting or working on the saw.

4.0 Personal Protective Equipment

- 4.1 Safety glasses with side shields and faceshield.
- 4.2 Chainsaw chaps.
- 4.3 Safety toe work boots.
- 4.4 Gloves that provide cut abrasion and impact resistance.
- 4.5 Hearing protection: earplugs and/or earmuffs.
- 4.6 Respirator if required (concrete operations).

Handheld Grinder

S3AM-305-ATT4

1.0 Objective / Overview

- 1.1 Handheld grinders are high-speed electric- or pneumatic-powered grinding tools used to shape or cut metal, and can be dangerous to operate.
- 1.2 Grinders are used in a variety of activities (i.e., piping installation/repair, metal, restoring, polishing, sharpening, etc.).

2.0 Potential Hazards

- 2.1 Kickback – Sudden and violent reverse movement of the grinder
- 2.2 Electric shock
- 2.3 Flying debris
- 2.4 An improperly installed or incompatible wheel can break or explode and cause injury.
- 2.5 Moving parts (severe cuts)
- 2.6 Fire hazard from sparks igniting nearby debris or objects
- 2.7 Noise
- 2.8 Hand/arm vibration

3.0 Safe Operating Guidelines

- 3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT17 Electric & Battery Hand Tools* for additional guidelines.
- 3.2 Inspect the tool before every use. Damaged tools must be removed from use and tagged "DO NOT USE".
- 3.3 Grinder guards are to be used at all times and must not be altered.
 - 3.3.1 US requirements specify a maximum of 180° of the grinding wheel to be exposed.
 - 3.3.2 While 120° coverage may be permissible in certain jurisdictions, guards that are greater are not to be cut down.
 - 3.3.3 Replace damaged or defective guards immediately
- 3.4 Grinders must be used with an unmodified manufacturer supplied handle at all times. If removal of the handle is required the reason must be appropriately documented and approved by project / location manager and SH&E manager or designee. Client approval may also be required.
- 3.5 Trigger locks are not permitted. If a grinder is found with a trigger lock, the lock shall be disabled.
- 3.6 Never use the grinder for jobs for which it is not designed (e.g. cutting with a grinding wheel vs. cutting disc).
- 3.7 Grinders must be permanently marked with the manufacturer's established maximum RPM (revolutions per minute).
- 3.8 Inspect the disk or wheel prior to operation:
 - 3.8.1 Wire wheels must be inspected for loose and broken wires.



- 3.8.2 Ensure the RPM (as posted on the wheel) is equal to or greater than that posted on the grinder, the disk / wheel is the correct size for the grinder, and the type of wheel is compatible with the material being ground or cut.
- 3.8.3 Wheels must be replaced as specified by the manufacturer. In the absence of specifications a wheel shall not be worn down to a size which would allow the mounting flange assembly to contact the work-piece or work-piece holding fixture.
- 3.8.4 Ensure the disk or wheel is checked for cracks or other damage. A ring test can be conducted on clean, dry, unmounted wheels greater than 4" (10.16 centimeters) in diameter:
 - Suspend the wheel by its arbor hole;
 - Use a non-metallic tool (wood, plastic) to gently tap the wheel at 45° from the vertical center line on either side of the wheel, approximately 1 to 2 inches (2.5 – 5 centimeters) from the edge;
 - Rotate the wheel 45° and repeat the process until the entire wheel has been tested;
 - A wheel that emits a metallic ring indicates absence of damage, whereas a dull sound means the wheel should be removed from service.
- 3.8.5 If cracked, chipped, or there is any other evidence of damage, remove from service and replace wheel before use.
- 3.9 When mounting the wheels:
 - 3.9.1 Grinders must be unplugged before changing wheels, discs or positioning guards.
 - 3.9.2 Follow manufacturer's specifications (e.g. stamp facing grinder, mount up, mount down, etc.)
 - 3.9.3 Ensure that the mounting flanges are clean and the mounting blotters are used.
 - 3.9.4 Do not over tighten the mounting nut.
 - 3.9.5 Before grinding or cutting, run newly mounted wheels at operating speed to check for vibrations.
- 3.10 General Safety Provisions
 - 3.10.1 Ensure abrasive wheels are stored according to manufacturer specifications (absence of temperature extremes and solvents, dry area protected from impact, first in first out).
 - 3.10.2 Keep the work area clean. Do not grind near flammable and combustible materials. Sparks can ignite debris and flammable vapors. A fully charged fire extinguisher must be located nearby. Use of a fire blanket may be necessary.
 - 3.10.3 All observers should be kept at a safe distance from the work area to ensure they are protected from flying debris / sparks. Whenever practicable, use screens or shields.
 - 3.10.4 Always secure work with clamps or a vise, freeing both hands to operate the tool. Never clamp a handheld grinder in a vice.
 - 3.10.5 Use grinding wheels only at their rated speed.
 - 3.10.6 Ensure safety guard(s) is positioned properly prior to start-up.
 - 3.10.7 Allow the grinder to come to full operating speed before beginning grinding operation.
 - 3.10.8 Do not use the side of a grinding wheel unless the wheel is designed for side grinding.
 - 3.10.9 Always stand to the side of the wheel, never directly behind it.
 - Be sure to keep your footing and maintain proper balance. Keep hands, fingers, and other body parts from coming into contact with the revolving wheel.
 - While in operation, grinder shall be held with a firm grip using both hands. One engaging the trigger, and the second holding the handle.

3.10.10 Grinding aluminum is prohibited.

3.10.11 Tools shall be maintained with care. They should be kept clean and sharp for the best performance. Follow instructions in the user's manual for lubricating and care instructions.

4.0 Personal Protective Equipment (PPE)

4.1 Please refer to *S3AM-208-PR1 Personal Protective Equipment* for further information.

4.2 Gloves providing appropriate heat, impact, abrasion, cut, tear, & puncture resistance.

4.3 Wear appropriate apparel. Long-sleeved shirts and pants are required; clothing shall be made of natural fibers. Synthetics are not permitted. Note: Long hair, loose or baggy clothing, hoodie strings, ties, or jewelry can become caught in moving parts.

4.4 Dual eye protection required - Safety glasses with sideshields and properly impact-rated face shield. Welding helmets used as a face shield shall be verified as approved by CSA / ANSI for protection against impact.

4.5 Safety toe work boots.

4.6 Hearing protection: earplugs and/or earmuffs.

4.7 Other PPE as necessary for the work site/activity (e.g., hard hat, respiratory protection).

Impact Wrench

S3AM-305-ATT5

1.0 Objective / Overview

- 1.1 Impact wrenches are mainly used for tire changing but that does not limit their use. They can be used in all applications when a certain amount of torque is needed to loosen or tighten nuts and bolts.
- 1.2 The danger comes in to play when employees try to use the wrong sockets with an air wrench. Employees using air wrenches must have a general understanding of how to use them.

2.0 Potential Hazards

- 2.1 Flying debris
- 2.2 Noise
- 2.3 Cuts
- 2.4 Hand/arm vibration

3.0 Safe Operating Guidelines

- 3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT14 Pneumatic Tools* for additional guidelines.
- 3.2 Impact wrench sockets and accessories must be used with this tool. Do not use hand sockets and accessories.
- 3.3 The proper fastening torque may differ depending upon the kind or size of the bolt.
- 3.4 Check the torque with a torque wrench.
- 3.5 Connect tool to air hose of recommended size.
- 3.6 Never use a wire, soft pin, or nail to hold the socket onto the square spindle of the impact wrench.
- 3.7 If the proper retaining device on the tool is broken, the tool shall be removed from service to be repaired.
- 3.8 On applications where a low or critical level of torque is required, it is recommended that each fastener is impacted lightly. Then perform the final tightening with a hand torque wrench.

4.0 Personal Protective Equipment

- 4.1 Safety toed boots
- 4.2 Anti-vibration gloves with impact and abrasion and cut resistance.
- 4.3 Safety glasses with side shields.
- 4.4 Hearing protection.

Nail Gun & Stapling Tool

S3AM-305-ATT6

1.0 Objective / Overview

- 1.1 Nail guns and stapling tools (pneumatic power-fastening devices) are useful, but must be handled with care.
- 1.2 Nail guns and stapling tools have been shown to be the cause of unnecessary injuries when the design of the gun places emphasis on speed, rather than safety.

2.0 Potential Hazards

- 2.1 Flying debris/nails
- 2.2 Imbedded object
- 2.3 Puncture wounds
- 2.4 Noise

3.0 Safe Operating Guidelines

- 3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT14 Pneumatic Tool* for additional guidelines.
- 3.2 Permit only experienced and trained persons to operate pneumatic nailing and stapling tools. Never let an inexperienced worker use a nail gun without supervised training.
- 3.3 Never point a nail gun or stapling tool toward the body or any other personnel.
 - 3.3.1 Never rest the gun against any part of your body, or try to climb a ladder with the gun cradled against your body.
 - 3.3.2 Be aware of other workers in the work area.
 - 3.3.3 Be aware of what is located behind the nailing surface. Never place hands or other body parts directly behind the nailing surface.
 - 3.3.4 Ensure no one is in the line of fire should an incorrectly selected fastener eject out the other side of the material.
- 3.4 Inspect a tool before connecting it to air supply:
 - 3.4.1 Check tool safety mechanisms if applicable. Never disable a safety tip on a nail gun or stapling tool.
 - 3.4.2 Tighten securely all screws and cylinder caps.
 - 3.4.3 Pneumatic power-fastening devices that shoot nails, rivets, staples, or similar fasteners and operate at pressures more than 100 pounds per square inch (6,890 kPa), must be equipped with a safety interlock to keep fasteners from being ejected, unless the muzzle is pressed against the work surface.
- 3.5 Check correct air supply and pressure before connecting a tool.
- 3.6 Check that the tool is correctly and securely connected to the air supply hose and that it is in good working order, with the safety mechanism operative, before using.
- 3.7 Always handle a tool as if it loaded with fasteners (nails, staples, etc.). Do not carry a tool with a finger on the trigger or with the trigger depressed.
- 3.8 Equip tools with a work-contacting element that limits the contact area to one that is as small as practical.
- 3.9 Make sure that the mechanical linkage between the work-contacting element and trigger is enclosed.

- 3.10 Disconnect a tool from the air supply and ensure the air is completely exhausted from the tool when the tool is unattended, when loading with fasteners (nails, staples), and during cleaning or adjustment.
- 3.11 Before clearing a blockage, be sure that depressing the trigger exhausts all air from the tool and the tool is disconnected from the air supply.
- 3.12 Use only fasteners recommended by the manufacturer. Ensure fasteners are appropriate to the work surface to ensure fastener does not eject completely through the material.
- 3.13 Avoid nailing into knots as nail can splinter wood.
- 3.14 Permit only properly trained people to carry out tool maintenance.
- 3.15 Do not depress the trigger unless the nosepiece of tool is directed onto a safe work surface and properly aligned both vertically and horizontally with the surface
- 3.16 Do not overreach. Keep proper footing and balance.
- 3.17 Ensure the hand not holding the nail gun or stapling tool is a minimum of 12 inches (30cm) away from the nosepiece of the tool.
- 3.18 Keep the gun properly aligned with your work both vertically and horizontally.

4.0 Personal Protective Equipment

- 4.1 Gloves providing appropriate protection to the task (e.g. impact, puncture, chemical, etc.).
- 4.2 Safety toed boots.
- 4.3 Use hearing protection, where required.
- 4.4 Wear safety glasses with side shields at all times and face shield if flying debris may be encountered.

Americas

Dustless Vacuum

S3AM-305-ATT7

1.0 Objective / Overview

- 1.1 Dustless decontamination system (also referred to as Pentek brand name) removes and packages surface contamination from concrete and steel structures.
- 1.2 The Pentek integrated suite of manually operated equipment (e.g., squirrel III, corner cutter, roto-peen, and crack chaser) is designed for the safe removal of radioactive materials, lead-based paints, polychlorinated biphenyls, pesticides, chemical residues, and other contaminated coatings.
- 1.3 The Pentek system incorporates a high-performance vacuum and waste packaging unit, the VAC-PAC, in conjunction with pneumatically operated equipment to remove contaminated material. Dust and debris are captured at the cutting tool surface. Supporting equipment required to operate the unit includes a 60 kilowatt generator and an air compressor (minimum 350 cubic feet capacity), as well as a drum grapple for drum handling activities.

2.0 Hazards

- 2.1 Noise
- 2.2 Vibration
- 2.3 Tripping
- 2.4 Hot surfaces (vacuum unit)
- 2.5 Electrical (high voltage)
- 2.6 Pinch
- 2.7 Back strain
- 2.8 High pressure air

3.0 Safe Operating Guidelines

- 3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT14 Pneumatic Tool* for additional guidelines.
- 3.2 Prior to use, a pre-operation inspection must be completed to determine if the unit is in safe working condition.
- 3.3 The vacuum unit should be placed a minimum of 50 feet (15.2 meters) away from the work area.
- 3.4 Once in position to begin work, apply the brake to stabilize the unit. When raising the VAC-PAC to insert/remove a drum, do not place your body or any extremity under the VAC-PAC while it is in the raised position.
- 3.5 Two workers should be used to maneuver the unit into place.
- 3.6 A minimum 10 feet (3 meters) clearance will be established around the unit while in operation.
- 3.7 Workers should be aware of their position in relation to the hoses and cable to minimize tripping hazards.
- 3.8 A competent person will train each worker in the operation of the unit.
- 3.9 Maintenance in excess of preventive maintenance activities (e.g., lubrication) will be performed by manufacturer personnel ONLY. Always know where the emergency stop is located.
- 3.10 Operators of a motorized drum grapple must be trained in agreement with the powered industrial truck

standard. Refer to *S3AM-324-PR1 Powered Industrial Trucks*.

- 3.11 Review *S3AM-302-PR1 Electrical Safety* prior to refueling the electrical generator and/or compressor.

4.0 Personal Protective Equipment

- 4.1 Leather gloves (maintenance).
- 4.2 As applicable, Tyvek suit (with hood).
- 4.3 Anti-vibration gloves (operation).
- 4.4 Hearing protection (plugs or muffs).

Power Drill

S3AM-305-ATT8

1.0 Objective / Overview

- 1.1 Available in a variety of types and capacities, portable power drills are undoubtedly the most used power tools.
- 1.2 Because of their handiness and application to a wide range of jobs, drills often receive heavy use. For this reason, you will need to carefully check your drill's capacity limitations and accessory recommendations.

2.0 Hazards

- 2.1 Electricity
- 2.2 Flying debris
- 2.3 Rotating and sharp parts
- 2.4 Burns (hot bits)
- 2.5 Manual handling (sprains/strains - wrist)

3.0 Safe Operating Guidelines

- 3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT17 Electric & Battery Hand Tools* for additional guidelines.
- 3.2 Always keep drill bits sharp.
- 3.3 Disconnect the power supply before changing or adjusting bit or attachments,
- 3.4 Do not use high speed steel (HSS) bits without cooling or using lubrication.
- 3.5 Be sure the chuck is tightly secured to the spindle. This is especially important on reversible-type drills. Tighten the bit securely as described by the owner/operators manual.
- 3.6 The chuck key must be removed from the chuck before starting the drill. A flying key can be an injury-inflicting missile.
- 3.7 Secure workpiece being drilled to prevent movement.
- 3.8 If the bit is long enough to pass through the material, select a shorter drill bit or provide against damage and injury.
 - 3.8.1 Prevent other workers from accessing the area.
 - 3.8.2 Remove or provide coverage for material that could be damaged by the drill bit.
- 3.9 Secure magnetic drills with a chain or rope to prevent falling. Label cord connections to prevent unplugging.
- 3.10 Check auxiliary handles, if part of the tool. Be sure they are securely installed.
- 3.11 Always use the auxiliary drill handle when provided. It gives you more control of the drill, especially if stalled conditions occur.
- 3.12 Grasp the drill firmly by insulated surfaces.
- 3.13 Always hold or brace the tool securely. Brace against stationary objects for maximum control. If drilling in a clockwise -- forward -- direction, brace the drill to prevent a counter-clockwise reaction.
- 3.14 Do not overreach. Always keep proper footing and balance.
- 3.15 Don't force a drill. Apply enough pressure to keep the drill bit cutting smoothly. If the drill slows down, relieve

the pressure. Forcing the drill can cause the motor to overheat, damage the bit and reduce operator control.

4.0 Personal Protective Equipment

- 4.1 Wear proper apparel for the task. Long hair, loose or baggy clothing, ties, or jewellery can become caught in moving parts.
- 4.2 Gloves that provide cut, abrasion and impact resistance.
- 4.3 Safety toed boots.
- 4.4 Safety glasses with side shields and face shield.
- 4.5 Hearing protection.

Pressure Washer

S3AM-305-ATT9

1.0 Objective / Overview

- 1.1 Pressure washing can be divided into three categories based on the water pressure the equipment is capable of producing:
- Ultra high pressure jetting – greater than 30,000 psi
 - High pressure washing – 5,000 to 30,000 psi
 - Pressure washing – less than 5,000 psi
- 1.2 Generally, light duty portable pressure washing equipment and car washes produce less than 5,000 psi. High pressure washing equipment is often used for such tasks as cleaning vessels and process piping. Ultra high pressure jetting is also often employed to clean vessels and to remove coatings and scaling of production equipment. If not used correctly and safely, pressure washers can be dangerous piece of work equipment.
- 1.3 AECOM only allows trained, authorized personnel to operate the high pressure washers. Along with training, other safety measures include: reviewing the manufacturers instructional booklet, proper maintenance of equipment, and personal protective equipment.

2.0 Hazards

- 2.1 Kickback – Sudden and violent reverse movement of the gun
- 2.2 Flying debris
- 2.3 Slips and trips on wet surfaces and hoses
- 2.4 Noise
- 2.5 Manual handling
- 2.6 Exhaust fumes/carbon monoxide (CO) in enclosed spaces
- 2.7 Contact with high pressure / high temperature fluids

3.0 Safe Operating Guidelines

- 3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, *S3AM-305-ATT17 Electric & Battery Hand Tools* or *S3AM-305-ATT16 Small Engines* for additional guidelines.
- 3.2 Ensure area is properly flagged with tags identifying work being performed and hazards. Keep all unauthorized workers out of area while job in progress.
- 3.3 Inspect all hoses, fittings, wands, cords and hose reel for damage or defects.
- 3.3.1 Equipment is complete and assembled correctly (i.e. nozzle tip correctly connected to the wand and not directly to hose).
- 3.3.2 Ensure trigger mechanism is functioning properly.
- 3.3.3 Fittings are securely attached.
- 3.3.4 Insulated components are in place.
- 3.4 Check fuel connections and hoses for signs of leaks, defects or damage.
- 3.5 Confirm nozzle / jets are clear by turning on water, without pump pressure.

- 3.6 Check pressure pump oil level before use. Hold the wand firmly with the trigger released when turning the pump on.
- 3.7 Recheck hoses once the system is pressurized.
- 3.8 Never service equipment while energized or pressurized.
- 3.9 Ensure other personnel are clear of area while pressure washer is pressurized. Non-operators must remain a minimum of 25 feet (7.6m) from the operator.
- 3.10 Do not wash at a 90 degree angle to minimize spray and flying debris.
- 3.11 Never point a pressure washer at yourself or others. Contact with high pressure fluid can result in serious cut or injection injuries.
- 3.12 Increase pressure slowly during operation to prevent hose kick-back.
- 3.13 Do not drive over, pull on, or kink the high pressure hose. Damage to the hose may compromise the wire braiding inside and cause the hose to burst.
- 3.14 Whip checks must be used for all high pressure connections.
- 3.15 High-pressure washing equipment should be cleaned often to avoid dirt buildup, especially around the trigger and guard area.
- 3.16 Always set the trigger safety lock when the gun valve is not in use.
- 3.17 Relieve the pressure in the system before coupling and uncoupling hoses.
- 3.18 Visually inspect the full length of high pressure discharge hose and inspect other high pressure fluid-handling components for abrasions or cuts, damage caused by exposure to chemicals and for damage caused by kinks in the hose.
- 3.19 High pressure washers shall be used to clean or decontaminate equipment, surfaces or structures only.
- 3.20 High pressure washers WILL NOT be used to clean or decontaminate workers or personal protective equipment while it is being worn.
- 3.21 Maintain a distance from the spray contact point to reduce noise exposure and risk of being struck by flying debris. Avoid overreaching and maintain a stable stance.
- 3.22 When shutting down a pressure washer, turn the pump off before turning the water supply off.
- 3.23 After turning off pressure washer, ensure all residual pressure is released from system by squeezing the trigger. Consult the operator's manual for any other procedures specific to the equipment for shut-down.
- 3.24 Protect unit from freezing, when applicable.

4.0 Personal Protective Equipment

- 4.1 Hardhat.
- 4.2 Safety glasses with side shields and a face shield.
- 4.3 Gloves providing appropriate protection (rubber, chemical).
- 4.4 Hearing protection.
- 4.5 PVC (or equivalent) rain suit.
- 4.6 Safety toed boots with metatarsal protection.

Reciprocating Saw

S3AM-305-ATT10

1.0 Objective / Overview

- 1.1 The versatility of the reciprocating saw, in cutting metal, pipe, wood and other materials have made it a widely used tool.
- 1.2 By design, it is a simple tool to handle. Its demands for safe use, however, are very important.

2.0 Potential Hazards

- 2.1 Flying debris
- 2.2 Noise
- 2.3 Sharp, moving parts (cuts)
- 2.4 Hand/arm vibration
- 2.5 Electricity

3.0 Safe Operating Guidelines

- 3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT17 Electric & Battery Hand Tools* for additional guidelines.
- 3.2 Use sharp blades. Dull blades can produce excessive heat, make sawing difficult, result in forcing the tool, and possibly cause an accident.
- 3.3 Ensure appropriate blade selection. Different work surfaces demand different blades
- 3.4 Position yourself to maintain full control of the tool, and avoid cutting above shoulder height. Always use two hands to operate the saw.
- 3.5 To minimize blade flexing and provide a smooth cut, use the shortest blade that will do the job.
- 3.6 The work piece must be clamped securely, and the shoe of the saw held firmly against the work to prevent operator injury and blade breakage.
- 3.7 Maintain firm contact between the saw's shoe and the material being cut.
- 3.8 When making a "blind" cut (cannot see behind what is being cut), be sure that hidden electrical wiring, or water pipes are not in the path of the cut.
- 3.9 If wires are present, they must be disconnected at their power source by a qualified person or avoided, to prevent the possibility of lethal shock or fire.
- 3.10 Water pipes must be drained and capped.
- 3.11 Always hold the tool by the insulated grouping surfaces. When making anything other than a through cut, allow the tool to come to a complete stop before removing the blade from the work piece. This prevents breakage of the blade, and possible loss of tool control. Do not operate reciprocating saw in explosive atmospheres.
- 3.12 Do not overreach. Keep proper footing and balance at all times.
- 3.13 Check for misalignment or binding of moving parts, breakage or parts and any other condition that may affect the tool's operation.

4.0 Personal Protective Equipment

- 4.1 Wear proper apparel for the task. Long hair, loose or baggy clothing, ties, or jewelry can become caught in moving parts.
- 4.2 Gloves that provide cut abrasion and impact resistance.
- 4.3 Kickback apron, as necessary.
- 4.4 Safety toed boots.
- 4.5 Safety glasses with side shields and face shield.
- 4.6 Hearing protection.

Sander

S3AM-305-ATT11

1.0 Objective / Overview

- 1.1 Sanders are commonly used at project sites for a variety of tasks.
- 1.2 Often times the hazards associated with sanders are overlooked; they don't appear threatening because they don't have sharp blades or bits. These misconceptions can be prevented through proper training and personal protective equipment (PPE) selection.

2.0 Potential Hazards

- 2.1 Kickback – Sudden and violent reverse of the sander
- 2.2 Noise
- 2.3 Hand/arm vibration
- 2.4 Dust exposure
- 2.5 Flying debris
- 2.6 Severe abrasive parts
- 2.7 Electricity
- 2.8 Fuel (fine dust) and ignition sources (electricity, friction)

3.0 Safe Operating Guidelines

- 3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT17 Electric & Battery Hand Tools* for additional guidelines.
- 3.2 Disconnect power supply before changing a sanding belt, making adjustments, or emptying dust collector.
- 3.3 Inspect sanding belts before use. Replace those belts that are worn or frayed.
- 3.4 Install sanding belts that are the same widths as the pulley drum.
- 3.5 Adjust sanding belt tension to keep the belt running true and at the same speed as pulley drum.
- 3.6 Secure the sanding belt in the direction shown on the belt and the machine. Keep hands away from the sanding belt.
- 3.7 Before starting a sander, be sure the power cord and extension cords are out of the belt path and are long enough to freely complete the task. The sander must be either double insulated or connected to a ground fault circuit interrupter.
- 3.8 Use two hands to operate sanders – one on the trigger and the other on the front handle knob. Move sanders away from the body.
- 3.9 Clean dust from the motor and vents at regular intervals.
- 3.10 Do not use a sander without an exhaust system or dust collector present that is in good working order. The dust created when sanding can be a fire and explosion hazard. Proper ventilation is essential as well as guarding against open flame and sparks.
- 3.11 Empty the collector when ¼ full. Minimise dust disturbance when emptying the collector.
- 3.12 Do not exert excessive pressure on a moving sander. The weight of the sander provides adequate pressure for the job.

- 3.13 Do not work on unsecured stock unless it is heavy enough to stay in place. Clamp the stop into place or use a 'stop block' to prevent movement.
- 3.14 Do not overreach. Always keep proper footing and balance.
- 3.15 Do not cover air vents of the sander.
- 3.16 Check often to ensure that guards are in their normal position.

4.0 Personal Protective Equipment

- 4.1 Wear proper apparel for the task. Long hair, loose or baggy clothing, ties, or jewellery can become caught in moving parts.
- 4.2 Gloves that provide cut, abrasion and impact resistance.
- 4.3 Safety toed boots.
- 4.4 Safety goggles and faceshield.
- 4.5 Hearing protection.
- 4.6 Respiratory protection, as necessary.

Americas**Knives****S3AM-305-ATT12****1.0 Objective / Overview**

- 1.1 Knives serve a variety of purposes at work sites, and can be a useful tool, when used safely and correctly.
- 1.2 Learning proper positioning and correct use of a knife will drastically reduce the potential of cut-related injuries.

2.0 Hazards

- 2.1 Improper body positioning
- 2.2 Improper knife selection
- 2.3 Defective knife
- 2.4 Improper knife operation (including storage)

3.0 Safe Operating Guidelines

- 3.1 Select the appropriate knife for the task. Consider using a rounded tip blade if the task allows.
- 3.2 Always be sure that knives are sharp and not dull. A dull blade will require more force to cut, increasing the likelihood of injury (e.g. hand slipping, knife breaking, etc.). Replace dull blades – A knife that tears rather than cuts, generally indicates the blade is dull.
- 3.3 Be sure the blade is seated in the frame of the knife correctly, closed, and fastened together properly.
- 3.4 Always direct the cut away from yourself and others
 - 3.4.1 Keep body parts away from the cut line, (e.g., fingers, leg, etc.)
 - 3.4.2 Ensure that the material being cut is stabilized and not against a body part (e.g. cutting rope against your leg).
 - 3.4.3 Always pull the knife, never push the knife (the blade may break, and momentum could cause the body to come into contact with broken blade).
- 3.5 Ensure knife blades are protected or retracted when not in use.
 - 3.5.1 Never carry a knife with an exposed blade in your pocket.
- 3.6 Use of razor and break away utility knives is prohibited.
 - 3.6.1 Purchase safety-equipped utility knives with guarding or automatically retracting blades.
- 3.7 When using a knife to cut thicker materials, use several passes. Increased force on the blade can cause it to stray from the intended cut path, or break the blade.
- 3.8 When changing blades, always handle from the non-sharp side. Cover blade with duct tape and dispose.
- 3.9 Use an alternate tool when possible (scissors, wire cutters, etc.).
- 3.10 Let a falling knife fall.

4.0 Personal Protective Equipment

- 4.1 Cut resistant gloves are mandatory when using knives (Kevlar, thick leather, etc.).

Americas**Clearing & Grubbing Equipment****S3AM-305-ATT13**

The following safety precautions will be followed during site clearing and tree falling.

1.0 General

- 1.1 Refer to *S3AM-305-PR1 Hand & Power Tools* for additional guidance.
- 1.2 As applicable, refer also to *S3AM-305-ATT15 Manual Hand Tools*, *S3AM-305-ATT16 Small Engines*, and *S3AM-305-ATT17 Electric & Battery Hand Tools* for additional guidance.
- 1.3 All clearing activities shall terminate during electrical storms and periods of high winds.
- 1.4 Dead, broken or rotted limbs or trees (widow makers) shall be felled first.
- 1.5 Be aware of the presence of other personnel when using any tool, especially picks or axes.

2.0 Machete, Pick and Axe Use

- 2.1 A machetes, picks and axes will only be used for their designated purpose; do not carelessly swing the tool when it is not needed.
- 2.2 To prevent lacerations, employees will wear Kevlar gloves and Kevlar chain saw chaps.
- 2.3 Machetes, picks and axes shall not be used when other employees are in the immediate work area.

3.0 Use of Weed Whips

- 3.1 Weed whips may be used to clear vegetation such as grass, light brush, briars and tree seedlings. The L-shaped weed whip cuts grass and weeds but is unstable for use on larger growth; the triangular-frame weed whip cuts briars and woody stems up to a half-inch in diameter. A "Suwannee" sling is a heavy duty weed whip that also has an axe blade. It does the same work as a weed whip, but can also cut through large materials. The heavier weight of this tool allows it to more easily cut off larger material than a weed whip.
- 3.2 When using weed whips, employees should follow these safety procedures:
 - 3.2.1 Select the correct tool for the types and size of vegetation present across the landfill.
 - 3.2.2 Employees will wear gloves that provide impact, abrasion, cut, tear, and puncture resistance when using weed whips.
 - 3.2.3 Weed whips are meant to be swung back and forth with both hands. Avoid using a golf swing. The tool should be swung no higher than an employee's side.
 - 3.2.4 Strong swings should be made to prevent the blade from bouncing or glancing off springy growth.
 - 3.2.5 Screws hold the serrated double-edge blade in place. These screws can work loose so check them before each use.
 - 3.2.6 At the end of the day, inspect the whips for damage. Clean, sharpen, and oil as necessary and store with a sheath in place.

4.0 Chain Saws

- 4.1 Refer to *S3AM-305-ATT1 Chainsaw*.

5.0 Felling Trees Manually

- 5.1 Before cutting begins, survey the work area for dead limbs, the lean of the tree to be cut, wind conditions and the location of other trees.

- 5.2 Remove lodged trees (tree has not fallen to the ground after being separated from its stump) as soon as possible. Never work under a lodged tree.
- 5.3 The distance between workers should be maintained at twice the height of the trees being felled.

6.0 Chipping Operations

- 6.1 Prior to use, make sure all safety devices and controls, such as emergency shut-off devices, are tested and verified to be functioning properly.
- 6.2 Access covers and doors shall not be opened until the drum or disk is at a complete stop.
- 6.3 Infeed and discharge ports shall be designed to prevent employee contact with disc, knives and blower blades.
- 6.4 The operator must be completely familiar with the controls and proper use of the equipment.
- 6.5 Workers feeding material into self-feeding wood chippers are at risk of being fed through the chipper if they reach or fall into the infeed hopper or become entangled in branches feeding into the machine.
 - 6.5.1 Make sure two workers (buddy system) are in close contact with each other when operating the chipper.
 - 6.5.2 Stand to the side of the chipper while inserting limbs into chipper, never stand directly in front.
 - 6.5.3 Insert trunk portion of tree/limb first. This will prevent the branches from getting entangled with clothing, etc. and pulling you in with the tree/limb.
 - 6.5.4 Bystanders should be kept at least 25 feet (7.6m) away when in operation.
 - 6.5.5 Keep the area around the wood chipper free of tripping hazards.
- 6.6 Never wear loose clothing that may get caught on feed material or moving parts.

7.0 Personal Protective Equipment

- 7.1 Wear proper apparel for the task.
 - 7.1.1 Long hair, loose or baggy clothing, ties, or jewellery can become caught in moving parts.
 - 7.1.2 Wear clothing with long sleeves and full length pants of durable material.
- 7.2 Use gloves that provide impact, abrasion, cut, tear and puncture resistance.
- 7.3 Safety toed boots with ankle support.
- 7.4 Safety glasses with side shields and face shield.
- 7.5 Hearing protection as necessary.

Pneumatic Tools

S3AM-305-ATT14

1.0 Objective / Overview

- 1.1 Pneumatic tools utilize air pressure to perform the tool's task.
- 1.2 Safe measures for use include proper training, good body mechanics and operating technique, well-maintained equipment, and protective equipment.
- 1.3 There are several dangers associated with the use of pneumatic tools. First and foremost is the danger of getting hit by one of the tool's attachments or by some kind of fastener the worker is using with the tool.

2.0 Hazards

- 2.1 Improperly secured air hoses
- 2.2 Noise
- 2.3 Flying debris
- 2.4 Defective tool
- 2.5 Improper operation

3.0 Safe Operating Guidelines

- 3.1 Review the manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT17 Electric & Battery Hand Tools* for additional guidelines.
- 3.2 Never use bottled gas as a power source for pneumatic tools.
- 3.3 Drain water from air compressor tank and condensation from air lines.
 - 3.3.1 Blow out the air line before connecting a tool. Hold hose firmly and blow away from yourself and others.
- 3.4 Pneumatic tools must be checked to see that the tools are fastened securely to the air hose to prevent them from becoming disconnected. Pneumatic tools must have the air supply controlled according to manufacturer's specifications.
- 3.5 Make sure that hose connections fit properly and are equipped with a mechanical means of securing the connection between tool/hose/compressor to prevent whipping in case of disconnection or failure (e.g. chains, tie wires, whip checks or equivalent retaining devices).
- 3.6 Safety clips or tool retainers must be in place on pneumatic impact tools to prevent accessories (e.g. chisel on a chipping hammer) or attachments from being ejected.
- 3.7 If an air hose is more than 1/2-inch (12.7 mm) in diameter, a safety excess flow valve must be installed at the source of the air supply to reduce pressure in case of hose failure.
- 3.8 In general, the same precautions should be taken with an air hose that are recommended for electric cords, as the hose is subject to the same kind of damage or accidental striking, and because it also presents tripping hazards. Avoid creating trip hazards caused by hoses laid across walkways, curled underfoot, on ladders.
- 3.9 Airless spray guns that atomize paints and fluids at pressures of 1,000 pounds or more per square inch (6,890 kPa) must be equipped with automatic or visible manual safety devices that will prevent pulling the trigger until the safety device is manually released.

- 3.10 Ensure that the compressed air supplied to the tool is clean and dry. Dust, moisture, and corrosive fumes can damage a tool. An in-line regulator filter and lubricator increases tool life.
- 3.11 Keep tools clean and lubricated, and maintain them according to the manufacturers' instructions.
- 3.12 Use only the attachments that the manufacturer recommends for the tools in use.
- 3.13 Use the proper hose and fittings of the correct diameter and type for the pneumatic or hydraulic application.
 - 3.13.1 The manufacturer's recommended safe operating pressure for hoses, valves, pipes, filters, and other fittings must not be exceeded.
 - 3.13.2 Use hoses specifically designed to resist abrasion, cutting, crushing and failure from continuous flexing.
 - 3.13.3 Choose air supply hoses that have a minimum working pressure rating of 150 pounds per square inch gauge or 150 percent of the maximum pressure produced in the system, whichever is higher.
 - 3.13.4 Check hoses regularly for cuts, bulges and abrasions. Tag and replace, if defective.
- 3.14 Install quick disconnects of a pressure-release type rather than a disengagement type. Attach the male end of the connector to the tool, NOT the hose.
- 3.15 Reduce physical fatigue by supporting heavy tools with a counter-balance wherever possible.
- 3.16 Do not operate the tool at a pressure above the manufacturer's rating.
- 3.17 Turn off the air pressure to the hose, exhaust the airline and disconnect the tool from the air supply when not in use, before servicing or when changing power tools or attachments.
- 3.18 Do not carry a pneumatic tool by its hose.
- 3.19 Do not use compressed air for cleaning purposes unless the pressure is reduced to 30 pounds per square inch (psi) or less. This rule does not apply for concrete form, mill scale, green cutting, and similar cleaning operations. Proper respiratory, hand, eye, and ear protection must be worn.
- 3.20 Compressed air guns shall never be pointed toward anyone.
 - 3.20.1 Employees shall never "dead-end" them against themselves or anyone else.
 - 3.20.2 A chip guard shall be used when compressed air is used for cleaning.
 - 3.20.3 Never use compressed air to blow debris or to clean dirt from clothes or body.

4.0 Personal Protective Equipment

- 4.1 Gloves providing appropriate protection to the task (e.g. impact, puncture, chemical, etc.)
- 4.2 Safety toed boots
- 4.3 Use hearing protection, where required.
- 4.4 Wear safety glasses with side shields at all times and face shield if flying debris may be encountered.

Manual Hand Tools

S3AM-305-ATT15

1.0 General

- 1.1 Review manufacturer's operating manual and *S3AM-305-PR1 Hand & Power Tools* for additional guidelines.
- 1.2 Carry tools using a heavy belt or apron and hang tools at your sides.
- 1.3 Never carry tools in your pockets or hanging behind your back.

2.0 Hammers

- 2.1 Hammers are designed according to the intended purpose. Select a hammer that is comfortable for you and that is the proper size and weight for the job. Misuse can cause the striking face to chip, possibly causing a serious injury.
- 2.2 Choose a hammer with a striking face diameter approximately ½ inch (1.3 centimeters) larger than the face of the tool being struck (e.g., chisels, punches, wedges, etc.).
- 2.3 Strike a hammer blow squarely with the striking face parallel to the surface being struck. Always avoid glancing blows and over and under strikes. (Hammers with beveled faces are less likely to chip or spall).
- 2.4 Look behind and above you before swinging the hammer.
- 2.5 Watch the object you are hitting.
- 2.6 Hold the hammer with your wrist straight and your hand firmly wrapped around the handle.
- 2.7 Do not use handles that are rough, cracked, broken, splintered, sharp-edged or loosely attached to the head. Remove from service and replace the handle if possible.
- 2.8 Do not use any hammer head with dents, cracks, chips, mushrooming, or excessive wear.
- 2.9 Do not use a hammer for any purpose for which it was not designed or intended.
- 2.10 Do not use one hammer to strike another hammer, other hard metal objects, stones or concrete.
- 2.11 Do not redress, grind, weld or reheat-treat a hammer head.
- 2.12 Do not strike with the side or cheek of the hammer.

3.0 Pipe Cutters, Reamers, Taps and Threaders

- 3.1 Replace pipe cutter wheels which are nicked or otherwise damaged.
- 3.2 Use a three- or four-wheeled cutter, if there is not enough space to swing the single wheel pipe cutter completely around the pipe.
- 3.3 Choose a cutting wheel suitable for cutting the type of pipe material required:
 - 3.3.1 Thin wheel for cutting ordinary steel pipe.
 - 3.3.2 Stout wheel for cutting cast iron.
 - 3.3.3 Other wheels for cutting stainless steel, plastic and other materials.
- 3.4 Select the proper hole diameter and correct tap size to tap a hole. The hole should be sized so that the thread cut by the tap will be about 75 percent as deep as the thread on the tap.
- 3.5 Use a proper tap wrench (with a "T" handle) for turning a tap.
- 3.6 Use lubricant or machine cutting fluid with metals other than cast iron.

- 3.7 Do not permit chips to clog flutes (grooves in the tap that allow metal chips to escape from the hole). The chips may prevent the tap from turning – this may result in the tap breaking if you continue to apply pressure.
- 3.8 Do not attempt to thread hardened steel. This can chip or damage the die.
- 3.9 Do not thread any rod or other cylindrical object that is larger in diameter than the major diameter of the die thread.
- 3.10 Do not use a spiral reamer on a rotating pipe. The reamer may snag and cause serious injury.

4.0 Pliers and Wire Cutters

- 4.1 Pliers are made in various shapes and sizes and for many uses. Use the correct pliers or wire cutters for the job.
- 4.2 Choose pliers or wire cutters that have a grip span of 2½ – 3½ inches (6.4 – 8.9 centimeters) to prevent palm or fingers from being pinched when the tools are closed.
- 4.3 Use adjustable pliers that allow for a firm grip of the work piece while maintaining a comfortable handgrip (i.e., hand grasp is not too wide).
- 4.4 Use tools only if they are in good condition.
 - 4.4.1 Make sure that the cutting edges are sharp. Dull and worn-down cutting edges require many times more force for cutting.
 - 4.4.2 Make sure that the toothed jaws are clean and sharp. Greasy or worn-down jaws can result in compromised safety. Such tools also require increased force to hold the work piece which, in turn, increases the risk of muscular fatigue and repetitive strain injuries.
- 4.5 Oil pliers and wire cutters regularly. A drop of oil on the hinge will make the tools easier to use.
- 4.6 Pull on the pliers; do not push away from you when applying pressure. If the tool slips unexpectedly, you may lose your balance or injure your hand.
- 4.7 Cut at right angles. Never rock the cutting tool from side to side or bend wire back and forth against the cutting edges.
- 4.8 Do not cut hardened wire unless the pliers or wire cutters are specifically manufactured for this purpose.
- 4.9 Do not expose pliers or wire cutters to excessive heat.
- 4.10 Do not bend stiff wire with light pliers. Needle-nose pliers can be damaged by using the tips to bend large wire. Use a sturdier tool.
- 4.11 Do not use pliers as a hammer.
- 4.12 Do not hammer on pliers or wire cutters to cut wires or bolts.
- 4.13 Do not extend the length of handles to gain greater leverage. Use a larger pair of pliers for gripping or a bolt cutter for cutting.
- 4.14 Do not use cushion grip handles for jobs requiring tools with electrically insulated handles. Cushion grips are for comfort primarily and do not protect against electric shock.
- 4.15 Do not use pliers on nuts and bolts; use a wrench.

5.0 Screwdrivers

- 5.1 Screwdrivers are made in various shapes and sizes and for many uses. Use the correct screwdriver for the job.
- 5.2 Choose contoured handles that fit the shank tightly, with a flange to keep the hand from slipping off the tool.

- 5.3 Use a slot screwdriver with a blade tip width that is the same as the width of the slotted screw head.
- 5.4 For cross-head screws, use the correct size and type of screwdriver; a Phillips screwdriver may slip out of a screw head designed for use with the slightly flatter-tipped Pozidriv screwdriver.
- 5.5 Use a vise or clamp to hold the stock if the piece is small or moves easily.
- 5.6 Keep the screwdriver handle clean. A greasy handle could cause an injury or damage from unexpected slippage.
- 5.7 If work must be carried out on "live" electrical equipment, use screwdrivers that have insulated handles designed for electrical work and a non-conducting shaft. Remember, most plastic handles are designed for grip and comfort.
- 5.8 Use non-magnetic tools when working near strong magnets (e.g., in some laboratories).
- 5.9 Use a screw-holding screwdriver (with screw-holding clips or magnetic blades) to get screws started in awkward, hard-to-reach areas. Square-tipped screwdrivers (e.g., Robertson) that hold screws with recessed square holes are also useful in such situations.
- 5.10 Use an offset screwdriver in close quarters where a conventional screwdriver cannot be used.
- 5.11 Use a screwdriver that incorporates the following features when continuous work is needed:
 - 5.11.1 Use a pistol grip to provide for a straighter wrist and better leverage.
 - 5.11.2 Use a "Yankee drill" mechanism (spiral ratchet screwdriver or push screwdriver) which rotates the blade when the tool is pushed forward.
 - 5.11.3 Use a ratchet device to drive hard-to-move screws efficiently, or use a powered screwdriver.
- 5.12 File a rounded tip square making sure the edges are straight. A dull or rounded tip can slip out of the slot and cause hand injury or damage to materials.
- 5.13 Store screwdrivers in a rack or partitioned pouch so that the proper screwdriver can be selected quickly.
- 5.14 Do not lean or push on a screwdriver with any more force than necessary to keep contact with the screw. A screw properly piloted and fitted will draw itself into the right position when turned. Keep the shank directly over the screw being driven.
- 5.15 Do not hold the stock in one hand while using the screwdriver with the other as an injury may result if the screwdriver slips out of the slot.
- 5.16 Do not hammer screws that cannot be turned.
- 5.17 Do not grind the screwdriver tip to fit another size screw head.
- 5.18 Do not try to use screwdrivers on screw heads for which they are not designed (e.g., straight blade screwdrivers on Phillips, clutch head, Torx or multi-fluted spline screw heads).
- 5.19 Do not use defective screwdrivers (e.g. rounded or damaged edges or tips; split or broken handles; bent shafts).
- 5.20 Do not use a screwdriver for prying, punching, chiseling, scoring, scraping or stirring paint.
- 5.21 Do not use pliers on the handle of a screwdriver for extra turning power. A wrench should be used only on the square screwdriver shank designed for that purpose.
- 5.22 Do not expose a screwdriver blade to excessive heat. Heat can affect the temper of the metal and weaken the tool.
- 5.23 Do not use a screwdriver to check if an electrical circuit is live. Use a suitable meter or other circuit testing device.
- 5.24 Do not carry screwdrivers in clothing pockets.

6.0 Snips

- 6.1 Wear safety glasses and protective gloves when working with snips. Small pieces of metal may go flying in the air and cut edges of metal are sharp.
- 6.2 Snips are made in various shapes and sizes for various tasks. The handle can be like those on scissors with finger and thumb holes or like plier handles. Models are available for cutting in straight lines and in curves to the left or right.
- 6.3 Select the right size and type of snips for the job; check the manufacturer's specifications about the intended use of the snips (e.g., type of cut - straight, wide curve, tight curve, right or left, and maximum thickness and kind of metal or other material that can be cut).
 - 6.3.1 Universal snips can cut in both straight and wide curves.
 - 6.3.2 Straight snips and duckbill snips (flat blade, "perpendicular" to the handle, with pointed tips) are generally designed to cut in straight lines; some duckbill snips are designed for cutting curved lines.
 - 6.3.3 Hawk's bill snips (with crescent-shaped jaws) are used for cutting tight circles.
 - 6.3.4 Aviation snips have compound leverage that reduces the effort required for cutting.
 - 6.3.5 Offset snips have jaws that are set at an angle from the handle.
- 6.4 Use only snips that are sharp and in good condition.
- 6.5 Use snips for cutting soft metal only. Hard or hardened metal should be cut with tools designed for that purpose.
- 6.6 Use ordinary hand pressure for cutting. If extra force is needed, use a larger tool.
- 6.7 Cut so that the waste is on the right if you are right-handed or on the left if you are left-handed.
- 6.8 Avoid springing the blades. This results from trying to cut metal that is too thick or heavy for the snips you are using.
- 6.9 Keep the nut and the pivot bolt properly adjusted at all times.
- 6.10 Oil the pivot bolt on the snips occasionally.
- 6.11 Do not try to cut sharp curves with straight cut snips.
- 6.12 Do not cut sheet metal thicker than the manufacturer's recommended upper limit (e.g., cuts up to 16-gauge cold, rolled steel or 18-gauge stainless steel). Do not extend the length of handles to gain greater leverage.
- 6.13 Do not hammer or use your foot to exert extra pressure on the cutting edges.
- 6.14 Do not use cushion grip handles for tasks requiring insulated handles. They are for comfort primarily and not for protection against electric shocks.
- 6.15 Do not attempt to re-sharpen snips in a sharpening device designed for scissors, garden tools, or cutlery.

7.0 Wrenches

- 7.1 Use the correct wrench for the job - pipe wrenches for pipes and plumbing fittings, and general-use wrenches for nuts and bolts.
 - 7.1.1 Do not use pipe wrenches on nuts and bolts.
 - 7.1.2 Use a box or socket wrench with a straight handle, rather than an off-set handle, when possible.
 - 7.1.3 Do not use a conventional adjustable wrench for turning a tap – it will cause uneven pressure on the tap that may cause it to break.
 - 7.1.4 Do not use a makeshift wrench.

- 7.2 Inspect pipe wrenches periodically for worn or unsafe parts and replace them:
 - 7.2.1 Wrenches must not be used when jaws are sprung to the point that slippage occurs.
 - 7.2.2 Ensure that the teeth of a pipe wrench are sharp, clean and free of oil and debris.
 - 7.2.3 Do not use worn adjustable wrenches. Inspect the threads, knurl, jaw and pin for wear.
 - 7.2.4 Discard any bent or damaged wrenches (e.g., open-ended wrenches with spread jaws or box wrenches with broken or damaged points).
- 7.3 Select the correct jaw size to avoid slippage.
 - 7.3.1 Ensure that the jaw of an open-ended wrench is in full contact (fully seated, "flat," not tilted) with the nut or bolt before applying pressure.
 - 7.3.2 Face a pipe wrench or adjustable wrench "forward," adjust tightly and turn the wrench so pressure is against the permanent or fixed jaw. Do not pull on a wrench that is loosely adjusted.
 - 7.3.3 Adjust the pipe wrench grip to maintain a gap between the back of the hook jaw and the pipe. This concentrates the pressure at the jaw teeth, producing the maximum gripping force. It also aids the ratcheting action.
 - 7.3.4 Do not insert a shim in a wrench for better fit.
 - 7.3.5 Before applying pressure, ensure that the jaws have a good bite.
 - 7.3.6 Make sure adjustable wrenches do not "slide" open during use.
 - 7.3.7 Do not increase the leverage by adding sleeved additions (e.g., a pipe) to increase tool handle length. Use a larger wrench as necessary.
- 7.4 Ensure that the pipe or fitting is clean to prevent unexpected slippage and possible injury.
- 7.5 Maintain a proper stance with feet firmly placed to maintain balance.
 - 7.5.1 Position the body in a way that will prevent loss of balance and injury if the wrench slips or something (e.g., a bolt) suddenly breaks.
 - 7.5.2 Pull, rather than push on the wrench handle as body balance is more likely to be maintained if the wrench slips.
 - 7.5.3 Pull using a slow, steady pull; do not use fast, jerky movements.
- 7.6 Apply a small amount of pressure to a ratchet wrench initially to ensure that the ratchet wheel (or gear) is engaged with the pawl (a catch fitting in the gear) for the direction you are applying pressure.
- 7.7 Support the head of the ratchet wrench when socket extensions are used.
- 7.8 Stand aside when work is done with wrenches overhead.
- 7.9 Do not use a wrench on moving machinery.
- 7.10 Do not use the wrong tools for the job. For example: Do not use pliers instead of a wrench or a wrench as a hammer. Do not use pipe wrenches for lifting or bending pipes.
- 7.11 Do not strike a wrench (except a "strike face" wrench) with a hammer or similar object to gain more force.
- 7.12 Do not expose a wrench to excessive heat (like from a blow torch) that could affect the temper of the metal and ruin the tool.

8.0 Files/Rasps

- 8.1 Do not use a file as a pry bar, hammer, screwdriver, or chisel.
- 8.2 When using a file or a rasp, grasp the handle in one hand and the toe of the file in the other.
- 8.3 Do not hammer on a file.

9.0 Chisels and Punches

- 9.1 Use the right size and type of chisel (metal or wood) or punch (drift pin, centre, pin) for the job.
- 9.2 Use tools only if they are good condition (i.e., cutting edges are sharp, struck head is not mushroomed or chipped).
 - 9.2.1 Do not use chisels or punches if the cutting edge is dull, mushroomed or chipped, or if the point of a punch is slanted or damaged.
 - 9.2.2 Choose smooth, rectangular handles that have no sharp edges and are attached firmly to the chisel. Replace broken or splintered handles.
 - 9.2.3 Redress striking tools with burred or mushroomed heads.
 - Redress the point or cutting edge to its original shape.
 - Do not use a grinder to redress heat-treated tools. Use a whetstone.
 - Grind to a slightly convex cutting edge.
 - The point angle of the chisel should be 70° for hard metals, 60° for soft.
 - Do not apply too much pressure to the head when grinding a chisel. The heat generated can remove the temper. Immerse the chisel in cold water periodically when grinding.
 - 9.2.4 Replace any chisel or punch that is bent, cracked, shows excessive wear or cannot successfully be redressed.
- 9.3 Check stock thoroughly for knots, staples, nails, screws, or other foreign objects before chiseling or punching.
- 9.4 Hold the chisel, for shearing and chipping, at an angle which permits the bevel of the cutting edge to lie flat against the shearing plane.
- 9.5 Use the appropriate type and size of hammer for the chisel or punch, such as:
 - 9.5.1 A wooden or plastic mallet with a large striking face on chisels.
 - 9.5.2 Heavy-duty or framing chisels made of a solid or molded handle can be struck with a steel hammer.
 - 9.5.3 Ball-peen hammers are generally chosen for use with punches.
 - 9.5.4 Refer to the 'Hammers' section of this document for further guidance.
- 9.6 Chip or cut away from the body. Keep hands and body behind the cutting edge.
- 9.7 Make finishing or paring cuts with hand pressure alone.
- 9.8 Provide hand protection if possible:
 - 9.8.1 Use a sponge rubber shield, punch or chisel holder.
 - 9.8.2 Clamp small work pieces in a vise and chip towards the stationary jaw when working with a chisel.
 - 9.8.3 Do not allow bull point chisels to be hand-held by one employee and struck by another. Use tongs or a chisel holder to guide the chisel so that the holder's hand will not be injured.
- 9.9 Do not use cold chisels for cutting or splitting stone or concrete.
- 9.10 Do not use a drift pin punch (also called an aligning punch) as a pin punch intended for driving, removing, or loosening pins, keys, and rivets.
- 9.11 Do not use a wood chisel on metal.
- 9.12 Do not use a wood chisel as a pry or a wedge.
- 9.13 Place chisels safely within the plastic protective caps to cover cutting edges when not in use.

- 9.14 Store chisels in a “storage roll,” a cloth or plastic bag with slots for each chisel, and keep them in a drawer or tray.

10.0 Hacksaws

- 10.1 Select correct blade for material being cut.
- 10.2 Keep saw blades clean and lightly oiled using light machine oil on the blade to keep it from overheating and breaking.
- 10.3 Secure blade with the teeth pointing forward. Tighten the nut until the blade is under tension.
- 10.4 Keep blade rigid, and frame properly aligned.
- 10.5 Cut using steady strokes, directed away from you.
- 10.6 Use entire length of blade in each cutting stroke.
- 10.7 Cut harder materials more slowly than soft materials.
- 10.8 Clamp thin, flat pieces requiring edge cutting.
- 10.9 Do not apply too much pressure on the blade as the blade may break.
- 10.10 Do not twist when applying pressure.
- 10.11 Do not use when the blade becomes loose in the frame.

11.0 Vises

- 11.1 When clamping a long work piece in a vise, support the far end of the work piece by using an adjustable pipe stand, saw horse or box.
- 11.2 Position the work piece in the vise so that the entire face of the jaw supports the work piece.
- 11.3 Do not use a vise that has worn or broken jaw inserts, or has cracks or fractures in the body of the vise.
- 11.4 Do not slip a pipe over the handle of a vise to gain extra leverage.

12.0 Clamps

- 12.1 Do not use a C-clamp for hoisting materials.
- 12.2 Do not use a C-clamp as a permanent fastening device.

13.0 Pry Bars

- 13.1 Establish balance and stable footing when using a bar for prying.
- 13.2 Pry bars must be appropriate to the task to prevent slipping or tool breakage.

14.0 Jacks

- 14.1 All jacks—including lever and ratchet jacks, screw jacks, and hydraulic jacks—must have a stop indicator, and the stop limit must not be exceeded.
- 14.2 The manufacturer’s load limit must be permanently marked in a prominent place on the jack, and the load limit must not be exceeded.
- 14.3 A jack should never be used to support a lifted load. Once the load has been lifted, it must immediately be blocked up. Put a block under the base of the jack when the foundation is not firm, and place a block between the jack cap and load if the cap might slip.
- 14.4 To set up a jack, make certain of the following:

- 14.4.1 The base of the jack rests on a firm, level surface;
 - 14.4.2 The jack is correctly centered;
 - 14.4.3 The jack head bears against a level surface; and
 - 14.4.4 The lift force is applied evenly.
- 14.5 Clear all tools, equipment and any other obstructions from under the load before lowering the jack.
- 14.6 Proper maintenance of jacks is essential for safety. All jacks must be lubricated regularly. In addition, each jack must be inspected according to the following schedule:
- 14.6.1 For jacks used continuously or intermittently at one site—inspected at least once every 6 months;
 - 14.6.2 For jacks sent out of the shop for special work—inspected when sent out and inspected when returned; and
 - 14.6.3 For jacks subjected to abnormal loads or shock—inspected before use and immediately thereafter.

Small Engines

S3AM-305-ATT16

1.0 Objective / Overview

- 1.1 Operate small engine machines (liquid fuel tools), such as push mowers, weed trimmers, pumps and leaf blowers, in a safe manner.
- 1.2 Workers must be trained and competent in the safe operation and maintenance of the tool.

2.0 Potential Hazards

- 2.1 Flying debris
- 2.2 Noise
- 2.3 Moving and sharp parts
- 2.4 Hot surfaces

3.0 Safe Operating Guidelines

- 3.1 Review *S3AM-305-PR1 Hand & Power Tools* and the manufacturer's operating manual for further guidance.
- 3.2 Do not wear loose or baggy clothing around tools with rotating parts.
- 3.3 Never run the engine indoors, in poorly ventilated areas, or in a location where the exhaust could be drawn into a building through an opening.
 - 3.3.1 When an engine must be operated in an enclosed space, effective ventilation and/or proper respirators such as atmosphere-supplying respirators must be utilized to avoid breathing carbon monoxide.
- 3.4 Never store engine with fuel in fuel tank inside a building with potential sources of ignition such as hot water and space heaters, clothes dryers, electric motors, etc.
- 3.5 Ensure the fuel cap is in place. Never start or operate the engine with the fuel fill cap removed.
- 3.6 Refuelling:
 - 3.6.1 Never remove fuel cap or add fuel when engine is running.
 - 3.6.2 Shut down the engine and allow it to cool prior to refueling to prevent accidental ignition of hazardous vapors.
 - 3.6.3 Never pour gasoline on hot surfaces.
 - 3.6.4 Fill in well-ventilated area.
 - 3.6.5 Do not re-fuel around an open flame or while smoking.
- 3.7 Use only properly labelled, American National Standards Institute/Canadian Standards Association-approved red gasoline containers to store and dispense fuel.
- 3.8 The worker must be careful to handle, transport, and store gas or fuel only in approved flammable liquid containers, according to proper procedures for flammable liquids.
- 3.9 Noise hazards associated with gasoline engines must be mitigated by the use of proper hearing protection. Ear plugs, ear muffs or a combination of the two must be used to protect workers from excessive noise levels.
- 3.10 Appropriate fire extinguishers must also be available in the area.

- 3.11 Do not pour fuel from engine or siphon fuel by mouth.
- 3.12 Never leave the engine unattended while it is running.
- 3.13 Never operate the engine with an unguarded engine shaft.
- 3.14 Do not modify the engine or tamper with the factory setting of the engine governor.
- 3.15 Never operate the engine without a muffler guard in place and avoid touching hot areas of the engine.
- 3.16 Keep all flammable materials away from the muffler and the rest of the engine; do not idle or park the engine in dry grass or ground cover.
- 3.17 When working on the equipment, avoid accidental starts by removing the ignition key, turn off all engine switches, disconnect the battery and disconnect the spark plug, keeping it away from metal part.

4.0 Personal Protective Equipment

- 4.1 Always wear safety glasses with shields. Add face shield if potential for flying debris.
- 4.2 Gloves providing the appropriate protection (e.g. impact, abrasion, chemical, etc.).
- 4.3 Wear proper apparel for the task. Long hair, loose or baggy clothing, ties, or jewellery can become caught in moving parts. Long pants and long sleeve shirt.
- 4.4 Safety toe work boots.
- 4.5 Hearing protection (earmuffs or earplugs).

Electric & Battery Hand Tools

S3AM-305-ATT17

1.0 Objective / Overview

- 1.1 Electric and battery hand tools, also known as power tools, allow the user to perform their task more easily by providing more torque, speed, etc.

2.0 Hazards

- 2.1 Electricity

3.0 Safe Work Practices (General)

- 3.1 Review manufacturer's operating manual and *S3AM-305-PR1 Hand & Power Tools* for additional guidelines.
- 3.2 All electrical tools and equipment must be operated in accordance with the requirements of *S3AM-302-PR1 Electrical Safety*.
- 3.3 Keep all people not involved with the work at a safe distance from the work area.
- 3.4 Inspect power tools prior to each use.
 - 3.4.1 Ensure that the power tool has the correct guard, shield or other attachment that the manufacturer recommends.
 - 3.4.2 Ensure that the tools are properly grounded using a three-prong plug (no loose or faulty prongs), are double insulated (and are labeled as such), or are powered by a low-voltage isolation transformer; this will protect users from an electrical shock.
 - 3.4.3 Check the handle and body casing of the tool for cracks or other damage.
 - 3.4.4 If the tool has auxiliary or double handles, check to see that they installed securely.
 - 3.4.5 Inspect cords for defects: check the plug and power cord for cracking, fraying, and other signs of wear or faults in the cord insulation.
 - 3.4.6 Ensure power tool switches and triggers are fully functional.
 - 3.4.7 If equipped with a trigger-lock, ensure it is disabled.
 - 3.4.8 If a power tool is defective, remove it from service, and tag it clearly "Out of service for repair" or "Do Not Use". Replace damaged equipment immediately – do not use defective tools "temporarily."
DO NOT ATTEMPT FIELD REPAIRS.
- 3.5 Maintain tools with care; keep them sharp and clean for best performance.
- 3.6 Follow instructions in the user's manual for lubricating and changing accessories.
- 3.7 Do not over-reach. Be sure to keep good footing and maintain good balance when operating power tools.
- 3.8 If they are available, choose tools with double handles to permit easier holding and better manipulation of the tool.
- 3.9 Do not brush away sawdust, shavings or turnings while the power tool is running. Never use compressed air for cleaning surfaces or removing sawdust, metal turnings, etc.
- 3.10 Do not operate power tools that are not specified as intrinsically safe in an area containing explosive vapors or gases.
- 3.11 Do not clean tools with flammable or toxic solvents.
- 3.12 Do not surprise or touch anyone who is operating a power tool. Startling an operator could result in injury or

property damage.

- 3.13 Hand-held power tools must be equipped with a constant-pressure switch or control that shuts off the power when pressure is released.
 - 3.13.1 Powered hand tools shall not be capable of being locked in the ON position. Trigger locks are not permitted.
 - 3.13.2 All power tools should be ordered without trigger locks; if a tool is found with a trigger lock intact it must be disabled.
- 3.14 Avoid accidental starting. Do not hold fingers on the switch button, and ensure it is in the OFF position while plugging the tool in or while carrying an energized (plugged-in, battery in place) tool.
- 3.15 Do not leave a running tool unattended and ensure the power tool will not re-energize when not in use and when servicing, cleaning, making adjustments, applying flammable solutions or changing accessories:
 - 3.15.1 Ensure it has stopped running completely.
 - 3.15.2 Ensure the trigger or switch is OFF.
 - 3.15.3 Ensure the power tool is disconnected from the power supply (unplugged or battery removed).
- 3.16 Operate power tools within their design limitations.
- 3.17 Store power tools, batteries and electrical cords in a clean, dry area off the ground when not in use.
- 3.18 Do not use power tools in damp or wet locations unless they are approved for that purpose.
- 3.19 Keep work areas well lighted when operating power tools.
- 3.20 Equipment must have proper guards or shields and they must remain in place to protect the operator and others from the following:
 - 3.20.1 Point of operation.
 - 3.20.2 In-running nip points.
 - 3.20.3 Rotating parts.
 - 3.20.4 Flying chips and sparks.
- 3.21 If a guard is removed to clean or repair parts, replace it before testing the equipment and returning the machine to service
- 3.22 If, due to damage or deterioration, the original guard provided on a piece of equipment cannot be put in place, the tool must be removed from service.
- 3.23 Do not modify, remove, or disable any machine guards.
- 3.24 Remove any wrenches and adjusting tools before turning on a tool.
- 3.25 Use clamps, a vice or other devices to hold and support the piece being worked on, when practical to do so. This will allow you to use both hands for better control of the tool and will help prevent injuries if a tool jams or binds in a work piece.

4.0 Battery Powered Tools

- 4.1 Use only the type of battery specified by the tool manufacturer for the battery-powered tool to be used.
- 4.2 Recharge a battery or battery-powered tool only with a charger that specified for the battery.
- 4.3 Store a battery pack safely so that no metal parts, nails, screws, wrenches and so on can come in contact with the battery terminals; this could result in shorting out the battery and possibly cause sparks, fires or burns.

5.0 Safe Work Practice (Electric)

- 5.1 During use, keep power cords clear of tools and the path that the tool will take.
- 5.2 Employees' hands shall not be wet when plugging and unplugging cord and plug connected equipment and extension cords.
- 5.3 Portable electric equipment shall be disconnected when not in use, before servicing, and when changing accessories such as blades, bits, and cutters.
- 5.4 Portable electric equipment and extension cords used in potentially wet locations shall be approved for use in those locations by a nationally recognized testing laboratory, inspection agency, or other organization concerned with product evaluation (e.g., F.M., UL, etc.).
- 5.5 The outlet box for portable extension cords for outdoor use shall be weatherproof and shall be maintained in good condition.
- 5.6 Maintain electrical cords and connections in good working order:
 - 5.6.1 Cords and connection must be American National Standards Institute/Canadian Standards Association approved and bear a standardized certification marking (e.g., CSA, ANSI, UL, CE etc.).
 - 5.6.2 To prevent overheating, use only approved extension cords that have the proper wire size for the length of cord and power requirements of the electric tool to be used.
 - Do not connect or splice extension cords together to make a longer connection.
 - For outdoor work, use outdoor extension cords marked "W-A" or "W."
 - 5.6.3 Eliminate octopus connections: if more than one receptacle plug is needed, use a power bar or power distribution strip that has an integral power cord and a built-in overcurrent protection.
 - 5.6.4 Portable electrical equipment shall not be carried by the cord, nor raised or lowered by the cord.
 - 5.6.5 Electrical cords shall not be removed from a receptacle by pulling on the cord line.
 - 5.6.6 Cords shall not be placed across walkways unless appropriate cord and worker protection is in place to prevent damage to the cord and worker tripping hazards (e.g. cable protectors, cords suspended over walkway, etc.).
 - 5.6.7 Do not walk on or allow vehicles or other moving equipment to pass over unprotected power cords. Cords should be put in conduits or protected by placing planks on each side of them.
 - 5.6.8 A cord should not be pulled or dragged over nails, hooks, or other sharp objects that may cause cuts in the insulation.
 - 5.6.9 Keep cords away from heat, oil, sharp edges and moving parts.
 - 5.6.10 Never use extension cords as permanent wiring as they are for temporary use only. Do not run behind bookshelves, or furniture if the cord cannot be monitored for severe bending or damage.
 - 5.6.11 Inspect cords frequently for such damage such as fraying, kinks, cuts, and cracked or broken outer jackets. Any cord that exhibits damage or feels more than comfortably warm to the touch shall be removed from service, tagged "Do Not Use" and checked by an electrician.
 - 5.6.12 Do not tie power cords in knots. Knots can cause short circuits and shocks. Loop the cords or use a twist lock plug.
- 5.7 Electrical shock associated with power tool use can cause heart failure and burns, as well as injury from falls. Under certain conditions, even a small amount of electric current can result in fibrillation of the heart and death.
 - 5.7.1 Verify that the power source is the same voltage and current as indicated on the nameplate of the tool. Using a higher voltage can cause serious injury to the operator as well as burn out the tool.
 - 5.7.2 All electrical connections for these tools must be suitable for the type of tool and the working

conditions (wet, dusty, flammable vapors).

- 5.7.3 To protect the worker from shock and burns, electric tools must have a three-wire cord with a ground and be plugged into a grounded receptacle, be double insulated, or be powered by a low-voltage isolation transformer.
- 5.7.4 All outdoor receptacles must be protected by means of a ground fault circuit interrupter (GFCI or GFI) available in portable or fixed models. Do not use any electric power tools outdoors in a receptacle that is not properly protected.
- 5.7.5 Three-wire cords contain two current-carrying conductors and a grounding conductor. Any time an adapter is used to accommodate a two-hole receptacle, the adapter wire must be attached to a known ground.
- 5.7.6 The third prong must never be removed from the plug.
- 5.7.7 Double-insulated tools are available that provide protection against electrical shock without third-wire grounding. On double-insulated tools, an internal layer of protective insulation completely isolates the external housing of the tool.
- 5.7.8 Avoid body contact with grounded surfaces like refrigerators, pipes and radiators when using electric powered tools; this will reduce the likelihood of shock if the operator's body is grounded.
- 5.7.9 Report all shocks and/or sparks from electrical tools, no matter how minor. The tool in question should be tagged out and not be used until it has been checked for ground fault.
- 5.8 Only authorized persons are permitted to activate, de-activate or lockout electrical equipment.
- 5.9 Where there is or may be a danger to a worker, from the inadvertent operation of electrical equipment, then that equipment must be locked out and tagged prior to commencing work. Refer to *S3AM-325-PR1 Lockout Tagout*.
 - 5.9.1 Switch off all appropriate devices (MCC, Distribution Panel, Disconnect).
 - Stand to one side when engaging or disengaging an electrical circuit breaker to avoid electrical flash backs Lock and tag Electrical Supply devices in the "OFF" position.
 - 5.9.2 Test to be sure the equipment cannot be operated at the STOP-START switch.
 - 5.9.3 Test to be sure electrical equipment is de-energized.
 - 5.9.4 After completion of task, remove padlocks and destroy tags.

6.0 Personal Protective Equipment (Level D PPE)

- 6.1 Wear proper apparel for the task. Long hair, loose or baggy clothing, ties, or jewellery can become caught in moving parts.
- 6.2 Use gloves with protection appropriate to the task (e.g. impact, abrasion, puncture, etc.).
- 6.3 Safety toed boots.
- 6.4 Use hearing protection as necessary.
- 6.5 Kickback aprons as necessary.
- 6.6 Wear safety glasses with side shields at all times (or safety goggles) and face shield if flying debris may be encountered.

7.0 Belt Sanders

- 7.1 Refer to *S3AM-305-ATT11 Sanders*.

8.0 Drills

- 8.1 Refer to *S3AM-305-ATT8 Power Drill*.

9.0 Planers and Joiners

- 9.1 Use blades of the same weight and set at the same height.
- 9.2 Ensure that the blade-locking screws are tight.
- 9.3 Guard planers and joiners to prevent contact with the blades throughout the full length of the cutting area.
- 9.4 Support the material (stock) in a comfortable position that will allow the job to be done safely and accurately.
- 9.5 Check stock thoroughly for staples, nails, screws, or other foreign objects before using a planer.
- 9.6 Start a cut with the infeed table (front shoe) resting firmly on the stock and with the cutter head slightly behind the edge of the stock.
- 9.7 Use two hands to operate a planer - one hand on the trigger switch and the other on a front handle.
- 9.8 Do not put fingers or any object in a deflector to clean out chips while a planer is running.
- 9.9 Disconnect the power supply when stopping to dump out chips.
- 9.10 Do not set a planer down until blades have stopped turning.
- 9.11 Keep all cords clear of cutting area.

10.0 Routers

- 10.1 Ensure that the bit is securely mounted in the chuck and the base is tight.
- 10.2 Put the base of the router on the work, template or guide. Make sure that the bit can rotate freely before switching on the motor.
- 10.3 Secure stock. Never hold or have another individual hold the material. Sudden torque or kickback from the router can cause damage and injury.
- 10.4 Before using a router, check stock thoroughly for staples, nails, screws or other foreign objects.
- 10.5 Keep all cords clear of cutting area.
- 10.6 Always hold both hands on router handles, until a motor has stopped. Do not set the router down until the exposed router bit has stopped turning.
- 10.7 When inside routing, start the motor with the bit above the stock. When the router reaches full power, lower the bit to two times the required depth.
- 10.8 When routing outside edges, guide the router counter clockwise around the work.
- 10.9 When routing bevels, moldings and other edge work, make sure the router bit is in contact with the stock to the left of a starting point and is pointed in the correct cutting direction.
- 10.10 Feed the router bit into the material at a firm, controlled speed.
- 10.11 Softwood may enable fast router cutting speed. With hardwood, knotty and twisted wood, or with larger bits, cutting may be very slow.
- 10.12 The sound of the motor can indicate safe cutting speeds. When the router is fed into the material too slowly, the motor makes a high-pitched whine. When the router is pushed too hard, the motor makes a low growling noise.
- 10.13 When the type of wood or size of the bit requires going slow, make two or more passes to prevent the router from burning out or kicking back.
- 10.14 To decide the depth of cut and how many passes to make, test the router on scrap lumber similar to the work.

11.0 Circular Saws

- 11.1 Refer to *S3AM-305-ATT2 Circular Saw*.

12.0 Other Saws

- 12.1 Use lubricants when cutting metals.
- 12.2 Keep all cords clear of cutting area.
- 12.3 Cut green or wet material slowly and with caution. Check all material being cut for nails, hard knots, etc.
- 12.4 Make sure guards are installed and are working properly.
- 12.4.1 Table saws must be fitted with blade guards and a splitter to prevent the work from squeezing the blade and kicking back on the operator.
- Exposed parts of the saw blade under the table must be properly guarded.
 - All swing cutoff and radial saws that are drawn across a table with limit stops to prevent the saw from traveling beyond the edge of the table
- 12.4.2 Ensure band saw blades are fully enclosed except at the point of operation.
- 12.4.3 Ensure swing cut-off saws have a guard completely covering the upper half of the saw.
- 12.5 Remember sabre saws cut on the upstroke.
- 12.6 Position the saw beside the material before cutting and avoid entering the cut with a moving blade.
- 12.7 Secure and support stock as close as possible to the cutting line to avoid vibration.
- 12.7.1 Hold the material being cut firmly against a back guide or fence and cut with a single, steady pass.
- 12.7.2 Use a push stick or guide when cutting operation requires the hands of the operator to come close to the blade.
- 12.7.3 When cutting long stock, provide extension tables and a helper to assist the operator.
- 12.7.4 Keep the base or shoe of the saw in firm contact with the stock being cut.
- 12.7.5 Automatic feed devices should be used whenever feasible.
- 12.8 Select the correct blade for the material being cut and allow it to cut steadily. Do not force it. Clean and sharp blades operate best.
- 12.9 Set the blade to go no further than 1/8 to 1/4 inch deeper than the material being cut.
- 12.10 Do not start cutting until the saw reaches its full power.
- 12.11 Do not force a saw along or around a curve. Allow the machine to turn with ease.
- 12.12 Do not insert a blade into or withdraw a blade from a cut or lead hole while the blade is moving.
- 12.13 Do not put down a saw until the motor has stopped.
- 12.14 Do not reach under or around the stock being cut.
- 12.15 Maintain control of the saw always. Avoid cutting above shoulder height.
- 12.16 External Cuts
- 12.16.1 Make sure that the blade is not in contact with the material or the saw will stall when the motor starts.
- 12.16.2 Hold the saw firmly down against the material and switch the saw on.
- 12.16.3 Feed the blade slowly into the stock, maintaining an even forward pressure.

12.17 Internal Cuts

12.17.1 Drill a lead hole slightly larger than the saw blade. With the saw switched off, insert the blade in the hole until the shoe rests firmly on the stock.

12.17.2 Do not let the blade touch the stock until the saw has been switched on.

Americas

Hand & Power Tool Maintenance Inventory

S3AM-305-FM1

EQUIPMENT (MAKE, MODEL, SERIAL #)	EQUIPMENT OWNER	EQUIPMENT STATUS (ON HIRE, ACTIVE, DECOMMISSIONED)	FREQUENCY OF SERVICE	SERVICE TYPE	MANUFACTURER'S STANDARDS	INDUSTRY STANDARDS	LEGISLATED REQUIREMENTS	LOCATION OF EQUIPMENT

Americas

Hand & Power Tool Inspection Report

S3AM-305-FM2

[illegible]

1.0 Purpose and Scope

- 1.1 This procedure applies to all AECOM Americas based employees and operations and any other entity and its personnel contractually required to comply with this document's content where the potential for hand injuries is present.
- 1.2 This procedure is intended to protect employees from activities that may expose them to hand injury. This procedure provides information on recognizing those conditions that require personal protective equipment (PPE) or specific work practices to reduce the risk of hand injury.
- 1.3 All personnel shall have gloves in their immediate possession 100% of the time when in a shop or on a work site. Appropriate gloves shall be worn when employees work with or near any materials or equipment that present the potential for hand injury due to sharp edges, corrosives, flammable and irritating materials, extreme temperatures, splinters, etc.

2.0 Terms and Definitions

- 2.1 None

3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-208-PR1 – Personal Protective Equipment
- 3.3 S3AM-209-PR1 – Risk Assessment & Management
- 3.4 S3AM-325-PR1 – Lockout Tagout

4.0 Procedure

- 4.1 Roles and Responsibilities

4.1.1 Manager / Supervisor

- Implementation of this standard for the applicable facility, site, or project location.
- Confirm employees are familiar with this procedure and have appropriate training.
- Confirm the appropriate hand protection is available on site as necessary.

4.1.2 Employees

- Recognize hazards to hands.
- Comply with this procedure as well as client or work location requirements.

4.1.3 SH&E Manager

- Advise supervisors and site personnel on matters relating to hand safety.
- Work with the manager / supervisor to confirm that sufficient PPE and equipment are available.
- Maintain contact with manager / supervisor to regularly evaluate site conditions and new information that might require modifications to this procedure.
- Conduct training or briefings, when necessary, and to explain the content of this procedure and site hazards to employees.

- Assist in investigation of incidents that resulted or could have resulted in an injury.

4.2 Hazard Assessment

4.2.1 Perform hazard assessments for those work activities likely to require Personal Protective Equipment (PPE).

- Use the Task Hazard Assessment (THA) to perform the hazard assessment (in accordance with *S3AM-209-PR1 Risk Assessment & Management*). The THA will accompany AECOM personnel at jobsites for use in the event of a job or task change, or
- Use the *Gloves Needs Assessment – S3AM-317-FM1* or equivalent to perform the assessment.
- Re-evaluate completed hazard assessments when the job or task changes.

4.2.2 The hierarchy of controls should be considered during the THA process to minimize or eliminate the need for hand protection PPE or material handling tools. Examples of controls are chemical substitution, machine guarding, and use of different tools.

4.2.3 Select PPE that will protect employees if hazards cannot be eliminated.

- Review Safety Data Sheets for project or task-specific chemicals to determine appropriate PPE. If needed, consult with a SH&E Manager for assistance.
- Review glove manufacturer recommendations for both physical and chemical protection.
- Obtain gloves of the correct size for the employees.
- When both chemical and physical protection is of concern, wear the chemical protection gloves (e.g., nitrile) inside the physical protection gloves (e.g., leather, Kevlar®).
- Nitrile gloves or equivalent chemical resistant shall always be used for protection from hazardous fluids or non-corrosive chemicals.
- Do not wear metal or metal-reinforced gloves when working with electrical equipment or on electrical services. Proper leather and/or rubber gloves designed and tested for this purpose shall be used.
- Refer to *S3AM-208-PR1 – Personal Protective Equipment* for additional information.

4.2.4 Follow glove requirements in the applicable SH&E plan.

4.3 Guidelines for Working With and Around Equipment (Hand Tools, Portable Powered Equipment)

4.3.1 General

- As applicable, employees shall be trained in the use of all tools. Refer to *S3AM-003-PR1 SH&E Training*.
- Keep hand and power tools in good repair and use them only for the task for which they were designed.
- Inspect tools before use and remove damaged or defective tools from service.
- Operate tools in accordance with manufacturer's instructions.
- Do not remove or bypass a guarding device for any reason.
- Keep surfaces and handles clean and free of excess oil to prevent slipping.
- Do not carry sharp tools in pockets.
- Clean tools and return to the toolbox or storage area upon completion of a job.

- Confirm that the wrench is in full contact (fully seated, "flat", not tilted) with the nut or bolt before applying pressure.
 - Place the body in the proper position for optimal balance and bracing to prevent falls if the tool slips.
 - Make sure hands and fingers have sufficient clearance in the event the tool slips.
 - Whenever possible, pull on a wrench and avoid pushing.
- When working with tools overhead, place tools in a holding receptacle when not in use.
- Do not throw tools from place to place or from person to person, or drop tools from heights.
- Inspect all tools prior to start-up or use to identify any defects.
- Powered hand tools shall not be capable of being locked in the ON position.
- Require that all power-fastening devices be equipped with a safety interlock capable of activation only when in contact with the work surface.
- Do not allow loose clothing, long hair, loose jewelry, rings, and chains to be worn while working with power tools or rotating equipment.
- Do not increase the leverage by adding sleeved additions (e.g. a pipe or snipe) to increase tool handle length.
- Make provisions to prevent machines from restarting through proper lockout/tagout (refer to *S3AM-325-PR1 – Lockout Tagout*).

4.3.2 Cutting Tools

- Always use the specific tool designed for the task. Tubing cutters, snips, self-retracting knives, concealed blade cutters, and related tools are task specific and minimize the risk of hand injury. For more information about cutting tools, see *S3AM-317-ATT1 Safe Alternative Tools*.
- Fixed open-blade knives (FOBK) are prohibited from use during the course of AECOM work.
 - Examples of fixed open-blade knives include pocket knives, multi-tools, hunting knives, and standard utility knives.
 - Any exception to this requirement shall require approval of the Manager / Supervisor and SH&E Manager.
- When utilizing cutting tools, personnel will observe the following precautions to the fullest extent possible:
 - Use the correct tool and correct size tool for the job.
 - Cut in a direction away from yourself and not toward other workers in the area.
 - Maintain the noncutting hand and arm toward the body and out of the direction of the cutting tool if it were to slip out of the material being cut.
 - Ensure that the tool is sharp and clean; dirty and dull tools typically cause poor cuts and more hazard than a sharp, clean cutting tool.
 - Store these tools correctly with covers in place or blades retracted, as provided by the manufacturer.
 - On tasks where cutting may be very frequent or last all day (e.g., liner samples), consider Kevlar® gloves in the PPE evaluation for the project.
 - Do not remove guards on paper cutters.
 - In office locations, paper cutters must always be kept in a locked position when not in use.

4.3.3 Moving/Rotating Equipment

- General Requirements for Rotating Equipment (feed augers, chippers, conveyors, etc.)

- Never place hands, fingers, or extremities near hoppers and operational areas of machinery.
- When the equipment is rotating, stay clear of the rotating components and only operate equipment with proper machine guarding in place.
- Never clean a jammed piece of equipment unless the transmission is in neutral and the power source or the engine is off, locked out, and the moving parts of the equipment have stopped rotating. Refer to *S3AM-325-PR1 – Lockout Tagout*.

4.3.4 Other Physical Hazards

- Activities such as drum handling, fencing, work near razor wire, manhole cover removal, and demolition also pose hazards to hands. Use tools instead of hands for high hazard tasks whenever possible.
- Plan work to avoid pinch points for hands when moving drums, moving manhole covers into position, and handling other heavy objects.
- Work handling scrap metal, glass or other sharp edges requires proper hand PPE (Kevlar® or leather gloves).
- Activities involving hoisting, lifting and landing of a load shall be done “hands-free” when possible. Refer to *S3AM-317-ATT2 – Safe Hands-Free Lifting Guidelines*.

4.4 Ergonomics – Hand and Wrist Care

- 4.4.1 Keep your wrist in neutral. Avoid using your wrist in a bent (flexed), extended, or twisted position for long periods of time. Instead try to maintain a neutral (straight) wrist position. Ergonomic tools may be needed for long-term work.
- 4.4.2 Watch your grip. Gripping, grasping, or lifting with the thumb and index finger can put stress on your wrist. When practical, use the whole hand and all the fingers to grasp an object.
- 4.4.3 Minimize repetition. Even simple, light tasks may eventually cause injury. If possible, avoid repetitive movements or holding an object in the same way for extended periods of time.
- 4.4.4 Reduce speed and force. Reducing the speed with which you do a forceful, repetitive movement gives your wrist time to recover from the effort. Using power tools helps reduce the force.
- 4.4.5 Rest your hands. Periodically give your hands a break by letting them rest briefly. Or you may be able to alternate easy and hard tasks, switch hands, or rotate work activities.
- 4.4.6 Consider low vibration or anti- vibration hand power tools when possible.

4.5 Cleaning Hands

- 4.5.1 Avoid contamination of hands by proper use of gloves when contact with physical, chemical, or biological hazards is possible.
- 4.5.2 Use soap and water for normal hand cleaning. Do not use solvents for cleaning as they remove essential oils in the skin and may cause dermatitis. Do not use pressure washers for hand cleaning.
- 4.5.3 If the hands contact a corrosive (e.g., nitric acid), wash the area with water for fifteen minutes and then seek medical attention.
- 4.5.4 Use antibiotic ointment and skin protection on minor breaks/scratches of the skin.
- 4.5.5 In some cases barrier creams may be used to provide limited protection for hands exposed to greases and oils.

4.6 Safe Hands Observation Tool

- 4.6.1 The *Safe Hand Task Review Card S3AM-317-FM2* may be used to supplement and reinforce safe work practices and the requirements of this procedure.

4.6.2 The observer's responsibilities include:

- Two-way conversation with the employees being observed.
- Completing the card and mark the applicable fields on the back of the card.
- Submitting the completed cards to the supervisor.

4.6.3 The supervisor's responsibilities include:

- Reviewing the completed cards.
- Identifying best work practices and any improvements.
- Communicating any changes back the employee(s).

5.0 Records

The following documentation will be maintained:

5.1 Hand tool training records, as applicable.

6.0 Attachments

- 6.1 [S3AM-317-FM1](#) [Glove Needs Assessment](#)
- 6.2 [S3AM-317-FM2](#) [Safe Hands Task Review Card](#)
- 6.3 [S3AM-317-ATT1](#) [Safe Alternative Tools](#)
- 6.4 [S3AM-317-ATT2](#) [Safe Hands-Free Lifting Guidelines](#)

Americas

Glove Needs Assessment

S3AM-317-FM1

Mgr. / Supervisor Name:

Work Area Name:

Task/Operation Being Evaluated:

Date:

1.0 Using the Protection and Performance Needs Assessment Table Below

- 1.1 Function and performance needs must be evaluated thoroughly. If employees have a strong need for dexterity, tactility, and/or grip this should be identified as a priority. Rank properties in the table below with 1 being the highest priority. Do not assign the same priority more than once. It is only necessary to rank the applicable properties. If all properties are ranked, the lowest priority would be ranked 12.

Protection and Performance Needs Assessment			
Category	Properties	Protection and Performance Needs	Priority (1=Top Priority)
Mechanical	Cut Resistance	Protection from sharp edges, blades, and other cutting hazards	
	Puncture Resistance	Protection from sharp objects like nails, pins, needles, wire	
	Abrasion Resistance	Durability and resistance to abrasive objects or materials	
	Shielding	Protection from impact, ricochet, small projectiles.	
Chemical	Degradation & Absorption Resistance	Durability and resistance to breaking down and/or permeating the glove from exposure to chemicals. Refer to the chemical's Safety Data Sheet for the appropriate glove choice.	
Thermal	Heat Resistance	Thermal protection from hot objects or materials	
	Cold Resistance	Thermal protection from cold weather, objects, or materials	
Vibration	Anti-Vibration	Vibration reduction from operating certain tools and equipment	
Electrical	Insulation	If performing work on electrical equipment, this must be the top priority	
Function	Dexterity	Ability to manipulate objects and control hands in the desired manner	
	Tactility	Ability to sense objects by touch	
	Grip	Ability to exert pressure on an object when holding it	

- 1.2 Identify a glove that meets the top protection and performance priorities.

In most cases there are trade-offs between hazard protection and functional performance of a glove. These factors are equally important. The higher the severity of the hazard, the more important hazard protection is. The table below offers additional guidance on key considerations when selecting a glove for certain protection and performance properties.

Category	Properties	Key Considerations and Selection Criteria
Mechanical	Cut Resistance	Testing Standard: ASTM F1790 and ASTM F1970-05 There are 5 levels of cut resistance. 5 is the highest.
	Puncture Resistance	Testing Standard: EN 388:2003 This testing measures the force required to pierce the sample with a standard sized point.
	Abrasion Resistance	Testing Standard: ASTM D3389-05 and ASTM D3884-09 Abrasion resistance testing measures how well the glove material resists loss of material from rubbing on rough surfaces.
	Shielding	Some gloves offer thick padding or hard guards around the back of the hand or knuckles. These can offer good protection against impact.
Chemical	Degradation & Absorption Resistance	Identify products / chemicals that present potential exposures. Refer to the chemical's Safety Data Sheet and glove manufacturer's specifications for the appropriate glove choice.
Thermal	Heat Resistance	Testing Standard: ASTM F1060-08 This testing measures the insulation provided by the glove when contacting a hot surface. Higher temperatures reported indicate a glove with greater insulation.
	Cold Resistance	Testing Standard: EN 511:1994 (for ambient temperature) Testing Standard: ISO 5085:1989-1 (for cold surfaces) Choosing the right glove depends on whether protection is needed from cold weather or cold surfaces.
Vibration	Anti-Vibration	Testing Standard: ANSI S2.73-2002 (R2007) This testing method measures the vibration transmission of the glove.
Electrical	Insulation	Testing Standard: ASTM D120-09 Glove protection depends on the maximum voltage of energized components.
		50 – 480V Class 00 with Leather Protectors
		480 – 600V Class 0 with Leather Protectors
		600V and above Class 0 or higher (depending on maximum voltage) with Leather Protectors
Function	Dexterity	Testing Method: EN 420:2003 Ability to manipulate objects and control hands in the desired manner. This testing method assesses the wearer's ability to pick up small diameter pins lying on a flat surface with their thumb and forefinger. If high dexterity is needed, and the hazards are relatively low to the forefinger and thumb, consider a glove that is tip less for those two digits.
	Tactility	Ability to sense objects by touch. There is no standard test. However, a common field test is to determine if the wearer can feel a pulse while wearing the glove. This is affected by the thickness of the glove, presence of liners, glove surface characteristics, and properties of the coating material.
	Grip	Testing Standard: NFPA 1971 (Grip) Ability to exert pressure on an object when holding it.



Safe Hands Task Review Card

Task Being Performed: _____

Date: _____

Person Performing Task Review: _____

Pre-Job: Did Employees identify/discuss?

- Placement of hands
- Potential hazards to the hands (sharp edges, chemicals, etc.)
- Actions to eliminate exposure to hands
- Type of gloves or other PPE to protect hands

Safe Hands Task Review Card (S3AM-317-FM2)
Revision 0 March 1, 2016

Go To Back of Card



Safe Hands Task Review Card

Task Being Performed: _____

Date: _____

Person Performing Task Review: _____

Pre-Job: Did Employees identify/discuss?

- Placement of hands
- Potential hazards to the hands (sharp edges, chemicals, etc.)
- Actions to eliminate exposure to hands
- Type of gloves or other PPE to protect hands

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Safe Hands Task Review Card

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Safe Hands Task Review Card

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- Actions to eliminate exposure to hands
- Type of gloves or other PPE to protect hands

Safe Hands Task Review Card (S3AM-317-FM2)
Revision 0 March 1, 2016

Go To Back of Card

Task: _____

Are employees hands placed near hazard areas?

- ☐ Sharp Edges
- ☐ Crush Hazards
- ☐ Pinch Points
- ☐ Chemicals

Could other tools or controls be used to prevent hand from being in the hazard zone?

- ☐ Block Materials
- ☐ Cover Sharp Edges
- ☐ Are tools used to keep hands clear of pinch/crush hazards

Are the gloves being used appropriate for the task?

- ☐ Do they offer the right type of protection from the identified hazards?
- ☐ Do they have enough dexterity to complete the task while worn?

Is the off-hand placed away from the hazard zone?

- ☐ Yes
- ☐ No

Are there any other actions that could have been taken to keep hands safe?

Task: _____

Are employees hands placed near hazard areas?

- ☐ Sharp Edges
- ☐ Crush Hazards
- ☐ Pinch Points
- ☐ Chemicals

Could other tools or controls be used to prevent hand from being in the hazard zone?

- ☐ Block Materials
- ☐ Cover Sharp Edges
- ☐ Are tools used to keep hands clear of pinch/crush hazards

Are the gloves being used appropriate for the task?

- ☐ Do they offer the right type of protection from the identified hazards?
- ☐ Do they have enough dexterity to complete the task while worn?

Is the off-hand placed away from the hazard zone?

- ☐ Yes
- ☐ No

Are there any other actions that could have been taken to keep hands safe?

Task: _____

Are employees hands placed near hazard areas?

- ☐ Sharp Edges
- ☐ Crush Hazards
- ☐ Pinch Points
- ☐ Chemicals

Could other tools or controls be used to prevent hand from being in the hazard zone?

- ☐ Block Materials
- ☐ Cover Sharp Edges
- ☐ Are tools used to keep hands clear of pinch/crush hazards

Are the gloves being used appropriate for the task?

- ☐ Do they offer the right type of protection from the identified hazards?
- ☐ Do they have enough dexterity to complete the task while worn?

Is the off-hand placed away from the hazard zone?

- ☐ Yes
- ☐ No

Are there any other actions that could have been taken to keep hands safe?

Task: _____

Are employees hands placed near hazard areas?

- ☐ Sharp Edges
- ☐ Crush Hazards
- ☐ Pinch Points
- ☐ Chemicals

Could other tools or controls be used to prevent hand from being in the hazard zone?

- ☐ Block Materials
- ☐ Cover Sharp Edges
- ☐ Are tools used to keep hands clear of pinch/crush hazards

Are the gloves being used appropriate for the task?

- ☐ Do they offer the right type of protection from the identified hazards?
- ☐ Do they have enough dexterity to complete the task while worn?

Is the off-hand placed away from the hazard zone?

- ☐ Yes
- ☐ No

Are there any other actions that could have been taken to keep hands safe?

Americas

Safe Alternative Tools

S3AM-317-ATT1

1.0 Types of Safety Knives or Alternative Cutting Tools

- 1.1 Self-retracting utility knives (brands – OLFA, Martor, Allway Tools)



- 1.2 Guarded utility knives (brands – The Safety Knife Co., Martor)



- 1.3 Shears, snips, scissors (brands – Ridgid, Craftsman, Wolfcraft)



- 1.4 Concealed blade cutters (brands – The Safety Knife Co., Martor)



- 1.5 Pipe cutters (brands – Ridgid, Empire)



- 1.6 Specialty cutter (brand – Geoprobe)



1.0 What is Safe Hands Free Lifting?

The Task Hazard Assessment (THA) shall identify the measures taken to prevent injuries to hands, including methods to perform hands-free lifting as well as address proper glove selection. The most hazardous parts of a lifting operation are hoisting and landing of the load. Therefore at these critical stages, personnel must be as far away from the load as possible in case the load shifts or drops. To ensure this happens, it is essential to adopt a “hands-free” lifting guideline that is rigidly followed.

Once a load is properly rigged and connected to a mechanical lifting device, personnel should not handle or touch a load or rigging with any part of their body as the load is being lifted or before the load is properly set down, and all potential energy is released.

However, there will always be certain jobs which will require “hands-on” for final positioning. These should be treated as exceptions to the norm and fully addressed in the risk assessment process with special attention given to the risk of injury to fingers, hands, toes and feet.

2.0 Objective of Safe Hands Free Lifting

To eliminate the risk of injury to personnel from pinch points, caught between zones, entanglement hazards and a reduced field of vision.

3.0 What are the benefits of Safe Hands Free Lifting?

- Significantly reduces crush, entanglement and hand injuries.
- Clears you of the potential injury zone for dropped objects.
- Clears you of the potential swing area.
- Personnel can see more of the load zone.
- Better posture when pushing and pulling objects.
- Less strain on the lower back and neck area.
- Creates a strong safety culture for all project personnel.

4.0 Can every load be guided with Safe Hands Free Lifting?

- 4.1 MOSTLY, but there *may* be times when due to restricted work space, working from elevated work platforms, awkward angles and body posture, that hands will need to be used.
- 4.2 HOWEVER, every load must be assessed in real time as part of the Safe Work Planning process. Remember to document and communicate the process to be used with all involved employees.

5.0 How is Safe Hands Free Lifting Achieved?

5.1 The Correct Mindset

Changing the way we have done things for years always results in an element of “pushback” from people set in their ways. We have to persevere with fresh ideas or we will never change things for the better. It is a natural reaction to hold the rigging in place until the tension is taken up to make sure the load is properly slung and balanced. Nevertheless, how often have you heard of people getting hands, fingers and body pinched, trapped or crushed by the rigging?

5.2 Tag Lines

Tag lines must be attached to a load prior to lifting and provided at the appropriate length to allow employees to stay clear of the drop zone and any pinch/crush points the load may create.

Whether or not to use tag lines has always been a debatable point, but the consensus of opinion is that although their use can introduce additional hazards, their use generally increases the safety of the lift. Having said that, the advantages and disadvantages will be considered and their use determined during the risk assessment and documented.

5.3 Push / Pull Sticks

Push / Pull sticks are simply wooden or fiber glass poles with a boat hook at one end and a rubber or leather pad at the other. Ideally, these should be about 2 meters / 6 feet long. Their primary use is to retrieve tag lines hanging vertically down from the load so that personnel do not have to get too close to the suspended load. Their secondary use is to push and maneuver loads into the correct orientation / position for landing or guiding them into tight spaces while remaining hands-free / hands-off.

Achieving "hands-free" lifting is not difficult; it is an awareness of the hazards and planning the work and working the plan. If you do come up against jobs that appear to require "hands-on", think long and hard about how you can change that and if you think it needs special tools or equipment to achieve "hands-free".

6.0 What has to happen if you put your hands on the load?


- Safe Work Planning.
- Use proper gloves.
- Agree on the communication method within the lift group.
- Never touch the load with your arm higher than your shoulder level.
- Use hooks to pull tag lines away from the drop zone.
- Keep out of the drop zone.
- Look ahead for the pinch points and crush zones.

7.0 Mandatory Safe Hand Practices

- All personnel must have GLOVES in possession 100% of the time.
- Appropriate GLOVES shall be worn when employees work with or near any materials or equipment that present the potential for hand injury due to sharp edges, corrosives, flammable and irritating materials, extreme temperatures, splinters, etc.
- All Hoisted Loads should only be touched with a HANDS FREE TOOL.
- DO NOT place any part of your body under a suspended load.

8.0 Guidelines for Safe Hands-Free Lifting are in addition to any requirements of S3AM-317-PR1 Hand Safety

8.1 Safe Hands Free Lifting Tools



- Rubber dipped or vinyl coated tag lines prevent curling of rope.
- Eliminates trip and entanglement hazards.

- Example of aluminum boat hook modified for Safe Hands Free Lifting.
- One end rubberized for controlled pushing.
- Hook ideal for pulling tag lines to you and not walking into the drop zone.



- Other tool options for Safe Hands Free Lifting



8.2 Photo Examples



Heavy Equipment

S3AM-309-PR1

1.0 Purpose and Scope

- 1.1 Outline the safe working requirements for working with and near heavy equipment and heavy equipment operation.
- 1.2 Military related vehicles and equipment (e.g. tanks) are not covered under this standard.
- 1.3 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.

2.0 Terms and Definitions

- 2.1 **Heavy equipment** –All excavating equipment (e.g. scrapers, loaders, crawler or wheel tractors, excavators, backhoes, bulldozers, graders, agricultural and industrial tractors, etc.), cranes, lift trucks, drills, etc. This may include off-highway trucks (e.g. dump truck, heavy haul truck, etc.). For requirements related to crew trucks refer to *S3AM-005-PR1 Driving*.
- 2.2 **Operator** – Any person who operates the controls while the heavy equipment is in motion or the engine is running.
- 2.3 **Ground personnel/workers** – Personnel performing work on the ground around heavy equipment (note: operators are considered ground personnel when outside of the equipment cab).

3.0 References

- 3.1 S3AM-005-PR1 Driving
- 3.2 S3AM-202-PR1 Competent Person Designation
- 3.3 S3AM-213-PR1 Subcontractor Management
- 3.4 S3AM-303-PR1 Excavation
- 3.5 S3AM-322-PR1 Overhead Lines
- 3.6 S3AM-325-PR1 Lockout Tagout
- 3.7 S3AM-331-PR1 Underground Utilities & Subsurface Installation Clearance

4.0 Procedure

- 4.1 Roles and Responsibilities
 - 4.1.1 **Managers / Supervisors**
 - Responsible for confirming all equipment is in good working order and all equipment operators are verified as qualified on the piece of machinery they are assigned.
 - As applicable, review as-built drawings.
 - Maintain operation manuals at the site for each piece of equipment that is present on the site and in use.
 - Maintain a list of operators for the project, and the specific equipment that they are authorized to operate.
 - Prohibit equipment from being operated by any personnel who have not been specifically authorized to operate it.

- Confirm an equipment maintenance inventory is maintained, schedules adhered to and appropriate inspections of equipment are conducted.
- Confirm subcontractors are properly pre-qualified in accordance with *S3AM-213-PR1 Subcontractor Management*.
- Require that subcontractor employees follow established safety procedures in operation, inspection, and maintenance of vehicles and equipment.
- Inform AECOM and subcontractor machinery operators about applicable local regulations restricting the consecutive minutes of engine idling time allowed.
- Confirm subcontractor machinery and mechanized equipment is approved for use in accordance with the requirements of *S3AM-309-FM1 Approval of Machinery & Mechanized Equipment*.
- Confirm that all rented equipment bears any required current certification marks and arrives in proper working order with the manufacturer's operating manual before acceptance from the supplier.
- Confirm that AECOM and subcontractor machinery and mechanized equipment is certified, as applicable, in accordance with manufacturer specifications and/or regulatory requirements.
- Visually observe the subcontractors' vehicles and equipment, for any unsafe conditions or practices. Equipment or operation not in compliance with applicable safety standards is prohibited.

4.1.2 **Employees / Ground Personnel**

- Confirm that all rented equipment arrives in proper working order with the manufacturer's operating manual before acceptance from the supplier.
- Ground personnel when working in the vicinity of heavy equipment shall have received training, and comply with the applicable rules of engagement.

4.1.3 **Operators (of heavy equipment)**

- Operate the equipment safely, maintain full control of the equipment, and comply with manufacturer's operation manual and the laws governing the operation of the equipment.
- Inspect equipment and immediately report defects and conditions affecting the safe operation of the equipment to the appropriate Supervisor.
- Trainees may operate equipment in accordance with jurisdictional requirements and under the direct supervision of a trainer.

4.2 **Communication**

- 4.2.1 Communication between site Managers / Supervisors, heavy equipment Operators, and site Employees / Ground Personnel is a key method of preventing serious injury or death during heavy equipment operations.
- 4.2.2 Managers shall confirm the Industrial site or project specific SH&E Plan is developed and communicated to all affected and involved employees. Refer to *S3AM-209-PR1 Risk Assessment & Management*.
- 4.2.3 Task Hazard Assessments and Daily Tailgate meetings shall be conducted in accordance with *S3AM-209-PR1 Risk Assessment & Management*.
- 4.2.4 Concerning worksites in which other employers control concurrent operations and SH&E issues related to the worksite, the manager shall coordinate with those conducting concurrent operations to confirm appropriate control measures are in place to protect employees from the hazards associated with activities to be performed.

- Coordination shall occur prior to work commencing, periodically thereafter, and as necessary given changes in scope and/or working conditions.
- Affected employees (including managers and supervisors) shall seek to participate in all site SH&E meetings related to concurrent operations.

4.2.5 The following points outline the communication requirements during heavy equipment operations:

- Site Supervisors/t Managers shall confirm that all operators are notified/informed of when, where, and how many ground personnel will be working on site.
- Site Supervisors/ Managers shall inform all ground personnel before changes are made in the locations of designated work areas.
- Prior to work initiating on site, the Site Supervisor/ Manager is to confirm all operators and ground personnel are trained on the hand signals that will be used to communicate between operators and ground personnel.
- Ground Personnel working around heavy equipment operations are to maintain eye contact with operators to the greatest extent possible (always face equipment). Never approach equipment from a blind spot or angle.
- All heavy equipment whose backup view can be obstructed shall be equipped with reverse warning devices (e.g., backup alarms) that can be significantly heard over equipment and other background noise. Reverse signaling lights shall be in working order.
- When feasible, two-way radios shall be used to verify the location of nearby ground personnel.
- When an operator cannot adequately survey the working or traveling zone, a signal person shall use a standard set of hand signals to provide directions. Flags or other high visibility devices may be used to highlight these signals.

4.3 Ground Personnel

4.3.1 Ground clearance around heavy equipment may significantly reduce hazards posed during heavy equipment operations.

4.3.2 The following points outline the clearance requirements during heavy equipment operations:

- Ground Personnel shall always yield to heavy equipment.
- Ground Personnel shall maintain a suitable “buffer” area of clearance from all active heavy equipment.
- A task hazard assessment that identifies any special precautions shall be completed and communicated to all AECOM personnel associated with or affected by the activity.
- Site Supervisors/ Managers shall designate areas of heavy equipment operation and confirm that all ground personnel are aware of designated areas.
 - Designated areas shall include work zone boundaries and travel routes for heavy equipment.
 - Travel routes shall be set up to reduce crossing of heavy equipment paths and to keep heavy equipment away from ground personnel.
 - Work zone boundaries shall consider line of fire hazards related to the equipment and associated activities. Refer also to *S3AM-309-ATT2 Operator Line of Sight*.
 - If working near heavy equipment, Ground Personnel shall stay clear of loads to be lifted or suspended loads, and out of the travel and swing areas (excavators, all-terrain forklifts, hoists, etc.) of all heavy equipment.
 - During winch use, all swampers or other personnel will remain outside the “whip area” of the winch line or tow cable.

- At a minimum, employees shall maintain a distance of at least two pile lengths from where piles are being cut and dropped, other than in situations where cut piles are being guided to the ground utilizing mechanical means (e.g., pile driver and shackle) to control the direction and speed of fall of the cut pile.
 - When feasible, Site Supervisors/ Managers shall set up physical barriers (e.g., caution tape, orange cones, concrete jersey barriers) around designated areas and confirm that unauthorized ground personnel do not enter such areas.
 - Operators shall stop work whenever unauthorized personnel or equipment enter the designated area and only resume when the area has been cleared.
 - Operators shall only move equipment when aware of the location of all workers and when the travel path is clear.
 - Ground Personnel shall never stand between two pieces of operating heavy equipment or other objects (e.g., steel support beams, trees, buildings, etc.).
 - Ground Personnel shall never stand directly below heavy equipment located on higher ground unless it can be verified ground stability is not a factor and grade of slope is such that it would not contribute to equipment tip-over.
 - Ground Personnel may only enter the swing area, work area or path of travel of any operating equipment when:
 - They have attracted the operator's attention and established eye contact, and
 - The operator has idled the equipment down, placed it in neutral, grounded engaging tools, set brakes and communicated entry is permitted.
 - Employees shall keep all extremities, hair, tools, and loose clothing away from pinch points and other moving parts on heavy equipment.
 - Employees shall not talk, text, or otherwise use a cell phone while standing or walking on a roadway or other heavy equipment path.
- 4.3.3 At a minimum, all Ground Personnel and Operators outside of heavy equipment shall wear the following:
- High visibility safety vest (fluorescent background material and retro-reflective striping) meeting jurisdictional requirements that is visible from all angles.
 - Background material: should be fluorescent yellow-green, fluorescent orange-red or fluorescent red.
 - Combined-performance retro-reflective material (e.g. the stripes): should be fluorescent yellow-green, fluorescent orange-red or fluorescent red - and shall be in contrast (that is, have a distinct color difference) to the background material.
 - Hazards may require high visibility garments that cover torso, legs and arms.
 - Confirm that vest is not faded or covered with outer garments, dirt, etc.
 - American National Standards Institute/Canadian Standards Association- (ANSI/CSA-) approved hard hat
 - ANSI/CSA-approved safety glasses with side shields
 - At a minimum, CSA or ASTM approved, high-cut (min. 6"), puncture, impact and compression resistant footwear.
 - ANSI/CSA-approved hearing protection as needed
 - Appropriate work clothes (e.g., full-length jeans/trousers and a sleeved shirt; no tank, crew tops or other loose clothing permitted).

4.4 Prior to work commencing

- 4.4.1 All heavy equipment will be inspected pre-shift and then regularly as required with the details of the inspection recorded in a log book.
- Roll-over protection systems (ROPS) and appropriate overhead protection (Fall Object Protection FOP) shall be in place given the specific equipment requirements. Utilize equipment with enclosed cabs where feasible or accessible.
 - Where use of equipment with enclosed cabs is not feasible or said equipment is not accessible, operators shall use any additional personal protective equipment determined as necessary (e.g. goggles, additional hearing protection, etc.).
 - Equipment operated in hazardous atmosphere environments shall be equipped with the proper safety equipment (e.g., spark arrestors, positive air shut off, etc.).
 - Operation of equipment that has or had cab glass (per the manufacturer's specifications) that is cracked/broken (obstructing the operator's view) or missing is prohibited.
 - A locking device shall be provided that will prevent the accidental separation of towed and towing vehicles on every fifth-wheel mechanism and two-bar arrangement.
 - Trip handles for tailgates of dump trucks and heavy equipment shall be arranged so that when dumping, the operator will be in the clear.
 - The Operator will report defects and conditions affecting the safe operation of the equipment to the Site Supervisor or employer. Any repair or adjustment necessary for the safe operation of the equipment will be made before the equipment is used.
 - Exposed moving parts on heavy equipment (belts, gears, shafts, pulleys, sprockets, spindles, drums, fan belts, flywheels, chains, or other reciprocating, rotating or moving parts) which are a hazard to the operator or to other workers will be guarded.
 - If a part will be exposed for proper function it will be guarded as much as is practicable consistent with the intended function of the component.
- 4.4.2 An approved 4A40BC fire extinguisher shall be present on all heavy equipment. An approved 4A40BC fire extinguisher of appropriate rating shall be present and readily accessible on all heavy equipment.
- Fire extinguishers shall be inspected by the operator prior to heavy equipment operation each shift. Monthly and annual inspections shall be documented.
- 4.4.3 All Operators shall inspect the area adjacent to the machine prior to starting.
- Evaluate ground conditions, concurrent operations and obstructions to identify approved routes of travel and work areas.
 - As applicable, check that there is sufficient swing room and that the outriggers are adequately supported on solid and stable ground
- 4.4.4 Managers / Supervisors shall inform the operators of the equipment that AECOM employees are in the area and inquire if there are any restricted areas or specific rules or requirements. In some industrial facilities, heavy equipment has the 'right of way'.
- 4.4.5 Where the Operator will not have a full view of the path of travel, a signal person will be used on the ground that has a full view of the load, the operator, and the path.
- 4.4.6 All heavy equipment with limited visibility (operator cannot directly or by mirror or other effective device see immediately behind the machine) operated around workers or on a construction site:
- Shall have an audible back-up alarm installed that functions automatically when the vehicle or equipment is put into rear motion.

- All bi-directional equipment shall be equipped with a horn, distinguishable from the surrounding noise level, which shall be operated as needed when the machine is moving in either direction.
- Backing up or movement in both directions for bidirectional equipment shall occur only when a signal person communicates that it is safe to do so if alarms or horns are not feasible.

4.5 Operation

- 4.5.1 The Operator of heavy equipment is the only worker permitted to ride the equipment unless the equipment is equipped by the manufacturer for passengers. Manufacturer operator's manual shall be complied with.
- 4.5.2 A person will not operate heavy equipment unless the person has received adequate instruction and training in the safe use of the equipment, and has demonstrated to a qualified supervisor or instructor competency in operating the equipment.
 - Oilers, apprentices, and other operators will not be allowed to operate equipment unless authorized by the Manager.
- 4.5.3 The Operator of heavy equipment will operate the equipment safely, maintain full control of the equipment, and comply with the manufacturer's operator manual and the laws governing the operation of the equipment.
 - Operation of company-owned, leased, or rented vehicles or equipment while under the influence of alcohol or illegal drugs or otherwise impaired is prohibited.
 - Do not operate any equipment beyond its safe load or operational limits.
 - Operator shall not talk on, text, or otherwise use mobile phones while operating heavy equipment.
 - Never use bucket teeth or boom for lifting or moving heavy objects.
- 4.5.4 When heavy equipment is used for lifting or hoisting or similar operations there shall be a permanently affixed notation stating the safe working load capacity of the equipment and the notation shall be kept legible and clearly visible to the operator.
- 4.5.5 A Supervisor or Manager will not knowingly operate or permit a worker to operate heavy equipment which is, or could create, an undue hazard to the health or safety of any person. Where compliance is refused, the Manager or his or her designate should be notified immediately.
- 4.5.6 The Operator of heavy equipment will not leave the controls unattended unless the equipment has been secured against inadvertent movement.
 - The Operator is not to leave suspended load, machine or part or extension unattended, unless it has been immobilized and secured against inadvertent movement.
 - Turn off heavy equipment, place gear in neutral and set parking brake prior to leaving vehicle unattended.
 - Buckets and blades are to be placed on the ground and with hydraulic gears in neutral when not in use.
 - Brakes shall be set and, as necessary, wheels chocked or equivalent (as applicable) when not in use.
- 4.5.7 The Operator will maintain the cab, floor and deck of heavy equipment free of material, tools or other objects which could create a tripping hazard, interfere with the operation of controls, or be a hazard to the operator or other occupants in the event of an accident.
- 4.5.8 If heavy equipment has seat belts required by law or manufacturer's specifications, the Operator and passengers will use the belts whenever the equipment is in motion, or engaged in an operation which could cause the equipment to become unstable.

- Seat belts shall be maintained in functional condition, and replaced when necessary to ensure proper performance.
- 4.5.9 All vehicles transporting material or equipment on public roads shall comply with local laws pertaining to weight, height, length, and width. Obtain any permits required for these loads.
- 4.5.10 Never jump on to or off of a piece of heavy equipment, always maintain 3-points of contact at a minimum.
- 4.5.11 Never exit heavy equipment while it is in motion.
- 4.5.12 Do not ride with arms or legs outside of the truck body of equipment cab.
- Never ride on the outside of a piece of heavy equipment (e.g. in a standing position on the body, on running boards, or seated on side fenders, cabs, cab shields, rear of truck bed, on the load, bucket, etc.).
- 4.5.13 Have vehicle headlights on at all times when driving in the area.
- 4.5.14 Park motor vehicles off the haul roads, or away from the work areas.
- 4.5.15 Do not wear loose clothing or jewelry where there is a danger of entanglement in rotating equipment.
- 4.5.16 Do not enter the swing area of machines such as cranes, heavy drill rigs, or excavators, without first making eye contact with the operator, and receiving permission to do so. Refer to *S3AM-309-ATT2 Operator Line of Sight*.
- 4.5.17 Stay out of the blind areas around heavy equipment and never assume that the equipment operators have seen you or are aware of your presence.
- 4.5.18 Maintain a distance of at least 2 feet (60 centimeters) between the counterweight of swing machines and the nearest obstacle. If this distance cannot be maintained, a spotter shall observe and be in constant communication with the operator to prevent contact.
- 4.5.19 Vibrations from moving traffic or heavy equipment can cause excavations or spoil piles to become unstable.
- Excavation activity shall be conducted according to *SOP S3AM-303-PR1 Excavation*.
 - Equipment not involved in the excavating activity or not required to be in the vicinity shall keep clear. Equipment that shall operate in the vicinity shall maintain appropriate setback distances from edges of excavations or spoil piles.
- 4.5.20 All heavy equipment shall be operated in a safe manner that will not endanger persons or property.
- When ascending or descending grades in excess of 5 percent, loaded equipment shall be driven with the load upgrade.
 - When operating an electric-powered, remote controlled, hydraulic device used for demolishing concrete structures and refractory linings as well as excavating, refer to the *S3AM-309-ATT1 Brokk 180* for more specifics.
- 4.5.21 All heavy equipment shall be operated at safe speeds. Do not drive any vehicle at a speed greater than is reasonable and safe for weather conditions, traffic, intersections, width, and character of the roadway, type of motor vehicles, and any other existing condition.
- 4.5.22 Always move heavy equipment up and down the face of a slope. Never move equipment across the face of a slope.
- 4.5.23 Slow down and stay as far away as possible while operating near steep slopes, shoulders, ditches, cuts, or excavations.
- 4.5.24 When feasible, Operators shall travel with the "load trailing", if the load obstructs the forward view of the operator.

- 4.5.25 Slow down and sound horn when approaching a blind curve or intersection. Signal people equipped with 2-way radio communications may be required to adequately control traffic.
- 4.5.26 All haulage equipment / trucks, whose payload is loaded by means of cranes, power shovels, loaders, or similar equipment, shall have a cable shield and/or canopy adequate to protect the operator from shifting or falling material. If protection is not available for the operator, the operator shall leave the vehicle and wait in a designated safe location until it is loaded..
- 4.5.27 Equipment shall be shut down prior to and during fueling.
 - Confirm proper grounding/ bonding between equipment and fuel vehicle prior to fueling operations.
 - During fuel operations confirm fuel nozzle remains in contact with the tank.
 - Do not smoke, use electrical devices or have an open flame present while fueling.
 - Fuel shall not be carried in or on heavy equipment, except in permanent fuel tanks or approved safety cans.
- 4.5.28 Site vehicles will be parked in a designated parking location away from heavy equipment.
- 4.5.29 Operators shall never push/pull “stuck” or “broken-down” equipment unless a spotter determines that the area is cleared of all personnel around and underneath the equipment.
- 4.5.30 If designated for work in contaminated areas/zones, equipment shall be kept in the exclusion zone until work or the shift has been completed. Equipment will be decontaminated within designated decontamination areas.
- 4.5.31 Equipment left unattended at night adjacent to travelled roadways shall have appropriate lights or reflectors, or barricades equipped with appropriate lights or reflectors, to identify the location of that equipment, and shall not be closer than 6 feet (1.8m) (or the regulatory requirement for the work location) to the active roadway.
- 4.5.32 Rubber / pneumatic-tired earthmoving haulage equipment shall be equipped with fenders on all wheels. Mud flaps may be used in lieu of fenders whenever motor vehicle equipment is not designed for fenders.
- 4.5.33 Lift trucks shall have the rated capacity clearly posted on the vehicle, and the ratings are not to be exceeded.
- 4.5.34 Steering or spinner knobs shall not be attached to steering wheels.
- 4.5.35 High-lift rider industrial trucks shall be equipped with overhead guards.
- 4.5.36 All hot surfaces of equipment, including exhaust pipes or other lines, that present a possible injury or fire hazard, shall be guarded or insulated.
- 4.5.37 All equipment having a charging skip shall be provided with guards on both sides and open end of the skip area to prevent persons from walking under the skip while it is elevated.
- 4.5.38 Platforms, foot walks, steps, handholds, guardrails, and toeboards shall be designed, constructed, and installed on machinery and equipment to provide safe footing and access ways.
- 4.5.39 Substantial overhead protection shall be provided for the operators of fork lifts and similar equipment.
- 4.5.40 In an effort to reduce air emissions, fuel costs, and run-time hours (that can impact equipment warranty), operators shall limit heavy equipment engine idling to not more than five consecutive minutes. Local regulations at the location of the vehicle operation could require less than five consecutive minutes idling time. The idling limit does not apply to:
 - Idling when queuing.
 - Idling to verify that the vehicle is in safe operating condition.

- Idling for testing, servicing, repairing or diagnostic purposes.
- Idling necessary to accomplish work for which the vehicle was designed (cranes, man-lifts, forklifts, etc.)
- Idling required to bring equipment/vehicle to operating temperature, as specified by the manufacturer. Engine heaters shall be used for cold weather starting to avoid engine idling where feasible.
- Idling necessary to ensure safe operation of the vehicle.
- Idling to keep equipment (including windows) clear of ice and snow.
- Idling to provide air conditioning or heat to ensure the health and safety of the operator, but only when seated inside the equipment or vehicle.

4.6 Utilities

- 4.6.1 When contacted by heavy equipment, aboveground and underground utilities may cause severe injuries or death as a result of electrocution, explosion, etc. Refer to the *S3AM-322-PR1 Overhead Lines* procedure for more specifics.
- 4.6.2 The following outline the requirements while performing heavy equipment operations that may lead to contact with aboveground or underground utilities:
- Always be aware of surrounding utilities.
 - Confirm all equipment (e.g., dump trailers, loaders, excavators, etc.) is lowered prior to moving underneath aboveground utilities.
 - Confirm utilities are cleared and identified prior to beginning any earthmoving operation. Contact the local utility service providers for clearance prior to performing work. Confirm documentation of the contact is made; date, number; contact name, organization, etc. Refer to *SOP S3AM-303-PR1 Excavation* and *S3AM-331-PR1 Underground Utilities & Subsurface Installation Clearance*.

4.7 Training

- 4.7.1 The Operator or other qualified supervisor will provide all on-site personnel with an orientation to the heavy equipment and its associated hazards and controls.
- 4.7.2 Only designated, qualified personnel shall operate heavy equipment.
- 4.7.3 Operators shall have all appropriate jurisdictional licenses or training to operate a designated piece of heavy equipment.
- 4.7.4 Operators shall be evaluated through documented experience and routine monitoring of activities unless the equipment is operated by an AECOM operator in which case a practical evaluation is required. Operators shall be knowledgeable and competent in the operation of a designated piece of heavy equipment.

4.8 Inspection and Maintenance

- 4.8.1 Maintenance records for any service, repair or modification which affects the safe performance of the equipment will be maintained and be reasonably available to the operator and maintenance personnel regulatory agencies upon request during work hours.
- 4.8.2 Maintenance records will be maintained on the site or project for heavy equipment.
- 4.8.3 Conduct maintenance as prescribed by the manufacturer in the Operation Manual for each piece of equipment.
- 4.8.4 Servicing, maintenance and repair of heavy equipment will not be done when the equipment is operating.
- Lockout and tagout safety procedures are followed. Refer to *S3AM-325-PR1 Lockout Tagout*.

- Motors are turned off, unless required for performing maintenance or repair.
- All ground-engaging tools are grounded or securely blocked.
- Controls are set in a neutral position and brakes are set.
- Electrically driven equipment is installed with provision for tagging and locking out the controls while under repair.
- Manufacturer's requirements for maintenance and repair are followed.
- If continued operation is essential to the process, a safe means of protection shall be provided.
- Provide and use a safety tire rack, cage, or equivalent protection when inflating, mounting, or dismounting tires installed on split rims, or rims equipped with locking rings or similar devices.

4.8.5 All heavy equipment shall have a documented inspection and if necessary, repaired prior to use.

- Operators shall not operate heavy equipment that has not been cleared for use.
- All machinery and mechanized equipment will be verified to be in safe operating condition (refer to *S3AM-309-FM1 Approval of Machinery & Mechanized Equipment*) by a competent person (refer to *S3AM-202-PR1 Competent Person Designation*) within seven days prior to operation on a new site or project. Clearance is valid for up to one year for the given site or project.
- As applicable, all machinery and mechanized equipment shall be inspected / certified and tested at appropriate intervals as required by the manufacturer and/or regulatory requirements.

4.8.6 All heavy equipment shall be inspected at a minimum to the manufacturer's recommendations prior to each work shift. All defects shall be reported to the Supervisor/ Manager immediately.

- Defective heavy equipment shall be immediately tagged and taken out of service until repaired.
- Inspection, maintenance, service and repair records shall be maintained at the site. If a manufacturer's or company-specific inspection checklist is not provided, use *S3AM-309-FM2 Heavy Machinery Pre-Operation Checklist*.
- Records shall be made available for review upon request. Note: Documents may be electronically stored in the project files.

4.9 Fueling and batteries

- 4.9.1 A well-ventilated area shall be used for refueling.
- 4.9.2 Only the type and quality of fuel recommended by the engine manufacturer shall be used.
- 4.9.3 Fuel tanks shall not be filled while the engine is running. All electrical switches shall be turned off.
- 4.9.4 If there is potential to spill fuel on hot surfaces, the surfaces shall be permitted to cool down prior to fueling. Any spillage shall be cleaned before starting engine.
- 4.9.5 Spilled fuel shall be cleaned with cotton rags or cloths and disposed of in the proper receptacle; do not use wool or metallic cloth.
- 4.9.6 Open flames, lighted smoking materials, sparking equipment or any other type of ignition source shall remain a minimum of 35' (10.7m) from the fueling area and/or fuel source. This clearance shall be increased if required or conditions warrant.
- 4.9.7 Heaters in carrier cabs shall be turned off when refueling the carrier or the drill rig.
- 4.9.8 Portable containers to be filled shall be placed directly on the ground or be properly grounded prior to filling to prevent creation of a static charge. Portable fuel containers shall not be filled completely to allow expansion of the fuel during temperature changes.
- 4.9.9 Control electrostatic hazards.

- Before activating fuel pump, touch some part of vehicle / equipment to de-energize any static electricity that may be present.
 - The fuel nozzle shall be kept in contact with the tank being filled to prevent static sparks from igniting the fuel.
 - Fuel containers and transfer hoses shall be kept in contact with a metal surface during travel to prevent build-up of a static charge.
- 4.9.10 Portable fuel containers shall not travel in the vehicle or carrier cab with personnel.
- 4.9.11 Batteries shall be serviced in a ventilated area while wearing appropriate Personal Protective Equipment.
- 4.9.12 When a battery is removed from a vehicle or service unit, the battery shall be disconnected ground post first. Consult the SDS applicable to the battery and/or contents for additional information including; handling, precautions, and first aid measures.
- Spilled battery acid shall be immediately flushed off the skin with a continuous supply of water. Battery storage or maintenance areas shall have readily accessible eye wash stations.
 - Should battery acid get into the eyes, the eyes shall be flushed immediately with copious amounts of water and medical attention shall be sought immediately.
- 4.9.13 When installing a battery, the battery shall be connected ground post last.
- 4.9.14 When charging a battery, cell caps shall be loosened prior to charging to permit gas to escape.
- 4.9.15 When charging a battery, the power source shall be turned off to the battery before either connecting or disconnecting charger loads to the battery posts.
- 4.9.16 To avoid battery explosions, the cells shall be filled with electrolytes. A flashlight (not an open flame) shall be used to check water electrolyte levels. Avoid creating sparks around batteries by shorting across a battery terminal. Lighted smoking materials and flames shall be kept at least a minimum of 35 feet (10.7 meters) away from battery-charging stations.

5.0 Records

- 5.1 Inspection, maintenance, service and repair records shall be maintained with the equipment.

6.0 Attachments

- 6.1 [S3AM-309-ATT1](#) [Brokk180 Safety Card](#)
- 6.2 [S3AM-309-ATT2](#) [Operator Line of Sight](#)
- 6.3 [S3AM-309-FM1](#) [Approval of Machinery & Mechanized Equipment](#)
- 6.4 [S3AM-309-FM2](#) [Heavy Machinery Pre-Operation Checklist](#)
- 6.5 [S3AM-309-FM3](#) [Rubber Tire Backhoe Operator Skill Evaluation](#)
- 6.6 [S3AM-309-FM4](#) [Scraper Operator Skill Evaluation](#)
- 6.7 [S3AM-309-FM5](#) [Bull Dozer Operator Skill Evaluation](#)
- 6.8 [S3AM-309-FM6](#) [Dump Truck Operator Skill Evaluation](#)
- 6.9 [S3AM-309-FM7](#) [Roller Compactor Operator Skill Evaluation](#)
- 6.10 [S3AM-309-FM8](#) [Front End Loader Operator Skill Evaluation](#)
- 6.11 [S3AM-309-FM9](#) [Grader Operator Skill Evaluation](#)
- 6.12 [S3AM-309-FM 10](#) [Excavator Operator Skill Evaluation](#)
- 6.13 [S3AM-309-FM11](#) [Water Truck Operator Skill Evaluation](#)

- 6.14 [S3AM-309-FM12](#) [Heavy Equipment Maintenance Inventory](#)
- 6.15 [S3AM-309-FM13](#) [Heavy Equipment Inspection Report](#)

1.0 Objective/Overview

- 1.1 The Brokk 180 is an electric-powered, remote controlled, hydraulic device used for demolishing concrete structures and refractory linings as well as excavating. This machine includes attachments designed exclusively for demolishing work (e.g., grapple, bucket, hydraulic hammer, etc.). By using the remote control unit, an operator can move the machine and attachments in different directions and speeds from afar.

2.0 Potential Hazards

- 2.1 Flying debris
- 2.2 Crush/impact/pinch from extendable boom, tracks, and tipping over
- 2.3 Struck-by
- 2.4 Electricity (subsurface utilities when excavating)
- 2.5 Gas lines (subsurface utilities when excavating)
- 2.6 Noise



3.0 Safe Operating Guidelines

- 3.1 Prior to use, complete a pre-operation inspection to determine if the unit is in safe working condition.
- 3.2 Position the unit to safely perform the intended task, then deploy the outriggers to stabilize the unit.
- 3.3 Confirm that the operator knows what the lifting capacity is; do not exceed the lifting capacity.
- 3.4 Complete a subsurface utility clearance prior to excavating.
- 3.5 Operator should define a swing radius area and exclude workers from the area. Establish a minimum 15-foot (4.5-meter) clearance around the unit while operating.
- 3.6 Do not allow debris to build up around the unit. Maintain good housekeeping practices.
- 3.7 Prior to removing debris from under the boom, stop, disengage the unit, and position the boom so that the attachment is at rest on the ground.
- 3.8 Personnel operating the unit with the remote control device will be properly trained and certified by a competent person.
- 3.9 The operator will be able to maintain line of sight visual contact with the unit at all times to assess hazards and site security.
- 3.10 Maintenance in excess of preventive maintenance activities (e.g., lubrication, replenishing fluids, etc.) will be performed by manufacturer personnel ONLY.
- 3.11 All operations will comply with the manufacturer's recommended policies.

4.0 Training Requirements

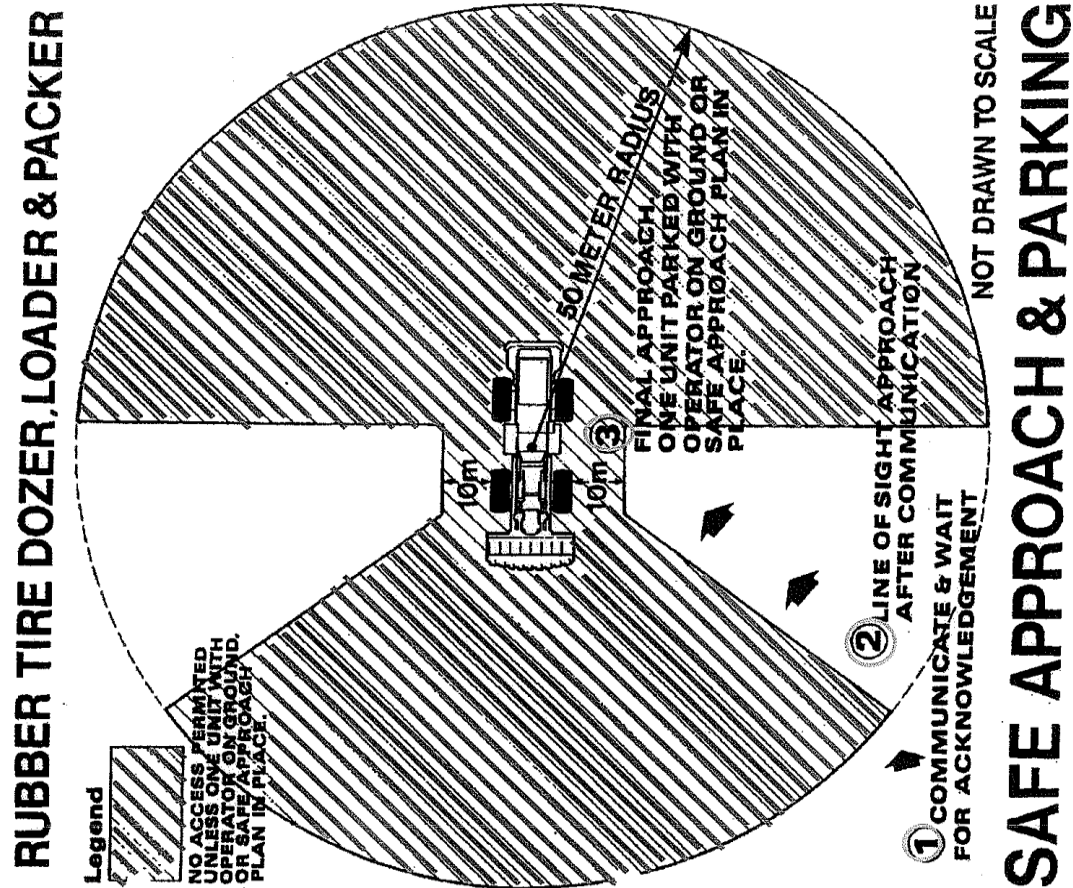
- 4.1 Review of applicable Standard Operating Procedures.
- 4.2 Complete knowledge and understanding of remote control functions.
- 4.3 Review and follow manufacturers' recommended policies and practices.

5.0 Personal Protective Equipment

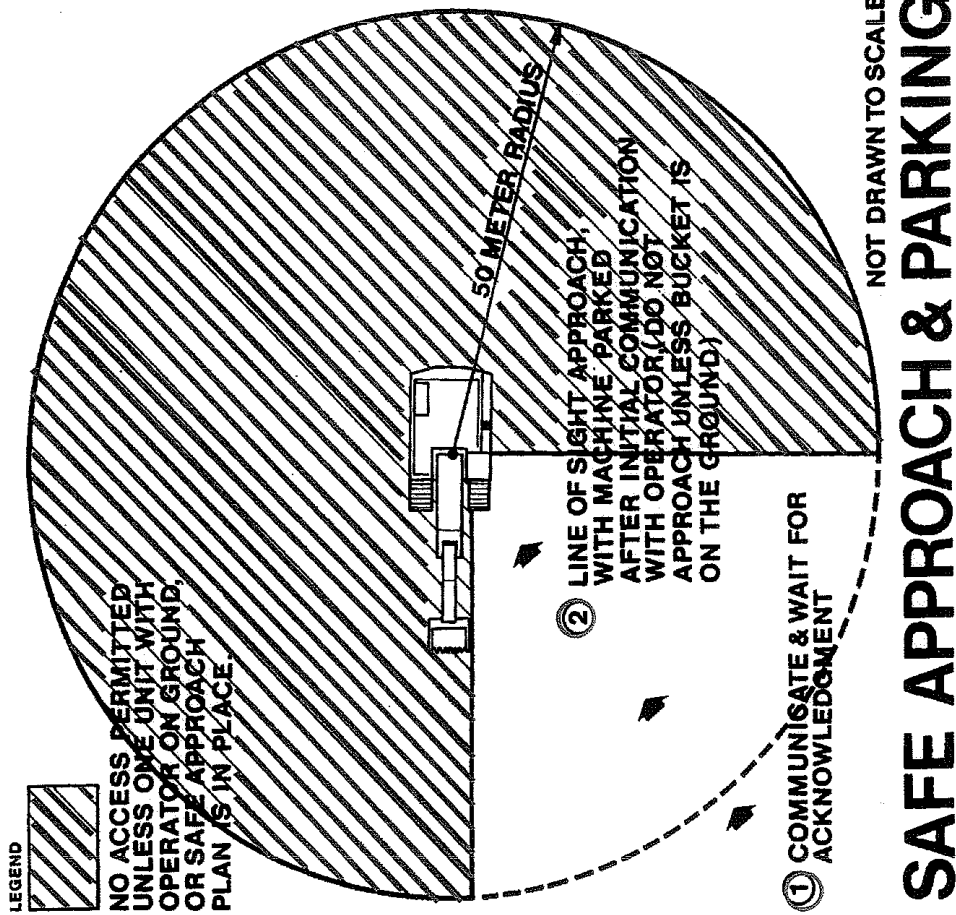
- 5.1 Class II (minimum) American National Standards Institute/Canadian Safety Association Safety Vest
- 5.2 Hard Hat
- 5.3 Safety Toe Boots
- 5.4 Safety glasses with side shields
- 5.5 Hearing protection (ear plugs and/or ear muffs)
- 5.6 Leather gloves

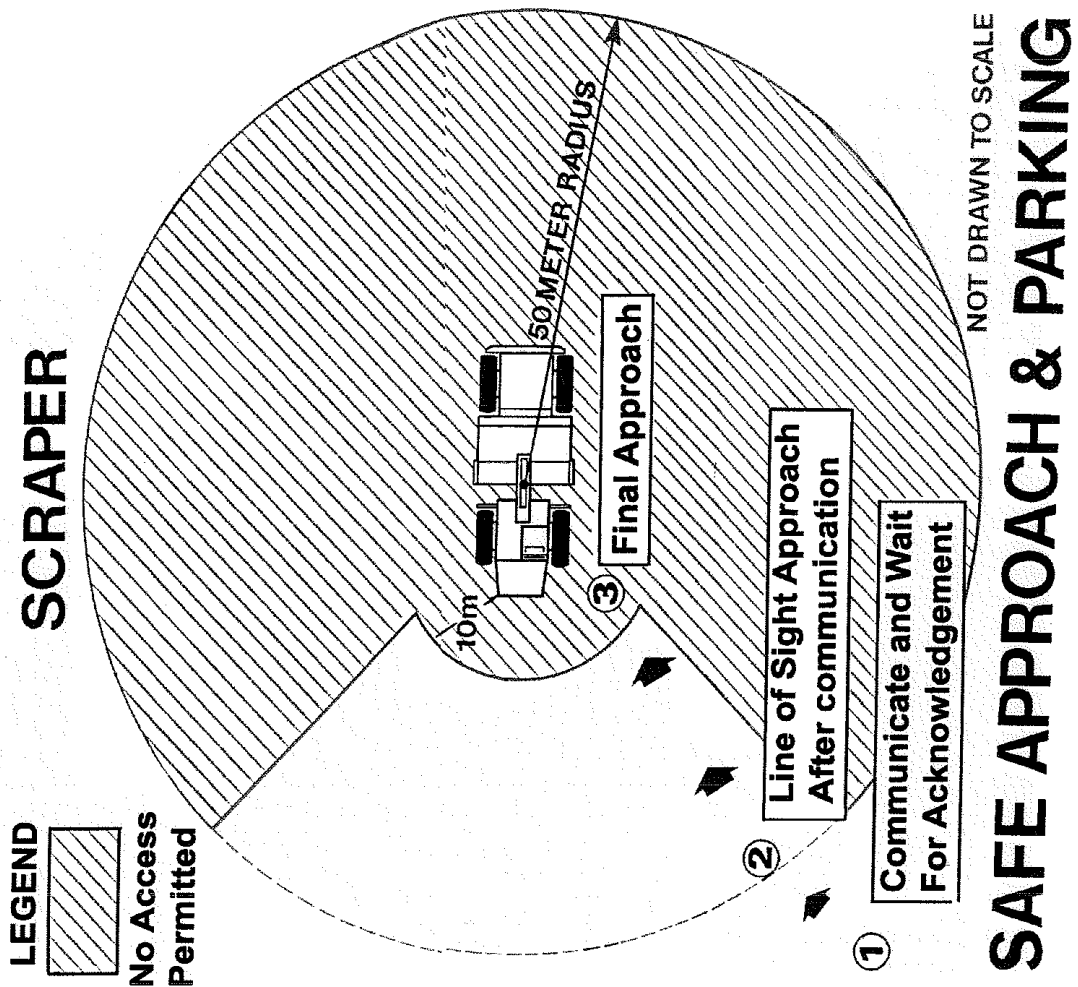
6.0 Other Safety Tips

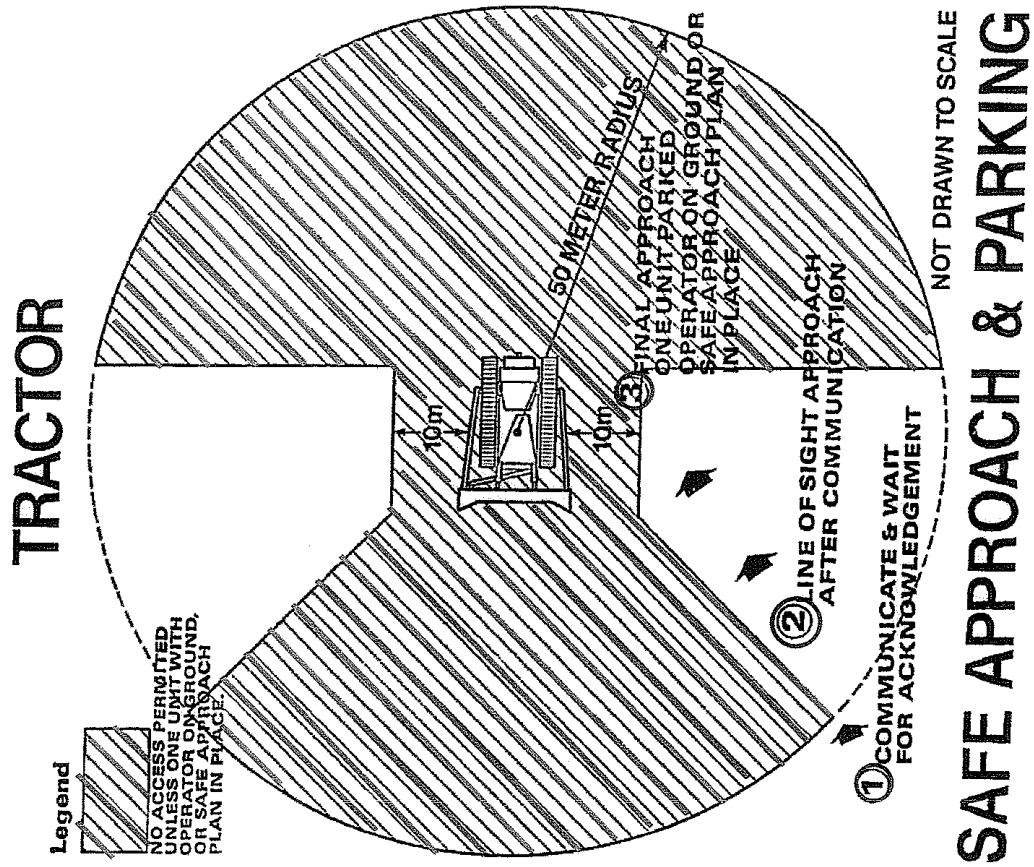
- 6.1 Never stand under a raised boom.
- 6.2 Pay close attention to power cords for potential tripping hazard and equipment entanglement.

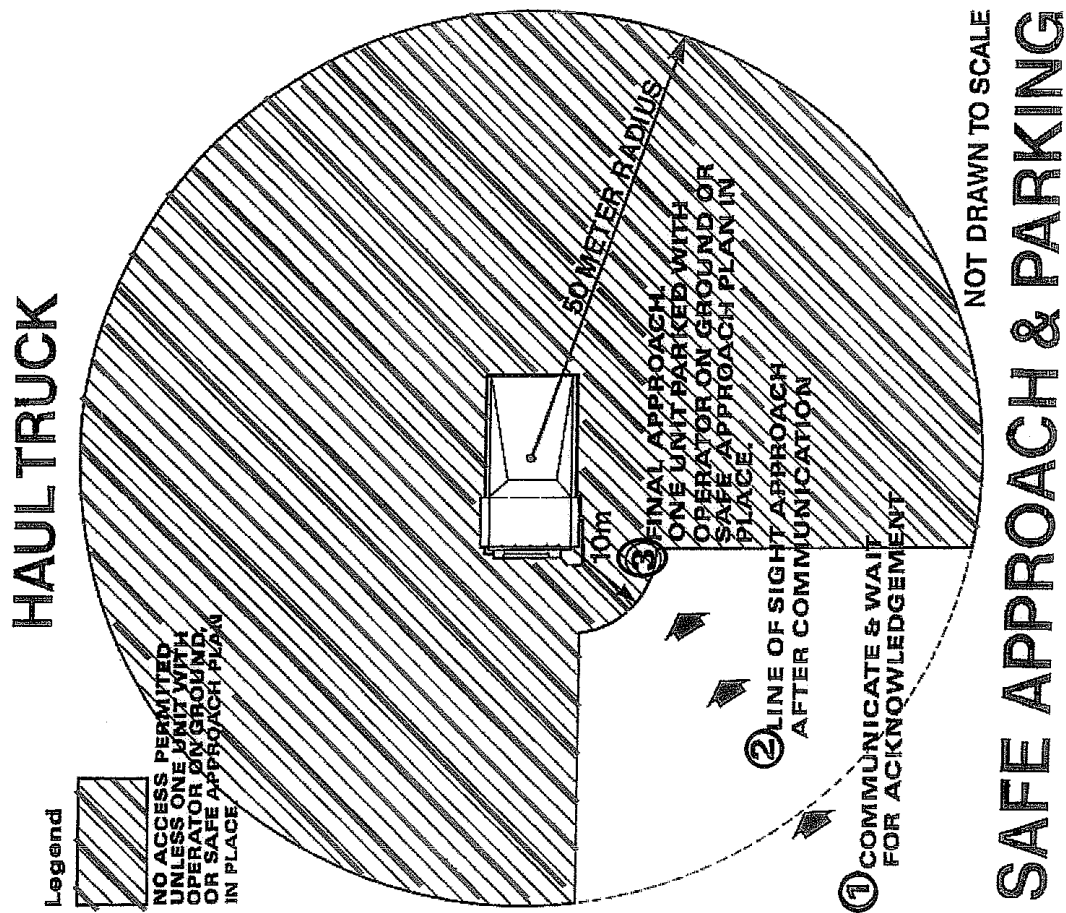


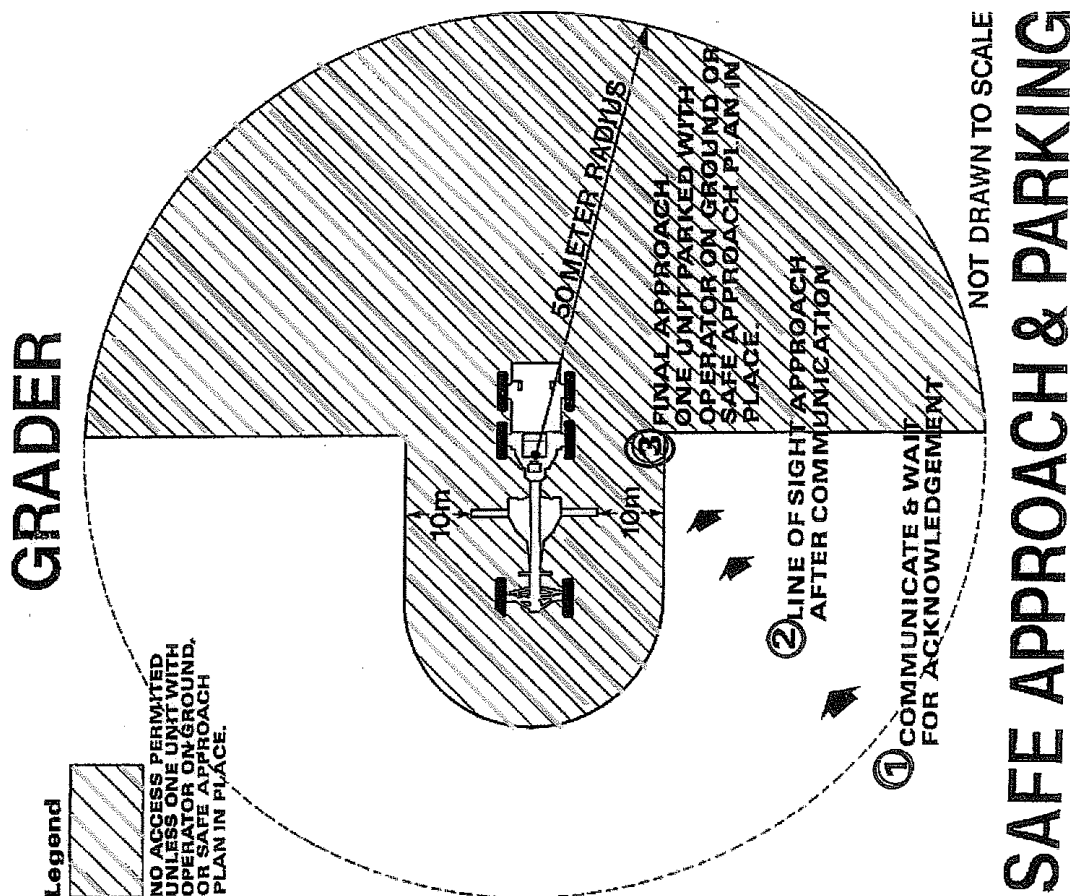
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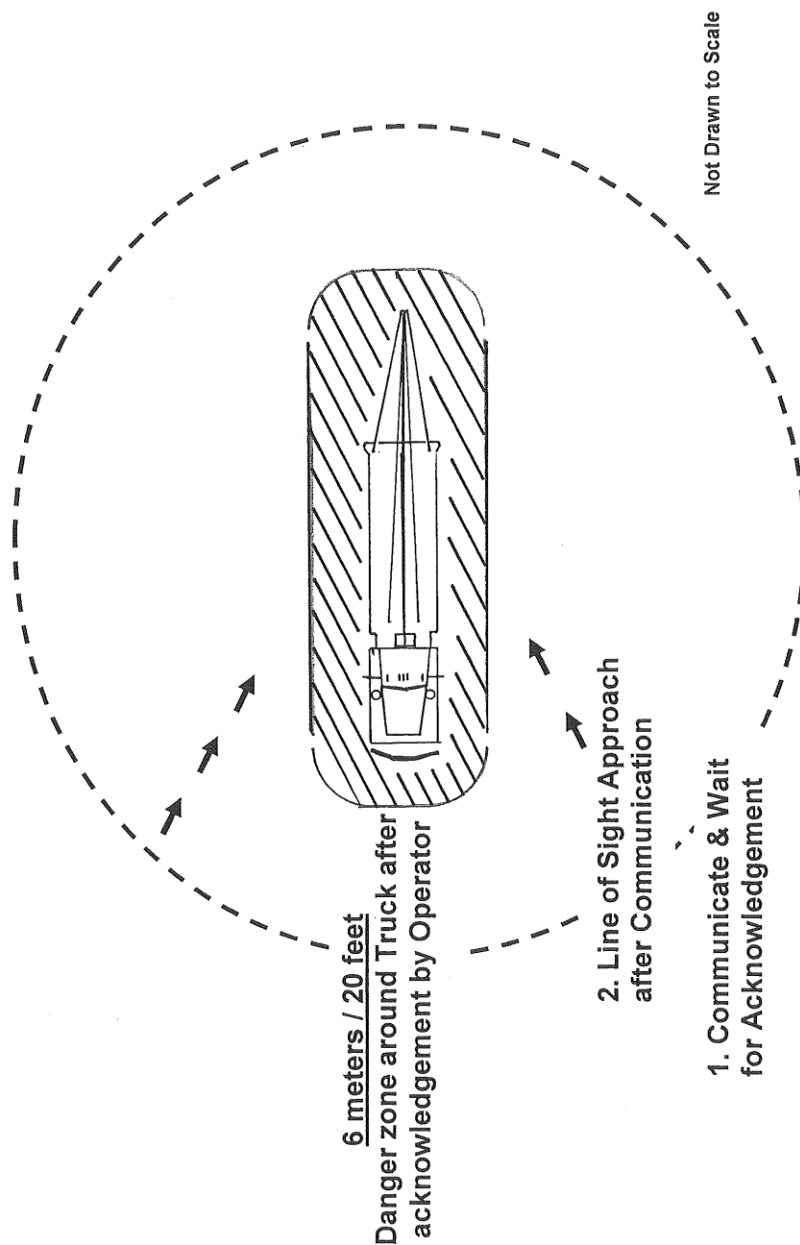








Bed / Pole Truck



SAFE APPROACH & PARKING

Americas**Approval of Machinery and Mechanized Equipment****S3AM-309-FM1****1.0 General Guidelines**

- 1.1 Subcontractor equipment shall comply with all applicable legislative requirements, local, State, Federal, Provincial, Territorial for motor vehicles and material handling heavy equipment.
- 1.2 Approval shall be obtained for all subcontractor machinery and mechanized equipment within seven calendar days of use on the project site.
- 1.3 As applicable, all machinery and mechanized equipment must be certified and tested at appropriate intervals as required by the manufacturer and/or regulatory requirements.
- 1.4 Heavy equipment includes, but is not limited to, drill rigs, front-end loaders, backhoes, trackhoes, bulldozers, forklifts, and similar equipment used for the implementation of the project Statement of Work.

2.0 Equipment Safety Inspections

- 2.1 The following presents general guidelines for certifying equipment is in safe operating condition before activities commence at the site and during site operations. The following guidelines are not meant to be all-inclusive.
 - 2.1.1 All machinery and mechanized equipment will be approved to be in safe operating condition (using the attached form) by a competent individual within seven calendar days in advance of operation on a new site or project. This approval is valid for one year for the given site or project.
 - 2.1.2 Equipment will be inspected on a daily basis by the owner/operator and daily logs will be maintained. All discrepancies shall be corrected prior to placing the equipment in service.
 - 2.1.3 Inspections shall include, but are not limited to, all hydraulic lines and fittings for wear and damage, all cable systems and pull ropes for damage and proper installation, exhaust systems, brake systems, and drill controls, etc.
 - 2.1.4 Drill rigs and related support equipment and vehicles shall be inspected by the driller in charge on a daily basis. These inspections shall be recorded on the Daily Drill Rig Checklist or on equivalent subcontractor forms.
 - 2.1.5 Preventive maintenance shall be conducted for all equipment according to manufacturer recommendations and/or the subcontractor's internal policies, schedules, and equipment Standard Operating Procedures.
 - 2.1.6 Only designated qualified persons shall operate and inspect machinery and mechanized equipment.
 - 2.1.7 The contractor shall maintain records of tests and inspections at the site and shall make the records available upon request of the designated authority; the records shall become part of the official project file.
 - 2.1.8 Equipment found to not be in safe operating condition or to have a deficiency that affects the safe operation of the equipment shall immediately be tagged, taken out of service, and its use prohibited until deficiencies have been corrected to a safe condition.
 - 2.1.9 All equipment shall be kept in the exclusion zone until decontaminated within designated decontamination areas.
 - 2.1.10 Equipment with an obstructed rear view must have an audible alarm that sounds when equipment is moving in reverse.

TO: AECOM

DATE:

FROM:

Project Name:

Project Number:

Project Location:

1. This form provides approval of machinery and mechanized equipment to be used on the referenced project for the following work:

Description of equipment work:	
Project site:	
Subcontractor providing equipment: Address:	
Dates (duration) of equipment work:	

2. Inspection and approval of machinery and mechanized equipment, as required by AECOM, has been made within seven calendar days in advance of use on the project site. This approval process shall be repeated for equipment that is used on the project or site for more than one year.

Identification of equipment (make, model, serial no.)		Date of Certification
1		
2		
3		

3. The above listed equipment has been inspected and tested as indicated on this form, and is DECLARED TO BE IN SAFE OPERATING CONDITION BY THE FOLLOWING COMPETENT INDIVIDUAL:

Name		Title
Company		
Signature		Date

4. If there are any questions regarding this certification, please contact the following AECOM representative:

Wildlife, Plants & Insects

S3AM-313-PR1

1.0 Purpose and Scope

- 1.1 Communicates the requirements and precautions to be taken by AECOM employees to protect against the biological hazards associated with insects, arachnids, snakes, poisonous plants, and other animals referred to herein collectively as “biological hazards”.
- 1.2 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document’s content.

2.0 Terms and Definitions

- 2.1 **Field Work** – Any activity conducted at a site that contains brush, overgrown grass, leaf litter, poisonous plants, or is located near mosquito breeding areas and includes work in structures where animals might exist that harbor fleas or ticks or where spiders and mites could be present. Field work includes, but is not limited to, Phase I, Phase II, Operations Monitoring & Maintenance, biological surveys, and other work that meets the definition of field work.
- 2.2 **Poisonous** – Capable of harming or killing by or as if by poison; toxic or venomous.
- 2.3 **Phase I Environmental Site Assessment** – Investigation of real property to determine the possibility of contamination, based on visual observation and property history, but no physical testing. Under new Environmental Protection Agency regulations that went into effect on November 1, 2006, a Phase I, as it is called for short, will be mandatory for all investors who wish to take advantage of Comprehensive Environmental Response, Compensation, and Liability Act defenses that will shield them from liability for future cleanup, should that prove necessary. The new Phase I rules, called “All Appropriate Inquiry” or AAI, also require more investigation than previously mandated. Investors can expect to see dramatic price increases over prior experiences.
- 2.4 **Phase II Environmental Site Assessment** – Investigation of real property through physical samplings and analyses to determine the nature and extent of contamination and, if indicated, a description of the recommended remediation method.

3.0 References

- 3.1 RS2-001-PR1 Firearms Standard
- 3.2 S3AM-004-PR1 Incident Reporting, Notifications & Investigation
- 3.3 S3AM-008-PR1 Fitness for Duty
- 3.4 S3AM-113-PR1 Heat Stress
- 3.5 S3AM-208-PR1 Personal Protective Equipment
- 3.6 S3AM-209-PR1 Risk Assessment & Management

4.0 Procedure

- 4.1 Roles and Responsibilities
 - 4.1.1 **Managers / Supervisors**
 - Responsible for managing field work.

- Work with employees to see that a Task Hazard Analysis (THA) for the work to be conducted has been performed prior to the beginning of the field work and that it includes an assessment of potential biological hazards.
- Implement control measures at the location to reduce the potential for employees to be exposed to injuries and illnesses from biological hazards while working.
- If the exposures cannot be eliminated or managed with engineering controls, approve the use and cost of Personal Protective Equipment (PPE) and protective repellents and lotions and confirm that exposed employees have and use these products.

4.1.2 **SH&E Manager**

- Confirm training and guidance is provided to employees consistent with this procedure.
- During the performance of site visits, assess the precautions being taken against biological hazards for compliance with this procedure.
- Assist AECOM personnel in identifying hazards and selecting appropriate control measures.
- As applicable, review and approve relevant SH&E Plans for locations that have biological hazards.

4.1.3 **Employees**

- Participate in required training related this procedure.
- Participate in the development of THAs for the task, identify control measures to limit exposure and request PPE, repellents, and protective lotions identified by this procedure.
- Update the applicable THA when a new, unaccounted for biological hazard is identified. Employee shall stop work to identify appropriate elimination or control measures (and obtain any necessary guidance) before continuing work.
- Obtain approval from Managers and/or Supervisors to purchase selected PPE prior to purchasing.
- Implement the precautions appropriate to prevent exposure to the hazardous wildlife, insects and plants.
- Observe requirements for reporting (e.g. tick bites, skin irritations, etc.) as detailed within the procedure and attachments.

4.2 Training

4.2.1 Employees shall be trained to recognize organisms that represent a threat in the regions in which they work – experienced field staff shall provide on the job training to assist staff with hazard recognition.

4.2.2 Employees shall be properly trained to the anticipated tasks and the associated required PPE.

4.3 Overview

4.3.1 The procedures discussed below are detailed because these hazards have historically posed the most significant risk to AECOM employees. Note that this discussion is not a fully encompassing list of hazards. As part of the SH&E Plan and THA developed by the AECOM personnel, in accordance with *S3AM-209-PR1 Risk Assessment & Management*, additional consideration shall be given to other biological hazards.

4.3.2 Departments of Public Health local to the worksite, as well as the Centers for Disease Control (CDC) can serve as a resource for identifying biological hazards not discussed in this procedure.

4.3.3 If additional biological hazards are identified, employees should stop work and contact the SH&E Manager to discuss the hazards and identify effective control measures. Those control measures shall be implemented at the location prior to restarting work.

4.4 Employee Sensitivity

- 4.4.1 Sensitivity to toxins generated by plants, insects and animals varies according to dosage and the ability of the victim to process the toxin; therefore, it is difficult to predict whether a reaction will occur, or how severe the reaction will be. Employees should be aware that there are a large number of organisms capable of causing serious irritations and allergic reactions. Some reactions will only erupt if a secondary exposure to sunlight occurs. Depending on the severity of the reaction, the result can be severe scarring, blindness or even death.
- 4.4.2 Employees also need to consider whether they are sensitive to the use of insect repellents.

4.5 Planning and Hazard Assessment

- 4.5.1 AECOM personnel shall confirm that the potential for exposure to specific biological hazards are assessed prior to the commencement of work and that the procedures specified by this procedure are integrated into the THA planning process and conveyed to employees conducting the field work. This information shall be communicated in the location-specific SH&E plan, the THA, pre-project kickoff meetings, and tailgate meetings at the location.
- 4.5.2 It is important to note that the precautions to be taken by employees to decrease the risk of exposure to biological hazards can directly increase the risk of heat-related illness due to thermal stresses. Therefore, heat stress monitoring and precautions shall be included as a critical component of the task-specific THA in accordance with *S3AM-511-PR1 Heat Stress*.
- 4.5.3 During the preparation of the location-specific SH&E plan and task specific THA, Managers, Supervisors, and employees shall determine what biological hazards might be encountered during the task or operations and shall prescribe the precautions to be taken to reduce the potential for exposure and the severity of resulting illnesses. Consideration will be given to conditions such as weather, proximity to breeding areas, host animals, and published information discussing the presence of the hazards.
- 4.5.4 It should be assumed that at least one of the biological hazards exists whenever working on undeveloped property. This can include insect activity any time that local temperatures exceed 40 degrees Fahrenheit (4.5 degrees Celsius) for a period of more than 24 hours. The stubble and roots of poisonous plants can be a hazard any time of year, including when some plants are dormant or mown.
- 4.5.5 The hazard assessments shall also consider the additional hazards posed by vegetative clearing such as the increased risk of coming in contact with poison ivy, oak or sumac and hazards associated with the use of tools and equipment to remove vegetation.
- 4.5.6 Employees in the field where biological hazards exist shall not enter the hazard areas unless they are wearing the appropriate protective clothing, repellents, and barrier creams specified below. If the hazard is recognized in the field but was not adequately assessed during the THA, the field staff shall stop work and not proceed until the THA has been amended and approved and protective measures implemented.
- 4.5.7 Employees who have severe allergic reactions are strongly recommended to notify their Manager, field Supervisor and co-workers of the potential for a reaction and demonstrate what medication they might need, where they keep it and how it is administered.
- 4.5.8 A decision flow chart and table for determining the potential for biological hazards in the Americas has been provided in *S3AM-313-ATT1 Biological Hazard Assessment Flow Chart*.

4.5.9 Restrictions:

- No firearms or weapons are allowed to be used without express permission by the Region Executive and Chief Resilience Officer, refer to the *RS2-001-PR1 Firearms Standard*.
- No weapons related work shall occur without an assessment that includes appropriate hazard control measures and training.

- Staff with life-threatening reactions shall not undertake work in areas infested with the allergen (e.g., wasps, poison ivy), unless precautions are met which satisfy a medical practitioner's requirements. Refer to *S3AM-008-PR1 Fitness for Duty*.

4.5.10 Precautions

- Be aware of the potential irritants in your area and know how to recognize them.
- Modify activities to avoid encounters (diurnal rhythms, seasonal rhythms).
- Avoid wearing perfume and cologne and strong smelling deodorants, lotions, soaps, and shampoos.
- When working in areas where there may be small insects that "hitchhike" (e.g., ticks, spiders, scorpions), it is recommended that clothes are turned inside out and shaken at the end of day; do not wear same clothes two days in a row.
- Staff should always be aware of where they are placing their hands, or where they are sitting in order to avoid contact with potential toxins. Avoid reaching into areas where visibility is limited.

4.6 Wildlife Hazards (Wild Animals, Reptiles and Birds)

4.6.1 Employees shall not work alone in areas where the risk of an encounter with dangerous wildlife is high. Wildlife handling shall only be completed under direct supervision of an experienced individual. Refer to the following work instructions for more specifics:

- *S3AM-313-ATT13 Alligators*
- *S3AM-313-ATT9 Large Carnivores & Ungulates*
- *S3AM-313-ATT10 Bear Safety*
- *S3AM-313-ATT11 Small Mammals*
- *S3AM-313-ATT12 Snakes & Scorpions*

4.7 Ticks, Spiders and other Insects

4.7.1 Insects for which precautionary measures should be taken include but are not limited to: mosquitoes (potential carriers of disease aside from dermatitis), black flies, wasps, bees, ticks, fire ants and European fire ants.

4.7.2 Employees with known allergies to insect stings should consult their personal physician for advice on any immediate medications that they should carry with them. Epi-pens¹ shall be carried at all times in the field by employees who are aware that anaphylactic shock is a possibility for them. AECOM highly recommends that employees with known allergies inform their co-workers of the allergy and the location of the medications they might carry for the allergy.

4.7.3 Habitat Avoidance, Elimination and/or Control

- The most effective method to manage worker safety and health is to eliminate, avoid and/or control hazards. Clearing the location of brush, high grass and foliage reduces the potential for exposure to biological hazards. Clearing will not eliminate the exposure to flying insects and there might be an increased exposure to ticks and spiders during the clearing process.
- Projects such as subsurface environmental assessment or remediation are often candidates for brush and overgrown grass to be cleared. In these instances, the Manager shall either request that the client eliminate vegetation, or request approval from the client to have vegetation clearing added to the scope of work.
 - It should be noted that vegetation clearance may unintentionally serve to spread noxious and poisonous plant materials around the site.

¹ *Epi-pens must be prescribed by a personal physician. Renew epi-pens on a regular schedule to ensure effectiveness and make sure your field companions know where it is and how to use it if you cannot self-administer the dose.*

- As applicable, measures should be taken to prevent spread, such as but not limited to, confirming equipment and materials are not placed on affected areas, and equipment is decontaminated after use and before removal from site.
- When work shall be conducted in areas that cannot or may not be cleared of foliage, personal precautions and protective measures shall be prescribed.
- Mosquitoes breed in stagnant water and typically only travel a quarter mile (less than half a kilometer) from their breeding site. Whenever possible, stagnant water should be drained to eliminate breeding areas. Managers and client site managers should be contacted to determine whether water can be drained and the most appropriate method for draining containers, containment areas, and other objects of standing water.
- If water cannot be drained, products similar to Mosquito Dunks® can be placed in the water to control mosquitoes. Once wet, the Mosquito Dunks® kill the immature, aquatic stage of the mosquito. The active ingredient is a beneficial organism that is lethal to mosquito larvae, but harmless to fish, humans, and other animals. Mosquito Dunks® provide long-term protection for 30 days or more.

4.7.4 Ticks

- Ticks can be encountered when walking in tall grass or shrubs. They crawl up clothing searching for exposed skin where they will attach themselves. The most serious concern is a possibility of contracting a disease.
- Data from the CDC indicates that tick-borne diseases have become increasingly prevalent. At the same time, tick repellents have become both safe and effective so it is possible to prevent the vast majority of bites and, therefore, most related illnesses. The use of permethrin is strongly advised.
- The most common and severe tick-borne illnesses in the U.S. are Lyme disease, Ehrlichiosis, and Rocky Mountain spotted fever. A summary table listing CDC informational resources for these diseases is provided in *S3AM-313-ATT2 Ticks* along with a listing of CDC information resources and maps showing the distribution of common tick-borne diseases in the U.S.
- When working in areas where ticks may occur, it is recommended that clothes are turned inside out and shaken at the end of day; do not wear the same clothes two days in a row.
- Employees should conduct a thorough full body tick check upon exiting the field. Shower within two hours of coming indoors to help wash away loose ticks. Clothes should be laundered in hot water or tumble dry clothes in a dryer on high heat for 10 minutes to kill ticks.
- To remove ticks that are embedded in skin, utilize a tick key. Alternatively use tweezers or fingers to carefully grasp the tick as close to the skin as possible and pull slowly upward, avoiding twisting or crushing the tick. Do not try to burn or smother the tick. Cleanse the bite area with soap and water, alcohol, or household antiseptic. Note the date and location of the bite and save the tick in a secure container such as an empty pill vial or film canister. A bit of moistened paper towel placed inside the container will keep ticks from drying out. Follow AECOM incident reporting guidelines to report the tick bite within 4 hours and notify the Manager or Supervisor.
- Familiarize yourself with the characteristic bulls-eye pattern of Lyme disease infection surrounding the bite. If you notice this type of pattern or rash resulting from a tick bite, immediately report the issue to your supervisor and follow the incident reporting requirements for your business group.
- If you experience symptoms such as fever, headache, fatigue, and a skin rash, you should immediately visit a medical practitioner as Lyme disease is treated easily with antibiotics in the early stages, but can spread to the heart, joints, and nervous system if left untreated.

4.7.5 Chiggers

- Chiggers are mite larvae, approximately ½ millimeter in size, and typically invisible to the naked eye. While chiggers are not known to carry infectious diseases, their bites and resulting rashes and itching can lead to dermatitis and a secondary infection.
- Chiggers are typically active from the last hard freeze in the winter or spring to the first hard freeze. They are active all year in the Gulf Coast and tropical areas.

4.7.6 Spiders

- Spiders can be found in derelict buildings, sheltered areas, basements, storage areas, well heads and even on open ground. Spiders can be found year round in sheltered areas and are often present in well heads and valve boxes.
- Most spider bites produce wounds with localized inflammation and swelling. The Black Widow and Brown Recluse spiders in the U.S. and others outside the U.S. inject a toxin that causes extensive tissue damage and intense pain.
- Additional information on spider identification can be found in attachment *S3AM-313-ATT3 Poisonous Spider Identification*.

4.7.7 Mosquitoes

- When a mosquito bites, it injects an enzyme that breaks down blood capillaries and acts as an anticoagulant. The enzymes induce an immune response in the host that results in itching and local inflammation. The tendency to scratch the bite sites can lead to secondary infections.
- CDC data indicates that mosquito-borne illnesses, including the strains of encephalitis, are a health risk. At least one of the Encephalitis strains listed below is known to exist in every area of the U.S. and in many other countries as well:
 - Eastern Equine encephalitis
 - Western Equine encephalitis
 - West Nile Virus
 - St. Louis encephalitis
 - La Crosse encephalitis
- Mosquitoes can transmit the West Nile Virus and other forms of encephalitis after becoming infected by feeding on the blood of birds which carry the virus.
- Most people infected with the virus experience no symptoms or they have flu-like symptoms. Sometimes though, the virus can cause severe illness, resulting in hospitalization and even death, so proper precautions should be taken. Consult a medical practitioner if you suspect you have West Nile Virus. Other diseases including Dengue Fever and Malaria are spread by mosquitoes in the sub-tropic and tropical parts of the world. See *S3AM-313-ATT4 Mosquito Borne Diseases* for information on the locations where mosquito borne diseases are known to be present.

4.7.8 Bees, Wasps and Hornets

- Wasps and bees will cause a painful sting to anyone if they are harassed. They are of most concern for individuals with allergic reactions who can go into anaphylactic shock. Also, instances where an individual is exposed to multiple stings can cause a serious health concern for anyone. These insects are most likely to sting when their hive or nest is threatened.
- Bees, hornets, and wasps may be found in derelict buildings, sheltered areas, behind covers or lids and even on open ground. Other protective measures are not normally effective against aggressive, flying insects. Be aware of the potential areas for these types of insects, approach these locations cautiously. Avoid reaching into areas where visibility is limited.
- If you see a nest in the area you are working in stop work. Contact the Manager or Site Supervisor for procedures to have the nest removed.

- If stung by a wasp, bee or hornet, notify a co-worker or someone who can help should you have an allergic reaction. Stay calm and treat the area with ice or cold water. Follow AECOM incident reporting guidelines to report the sting within 4 hours and notify the Manager or Supervisor immediately. Seek medical attention if you have any reactions to the sting such as developing a rash, excessive swelling or pain at the site of the bite or sting, or any swelling or numbness beyond the site of the bite or sting.

4.7.9 Fire Ants

- The fire ant (southern and western U.S.) and the European fire ant (northeastern U.S. and eastern Canada) is often very abundant where it is established. It is very aggressive and commonly climbs up clothing and stings unprovoked when it comes into contact with skin. Painful irritations will persist for an hour or more.

4.7.10 Personal Protective Equipment (PPE)

- Chemically-treated field clothing, full-length clothing, or Tyvek® coveralls.
- Gloves shall also be worn consistent with the recommendations of the site-specific SWP and/or THA to minimize hand exposure.
- Where ticks, chiggers, and spiders are presumed to exist, the Tyvek® or chemically treated clothing will be taped to the work boots.
- See *S3AM-313-ATT2 Ticks* for configuration of clothing for protection against ticks and insects.
- Application of insect repellent to clothing and/or exposed skin. Oil of lemon eucalyptus, DEET, and Permethrin have been recommended by the CDC for effective protection against mosquitoes that may carry the West Nile virus and related diseases.
- Note that DEET will reduce the effectiveness of Fire Resistance Clothing (FRC) and should not be applied to this clothing. If working in FRC, employees can use Permethrin as it has been shown not to reduce the effectiveness of FRC. Permethrin will need to be applied to FRC well in advance of the planned work. If permethrin is unavailable employees can apply DEET to their skin and let dry prior to putting FRC on.
 - Oil of Lemon Eucalyptus is a plant-based insect repellent on the market as Repel Lemon Eucalyptus. The products have been proven to be effective against mosquitoes, deer ticks, and no-see-ums for up to six hours. Derived from Oil of Lemon Eucalyptus, this non-greasy lotion or spray has a pleasant scent and is not known to be toxic to humans. The spray or lotions will be effective for approximately two to six hours and should be reapplied every two hours to sustain protection. Lemon Eucalyptus products cannot be applied to fire retardant clothing.
 - Permethrin is an insecticide with repellent properties registered with the Environmental Protection Agency and recommended by the CDC.
 - Permethrin is highly effective in preventing tick bites when applied to clothing, but is not effective when applied directly to the skin. Two options are available for Permethrin treatment of clothing worn during field work: 1) pre-treatment of fabric by the clothing manufacturer; or 2) manual treatment of their personal clothing using Permethrin spray in accordance with manufacturers recommendations. This will likely require treatment at home or the office prior to field mobilization. Caution should be used when applying Permethrin as it is highly toxic to fish and house cats. AECOM strongly recommends the first option (employees obtaining pre-treated clothing) to avoid the time required, potential risk, and housekeeping issues involved with manually treating the clothing with spray. Purchase pre-treated clothing in accordance with *S3AM-208-PR1 Personal Protective Equipment* and with the approval of your Supervisor or Manager.
 - The Permethrin pre-treatment is odorless and retains its effectiveness for approximately 25 washings. After 25 washings, the pre-treated clothing will be

considered no longer effective and removed from service. Clothing that has been manually treated by employees will be considered effective for five wash cycles.

- Also, use of clothing that has been pre-treated with Permethrin offers a reduction in the use and application of other insect repellents that shall be applied directly to the skin. Supervisor or Manager approval is required prior to purchase.
- If the employee opts not to utilize chemically pre-treated clothing while potentially exposed to insects, spiders and/or ticks, they shall either: 1) wear Tyvek® coveralls taped to the boots, or 2) wear full-length clothing consisting of long-legged pants and long-sleeved shirts treated with an insect repellent containing Permethrin, DEET, or an oil of lemon eucalyptus to their work clothing.
- Safety Data Sheets (SDS) for the repellents, lotions, and cleansers discussed in this Procedure are not required because the repellents, lotion, and clothing are consumer products used in the manner intended for the general public. Although not required, a SDS should be obtained for the products used and placed into the office SDS library and site-specific safety plan.

4.8 Poisonous Plants

4.8.1 Habitat Avoidance, Elimination and/or Control

- If poisonous plants are identified in the work area, employees will mark the plants using either flags or marking paint, and discuss what the specific indicator will be to signal to other employees to avoid the designated area. If employees decide to use ground-marking paint to identify poisonous plants, they should discuss this tactic with the Manager (and Client as appropriate) for approval.
- If removal of the plants is considered, it should be subcontracted to a professional landscaping service that is capable and experienced in removing the plant. If herbicides are considered for use, a discussion shall need to occur with the Manager (and Client as appropriate) to determine whether it is acceptable to apply herbicides at the work site. Application of herbicides may require a license.
- Employees shall not attempt to physically remove poisonous plants from the work area unless a clearing procedure, including PPE, is prepared in advance and approved by the SH&E Manager. The clearing procedure should be included in the SH&E Plan and THA and the required PPE specified.

4.8.2 Poisonous plants that employees should recognize and take precautions to avoid include: poison sumac, poison ivy (terrestrial and climbing), poison oak, giant hogweed² (or giant cow parsnip), wild parsnip, devil's club and stinging nettle. Many others are extremely poisonous to eat (e.g., poison hemlock; water parsnip) – do not eat anything that has not been identified. Refer to *S3AM-313-ATT5 Plants of Concern* for information on locations where some of these poisonous plants are found in the U.S.

- Of the toxic plants in the cashew family, poison ivy (*Rhus radicans*) is most widespread. It grows in a variety of forms such as a low sprawling shrub, dense ground cover, or a thick woody vine that grows high into the tree canopy. Poison oak (*Rhus diversiloba*) is typically a low shrub in drier soils. Both of these plants have leaves of three and white berries. Poison sumac (*Rhus vernix*) is a tall shrub that is less prolific in distribution. It grows in wet areas, has a compound leaf with a red leaf stem (rachis), and white berries. All of these plants possess urushiol oils in all parts of the plant. Touching the plant causes an itchy skin rash that can show up within 4-72 hours following contact. People have a wide range of reactions including swelling, itching, rash and bumps, patches or blisters.
- Uroshiol oil can also transfer onto clothing and equipment. The oil can remain active on surfaces for up to 5 years and can be transferred to your skin.

² Phytodermatiti producer: keep skin covered and wash well after exposure

- Wild parsnip is found throughout the U.S. and contains a poison that produces a rash similar to poison oak and ivy. Unlike poison oak and ivy, the active oil will not be present on unbroken leaves. See *S3AM-313-ATT6 Wild Parsnip Identification* for additional information and photos of wild parsnip.
 - Several plants in the carrot family contain toxic sap that causes severe dermatitis if it comes into contact with skin that is then exposed to sunlight. The most serious reaction is caused by the giant hogweed (*Heracleum mantegazzianum*), a plant that is spreading in southern Ontario and is also present in southwestern British Columbia. The plant is enormous, attaining up to 16 feet (5 meters) in height, which it does in one growing season. Contact causes painful blistering that can cause permanent disfigurement. It is to be avoided. Similar but less serious reactions can be caused by meadow parsnip (*Pastinaca sativa*) and cow parsnip (*Heracleum lanatum*). Meadow parsnip can be very abundant on disturbed sites.
 - Nettles, particularly stinging nettle (*Urtica dioica*) and wood nettle (*Laportea canadensis*) contain urticating hairs on the leaves and stems that cause sharp pain or itchiness on contact with skin. The irritation is immediate and normally lasts no more than an hour and there are no lasting consequences.
 - Some plants contain abundant stiff spines that can present a safety hazard, particularly if one is to fall into them. These include the cactus (*Opuntia spp.*), devils club (*Oplopanax horridum*), and prickly-ash (*Zanthoxylon americanum*).
- 4.8.3 A large number of plants are not harmful to touch but may contain poisonous berries or foliage that could cause serious complications or death if they are ingested. It goes without saying to not eat any berries or plants if you are unsure of their identity.
- Remember that in the fall and winter the hazard still exists in the form of stubble and roots.
- 4.8.4 Personal Protective Equipment (PPE)
- Employees conducting clearing, grubbing, or similarly disturbing work activities in areas where poisonous plants exist shall wear long-sleeve clothing or Tyvek® coveralls, and disposable cotton, leather or synthetic gloves. Employees shall not touch exposed skin (neck and face) with potentially contaminated gloves. Tyvek® and gloves worn to protect from exposure to poisonous plants shall be treated as contaminated, removed from the body in a manner that the contamination is not spread, and placed in plastic bags for disposal.
 - Personal clothing that has been exposed to poisonous plants shall be decontaminated with a poisonous plant cleanser such as Tecnu® or removed in a careful manner, bagged and washed separately from other clothing to remove urushiol.
 - Work boots will be decontaminated with either soap and water or a cleansing agent such as Tecnu® cleanser.
 - If foliage is being cleared and includes poisonous plants, exposed skin shall be treated with a dermal barrier cream such as Tecnu®'s Oak 'n Ivy Armor or Enviroderm's Ivy Block and either a full-face respirator or a half-face respirator (with goggles) fitted with a P-100 (HEPA) dust filter.
- 4.9 Bird Droppings and Biological Soil Hazards
- 4.9.1 Work in any area where pigeons or other flying animals (e.g. bats) may nest requires a written statement from the client which states the potential for, and extent of, accumulation of excrement on/in the structure from pigeons or other winged animals.
- 4.9.2 Substantial accumulations of droppings can pose physical and health risks as slippery surfaces (if wet) and if the material is disturbed and becomes airborne, it can be inhaled or ingested if personal hygiene practices are not implemented. Inhalation of airborne droppings can cause diseases such as histoplasmosis. Exposure to surfaces with bird droppings shall be safeguarded by implementing proper work practices, training employees for awareness and using PPE. See *S3AM-313-ATT8 Bird Droppings*.

- 4.9.3 Tularemia is a problem with contaminated soil in some locations. Tularemia is a disease of animals and humans caused by the bacterium *Francisella tularensis*. Rabbits, hares, and rodents are especially susceptible and often die in large numbers during outbreaks. Workers can contract Tularemia through tick and deer fly bites, but also through inhalation of contaminated aerosols or agricultural dusts. Check work areas for carcasses before disturbing the ground (e.g. mowing, brushing, grubbing, excavation, etc.).
- 4.10 Personal Hygiene and Body Checks
 - 4.10.1 Tick-borne diseases typically require that the tick be imbedded for four hours to begin disease transfer. The oils from poisonous plants can take up to 4 hours after exposure to penetrate the skin and react with the live proteins under the skin.
 - 4.10.2 It is recommended that exposed skin be checked frequently for the presence of ticks, insects, rashes, or discolorations. External clothing should also be checked for the presence of ticks and insects; these should be retained for identification and to determine if medical treatment is needed.
 - 4.10.3 Employees shall shower as soon as practical after working in the field and examine their bodies for the presence of ticks, insect bites, rashes, or swollen areas. If imbedded ticks are found, they should be removed using the technique described in *S3AM-313-ATT2 Ticks*.
- 4.11 Employees shall immediately notify their Manager or Supervisor of the presence of an imbedded tick, bee, wasp or hornet sting, other insect bite, rash, or any abnormal reaction. Reporting shall occur within 4 hours for a significant incident and 24 hours for all other SH&E incidents, and in accordance with *S3AM-004-PR Incident Reporting, Notifications & Investigation*.
- 4.12 The Manager or Supervisor shall forward the report to the SH&E Manager for follow up.

5.0 Records

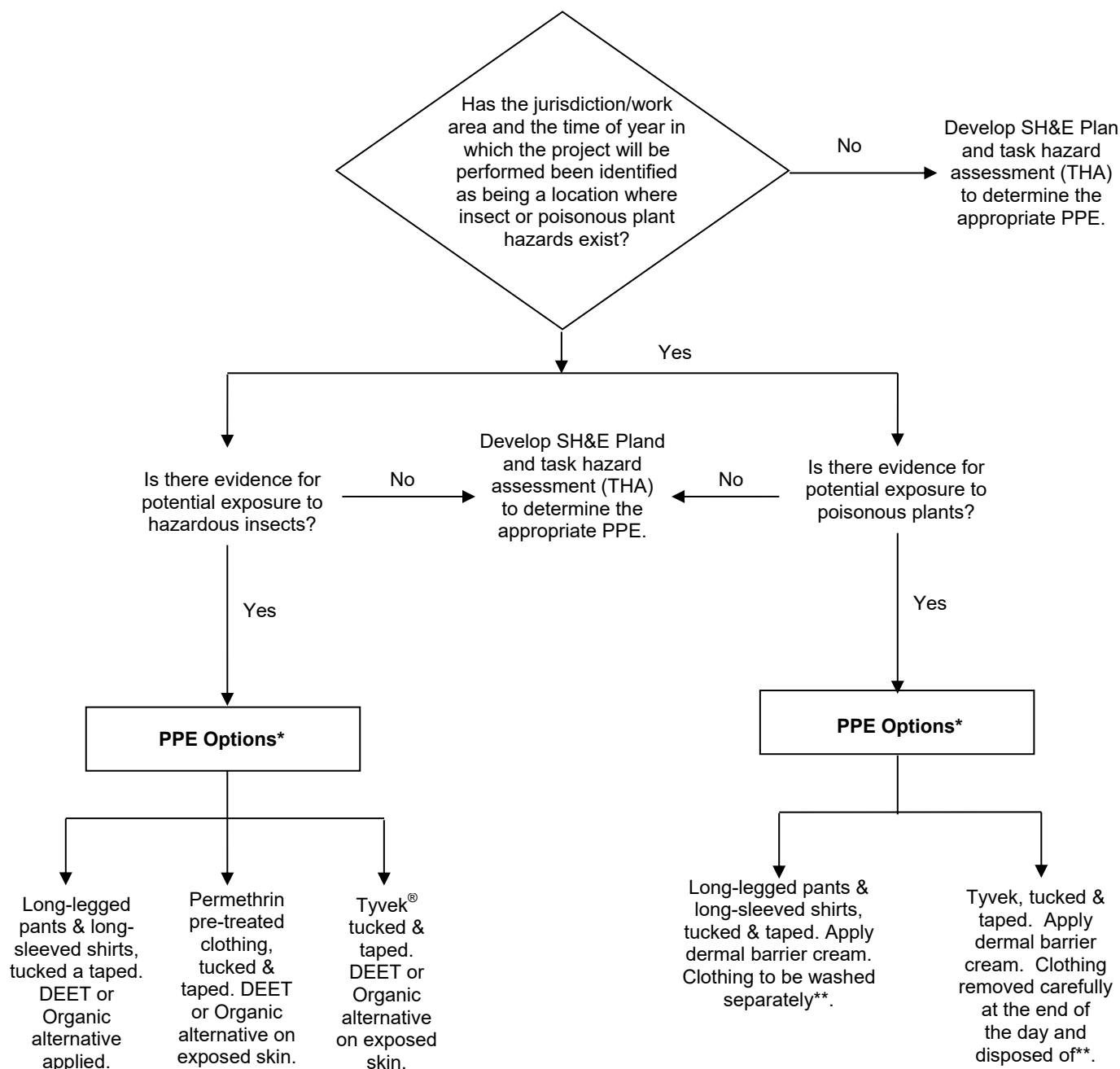
None

6.0 Attachments

- 6.1 [S3AM-313-ATT1 Biological Hazard Assessment Flow Chart](#)
- 6.2 [S3AM-313-ATT2 Ticks](#)
- 6.3 [S3AM-313-ATT3 Poisonous Spider Identification](#)
- 6.4 [S3AM-313-ATT4 Mosquito Borne Diseases](#)
- 6.5 [S3AM-313-ATT5 Plants of Concern](#)
- 6.6 [S3AM-313-ATT6 Wild Parsnip Identification](#)
- 6.7 [S3AM-313-ATT7 Alligators](#)
- 6.8 [S3AM-313-ATT8 Bird Droppings](#)
- 6.9 [S3AM-313-ATT9 Large Carnivores & Ungulates](#)
- 6.10 [S3AM-313-ATT10 Bear Safety](#)
- 6.11 [S3AM-313-ATT11 Small Mammals](#)
- 6.12 [S3AM-313-ATT12 Snakes & Scorpions](#)

Biological Hazard Assessment Decision Flowchart

S3AM-313-ATT1



* indicates that when both insect and poisonous plant hazards are recognized hazards at a project site, the most conservative combination of the available PPE choices will be selected. Include the selected PPE option in the respective SH&E Plan and THA.

** indicates that clothing that has been known or suspected to have come in contact with poisonous plants must be washed before it can be worn again. Similarly, Tyvek® that has been known or suspected to have come in contact with poisonous plants will be disposed of rather than reused during a subsequent day or project.

Americas

Ticks

S3AM-313-ATT2

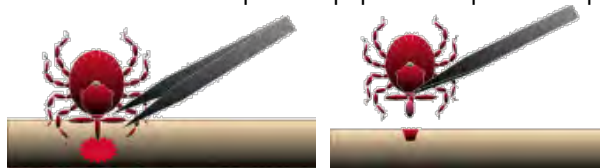
1.0 Background

- 1.1 The Public Health Agency of Canada and the Centers for Disease Control and Prevention work with States and Provinces, health authorities and other experts on research to define and monitor the occurrence of the ticks that carry bacterium that cause disease, including but not limited to:
 - 1.1.1 *Borrelia burgdorferi*, the bacterium that causes Lyme disease.
 - In the United States and Canada, the black-legged tick (*Ixodes scapularis*; often referred to as a deer tick) and the western black-legged tick (*Ixodes pacificus*) are the species known to transmit this disease-causing agent, as well as other less common agents.
 - 1.1.2 *Rickettsia rickettsia*, the bacterium that causes Rocky Mountain Spotted Fever.
 - In the United States and Canada, the American dog tick (*Dermacentor variabilis*), Rocky Mountain wood tick (*Dermacentor andersoni*), and brown dog tick (*Rhipicephalus sanguineus*) are known to transmit this disease-causing agent.
 - 1.1.3 *Francisella tularensis*, the bacterium that causes Tularemia.
 - In the United States, these include the American dog tick (*Dermacentor variabilis*), Rocky Mountain wood tick (*Dermacentor andersoni*), and Lone star tick (*Amblyomma americanum*).
 - 1.1.4 *Ehrlichiosis*, the general name to describe several bacterial diseases that affect animals and humans.
 - In the United States, these include the black-legged tick (*Ixodes scapularis*; often referred to as a deer tick) and the western black-legged tick (*Ixodes pacificus*), and Lone star tick (*Amblyomma americanum*).
- 1.2 Consult local health authorities to determine where tick populations are established or emerging. Locations where distribution may have previously been limited may show evidence of larger populations. Employees working in or adjacent to areas where there are established tick populations may have a greater chance of contact with ticks.
- 1.3 While there is a higher risk of coming in contact with infected ticks in areas where populations are established, there is also a low risk of tick-borne diseases being contracted almost anywhere in the Americas as migratory birds transport infected ticks over large geographic distances. Take precautions to reduce tick contact.
- 1.4 Lyme Disease
 - 1.4.1 The rate of infection of ticks with the bacterium that causes Lyme disease varies. Infection rates are typically higher in adult ticks compared to the other stages (nymphs and larvae).
 - 1.4.2 Despite the lower rates of infection, people are most likely to acquire Lyme disease from a nymph because this stage is so small and thus more likely to go unnoticed and feed for a sufficient amount of time for the Lyme disease bacterium to be transmitted (24-36 hours).
 - 1.4.3 Infection rates are often greater in tick populations that have been established for long periods of time compared to newly established ones.
 - 1.4.4 Lyme disease patients are most likely to have illness onset in April through November with onset peaking in June, July, or August and less likely to have illness onset from December through March

2.0 To Remove Attached Ticks



- 2.1 Use fine-tipped tweezers or notched tick extractor, and protect your fingers with a tissue, paper towel, or latex gloves (see figure). Persons should avoid removing ticks with bare hands.
- 2.2 Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause the mouthparts to break off and remain in the skin. (If this happens, remove mouthparts with tweezers. Consult your health care provider if illness occurs.)
- 2.3 After removing the tick, thoroughly disinfect the bite site and wash your hands with soap and water.
- 2.4 Do not squeeze, crush, or puncture the body of the tick because its fluids may contain infectious organisms. Skin accidentally exposed to tick fluids can be disinfected with iodine scrub, rubbing alcohol, or water containing detergents.
- 2.5 Save the tick for identification in case you become ill. This may help your doctor make an accurate diagnosis of potential diseases by determining what type of tick it is. Place the tick in a sealable plastic bag and put it in your freezer. Write the date of the bite on a piece of paper with a pencil and place it in the bag.



3.0 Folklore Remedies Don't Work

- 3.1 Folklore remedies, such as the use of petroleum jelly or hot matches, do little to encourage a tick to detach from skin. In fact, they may make matters worse by irritating the tick and stimulating it to release additional saliva or regurgitate gut contents, increasing the chances of transmitting the pathogen. These methods of tick removal should be avoided.

4.0 Configuration of Clothing

- 4.1 Loose-cuff trousers must be tucked into socks, wrapped with duct tape (or equivalent) completely around the cuff of the sock up on to the surface of the pant leg to prevent entry of insects between the sock and pants, and preferably reverse-wrapped with "sticky" side out (see figure below).



Americas

Poisonous Spider Identification

S3AM-313-ATT3

Black Widow Spider

- Found in warm, dry parts of throughout the United States and extend into the southern edge of Canada.
- Prefer to spin their webs in dark, sheltered spots close to the ground
- Abdomen usually shows hourglass marking.
- The female is 1 to 1.5 inches (3-4 centimeters) in diameter.
- Have been found in well casings and flush-mount covers.
- Not aggressive, but more likely to bite if guarding eggs.
- Light, local swelling and reddening of the bite are early signs of a bite, followed by intense muscular pain, rigidity of the abdomen and legs, difficulty breathing, and nausea.
- If bitten, see physician as soon as possible.

**Brown Spiders (Recluse)**

- Central and South U.S., although in some other areas, as well.
- 0.25-to 0.5-inch (0.6 to 1.3 centimeters)-long body and the size of silver dollar.
- Hides in decaying wood, baseboards, ceilings, cracks, and undisturbed piles of material.
- Bite either may go unnoticed or may be followed by a severe localized reaction, including scabbing, necrosis of affected tissue, and very slow healing.
- If bitten, see physician as soon as possible.

**Hobo Spider**

- Primarily found in Washington, Oregon, Wyoming, Colorado, Utah, Montana and the Pacific Northwest United States.
- 0.4-to 0.5-inch (1.1 to 1.3 centimeters)-long body and the size of silver dollar.
- Because of its common features and color, it is easily confused with other spider such as Brown Recluse Spiders.
- They rarely climb vertical surfaces and are uncommon above basements or ground level.
- Bite is initially painless. After 24 hours, the bite develops into a blister and after 24-36 hours, the blister breaks open, leaving an open, oozing ulceration.
- If bitten, see physician as soon as possible.



Exercise care when collecting samples and avoid reaching into areas where visibility is limited. If bitten by a spider, attempt to identify the spider, notify a co-worker or someone who can help should the bite site become painful, discolored, or swollen. Stay calm and treat the area with ice or cold water. Seek medical attention if you have any reactions to the sting such as developing a rash, excessive swelling or pain at the site of the bite or any swelling or numbness beyond the site of the bite.

Mosquito-Borne Diseases

S3AM-313-ATT4

1.0 Background

- 1.1 Employees working outdoors in the Americas may be exposed to mosquitoes that may transmit illnesses, including Encephalitis and Dengue.
- 1.2 Dengue is transmitted by the bite of a mosquito infected with one of the four dengue virus serotypes. Dengue is endemic to South America.
 - 1.2.1 Dengue is a febrile illness that affects infants, young children and adults with symptoms appearing 3-14 days after the infective bite.
 - 1.2.2 Symptoms range from mild fever, to incapacitating high fever, with severe headache, pain behind the eyes, muscle and joint pain, and rash.
 - 1.2.3 Severe dengue (also known as dengue hemorrhagic fever) is characterized by fever, abdominal pain, persistent vomiting, bleeding and breathing difficulty and is potentially fatal.
- 1.3 West Nile encephalitis is an infection of the brain that is caused by a virus known as the West Nile virus.
 - 1.3.1 Most individuals infected with WNV remain asymptomatic. West Nile (WN) fever is typically a mild illness lasting 3 to 6 days.
 - 1.3.2 The main symptoms are sudden onset of fever with chills, rash, malaise, headache, backache, arthralgia, myalgia and eye pain. Other non-specific symptoms may include nausea, vomiting, anorexia, diarrhoea, rhinorrhoea, sore throat, and cough.
 - 1.3.3 The main route of infection is via the bite of a mosquito that has been infected by feeding on West Nile Virus infected birds.
- 1.4 Arboviral encephalitis is a virus that exists in various forms in global distribution. Numerous forms occur in the Americas, including the following four primary forms that can be transmitted by mosquitoes:
 - 1.4.1 Eastern equine encephalitis (EEE) – United States and Canada
 - 1.4.2 Western equine encephalitis (WEE) – United States
 - 1.4.3 St. Louis encephalitis (SLE) – United States and Canada
 - 1.4.4 La Crosse (LAC) encephalitis.all of which are transmitted by mosquitoes – United States
- 1.5 Mosquitoes are known to breed in standing water; therefore, when standing water is found at a job site, actions should be taken to drain the water. Typically, mosquitoes will fly only a quarter of a mile (400 meters) from their breeding location.
- 1.6 The local Public Health Department and Center for Disease Control and Prevention (CDC) should be consulted to determine what diseases transmitted by mosquitoes are present and exposure prevention recommendations.

Plants of Concern

S3AM-313-ATT5

1.0 Background

- 1.1 Poison ivy, oak and sumac (poisonous plants) pose a significant threat to AECOM employees due to the dermatitis that results from exposure to the oil on these plants, called urushiol.



Poison Oak

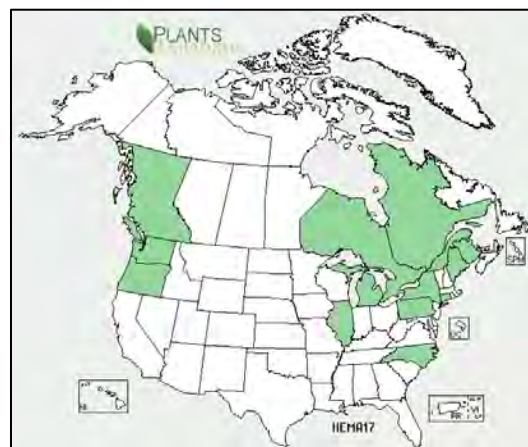
Poison Sumac

Poison Ivy

- 1.2 Exposure to urushiol produces a rash that can be irritating and cause the exposed employee to scratch the infected area, increasing susceptibility for an infection to result from the rash.
- 1.3 It should be noted that each time an employee is exposed to urushiol, it increases the severity of the reaction they will have in subsequent exposures.
- 1.4 Giant Hogweed is a phototoxic plant that causes skin irritation on contact with the sap and, when exposed to sun causes deep blisters.
- 1.5 Blisters from contact with Giant Hogweed can form black or purplish scars that can last for several years. Even a tiny amount of the sap in the eyes can cause temporary to permanent blindness.



Giant Hogweed



Giant Hogweed Distribution

Image obtained from
www.gclandscape.com

2.0 Treatment

- 2.1 In cases that involve severe rashes, medical treatment may be necessary to control the rash.
- 2.2 Employees that develop a rash as a result of exposure to poison ivy, oak or sumac should report the exposure immediately to their Supervisor, Project Manager and Region Safety, Health and Environment Manager.

Pacific Poison Oak Distribution



Image obtained from www.cdc.gov

Atlantic Poison Oak Distribution



Image obtained from www.cdc.gov

Poison Sumac Distribution



Image obtained from www.cdc.gov

Western Poison Ivy Distribution



Image obtained from www.cdc.gov

Eastern Poison Ivy Distribution



Image obtained from www.cdc.gov

Americas

Wild Parsnip Identification

S3AM-313-ATT6

1.0 Background

- 1.1 Wild parsnip (also known as poison parsnip) looks similar to a large carrot plant and is found in open places along roadsides and in waste places throughout the United States and Canada.
- 1.2 This plant produces a compound that causes severe blistering and discoloration after being exposed to sunlight—a condition known as photodermatitis. That is, when the skin comes in contact with this plant's juice and then is exposed to UV light, a severe burn develops.

2.0 Hazard

- 2.1 Everyone can get burned by wild parsnip. Unlike poison ivy, you don't need to be sensitized by a prior exposure. However, wild parsnip is only dangerous when the juice from broken leaves or stems gets on your skin—therefore, you can touch and brush against the undamaged plant without any danger.
- 2.2 If one gets some of the sap of hogweed (or meadow parsnip or cow parsnip) in contact with skin, it is critical that they stay out of the sun for 8 hours. If one needs to remove the plant they should be completely covered with overalls, gloves, hat and safety glasses.



Bird Droppings Safe Work Practices

S3AM-313-ATT8

1.0 Background

- 1.1 According to the National Institute for Occupational Safety and Health (NIOSH), histoplasmosis is an infectious disease caused by inhaling spores of a fungus called *Histoplasma capsulatum* (abbreviated *H. capsulatum*) that may inhabit accumulated masses of pigeon droppings and excrement of other birds and flying animals. Its symptoms vary greatly, but the disease primarily affects the lungs. Occasionally, other organs are affected. This form of the disease is called disseminated histoplasmosis, and it can be fatal if untreated. The acute respiratory disease form of histoplasmosis is characterized by respiratory symptoms, a general ill feeling, fever, chest pains, and a dry or non-productive cough. Distinct patterns may be seen on a chest x-ray. Chronic lung disease resembles tuberculosis and can worsen over months or years. If symptoms occur, they may start within 3 to 17 days of exposure, with an average of 10 days. On a positive note, histoplasmosis is not contagious.
- 1.2 Psittacosis, although primarily a respiratory disease, can cause a wide variety of clinical manifestations. Generally, about 10 days after infection occurs, the clinical illness begins abruptly with fever, chills, weakness, fatigue, muscle pain, anorexia, nausea, vomiting, excessive sweating and difficulty with breathing, headache, backache, and sensitivity to light.
- 1.3 Hypersensitivity pneumonitis is also known as pigeon breeder's disease.

2.0 Symptoms

- 2.1 The acute form of hypersensitivity pneumonitis is clinically characterized by chills, fever, cough, breathlessness without wheezing, and malaise 4-10 hours after exposure. In general, an acute attack subsides after 18 to 24 hours.

3.0 Treatment

- 3.1 If a person should develop any of the symptoms as noted above, or others, it is important to see a physician and inform him of an exposure to pigeon/bird or bat excrement. A failure to diagnose the preceding conditions could occur if a treating physician is unaware of a patient's exposure to pigeon/bird or bat excrement.

4.0 Prevention

- 4.1 Prior to work in any area where pigeons or other flying animals may nest, a written statement from the client shall be obtained in regards to the potential for, and extent of, accumulation of excrement on/in the structure from pigeons and other winged animals.
- 4.2 The client shall be asked to provide appropriate details as to the basis for their statement (e.g., date of last visual survey for pigeon/bird or bat excrement accumulation, date of last excrement removal effort, etc.).
- 4.3 In no case will an AECOM employee or contract employee be permitted to commence structure inspection procedures without the Project Manager having received and evaluated the aforementioned written statement from the client.
- 4.4 According to NIOSH, the best way to prevent exposure to *H. capsulatum* spores during survey and inspection work is to avoid situations where excrement and other potentially contaminated material can become airborne and inhaled. Therefore, it is preferable that the efforts to determine if, and to what extent, there is an accumulation of pigeon/bird or bat excrement on/in structures, or the efforts to clean-up/remove/dispose of such contaminated material, be left to the client or subcontracted out.

5.0 Safe Work Practices

- 5.1 In those cases where AECOM employees or contract employees are contracted by the client to determine the extent of accumulation of animal excrement in/on structures, the following minimum safety and health precautions shall be taken. (NOTE: precautionary measures are based on recommendations and best practices prescribed in the NIOSH 2004 public document titled *Histoplasmosis – Protecting Workers at Risk*).
- 5.2 All workers shall wear disposable protective clothing (Tyvek® coveralls). Disposable overalls with hoods shall be donned when working in areas where *H. capsulatum* spore-contaminated material is likely to fall from overhead.
- 5.3 All workers shall wear disposable shoe coverings fitted with ridged soles made of slip-resistant material to reduce the likelihood of slipping on wet or dusty surfaces. Gloves shall be worn.
- 5.4 All workers shall wear a full facepiece air purifying respirator fitted with P100 (HEPA) cartridges. If entering an enclosed area in which the extent of excrement contamination is unknown, additional protective measures shall be taken such that workers shall wear a powered air-purifying respirator (APR) with full facepiece fitted with P100 (HEPA) cartridges. Any variance from these requirements must be approved by the Region Safety, Health and Environment Manager. Workers donning APRs shall be medically screened, cleared, and trained in their proper use in accordance with AECOM safety program standards.
- 5.5 If contaminated material must be disturbed for purposes of removal/disposal or during the structure inspect process, it shall be wetted down prior to all work and will be rewetted as necessary to minimize airborne dusting.
- 5.6 After working in *H. capsulatum* spore-contaminated areas and before removing any respiratory protective equipment, workers shall remove all protective clothing and shoe coverings and seal them in a heavy-duty plastic bag for disposal.
- 5.7 Workers shall observe a high degree of personal hygiene, even if the exposure is casual. Special care shall be taken to wash hands, face, and other areas of exposed skin thoroughly before eating, drinking or smoking.

Americas

Large Carnivores & Ungulates

S3AM-313-ATT9

1.0 Hazard

- 1.1 Most wild carnivores in the feline family (cougars, lynx, and bobcat) or the canine family (wolves and coyotes) are more predictable than bears and are not predatory towards humans; however, all wild animals can be dangerous if they feel threatened or if they are sick or starving.
- 1.2 Most ungulates (deer, moose, elk, and caribou) will avoid humans and will flee as soon as a human is sighted; however, females with young (during May and June) and males during the mating season (September to November) can be very aggressive, especially if provoked.

2.0 Personal Protective Equipment

- 2.1 Noise makers such as bear bangers, whistles and bells can be used as deterrents for an approaching animal.
- 2.2 Pepper (bear) spray can be used to ward off an imminent attack.

3.0 Safe Work Practice

- 3.1 Most negative encounters with ungulates or carnivores can be avoided with a few key preventative measures:
 - 3.1.1 When working in wilderness isolation, always travel in pairs and make lots of noise.
 - 3.1.2 Always store food in air-tight containers away from sleeping areas (if camping) and never carry strong smelling foods which could attract animals.
 - 3.1.3 Keep your eyes open for fresh animal signs which may indicate a dangerous situation:
 - Extensive fresh rubbing on branches in the fall might indicate the presence of a rutting male ungulate that may become aggressive to defend a potential mate.
 - A fresh kill or carcass which might indicate the presence of a carnivore that may become aggressive to defend its food.
- 3.2 Maintaining a distance of at least 100 feet (30 meters) allows large animals an escape route. If you notice any signs of aggression or behavioral changes, you should move away to a safe location. Wildlife should not be enticed by reaching out or simulating calls.
- 3.3 Pets should be kept secure and away from wildlife as their actions can provoke an attack. Moose, deer and other wildlife may appear quite docile; however, if a dog makes them feel threatened, their behavior can become unpredictable.
- 3.4 **If you are approached by a carnivore (wolf, coyote, or cougar):**
 - 3.4.1 Pick up small children immediately.
 - 3.4.2 Try to appear bigger, hold your arms or an object over your head.
 - 3.4.3 Face the animal and retreat slowly. Do not run or play dead.
 - 3.4.4 Maintain steady eye contact with the animal.
 - 3.4.5 If the animal continues to approach, deter an attack by yelling, waving a stick or throwing rocks.
 - 3.4.6 If you are attacked, fight back. Hit the animal with a heavy stick or rock.
- 3.5 **If you are approached by an ungulate (moose, elk, deer, bison or caribou):**
 - 3.5.1 An angry moose, elk or deer will face you with its head and ears lowered.

- 3.5.2 Back away slowly.
- 3.5.3 Look for something to get behind like a tree or a car. You can go faster around an obstacle than the ungulate can.
- 3.5.4 An ungulate is more likely to bluff charge but if it continues the charge and you are attacked in the open, curl up in a ball on the ground. Always protect your head with your arms and lie still.
- 3.5.5 Stay still after the attack until the ungulate moves away.

Bear Safety

S3AM-313-ATT10

1.0 Hazard

- 1.1 An encounter with a bear of any species can have a wide variety of outcomes, ranging from a simple sighting, to a false charge, to a serious mauling or even death. Consequently, the risk of a bear encounter must be taken very seriously.
- 1.2 The hazard or risk associated with a bear encounter varies significantly depending on the location. It is important to research the project area before field work commences to determine the expected probability of encountering a bear. Remoteness from urbanized areas should not be a criterion, as bears have been encountered within city limits, especially near landfills.
- 1.3 The risk associated with a bear encounter also varies with the species of bear, the season, and the circumstances under which the bear is encountered.
- 1.4 Preparing staff for any type of encounter is key to managing the risk.

2.0 Personal Protective Equipment

- 2.1 The best deterrent of a “bad bear encounter” is knowledge: a good understanding of the ecology and the behavior of the bears that will likely be encountered.
- 2.2 Bear Spray and Bear Bangers
 - 2.2.1 Staff must have hands-on training for the safe use of bear spray (a pre-season practice run is a good use of expired bear spray).
 - 2.2.2 Prior to work commencing, staff must ensure that the bear spray they are carrying is still valid and not past its expiration date.
 - 2.2.3 During travel, bear spray must be sealed in an airtight container or bag and must not travel in the cab of a vehicle, aircraft, or helicopter.
- 2.3 Firearms
 - 2.3.1 Environments and conditions which pose a high risk of bear encounters, may warrant the use of an armed wildlife monitor. Project managers, in consultation with appropriate project staff and Safety, Health and Environment Management, are responsible for determining the level of risk for their projects and whether or not such measures are required.
 - 2.3.2 A person hired as an armed bear monitor must be properly trained in wildlife monitoring as well as certified in the expert usage of firearms.
 - 2.3.3 The usage of an armed bear monitor is intended only as an additional precautionary measure to be used in specific environments to ensure the protection of field staff; staff should still be equipped and trained appropriately for the risk.

3.0 Restrictions

- 3.1 Staff must not work alone in areas where there is a medium or high risk of a bear encounter.
- 3.2 AECOM personnel shall not carry firearms or attempt to function as a wildlife monitor and/or perform their professional duties. For possible exceptions contact the Regional SH&E Manager who will evaluate the potential hazards with Regional Manager and Legal and provide written response. This can only be overridden with expressed permission of Region Executive and AECOM Chief Resilience Officer, refer to *WP-001-PR Firearms Standard*.

4.0 Training

- 4.1 In-house Bear Awareness training must be taken by all field staff who work in bear country every three years at a minimum, or more often as required.
- 4.2 The Bear Awareness training involves testing and improving the employee's knowledge about bear encounters, watching videos regarding bear awareness and behavior, and participating in group discussions about how to avoid and how to respond to bear encounters.
- 4.3 Specific considerations are given to black bear, grizzly bear, and polar bear encounters.

5.0 Safe Work Practice

- 5.1 Staff must be aware of wildlife signs and avoid wildlife encounters.
- 5.2 Bear Signs
 - 5.2.1 Fresh tracks – It is often better to see the bear's tracks than to see the actual bear. If you can tell the direction that the bear is travelling in, it is prudent to change your course of direction. Bears will travel down the same pathways people or other large animals use. If you have a clear track you can determine which type of bear has passed through the area. If you see more than one track, you can tell that it is possibly a female with cubs. Avoid females with cubs!
 - 5.2.2 Scat – Bear scat will look different depending upon the bear's diet. Close examination of bear scat can sometimes give you an indication of what the bears have been eating at that time of year. If the scat contains remnants of human garbage, there is a human food conditioned bear in the area. These bears associate people with food and can be the most dangerous type of bear to encounter.
 - 5.2.3 Animal carcasses – IF YOU COME ACROSS A CARCASS, LEAVE THE AREA IMMEDIATELY. Grizzly bears will often cover their kills for a few days and let it rot, then come back and eat it. THE BEAR WILL STAY CLOSE BY. Grizzly bears will defend their kill and this is a situation that could prompt a defensive attack by a bear.
 - 5.2.4 Torn-up logs and stumps – Bears will forage for insects in dead logs and rotting trees. You will often see torn up logs and stumps, evidence of their foraging.
 - 5.2.5 Evidence of digging – Holes dug into the ground are often made by grizzly bears digging for roots or ground squirrels. In particular, grizzlies will dig for food in the early spring soon after they leave their dens.
 - 5.2.6 Claw marks on trees – Claw marks can be left on trees by black bears when they have climbed up a tree. Grizzly bears will also leave claw marks on trees and on the ground. Bears will often chew a small tree or a sign-post, so watch for signs of chew marks along the trail.
 - 5.2.7 Hair on trees – Bears will rub against trees, usually trees with rough bark, to scratch themselves. You can find evidence of bears by the hair left in the tree's bark. The higher the hair left on the tree, the bigger the bear. Remember that the bear will often stand on its back legs to scratch its back on the tree.
 - 5.2.8 Daybeds – Bears will be most active in the early morning and in the evening. It would be prudent for field staff to restrict their field activities during the bear's most active foraging times as much as possible. During the heat of the day, bears will rest in daybeds. These can be shallow depressions of piled up leaves in the forest, trampled vegetation, a shallow scrape or a hole. Daybeds are usually located in cool places. Bears will make daybeds along streams and rivers. Daybeds are often associated with feeding places and therefore should be avoided.

5.3 Prevention

5.3.1 Your best defense against bears is to actively practice bear avoidance techniques when working in the field. You can prevent chance encounters by taking the following precautions:

- Know the areas and habitats bears use at different times of the year, and attempt to avoid such areas or be extremely cautious if you have to travel through them.
- Contact the local Fish & Wildlife Office to get current information on the bears in the area. Ask what other camps are in the area and if they are following good bear avoidance practices. (i.e., do they keep a clean camp?) If there are nearby human food sources available, e.g., an open dumpsite, the local bears may not be afraid to approach your camp.
- Always be aware of your surroundings. Stay alert. Watch for signs of bears along your route.
- Use binoculars to look around for bears when you are in open terrain.
- Never approach a bear if you see one feeding in the distance.
- Note the behavior of other wildlife in the area. Flocks of ravens can alert you to a possible animal carcass, and perhaps a bear. The area should be avoided. Bird or squirrel alarm calls might be telling you that a bear is near.
- Whenever possible, travel in daylight and try to avoid areas with restricted visibility, e.g., dense brush.
- Make lots of noise, especially when travelling in dense vegetation. Sing, shout, or talk loudly. You can carry portable air horns or cans of rocks. (Please note that bear bells are not effective – they do not make enough noise to warn a bear that you are approaching. You need to be loud so the bear can hear you coming.) Remember that the noise you make can be masked by loud natural sounds such as the wind or water. Therefore it is possible that the noise you make can go unnoticed by a bear whose attention is focused on feeding. You must make every attempt not to surprise a bear. In areas of loud natural noise, be louder!
- Stay together and travel in groups. Bears are less likely to attack groups of people. When travelling in groups, stay close together. Being in a group doesn't help if the individuals have spread apart along the trail.
- Pets should not accompany you when you are travelling in bear country. If you must take your pet, keep the animal on a short leash at all times. Unleashed dogs will harass bears and once scared, run back to their owner with an angry bear in pursuit.
- Do not wear perfumes or cosmetic products when you are travelling in bear country. Do not mask your human scent.
- All sanitary products should be stored in a similar fashion as food (stored at least 10 feet [3 meters] above site).
- Children should be kept very close by in bear country.
- Carry bear deterrents and know their limitations. Be familiar with how to use the deterrents, how to transport the deterrent safely and under what conditions it is most effective. Carry the deterrent in a belt, out in front and ready to grab at a moment's notice, never in your backpack.

5.4 Field Worker Precautions in Bear Country

5.4.1 Field workers should take extra precautions when working in bear country:

- Make every effort to go out into the field with another person; you should not be working alone in the field. One person can act as a lookout for the other. Keep watch for bear signs.
- Never approach a bear.
- Report where you are going and when you will return every time you leave camp. Have a plan of action if someone does not report back to camp at a specified time.

- Bears do get used to a camp's schedule and you will have fewer surprise encounters if everyone in the camp comes and goes at the same time every day.
- Take a two-way radio with you when you go out into the field.
- Always carry bear deterrents with you in the field and understand each deterrent's limitations. Carry your deterrents on a belt, out in front and ready to use instantly. Do not carry your deterrents in your backpack.
- Keep any food that you take with you sealed in odor-proof/bear-proof containers. Make every attempt to take odorless food with you, not something with a heavy scent.
- Pack out any garbage in odor-proof containers and burn once you return to camp.
- The noise of an ATV or skidoo can scare off a bear. Starting the machine and revving it up can scare off a curious bear. **DO NOT CHASE A BEAR WITH AN ATV OR SKIDOO.** You may need to drive the ATV around in circles to scare off the bear, but do not chase the bear.
- Take extra precautions when travelling along lakes or stream beds; bears use streams and river beds as travel routes. Be sure to carry noise makers.
- Limit your workday so you are not out in the early morning or evening when bears are most likely to be foraging.
- All **employees** should be proficient in First Aid. Do not go out into the field without first aid training.
- All field camps should have a First Aid Kit.
- All field camps should have means of communication with local ambulance or air ambulance personnel.
- A person's best defense against bears is to avoid them. If this is not possible, then being heard, smelled, or seen may lessen your chances of surprising a bear and/or provoking an attack.
- All wildlife should be respected, avoided, and not harassed at any time.
- Cooking in remote areas should be avoided. Any food should be stored in airtight containers and all garbage should be managed appropriately: "pack it in, pack it out".
- A bear in camp or within human structures is not a chance encounter. If this bear challenges you, you must fight, scream, and do whatever is necessary to live, no matter what species the bear is!
- In general, there are two types of bear encounters: Defensive and Non-defensive for grizzly bears and black bears. Your response will vary based on your assessment of the situation (your training will help you in identifying these situations and the appropriate response).

6.0 Encounters

6.1 General Recommendations When Encountering a Bear

- Consider your surroundings and assess the situation before you act.
- Remain calm. Do not turn your back to a bear.
- **DO NOT RUN** – Running may trigger the bear's natural pursuit response. Bears are able to reach speeds of 25 miles per hour [40 kilometers per hour], much faster than Olympic sprinters. Bears are also excellent swimmers.

6.2 Bear Encounters in the Field

- 6.2.1 Your response will depend upon the type of encounter.

- 6.2.2 Bears are more predictable than once believed and you can determine your best course of action in a confrontation by understanding the bear's characteristics and motivation. There are two pieces of information you should be aware of in any bear encounter:
 - The type of bear you are dealing with, and
 - The reason for the encounter.
- 6.2.3 Some people believe that when you stand your ground against a predatory black bear attack, the bear will feel threatened and leave. This has been effective in some cases. HOWEVER, it is not effective against a grizzly bear predatory attack and it is very difficult to know when it will be effective against black bears. Polar bears do not follow the same behavioral patterns as grizzly and black bears; polar bears are almost always aggressive and will not back down. Special considerations must be given to projects where polar bear encounters are anticipated.
- 6.3 If you can leave undetected:
 - 6.3.1 Leave the area quietly in the same direction that you came from.
 - 6.3.2 Move while the bear's head is down. Stop moving when the bear lifts its head to check its surroundings.
 - 6.3.3 Stay downwind so the bear will not pick up your scent.
 - 6.3.4 When you have moved a safe distance away, you can either watch and wait until the bear leaves or make a wide detour around the bear.
 - 6.3.5 If the bear is unaware of you and approaching, allow the bear the right of way.
- 6.4 If you cannot leave undetected:
 - 6.4.1 Let the bear know that you are present by smell first; therefore move upwind so they can pick up your scent.
 - 6.4.2 If it is possible, try to keep the bear in your sight. Watch to see if the bear leaves when it smells that a person is nearby.
 - 6.4.3 Attempt to move out of the way without being noticed by the bear. If you cannot do this, talk loudly to let the bear know where you are.
- 6.5 If the bear is aware of you but in the distance:
 - Remain calm.
 - Continue walking slowly in the same general direction, but head away from the bear.
 - DO NOT RUN.
 - If the bear begins to follow you, drop your pack or some article, (not food) to distract the bear. This may distract the bear long enough for you to escape. If you drop food for the bear – you will help the bear associate food with humans and teach it that aggressive behaviour will be rewarded with food.
 - If it is a grizzly following you, climb a tree if there is a large tree around. Proper escape up a tree would require scrambling at least 33 feet (10 m), however this is applicable only to Grizzly encounters. Black bears are excellent climbers. Tree climbing should be last resort.
- 6.6 If the bear is aware of you and close:
 - A bear will feel threatened in a close confrontation. The bear's natural tendency will be to reduce or to remove the threat. Assist the bear by acting as non-threatening as possible.
 - Do not make direct eye contact with the bear.
 - Do not make any sudden moves.
 - Do not run!

- The bear needs to identify you as a person, so talk in low tones and slowly wave your arms over your head.
- Attempt to give the bear an opportunity to leave. Be sure the bear has an open escape route. Do not corner a wild animal.
- Try to back away slowly and/or climb a tree if appropriate.
- Attempt to deter the bear if you are in a safe position.

6.7 If the bear is close and threatening:

- If you have a deterrent such as a bear banger or bear spray, be prepared to use it depending on how close the bear is. Try to scare the bear off.
- If you do not have a deterrent, or if using the deterrent is not successful, act as non-threatening as possible.
- Talk to the bear in a calm authoritative tone of voice.
- Do not startle or provoke the bear by making sudden moves.
- Never imitate the bear's aggressive sounds, signals or posture. The bear is attempting to establish dominance and imitating its moves is a challenge to its dominance.
- Back slowly away from the bear and drop a pack or some other article in order to distract the bear momentarily.
- Remember that the bear may be defending cubs that you have not yet seen or they have a food cache nearby. Attempt to look as non-threatening as possible.

6.8 If the bear is very close and approaching:

- A distance of less than 164 feet (50 meters) in an open area and closer in a forested area.
- If the bear continues to approach, use your deterrent.
- If the bear does not respond to the deterrent you must now **STAND YOUR GROUND!**
- If the bear continues to approach and is acting aggressive, **YOU MAY HAVE TO SHOOT** if you are carrying a firearm.

6.9 If the Bear Charges:

- A bear will charge you at high speed down on all four legs and often crouched low to the ground.
- Bears do not charge when standing up on the hind legs.
- Many charges are bluffs and the bear will often stop or veer off just at the last minute. It is difficult to know if the bear is bluff charging or not until it gets very close.
- When faced with a charging bear you have two options:
 - Use your bear deterrent; or
 - Roll into a ball and cover your neck and head with your arms if you are unarmed and have no other choice.

Small Mammals**S3AM-313-ATT11****1.0 Hazard**

- 1.1 Working in the field either directly or indirectly with small mammals has inherent risks of injury or exposure to zoonotic diseases (infectious diseases that can be transmitted from animals to humans) that all field staff need to protect themselves against.
- 1.2 The risks are usually higher when there is direct contact with a wild animal, either through a break in the skin (blood), saliva, or excrement; however, there are also risks through air-borne diseases (e.g., Hantavirus).
- 1.3 Obviously, wildlife biologists directly handling wildlife, dead or alive, or working with wildlife feces or in enclosed habitats (such as caves), have an increased risk of exposure to a wider range of zoonotic diseases and should take extra precautions.

2.0 Personal Protective Equipment

- 2.1 Full-length clothing (long sleeves and pants)
- 2.2 Insect repellent
- 2.3 Respiratory equipment (when directly handling wildlife)
- 2.4 Gloves (when directly handling wildlife)

3.0 References

- 3.1 None.

4.0 Restrictions

- 4.1 Wildlife handling must only be completed under direct supervision of an experienced individual.

5.0 Training

- 5.1 Any staff that will be handling wildlife must be adequately trained and/or supervised by a wildlife biologist experienced in the job task.

6.0 Safe Work Practice

- 6.1 Wild animals can carry a variety of diseases that humans can contract: viral, parasitic, bacterial, and protozoal. Basic Personal Protective Equipment such as full-length clothing, gloves and a respiratory mask will greatly reduce the risk of exposure.
- 6.2 Treat unknown dogs encountered in field activities in the same manner as a wild animal. Be conscious of behaviors that seem to indicate anxiety (tail under the belly), defensiveness or aggressiveness, and attempt to leave the area if these are identified.
- 6.3 Whenever a wild animal must be handled, the procedure must be accomplished as safely and quickly as possible.
- 6.4 Proper techniques must be employed to avoid or minimize the risk of personal injury while, at the same time, avoiding or minimizing injury to the animal.
- 6.5 Gloves, catch sticks, caging, and other appropriate equipment may be necessary when handling a wild animal. Most of these animals will be extremely stressed, resisting every restraint attempt.

- 6.6 In the unfortunate circumstance that a person is bitten or scratched, he or she should cleanse the wound thoroughly with soap and flush with water immediately, providing for a mechanical removal of potentially infective organisms. This should be followed by cleansing under medical supervision and consultation with a physician to consider the potential exposure to the rabies virus.

7.0 Rabies

- 7.1 You will not be able to accurately determine if an animal has rabies simply by observation as traditional symptoms of rabies (foaming at the mouth, biting, etc.) do not occur in all animals nor at all stages. There are some mammals that are at a higher risk than others for the rabies virus, such as raccoons, skunks, stray cats and dogs, foxes, coyotes, rodents, and bats; however, any mammal can contract the virus.
- 7.2 Rabies is contracted by contact of an infected animal's saliva with an open wound – a bite or a scratch.
- 7.3 Symptoms of rabies in humans usually do not present themselves for a minimum of 10 days to a year or longer (the average is 30 to 50 days). Symptoms are typical of a flu, including malaise, loss of appetite, fatigue, headache, and fever. Over half of all patients have pain (sometimes itching) or numbness at the site of exposure. They may complain of insomnia or depression. Two to ten days later, signs of nervous system damage appear; these include hyperactivity and hypersensitivity, disorientation, hallucinations, seizures, and paralysis.
- 7.4 Because rabies is so difficult to detect and positively identify, it is very important to consult a physician immediately. If rabies is a possibility, begin treatment with the rabies vaccine as soon as possible (unlike other vaccines, rabies vaccination begins after exposure because the virus takes a comparatively long time to induce disease).

8.0 Hantavirus

- 8.1 Rodents can carry a variety of diseases; of notable concern is the North American hantavirus which can cause Hantavirus Pulmonary Syndrome (HPS).
- 8.2 A common host of the hantavirus is deer mouse and related species (*Peromyscus* spp.), which are common throughout much of North America.
- 8.3 Although infection is rare, it can be fatal and, therefore, it is necessary that risk of exposure be minimized. Infection can be spread to humans when they:
- 8.3.1 Breathe air contaminated by deer mouse saliva, urine or feces containing infectious hantaviruses; or
 - 8.3.2 Accidentally rub eyes, mouth or broken skin with hantavirus-infected deer mouse saliva, urine or feces.
- 8.4 The following precautions will be taken for all field operations:
- 8.4.1 Limit exposure to soils handling and use gloves where appropriate.
 - 8.4.2 Wash or sanitize hands often throughout the day and before meals.
 - 8.4.3 Equipment bags, storage areas, and vehicles will be inspected daily for signs of deer mouse infestation.
 - 8.4.4 Rodent-proof storage containers will be used when practical.
 - 8.4.5 Do not enter buildings infested with deer mice without adequate respiratory protection.
 - 8.4.6 Droppings should never be removed by vacuuming or sweeping. Wetting down an area with a mixture of 1:9 household bleach and water solution will reduce risk of airborne exposure.
- 8.5 If flu-like symptoms develop three days to six weeks after exposure to rodents, a doctor should be contacted immediately (mechanical ventilation is the primary method of treatment).

9.0 Bubonic Plague

- 9.1 The bacteria that cause plague, *Yersinia pestis*, maintain their existence in a cycle involving rodents and their fleas.
- 9.1.1 In urban areas or places with dense rat infestations, the plague bacteria can cycle between rats and their fleas.
- 9.1.2 Humans may contract the plague bacteria through:
- Infected flea bites.
 - Contact with contaminated fluid or tissue of a plague infected animal.
 - Infectious droplets from an infected person coughing into the air (very uncommon in the United States, but relatively frequent in developing countries).
- 9.1.3 Individuals infected develop sudden onset of fever, headache, chills, and weakness and one or more swollen, tender and painful lymph nodes (called buboes).
- 9.1.4 Immediate medical attention is necessary to prevent complications or death.
- 9.1.5 Rodent control measures should be employed at AECOM locations.
- 9.1.6 Wear gloves if handling potentially infected animals to prevent contact between skin and the plague bacteria. Contact the local health department with and questions about disposal of dead animals.
- 9.1.7 Repellent shall be used if there is potential exposure to rodent fleas. Products containing DEET can be applied to the skin as well as clothing and products containing permethrin can be applied to clothing (always follow instructions on the label).

Snakes & Scorpions

S3AM-313-ATT12

1.0 Hazard

- 1.1 Snakes have the ability to inject venom. A bite from a venomous snake, which may inject varying degrees of toxic venom, is rarely fatal but should always be considered a medical emergency.

2.0 Personal Protective Equipment

- 2.1 Long pants and shirts
- 2.2 Heavy gloves if staff will be handling debris or be close to the ground
- 2.3 Rubber boots, or boots that fully cover the foot (not sandals!) and preferably are at least 10 inches (25 centimeters) high
- 2.4 Snake Chaps that cover at least the shin
- 2.5 Personal first aid kit

3.0 Restrictions

- 3.1 Staff must not work alone in areas where the risk of a snake encounter is high.

4.0 Safe Work Practice




- 4.1 Prior to going into the field, staff should research the area and identify what species are present. Once confirmed, staff should contact local hospitals to identify which carry anti-venom and include that information into the SH&E Plan and THA.
- 4.2 Staff working in areas known to be inhabited by venomous snakes should take extra precautions, be able to identify the local snake species, and understand the best practices for administering first aid.
- 4.3 Most snakes in Canada are non-venomous; and most snake bites are not fatal, only painful. Learning to identify snake species will assist you in responding appropriately to an encounter, and will assist medical professionals in determining if antivenin needs to be administered if anyone is bit.
- 4.4 Most snakes are non-aggressive and will only attack if immediately threatened.
- 4.5 Prevention
 - 4.5.1 Before venturing out into the wilderness, familiarize yourself with the snakes in your area, both venomous and non-venomous species.
 - 4.5.2 Learn which habitats the venomous species in your region are likely to be encountered in, and use caution when in those habitats.
 - 4.5.3 Try as much as possible not to take a snake by surprise.
 - 4.5.4 Stay on trails where possible, and watch where you place your hands and feet, especially when climbing or stepping over fences, large rocks, and logs, or when collecting firewood. Take care when overturning any objects on the ground when in snake country.
 - 4.5.5 If you see a snake, give it as much room as possible. Most snakes have a strike distance that is only half the length of their body.
 - 4.5.6 If you get very close to a rattlesnake, hold very still until it calms down and starts to move away. Then slowly move backwards until you are at least one snake-body length away.

4.6 Treatment


- 4.6.1 A bite from a venomous snake should be considered a major medical emergency. Emergency services should be contacted immediately and staff should follow the direction of the medical responders.
- 4.6.2 Try to keep the snakebite victim still, as movement helps the venom spread through the body.
- 4.6.3 Keep the injured body part motionless and just below heart level.
- 4.6.4 Keep the victim warm, calm, and at rest, and transport him or her immediately to medical care.
- 4.6.5 Do not allow him to eat or drink anything.
- 4.6.6 If medical care is more than half an hour away, wrap a bandage a few inches above the bite, keeping it loose enough to enable blood flow (you should be able to fit a finger beneath it). Do not cut off blood flow with a tight tourniquet. Leave the bandage in place until reaching medical care.
- 4.6.7 Identify the snake that caused the bite to determine if it is venomous, and if antivenin needs to be administered. Do not waste time or endanger yourself trying to capture or kill it. Note the shape and color of the snake's head.
- 4.6.8 If you are alone and on foot, start walking slowly toward help, exerting the injured area as little as possible.
 - Note that there are several species of snakes that superficially resemble rattlesnakes. Several species, including Bull, Milk, Fox, and Rat Snakes will even rattle their tails when startled.
 - Massasauga Rattlesnake is recognized as a Threatened Species in Ontario and it is an offence to harass, or destroy the habitat of this species.
- 4.6.9 Workers in scorpion habitat have the potential to be stung.
 - Scorpions usually hide during the day and are active at night. They may be hiding under rocks, wood, or anything else lying on the ground. Some species may also burrow into the ground. Most scorpions live in dry, desert areas. However, some species can be found in grasslands, forests, and inside caves.
 - Scorpions are found in Southern and Southwestern United States.
 - One scorpion species, the Northern Scorpion (*Paruroctonus boreus*) occurs in semi-arid areas of southern British Columbia, Alberta, and Saskatchewan. It carries a stinger on the end of its tail. The sting is painful but not life threatening unless there is an allergic reaction.
 - Workers should wear long sleeves and pants. Clothing and shoes should be shaken out before put on.
 - Symptoms of a scorpion sting may include:
 - A stinging or burning sensation at the injection site (very little swelling or inflammation)
 - Convulsions
 - Staggering gait
 - Slurred speech
 - Drooling
 - Muscle twitches
 - Abdominal pain and cramps
 - Scorpion stings may be painful, but most are harmless. In the United States, only the Bark Scorpion has venom that can potentially cause severe symptoms.
 - Scorpions capable of lethal stings are found predominantly in Mexico and South America.
 - If there is any question as to what type of scorpion caused the sting, contact medical services immediately.





5.0 Species

5.1 Venomous Snakes in Canada

<p>Eastern Massasauga Rattlesnake (<i>Sistrurus catenatus</i>) found around Wainfleet, Windsor, Bruce Peninsula and eastern Georgian Bay in Ontario.</p>	 <p>Eastern Massasauga Rattlesnake picture by Michael Redmer/Courtesy Lincoln Park Zoo</p>
<p>Northern Pacific Rattlesnake (<i>Crotalus viridis</i>) found primarily in Okanagan and Thompson River valleys of southern British Columbia.</p>	 <p>LANCE TANNAHILL 2000</p>
<p>Prairie Rattlesnake (<i>Crotalus viridis</i>) found in south eastern Alberta, and south western Saskatchewan.</p>	

5.2 Venomous snakes in the United States

<p>Rattlesnake(<i>Crotalus cerastes</i>) found mostly concentrated in the southwestern United States, they extend north, east and south in diminishing numbers and varieties. Every contiguous state has one or more varieties of rattlesnake.</p> <p>The rattlesnake is found in many different biomes ranging from along the coast at sea level, the inland prairies and desert areas to the mountains at elevations of more than 10,000 feet.</p> <p>Species include: Sidewinder, Santa Catalina, Western,</p>	 <p>Western Rattlesnake</p>
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<p>Mojave, Red Diamond, Western Diamond, Ridge Nosed, Eastern Diamondback, and Pigmy.</p>	 <p>Eastern Diamondback</p>
<p>Copperhead (<i>Agkistrodon contortrix</i>) is the most common venomous snake found in the eastern United States. It can be found in the states of Texas, Oklahoma, Kansas, Missouri, Arkansas, Louisiana, Mississippi, Alabama, Georgia, Florida, South Carolina, North Carolina, Tennessee, Kentucky, Virginia, Illinois, Indiana, Ohio, Iowa, Pennsylvania, Maryland, New Jersey, Delaware, New York, Connecticut, and Massachusetts.</p>	
<p>Cottonmouths (water moccasins) (<i>Agkistrodon piscivorus</i>) found in the eastern United States from Virginia, south through the Florida peninsula and west to Arkansas, eastern and southern Oklahoma, and east and central Texas.</p>	
<p>Coral Snake (<i>Micrurus sp.</i>) found in the southern range of many temperate United States including North Carolina, Georgia, Alabama, Mississippi, Louisiana, Texas, Arkansas, Kentucky, Arizona, and New Mexico.</p>	 <p>Eastern Coral Snake, <i>Micrurus fulvius</i></p>

Working Alone

S3AM-314-PR1

1.0 Purpose and Scope

- 1.1 This procedure establishes the requirements for communication and accountability between personnel at a work site to reduce the potential for incidents occurring to one employee without help readily available and to facilitate the rapid mustering of assistance to employees in the event of an emergency.
- 1.2 This procedure applies to all AECOM America-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.

2.0 Terms and Definitions

- 2.1 **Buddy System** – A system of organizing employees at a work site in such a manner that each employee is accompanied by or in communication with at least one other employee or is escorted by a client or contractor representative during work site activities.
- 2.2 **Controlled Work Areas** – One or more designated work areas on a field project site where high risk activities and/or strictly defined operations take place. Such controlled work areas include, but are not limited to, remediation or construction sites; a restricted radius where a critical lift operation will take place could be declared a controlled work area. On a HAZWOPER site, the controlled work area is divided into the exclusion zone, the contaminated reduction zone, and the support zone.
- 2.3 **Working Alone** – Performing work with no line of sight or direct voice communication with another person who is aware of your assignment and capable of initiating emergency response.

3.0 References

- 3.1 S3AM-005-PR1 Driving
- 3.2 S3AM-209-PR1 Risk Assessment & Management

4.0 Procedure

- 4.1 Roles and Responsibilities
 - 4.1.1 **Manager or Supervisor**
 - Establish if employee is permitted to work alone, through evaluation of employee's experience, training and any personal limitations (e.g. life-threatening allergic reactions).
 - Provide the resources, communication devices, emergency response plans, and check-in procedures as listed in the Task Hazard Assessment (THA) or SH&E plan, etc. necessary so that employees are not working alone or have a buddy system in place.
 - Act as point of contact if employees miss their check-in.
 - 4.1.2 **Employees**
 - Complete training as required to prepare for working alone.
 - Confirm emergency contacts are provided to the Manager or supervisor in case of an emergency.
 - Establish a buddy system and check in procedure in accordance with the THA or SH&E Plan provided by the Manager and Supervisor.

4.1.3 SH&E Managers

- Review and approve relevant planning documents entailing employees working alone and on remote travel.

4.2 General

4.2.1 All projects/programs shall conduct a review of all tasks performed by AECOM to establish specific work alone procedural requirements as defined here. They shall have at minimum a THA and SH&E Plan that has been reviewed by the SH&E Manager.

4.2.2 Employees are discouraged from working alone on any site due to the risk of delayed assistance in the event of an incident. If they will be out of contact with other employees, they shall establish a buddy system or check-in procedure with another employee or responsible person.

4.2.3 Employees working alone or in small crews in remote isolation shall have an effective means of communication including cell/radio/satellite phone as well as established check-in times.

4.2.4 When traveling alone, staff shall take appropriate precautions, including notifying someone of their travel plans as well as carrying a communication device and safety equipment, as appropriate. See *S3AM-005-FM1 Journey Management Plan*.

4.3 No employee shall work by themselves or without a buddy system established if they are conducting a high risk job task.

4.3.1 The following tasks are considered high risk:

- Working at heights > 4 ft. (1.22 m) (Including aerial lifts, snooper trucks, scaffolds, etc.).
- Working in a confined space.
- Working in a trench or excavation.
- Performing tasks requiring lock out/tag out.
- Work on energized equipment.
- Working with electricity.
- Working with hazardous substances or materials (including all HAZWOPER projects).
- Working with material under pressure.
- Working where there is a possible threat of violence, including civil unrest.
- Working in avalanche areas.
- Working on water or ice.
- Working in remote or wilderness isolation.
- Working in a controlled area.
- Extreme heat or cold stress environments.
- Working with power tools/equipment (drill, chainsaw, grinder, etc.).
- Working with/operating heavy equipment or machinery, including drill rigs.
- Working in isolation from first aid services or immediate/emergency assistance.
- Working around mobile equipment.
- Exposure to vehicular traffic (highways, roads, parking lots, etc.).
- All-terrain vehicle work.
- Working on railroads or within 25 ft. (7.62 m) of tracks.
- Any activity/task involving non-voluntary use of respiratory protection, including for site access.

- Working with people diagnosed with Coronavirus or other pandemic diseases.

4.3.2 The following tasks (identified as high risk) may permit working alone provided it can be demonstrated there is no substantial increased risk associated with working alone:

- Working with power tools/equipment (e.g. power drill versus chainsaw).
- Working with material under pressure (e.g. small air compressor versus compressed gasses).

4.4 Office Work

4.4.1 The supervisor shall have in place and shall communicate as part of location specific orientation, its procedures for the safety and security of an employee working alone in the office. Contact numbers to be used in case of emergency are posted at all common gathering areas or major exits.

4.4.2 Employees working in the office after regular working hours or in situations where they are working alone shall keep the entrance to the office locked.

4.4.3 If the building is monitored by a security service, employees working in the office after regular working hours or working alone shall notify the security guard of their presence and anticipated hours. If the building does not have a security service, the employee working alone shall notify their supervisor or a family member or friend if agreed to by their supervisor.

4.4.4 During all working hours, employees shall stay alert to unauthorized entries into the building and to other suspicious activities and shall report them to security or their supervisor immediately.

4.5 Field Work

4.5.1 Prior to work commencing, a THA shall be prepared for all assignments on which employees are to work alone (in accordance with *S3AM-209-PR1 Risk Assessment & Management*). The THA shall consider travel time, weather, available communications, and the impact of working alone when establishing risk ratings of the hazards associated with the task and work environment.

4.5.2 The THA should also consider whether the employee assigned to work alone has sufficient training and qualifications in the tasks to be performed to allow the employee to work safely alone. The employee's personal medical conditions may be considered if the employee has voluntarily made the medical condition known to the Manager or Supervisor.

4.5.3 The THA should identify the controls required for the safety of employees as applicable to the job task and location. Some controls associated with working alone or in remote isolation include a buddy system, standardized check-in times, what to do if a check-in is missed (e.g. worker in proximity attends site, utilizing secondary communication method, etc.), specialized communication devices, and enhanced emergency supply kits.

4.5.4 The THA is completed in addition to the SH&E plan which details the work activities and the procedures to manage the hazards and in accordance with *S3AM-209-PR1 Risk Assessment & Management*.

4.6 Buddy System

4.6.1 When conducting work that has not been identified as high risk, employees shall work with a buddy (another responsible individual) or follow check –in procedures listed in the THA or SH&E Plan.

4.6.2 When conducting high risk work, employees shall work as a buddy system (another responsible individual) at all times.

4.6.3 Once assigned as buddies, personnel shall remain in contact.

4.6.4 When electronic communication devices are used, prior to starting work, a protocol shall be established and agreed to by each buddy to confirm that periodic effective and faultless communications are maintained

- 4.6.5 When unanticipated conditions develop that do not permit line of sight and direct voice contact, and alternate communication was not established in the THA, Stop Work and notify the Supervisor. If permission from the Supervisor is obtained to continue the work, voice contact shall be achieved using reliable electronic communication devices such as, but not limited to, hand-held radio or cell phone. The THA shall be updated to reflect this change.
- 4.6.6 If crews will separate once they reach their work site, they shall then be considered to be "working alone". The buddy system or check-in procedures shall be established, as determined by the work being high risk or non-high risk and as identified in the THA.
- 4.6.7 Client or contractor personnel may be substituted for an AECOM employee's buddy only if they are designated by the client or contractor and the AECOM manager or supervisor, and are properly trained to the tasks and the site's emergency response procedures.
- 4.6.8 A missed communication event shall initiate the applicable missed check-in actions established in the THA (e.g. worker in proximity attends site, utilizing secondary communication method, etc.) and may trigger emergency response procedures. The results of each communication event shall be documented in the program or project files.
- 4.7 Check-In Procedures
 - 4.7.1 All field crews shall establish check-in procedures as part of the THA or SH&E Plan prior to leaving the office. These procedures shall be reviewed daily as part of the Task Hazard Assessment review or more frequently if there is a change in work arrangements that could adversely affect a worker's well-being or a report that the system is not working effectively. These procedures shall be confirmed with the assigned Check-In Person daily.
 - 4.7.2 The timing and frequency of those check-in procedures schedule shall be established prior to the initiation of field operations and shall vary depending on the task and location of the work.
 - 4.7.3 If communication is lost between buddies or a check-in time is missed, it shall be assumed that an emergency situation exists, and the site's emergency response procedures shall be implemented. Site work shall cease until the emergency is resolved and the Supervisor directs personnel to restart work.
 - 4.7.4 If crews will separate once they reach their field site, they will then be considered to be "working alone" and will establish a buddy system with the other members of the crew.
 - 4.7.5 Employees working alone or in small crews in remote isolation will have an effective means of communication system (e.g., cell, radio, satellite phone, global positioning system communicator) as well as established check-in times.
 - 4.7.6 The Check-In Procedure will be reviewed daily as part of the THA review or more frequently if there is a change in work conditions that could adversely affect a worker's well-being or a report that the system is not working effectively.
- 4.8 Emergency Response Procedures
 - 4.8.1 All field employees and the Check-In Person shall be provided with the location specific Emergency Response Plan. This may be included in the THA or SH&E plan or exist as a separate document.
 - 4.8.2 The Check-In Person shall have access to a route map or understands their anticipated route of travel.
 - 4.8.3 The established contact person shall follow the procedures below, with specifics established in the SWP Plan or THA, if a field employee has missed a check-in:
 - First, they shall attempt to make contact with the field employee directly.
 - If that fails to provide a response, they shall contact other persons who may have been on site, including client supervisors, or other locations where the field employee might be (e.g., hotel, home, office).

- If the field employee still cannot be located, the emergency contact person notifies the manager or supervisor responsible for the employee.
- Depending on the location and situation, they shall then dispatch another employee, another supervisor, or an appropriate emergency response agency (e.g., police) to travel to the last known location of the field employee.
- If the dispatched responder arrives at the site but cannot locate the field employee, the appropriate public emergency contacts (e.g., police, search and rescue) shall be made and the employee's personal contacts shall be notified by Human Resources.
- If the dispatched responder finds the crew in an emergency situation (medical, environmental, structural, etc.), the appropriate steps shall be taken to isolate the hazard, administer first aid, and contact emergency support services.

4.9 Training

- 4.9.1 All employees shall receive an initial orientation that includes the hazards and controls associated with working alone.
- 4.9.2 If working in the wilderness, all field employees shall receive appropriate orienteering training using a map. Basic orienteering and navigation skills can be provided by an experienced employee before work commences. This training must be documented. Refer to the *S3AM-314-ATT1 Wilderness Isolation* instruction for more specifics.
- 4.9.3 Employees working alone should be trained in First Aid. Consideration should be given to Wilderness First Aid training based on the anticipated work environment.
- 4.9.4 Employees regularly working in remote, isolated wilderness locations will either participate in a wilderness survival course from a qualified provider (one or two day) or will obtain management approval based on their level of experience/competence in wilderness situations.

5.0 Records

- 5.1 None

6.0 Attachments

- 6.1 [S3AM-314-ATT1 Wilderness Isolation](#)

Wilderness Isolation

S3AM-314-ATT1

1.0 Planning

- 1.1 Working in wilderness isolation presents many more potential hazards and should only be conducted by teams with documented experience, safety plans, and equipment appropriate for the tasks and conditions of the work.
- 1.2 A safety plan and Task Hazard Analysis will be reviewed by the SH&E Manager.

2.0 Safety Equipment

- 2.1 All field employees should regularly carry the following on their person:
 - GPS Unit.
 - Compass.
 - Lighter, matches, or a "flint" of fire steel.
 - A knife or folding saw.
 - Map.
 - First aid kit.
 - Communication device appropriate to the type of coverage anticipated in the area.
- 2.2 When hiking long distances, it is recommended that a "mini survival kit" that includes the following items be carried in addition to the items listed above:
 - Fire starter (tinder). Cotton balls with lip balm work well, or paper egg cartons with cotton balls and paraffin wax; if buying commercial fire starter, test it after several months.
 - A whistle.
 - Heavy tinfoil (to melt snow, to cook on, or to boil water in).
 - Water and/or portable water purification device (e.g. steri-pens®).
 - Some high-energy food.
 - Cordage or rope (about 50 feet).
 - Bear spray and/or bear bangers.
- 2.3 When using an ATV or helicopter for isolated work, it is recommended that a survival bag or backpack that can be left at a known muster point be put together. This bag should include the following items:
 - Additional fire starter (tinder).
 - Matches, fire steel.
 - A multi-tool (like a Swiss Army knife).
 - A folding saw.
 - 3-8'x6" tarps plus one 12 X 16" tarp or larger (or a tent).
 - 100 " of utility cord or parachute cord.
 - A small pot.
 - A small stove (a small folding military stoves with trioxethelyne tablets will work well).
 - Closed cell foam pads or several square feet of double-wall bubble insulation (the silver sided bubble wrap used in construction) to use as a sleeping pad or for hypothermia treatment.
 - Emergency Food.
 - Water.
 - Sleeping bag with a mylar® bivouac (bivy) sack to be used as a vapor barrier inside.

3.0 Drinking Water

- 3.1 No surface water can be considered safe for human consumption without treatment. Even the cleanest looking spring water could be polluted. Untreated water may be contaminated with bacteria, viruses, or protozoa.
- 3.2 On short trips, carry treated water or obtain water from another safe source.
- 3.3 When field projects take you into remote isolation where there is the potential for not having access to clean drinking water, be sure to take the appropriate tools with you: a water filter, tin foil or a pot for boiling water, or tablets or chemicals for treating the water prior to consumption.
- 3.4 Generally, the chances of finding safe drinking water in the mountains increase as you gain altitude. Intense sunlight at high altitudes kills undesirable bacteria and viruses but harmful cysts are unaffected.
- 3.5 Runoff water from streams below glaciers is often cloudy with silt and should be filtered.
- 3.6 Well water and moving rivers are the best locations to obtain water. Avoid stagnant water, shoreline water, and water close to human habitations and campsites.
- 3.7 During the winter, it is best to use an open water source or to obtain water through a hole in the ice. Check the safety of the ice first. Melting ice and snow consumes fuel and takes extra time. Eating snow or ice directly can lead to chilling and hypothermia and could also cause stomach cramps and headaches. Beware of colored snow, which indicates the presence of algae that could cause diarrhea if ingested. Even in winter, all water should be purified.
- 3.8 Water Treatment
- 3.8.1 Each method of water treatment has its advantages and disadvantages. Use only boiled or treated (filtered and disinfected) water for drinking, brushing teeth, or washing fruits and vegetables that will be eaten raw. Heat is the oldest, safest and most effective method of purifying water. However when boiling is not practical because of time and lack of a heat source, water should be treated by filtration and disinfection. This method may not be as effective as boiling the water.
- 3.8.2 Use two water containers: one for treating water and the other for carrying purified water. After disinfection, shake the container vigorously. Wait five minutes. Shake it again with the lid loose so that some water leaks out to cleanse the mouth of the container. Then pour the water into a clean container for drinking water.
- 3.8.3 Boiling. Bring the water to a boil for at least one minute (adding one more minute for each 300 m (1000 ft.) above sea level. If the water is cloudy, filter it before boiling.
- 3.8.4 Filtration. Water filters for use in the wilderness are available. Avoid filters that allow particles larger than 0.5 microns to pass. Filters with a pore size of 0.1 to 0.3 micron can remove protozoa and some bacteria but may not remove viruses. Filtration alone is insufficient to purify water; hence, it should be combined with disinfection to kill viruses and bacteria.
- 3.8.5 Disinfection. Disinfect with chlorine or iodine compounds, following the manufacturers instructions. Disinfection alone may not kill some protozoa..

Table 1: Summary of Water Purification Methods				
	Boiling	Chlorine	Iodine	Filters
Bacteria	E	E	E	M
Viruses	E	E	E	N
Protozoa	E	M	M	M
Chemicals	M	N	N	N

E = effective M = may be effective (see text) N = not effective

- 3.8.6 Additional portable water purification devices are available, using methods such as ozone disinfection, ultraviolet purification, or solar water disinfection.
- 3.8.7 Water treatment methods should be evaluated for suitability to the work environment, the potential water hazards, and limitation of the device.
- 3.8.8 Some water-borne diseases are difficult to diagnose. If you are not feeling well and have recently drunk water from a source in the wild, inform your doctor that you may have consumed untreated water.

1.0 Purpose and Scope

- 1.1 This procedure applies to all AECOM Americas-based employees and operations, and any other entity and its personnel contractually required to comply with this document's content, where materials are stored and used. Note that this standard does not address manual material handling (e.g., manual lifting, lowering, pushing, pulling, carrying, holding, or restraining). Information on manual material handling can be found in *S3AM-014-PR1 Manual Lifting*.
- 1.2 The purpose of this standard is to ensure the safety of AECOM personnel during the storage of materials.

2.0 Terms and Definitions

- 2.1 None

3.0 References

- 3.1 S3AM-014-PR1 Manual Lifting
- 3.2 S3AM-115-PR1 Hazardous Materials Communication

4.0 Procedure

- 4.1 Implementation of this standard is the responsibility of the Manager directing activities of the facility, site, or project location.
- 4.2 Employees shall be properly trained and follow the established procedures applicable to the material stored.
- 4.3 General
- 4.3.1 Consult additional applicable jurisdictional requirements and AECOM procedures for specific tasks, materials, and equipment involved in material storage operations.
- 4.3.2 Storage areas should be specifically designated and be clearly marked. Aisles should be clearly marked, be of ample width for the type of storage, and be kept free from obstacles and trash.
- 4.3.3 Store materials in a manner that prevents damage or deterioration to the material and in a configuration that is safe and provides for the optimal and efficient use of storage space.
- 4.3.4 Material must not be stacked within 18 inches of the sprinkler heads. Material should be kept well clear of light fittings, heating pipes and ceilings.
- 4.3.5 Ensure that stacks are stable and self-supporting.
- Stack symmetrically.
 - Base areas and heights of stacks should be kept as small as circumstances permit. The ratio of height to base dimensions of large stacks should be correctly proportioned so that failure of part or whole of the stack does not occur.
 - Experience has shown that the height to base ratio of an unsupported stack should not exceed 3 to 1.
 - As most stacks are erected by visual alignment, a slight error in calculation near the base can easily result in a barely noticeable overhang, with a resultant loss of stability.

- Where effective banding and shrink wrapping can be achieved, the ratio of height to base can be safely increased to 4 to 1.
- Stable construction of the stack is entirely dependent upon the following factors:
 - Safe relation of height to dimension of base;
 - Sound interlocking of the material;
 - Contents of the cartons;
 - Shape of articles

4.3.6 Post maximum safe loads for all floors above grade in pounds per square foot.

4.3.7 As applicable, stack, rack, block, interlock, band or shrink-wrap, or otherwise secure all materials to be stored in tiers to prevent sliding, falling, or collapse.

4.3.8 De-stacking is largely the reverse process of stacking. Most accidents involving the collapse of stacked materials occur during de-stacking. The prime cause of this is haphazard removal. All stacking and de-stacking should be carried out under competent supervision. Basic rules for breaking down stacks are:

- One person should be responsible for the manner in which the stack is reduced;
- The stack should be taken down tier by tier and;
- As there is a high tripping hazard in the working area of a stack, tidiness and systematic work methods are essential.

4.3.9 Keep aisles, passageways, and other access ways clear to provide for the free and safe movement of material-handling equipment or employees. Mark all permanent aisles.

4.3.10 Segregate and label non-compatible materials. Refer to *S3AM-117-PR1 Hazardous Materials Communication*.

4.3.11 When loads swing freely, confirm non-compatible materials are segregated. Do not lift loads or swing over the heads of persons; it is not permitted to walk under a load. Wear hardhats in these areas.

4.3.12 Do not place material stored inside buildings under construction within 6 feet (1.8 meters) of any hoistway or inside floor openings, or within 10 feet (3 meters) of any exterior wall lower than the top of the material stored.

4.3.13 Pallets should be of sound construction, and be of adequate strength for the loads and conditions under which they are used. Where pallet loads are stacked tier on tier, the unit loads must be able to support the weight above.

4.3.14 Stacks, shelving and other fixtures for holding or storing materials should be so laid out and designed that there is sufficient access for safe loading and unloading by either manual or mechanical means

4.4 Stacking Frames

4.4.1 Conduct a visual inspection of the stacking frames prior to loading for damage (e.g., bent, twisted, broken or excessive rust). Remove from service any stacking frames that fall into any of these categories.

4.4.2 Several pallets can be loaded on a stacking frame provided they are stable and will not fall.

4.4.3 If more than one (1) pallet is placed on a stacking frame and materials are unstable or appear to be capable of falling, the pallets will be shrink-wrapped or banded together or stored in another storage location.

- 4.4.4 Do not exceed the maximum load of the stacking frame. Be sure to include the weight of the stacking frame in the maximum load calculation.
- 4.4.5 Material on a stacking frame will not extend above the top rail if another stacking frame is to be placed on top of the lower frame.
 - The highest or top stacking frame may have material that extends above the top rails, but the pallet itself must be below the top rails and the material secured.
- 4.4.6 Stacking frames will only be stacked high enough for forklift forks to be able to reach and remove one (1) frame at a time. At no time will they be stacked higher than five (5) high regardless of the dimensions of the stacking frame. Material placed on the top rack will be banded or shrink wrapped (if applicable).
- 4.4.7 Do not mix stacking frames manufactured by different companies (e.g., a UNICOR with a Nestainer or other manufacturer).
 - Stacking frames of different colors can be intermingled but will be of the same dimensions and manufacturer (e.g., UNICOR to UNICOR, Nestainer to Nestainer).
- 4.4.8 The 1st (lowest) stacking frame will have the greatest amount of weight. The subsequent frames will, if possible, have less weight than the frame immediately below it. This is to avoid top heaviness.
- 4.4.9 When picking up a stacking frame, ensure the MHE forks are securely seated into the two (2) stirrups of the frame. When traveling, maintain a clear field of vision and travel in reverse if vision is obstructed by the load. Sound your horn at all intersections and blind spots.
- 4.4.10 Transport one (1) loaded stacking frame at a time.
- 4.4.11 When traveling with a pallet, keep load as low as possible. Do not bulldoze pallets or stacking frames.
- 4.5 Bagged Materials
 - 4.5.1 Provide bags of cement and lime stacked over ten bags high with restraining walls of appropriate strength.
 - 4.5.2 Stack cement, lime, and similar materials in bags so that the mouths of the outside bags are facing the center of the stack.
 - 4.5.3 During un-stacking, keep the entire top of the stack nearly level, and maintain the necessary setback.
 - 4.5.4 Warn employees handling cement or lime about skin burns, and ensure that goggles, gloves, and clothing that fits snugly about the neck and wrists are worn.
 - 4.5.5 Lime must be stored to prevent a premature slaking action that may cause fire.
- 4.6 Bricks and Blocks
 - 4.6.1 Brick stacks must not exceed 7 feet (2.1 meters), and they should be tapered back starting at 4 feet (1.2 meters).
 - 4.6.2 Always stack bricks on planks, asphalt, or concrete, and never on uneven or soft surfaces.
 - 4.6.3 Keep the top of brick stacks level and maintain the taper during un-stacking operations.
 - 4.6.4 Stack blocks in tiers on solid, level surfaces, and taper back over the 6-foot (1.8-meter) level.
- 4.7 Lumber
 - 4.7.1 When stacking lumber, place cross strips on stacks more than 4 feet (1.2 meters) high.

- 4.7.2 Remove all nails from used lumber before stacking, unless the lumber is to be burned or hauled away without further handling.
- 4.7.3 Stack lumber on level and solidly supported sills to be stable and self-supporting.
- 4.7.4 Do not stack lumber more than 16 feet (4.9 meters) high.
- 4.8 Reinforcing and Structural Steel
 - 4.8.1 Store steel rods in separate stacks according to length and size.
 - 4.8.2 Carefully stack structural steel to prevent the danger of members sliding off, or the stack toppling over.
 - 4.8.3 Never store "I" beams with the webs vertical.
- 4.9 Foundation Bolts
 - 4.9.1 Stack bolts in separate stacks according to length and size.
- 4.10 Corrugated and Flat Iron
 - 4.10.1 Stack corrugated and flat iron flat, and not more than 4 feet (1.2 meters) high.
 - 4.10.2 Place spacing strips between bundles.
- 4.11 Pipes, Poles, and other Cylindrical Material
 - 4.11.1 Stack and block cylindrical material in such a way to keep the material from spreading or toppling.
 - 4.11.2 Do not stack pipes higher than 5 feet (1.5 meters) unless racked.
 - 4.11.3 When removing pipe or other material larger than 2 inches (5 centimeters) in diameter from storage, and where stacked pipe runs in one direction and is more than one pipe high, employees will be instructed to approach the stack from the ends, not from the sides.
- 4.12 Sand, Gravel, and Crushed Stone
 - 4.12.1 While removing sand, gravel, and crushed stone from stockpiles, ensure there are no overhanging or vertical faces at any time.
 - 4.12.2 Do not store material dumped against walls or partitions to a height that will endanger the stability or exceed the resisting strength of such walls and partitions.

5.0 Records

- 5.1 No documentation maintenance is required.

6.0 Attachments

- 6.1 None

Drilling, Boring & Direct Push Probing

S3AM-321-PR1

1.0 Purpose and Scope

- 1.1 This document provides procedures designed to help prevent injuries to personnel working on the project and pedestrians, property damage, and adverse environmental impact as a result of potential hazards associated with drilling, boring and direct-push probing. These hazards include, but are not limited to, encountering underground utilities, subsurface installations, rotating equipment and potential overhead hazards.
- 1.2 This procedure provides the minimum requirements to be followed when drilling, boring, and probing work are performed.
- 1.3 This procedure applies to all Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.
- 1.4 The Manager is responsible for meeting all the requirements in this procedure.
- 1.5 AECOM's clients may have specific procedures which shall be followed to identify and map utility and subsurface structures on their properties or facilities. Provided the client's procedures meet or exceed those of AECOM, approval shall be obtained from the Manager and the SH&E Manager to follow the client's procedures.

2.0 Terms and Definitions

- 2.1 **Underground Utilities** – All utility systems located beneath grade level, including, but not limited to, gas, electrical, water, compressed air, sewage, signaling, and communications, etc.
- 2.2 **Ground Disturbance (GD)** – Any indentation, interruption, intrusion, excavation, construction, or other activity in the earth's surface as a result of work that results in the penetration of the ground.
- 2.3 **Intrusive Activities** – Examples: Excavation of soil borings, installations of monitoring wells, installation of soil gas sampling probes, excavation of test pits / trenches or other man-made cuts, cavity, trench, or depression in an earth surface formed by earth removal.
- 2.4 **Subsurface Installations** – Examples: Subterranean tunnels, underground parking garages, and other structures beneath the surface.

3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-118-PR1 Hearing Conservation
- 3.3 S3AM-208-PR1 Personal Protection Equipment
- 3.4 S3AM-209-PR1 Risk Assessment & Management
- 3.5 S3AM-213-PR1 Subcontractor Management
- 3.6 S3AM-305-PR1 Hand & Power Tools
- 3.7 S3AM-306-PR1 Highway and Road Work
- 3.8 S3AM-322-PR1 Overhead Lines
- 3.9 S3AM-322-FM1 Overhead Electrical Lines Acknowledgement
- 3.10 S3AM-325-PR1 Lockout Tagout
- 3.11 S3AM-326-PR1 Machine Guarding
- 3.12 S3AM-331-PR1 Underground Utilities

3.13 S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 Manager

- Confirm the development of the project SH&E Plan and compliance with this procedure.
- Confirm the appropriate equipment and materials are available to conduct the drilling, boring or direct-push operations.
- Confirm compliance with *S3AM-331-PR1 Underground Utilities*.
- Review the *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* prior to authorizing work to proceed.
- Confirm that employees conducting drilling, boring or direct-push probing possess any required training, registrations or certifications.
- Confirm all employees involved and affected by the task review the SH&E Plan, *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* and Task Hazard Assessment (THA) prior to work commencing.
- Confirm an equipment maintenance inventory is maintained, schedules adhered to and appropriate inspections of equipment are conducted.
- Provide authorization (with the concurrence of the Site Supervisor and SH&E Manager) for work to resume if interrupted due to unexpected conditions or events.

4.1.2 Safety, Health & Environment (SH&E) Manager

- Assist AECOM management as needed by providing guidance and clarification as to issues that may arise.
- Review the project SH&E Plan to confirm compliance with jurisdictional regulations. Provide technical guidance as needed when a variance is pursued related to this procedure. Confirm variance process meets requirements identified in *S2-001-SM1 Global SH&E Management System Manual*.

4.1.3 Employees

- Maintain training as appropriate to the work to be completed (e.g., ground disturbance, lockout tagout, equipment operation, etc.). Refer to *S3AM-003-PR1 SH&E Training*.
- Review the SH&E Plan, *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* and Task Hazard Assessment (THA) prior to work commencing.
- As appropriate to the anticipated or encountered hazards and as addressed in the applicable planning documentation, utilize appropriate personal protective equipment (PPE) and applicable training, practices and operating procedures.
- Immediately notify the Manager of any unanticipated conditions or events. If assigned equipment, perform appropriate inspections and confirmations of maintenance and / or repairs.

4.2 Training

4.2.1 All on-site employees involved with drilling, boring, and direct-push probing shall be trained, at a minimum, in these procedures and in the procedures of *S3AM-331-PR1 Underground Utilities*.

4.2.2 All operators and assistants shall have the appropriate safety training based on the SH&E Training Matrix and any additional training assessments developed at the business group, and be versed in the equipment to be utilized.

- Refer to *S3AM-003-PR1 SH&E Training*.

- This training may include, but is not limited to, Excavation / Trenching (Ground Disturbance), HAZWOPER, Petroleum Safety Training (or Construction Safety Training), and H2S Alive as appropriate.
 - Only qualified personnel shall operate and inspect equipment.
- 4.2.3 All on-site Employees involved with drilling, boring, and direct-push probing activities shall be provided with on-site orientation of the drill rig and its operation.
- 4.2.4 All Employees involved with drilling, boring and direct-push probing activities at a client site shall receive the applicable client-required training.
- 4.3 Planning
- 4.3.1 SH&E Plan – At a minimum, a SH&E plan that includes a pre-job hazard assessment shall be prepared and communicated to all involved personnel prior to any drilling, boring, and direct-push probing activities. Refer to *S3AM-209-PR1 Risk Assessment & Management*.
- Assessment shall include both overhead and subsurface utilities and installations. Refer to *S3AM-322-PR1 Overhead Lines* and *S3AM-331-PR1 Underground Utilities*.
 - The SH&E Plan will address any required environmental monitoring including gas monitoring, dust, noise, metals, radiation or other monitoring as may be appropriate for site conditions.
 - All SH&E Plan requirements will be followed by the project team.
 - The location specific emergency response plan shall be in place, contain procedures applicable to the potential emergencies presented by the operations, and be reviewed with all personnel potentially affected.
- 4.3.2 A Task Hazard Assessment (THA) shall be completed before every assigned task at the work location. The focus of the analysis shall be on the specific assigned task and the evaluation of risks and assignment of control measures based on actual work conditions.
- 4.3.3 *S3AM-321- ATT2 Pre-Drilling, Boring & Direct-Push Probing Flow Chart* summarizes the key Pre-Drilling, Boring, and Direct-push probing requirements addressed in this procedure.
- 4.3.4 Procedures and documentation as detailed in *S3AM-322-PR1 Overhead Lines* and *S3AM-331-PR1 Underground Utilities* shall be completed prior to any intrusive subsurface work.
- The locations of subsurface and overhead utilities and subsurface installations will be investigated, documented, mapped on a site plan and evidenced with appropriate surface markings.
 - A site walk shall be conducted by the project team / site Manager and any other appropriate personnel, with the objectives of reviewing all planned intrusive activity locations, the locations of subsurface and overhead utilities and the potential for subsurface installations, to determine the appropriate utility clearance activities, and to observe other physical hazards.
 - All proposed subsurface activities will be reviewed in comparison to subsurface and overhead utilities and subsurface installations and adjustments made as necessary.
 - Appropriate clearance activities shall confirm location(s) of identified underground utilities and subsurface structures. Review the applicable completed *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist*.
 - Site Walks should be repeated as necessary following the clearance of subsurface utilities and installations to confirm hazards are clearly identified.
- 4.3.5 Confirm drilling location(s) and / or bore entry and bore exit points are adequately identified on the worksite to enable appropriate equipment positioning.
- 4.4 Permits, Notifications and Access Agreements

- 4.4.1 Any required notifications shall be provided within the appropriate timeframe to the applicable organization (e.g. owner, agency, governing body, etc.).
- 4.4.2 All applicable permits (e.g. client, government, working near rail road, etc.) will be identified, obtained, and adhered to.
- 4.4.3 Access agreements will be obtained and adhered to as necessary.
- 4.5 Pre-Qualifying and Re-Qualifying Drilling Subcontractors
 - 4.5.1 All drilling subcontractors will be properly pre-qualified in accordance with *S3AM-213-PR1 Subcontractor Management*.
 - 4.5.2 The qualifications of the drilling crew performing the work will be evaluated prior to each mobilization and each day by AECOM's on-site representative to assure that their safety performance, training, qualifications, equipment, processes, and approaches reflect AECOM standards for excellence.
 - 4.5.3 All drilling subcontractor equipment will be properly maintained and properly equipped, and the drilling subcontractor will verify their equipment is fully functional as a normal part of their daily and pre-work routine. Refer to *S3AM-321-FM1 Daily Drilling, Boring & Direct Push Equipment Inspection*.
- 4.6 General Health and Safety
 - 4.6.1 Personal Protective Equipment – Refer to the *S3AM-208-PR1 Personal Protection Equipment* for best practices. These requirements may be modified or expanded in the SH&E Plan. Clothing shall be close fitting and comfortable without loose ends, straps, draw strings, belts, or otherwise unfastened parts that might catch on some rotating or translating component of the rig.
 - Depending upon the hazards present, additional PPE may be required such as fire retardant clothing, specific hearing protection, respiratory protective equipment and chemical protective clothing.
 - If the location has potential for underground electrical utilities to be present, workers shall ensure footwear has additional protection of shock resistant soles required (white rectangle with omega symbol).
 - 4.6.2 Hearing Conservation – Hearing conservation program requirements may apply when working around operating equipment. Refer to *S3AM-118-PR1 Hearing Conservation*.
 - Each worker shall wear noise-reducing ear protectors around operating equipment or during elevated noise levels. Distance from the elevated noise level is the primary measure of control for non-essential drilling personnel.
- 4.7 Drilling, Boring and Direct Push Equipment Maintenance and Inspections
 - 4.7.1 All equipment will be inspected prior to the initiation of operations and daily during operations using the *S3AM-321-FM1 Daily Drilling, Boring & Direct-Push Equipment Inspection*. This inspection is the responsibility of the operator who will provide written documentation of the inspection prior to the start of drilling each day.
 - Equipment that is deemed defective will immediately be repaired by a qualified person, or, if repair is not practicable, tagged "Out of Service" and sent for repairs or discarded.
 - 4.7.2 Managers shall confirm an accurate inventory of the equipment within their operation requiring scheduled maintenance is developed. Using applicable regulations, industry standards, best practices, and manufacturer's recommendations, a maintenance schedule shall be developed with defined responsibility, required actions, and frequency. Refer to *S3AM-321-FM2 Drilling, Boring, & Direct-Push Equipment Maintenance Inventory*.
 - 4.7.3 The maintenance program for equipment shall:

- Adhere to applicable regulations, standards, and manufacturers' specifications;
- Provide for service by appropriately qualified maintenance personnel; and,
- Require maintenance schedules and records of maintenance.

4.7.4 Employees or operators who are assigned equipment are required to review maintenance schedules for that equipment and will confirm that required maintenance has occurred or see that it is undertaken.

4.8 General Requirements

4.8.1 Excluding geoprobe activities, set up any sample tables and general work areas for employees at a safe distance from the rig.

- The recommended safe distance is the height of the fully extended mast plus 5 feet (1.5 meters), and no less than 30 feet (9.1 meters) from the rig.
- An increase to this distance may be required due to noise exposure hazards. Refer to *S3AM-118-PR1Hearing Conservation*.

4.8.2 Operation of the drilling, boring or direct-push equipment shall be restricted to the designated operator except to activate the emergency shut-off as required.

- All rotary drilling equipment shall have an emergency shut off / kill switch. The location of the switch and operation should be reviewed with all involved Employees.

4.8.3 Sit-on direct push rigs are not permitted on AECOM worksites unless the rig has been modified (in accordance with manufacturer's requirements) to be operated by remote control or the rig has been manufactured with a rollover protection system and seat belt.

4.8.4 Consult jurisdictional regulations as use of J-hooks and cat-heads may be prohibited. Examples:

- 29 CFR 1926 requires derricks and cranes to use hooks with self-closing latches and permits the use of J-hooks only for a task unrelated to this procedure (setting trusses).
- British Columbia and Saskatchewan prohibit the use of friction cat-heads.

4.9 Identifying the Work Area

4.9.1 Ensure the work area is adequately identified:

- Including zone around the drilling, boring, or direct push equipment, as well as fluid equipment, entry point, exit point and any excavated areas.
- Utilize barricades, signage, pylons, snow fence, etc. as appropriate.
- Implement traffic control as necessary.
- Coordinate with concurrent operations to identify their associated hazards and controls, and communicate those associated with AECOM tasks.

4.9.2 When operating near public vehicular and pedestrian traffic, the on-site personnel shall take every precaution necessary to see that the work zone is properly established, identified, and isolated from both moving traffic and passer-by pedestrians (refer to *S3AM-306-PR1 Highway and Road Work*).

4.9.3 All traffic control devices shall be installed, placed, and maintained in accordance with a Traffic Control Plan, client specifications, and / or the Manual of Uniform Traffic Control Devices and Manual of Uniform Traffic Control Devices for Canada in Canada. Traffic control devices shall consist of and not be limited to

- Directional and informational signage;
- High visibility barricades, cones, or barrels;
- Lighting; and
- Other equipment and devices as required.

4.10 Clearing Work Areas

- 4.10.1 In addition to any minimum requirements the drilling subcontractor may have, prior to set up, adequate site clearing and leveling shall be performed to accommodate the rig and supplies and provide a safe working area.
- 4.10.2 Clearing the site includes clearing the intended drilling area obstacles and of underground utilities in accordance with *S3AM-331-PR1 Underground Utilities*.
- 4.10.3 Drilling or probing shall not commence when tree limbs, unstable ground, or site obstructions cause unsafe tool handling conditions.
 - The cleared / levelled area should be large enough to accommodate the rig and supplies.
 - If the rig is positioned on a steep grade and levelling of the ground is impossible or impractical, the wheel of the transport vehicle shall be blocked and other means employed of preventing the rig from moving or toppling over.
- 4.11 Drilling Activities
 - 4.11.1 Federal / State / Provincial / Territorial regulations that govern drill rig operations and exposed moving parts shall be adhered to.
 - 4.11.2 All applicable client on-site safety procedures shall be understood and adhered to.
 - 4.11.3 Minimum approach distances (MAD) from subsurface and overhead utilities and subsurface installations will be established including 5 feet (1.5 meters) from any subsurface utility, 7 feet (2.1 meters) from the pad surrounding any underground storage tanks, and 10 feet (3 meters) from any overhead energized electrical line (or further depending on line voltage). These approach distances are a minimum; government regulations and utility requirements may dictate a greater set back distance and should be confirmed.
 - 4.11.4 Verify that equipment / energy is isolated when lockout is required:
 - Refer to operator's manual and *S3AM-325-PR1 Lockout Tagout*.
 - Ensure stop switch is activated.
 - Driller is out of the seat.
 - Test controls to ensure they do not engage.
 - 4.11.5 In addition to any identified minimum requirements (as applicable, client, drilling subcontractor), the following safety measures shall be taken during drilling, boring or probing operations on site:
 - The operator and helper shall be present during all active rig operations.
 - Site personnel shall remain within visual contact of the rig operator.
 - Hard hats, approved safety boots, safety glasses, and hearing protection shall be worn in the work zone (minimum, the radius around the rig equal to the height of the drill rig mast) of a rig.
 - Gas monitoring shall be conducted as appropriate.
 - Hands, feet and other body parts shall be kept away from moving parts, (e.g. hoisted, rotating, pushing, etc.) including augers, drill rods and reamers.
 - When observing drilling, stand upwind of the drill rig to prevent potential exposure to vapors that may be emitted from the borehole.
 - The emergency shut-off switch on the rig shall be identified to site personnel and tested on a daily basis by the operator.
 - Unauthorized personnel shall be kept outside of the established work zone.
 - Rig crew and other worksite personnel shall not use a cell phone while operating the drill rig or other equipment or within the rig work zone.
 - Do not drive the rig from hole to hole with the mast (derrick) in the raised position.
 - Before raising the mast (derrick) look up to check for overhead obstructions. Refer to *S3AM-322-PR1 Overhead Lines*.

- Before raising the mast (derrick), all rig personnel (with the exception of the operator) and visitors should be cleared from the areas immediately to the rear and the sides of the mast. All rig personnel and visitors should be informed that the mast is being raised prior to raising it.
- Before the mast (derrick) of a drill rig is raised and drilling is commenced, the drill rig shall be first levelled and stabilized with levelling jacks and / or solid cribbing.
 - The drill rig shall be releveled if it settles after initial set up.
 - Lower the mast (derrick) only when the levelling jacks are down, and do not raise the levelling jack pads until the mast (derrick) is lowered completely.
- After the rig has been positioned to begin drilling, all brakes and / or locks shall be set before drilling begins.
- The operator of a rig shall only operate a drill rig from the position of the controls. The rig shall not be in operation if the operator of the rig leaves the area of the controls.
- Throwing or dropping tools shall not be permitted. All tools shall be carefully passed by hand between personnel or a hoist line should be used.
- If it is necessary to operate the rig within an enclosed area, make certain that exhaust fumes are conducted out of the area.
 - Exhaust fumes can be toxic and some cannot be detected by smell.
 - Air monitoring and, as necessary, noise monitoring shall be conducted.
- Clean mud and grease from boots before mounting a rig platform and use hand holds and railings. Watch for slippery ground when dismounting from the platform.
- During freezing weather, do not touch any metal parts of the rig with exposed flesh. Freezing of moist skin to metal can occur almost instantaneously.
- All unattended bore holes shall be adequately covered or otherwise protected to prevent rig personnel, site visitors, or animals from stepping or falling into the hole. All open bore holes shall be covered, protected, or backfilled adequately and according to Federal / State / Provincial / Territorial or local regulations on completion of the drilling project.
- When using a ladder on a rig, face the ladder and grasp either the side rails or the rungs with both hands while ascending and descending. Always use adequate fall protection and a full body harness when climbing above 6 feet (1.8 meters) of the ground. Do not attempt to use one or both hands to carry a tool while on a ladder. Use a hoist line and a tool "bucket" or a safety hook to raise or lower hand tools.

4.12 Drilling Fluid

- 4.12.1 Ensure drilling fluid is appropriate to the soil type and conditions to be encountered to enable smooth drilling.
- 4.12.2 Drilling fluid used in the boring process shall be contained at the entry and, as applicable, exit locations until recycled or removed from the site.
- 4.12.3 Confirm drilling fluid does not enter roadways, streams, municipal storm or sanitary sewer lines, and / or any other drainage system or body of water.
- 4.12.4 Monitor drilling equipment and fluid equipment for any leakage or spills. Confirm appropriate containment is in place and adequate spill response supplies are available.
- 4.12.5 It is important to monitor fluid flow and pressure gauges when drilling with any tooling, but it is essential when drilling with a mud motor (pump placed in the drill string to provide additional power to the bit while drilling).

4.13 Unanticipated Concrete / Debris or Void

- 4.13.1 The presence of subsurface installations and utilities requires special care when obstructions / refusal and voids are encountered and when unexpected absence of soil recovery occurs during

drilling operations. Other indicators of subsurface installations and utilities are the presence of warning tape, pea gravel, sand, non-indigenous material, bentonite, red concrete (indicative of electrical duct banks) and any departure from native soil or backfill.

- 4.13.2 If unanticipated concrete / debris is encountered and / or if a void is encountered, drilling will be immediately discontinued and the Manager notified. Drilling may only proceed with Manager or SH&E Manager approval.

4.14 Use of Manual Slide Hammer

- 4.14.1 The following health and safety procedures should be followed when using a manual slide hammer to install shallow injection points, drive point piezometers, and drill tools:

- Only use a manual slide hammer that either attaches directly to the point / piezometer being driven or that incorporates a cap on the point / piezometer / drill tool that prevents the slide hammer from slipping off the point / piezometer / drill tool.
- Always grasp the manual slide hammer (handles if equipped with handles) with both hands while driving the point / piezometer / drill tool.
- Never allow hands or feet to get between the manual slide hammer and the drive plate or anvil.

4.15 Use of Augers

- 4.15.1 The following general health and safety procedures should be followed when supervising borings with continuous flight hollow-stem augers:

- Never place hands or fingers under the bottom of an auger section when it is being hoisted over the top of the auger section in the ground or other hard surfaces such as the drill rig platform.
- Never allow feet to get under the auger section that is being hoisted.
- When augers are rotating, stay clear of the rotating auger and other rotating components of the drill rig. Never reach behind or around a rotating auger for any reason.
- Use a long-handled shovel to move auger cuttings away from a rotating auger. Never use hands or feet to move cuttings away from a rotating auger.
- Do not attempt to remove earth from rotating augers. Augers should be cleaned only when the drill rig is in neutral and the augers are stopped from rotating.
- Loud noises may occur while driving split spoons. At minimum hearing protection shall be worn when driving split spoons.
- When pulling / lifting augers, a clevis pin or other closed device shall be used. Use of J-hooks is prohibited.

4.16 Attaching and Breaking Rods

- 4.16.1 Do not use manual tools (e.g., pipe wrenches) in combination with rotation of the drill stem. Manual tools are not designed for the load, and may break.

- The use of such tools creates a significant impact hazard for those in the work area, because they rotate with the drill stem. Manual tool use in combination with a rotating drill stem to attach or break rods is therefore prohibited.
- Manual tools may be used if the drill stem is isolated / positively disengaged.
- Mechanical means of rod separation that are permitted include:
 - Opposing hydraulic controls.
 - Rod locking devices or machine's power vice.
 - Hydraulic breakout tools.
 - Hydraulic foot clamps.

- 4.16.2 Rod box changes present severe crushing hazards. Operators shall ensure all crew members are clear of the machine and hoisting equipment while they are changing rod boxes.

4.17 Rotary, Sonic and Core Drilling

- 4.17.1 In addition to the health and safety procedures identified above, the following general health and safety procedures should be followed when supervising borings with rotary, sonic and core drilling:

- Drill rods should not be braked during lowering into the hole with drill rod chuck jaws. Drill rods should not be held or lowered into the hole with pipe wrenches.
- If a string of drill rods are accidentally or inadvertently released into the hole, do not attempt to grab the falling rods with your hands or a wrench.
- When drill rods are hoisted from the hole, they should be cleaned for safe handling with a rubber or other suitable rod wiper. Do not use hands to clean drilling fluids from drill rods.
- When drill rods are rotating, stay clear of the rotating components of the drill rig. Never reach behind or around a rotating drill rod for any reason.
- Use a long-handled shovel to move cuttings away from the top of the borehole. Never use hands or feet to move cuttings away from the borehole.
- If work shall progress over a portable drilling fluid (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit should be equipped with rough-surfaced, fitted cover panels of adequate strength to hold drill rig personnel.
- Keep away from area where drill rods are being moved or raised to the rig. Do not stand in the area where a drill rod will fall or slide if it should be dropped.
- Loud noises may occur during drilling. Hearing protection shall be worn.

4.18 Direct-push

- 4.18.1 The following general health and safety procedures should be followed when supervising drilling borings with direct-push drilling:

- Loud noise may occur during direct-push drilling. Appropriate hearing protection shall be worn.
- When drill rods are hoisted from the hole, they should be cleaned for safe handling with a suitable rod wiper. Do not use hands to clean drilling fluids from drill rods.
- If work shall progress over a portable drilling fluid (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit should be equipped with rough-surfaced, fitted cover panels of adequate strength to hold drill rig personnel.
- Drill rods should not be lifted and leaned unsecured against the mast. Either provide some method of securing the upper ends of the drill rod sections for safe vertical storage or lay the rods down.

4.19 Horizontal Directional Drilling

- 4.19.1 During surface to surface operations a 16.4' (5 meters) safe zone shall be established and identified at both the entry and exit locations; no personnel are permitted to be within this zone unless the drill is locked out and the operator is out of the seat.
- 4.19.2 Machine shall be locked out before entering an excavation, changing tools, adding or removing drill stem or doing any other work on tools or the drill stem at the exit end of the bore.
- 4.19.3 A tracking head shall be installed on the drill stem:
- 4.19.4 Assemble drill head using components appropriate to the soil conditions to be encountered (e.g. nozzle, bit, beacon housing, etc.).
- 4.19.5 Ensure all personnel are clear of the bore entry point (outside of identified work zone).

- 4.19.6 At all times two way communication will be maintained at entrance and exit points using two way radios or equally effective communication means. If at any time communication is lost, all work will be stopped until communication is re-established
- 4.19.7 Locate drill head with tracking device at least every half-length of pipe. Adjust direction as necessary to follow the intended bore path.
- 4.19.8 Any drilling fluid returning to the surface shall be cleaned up promptly.
- 4.19.9 Drill pipe should exit the bore at an angle of 5 to 10° from the ground surface.
- 4.19.10 Turn off fluid flow as soon as drill head emerges.
- 4.19.11 Lockout machine and remove drill head using appropriate breakout tools.
- 4.19.12 Select and attach a reamer that allows the return of drilling fluids and cuttings, to reduce frictional pullback forces, and to allow for bend radius of the pipe. Reamer shall be:
 - The smaller of 1.5 times the outside diameter (O.D.) or 12 inches (300mm) larger than the diameter of the product pipe.
 - A diameter less than 1.5 times the diameter of the product may be necessary in collapsing soil formations.
 - Reamed diameter may need to be increased by up to 25% if substantial swelling of the soil is expected to occur.
- 4.19.13 All personnel shall clear the trench or the designated surface zone (16.4 feet [5 meters]) once the reamer is attached. Operator shall only reverse lockout and commence pullback when communication is received from personnel on exit hole side and operator has confirmed the message.
- 4.19.14 Personnel on exit hole side shall ensure reamer is pulled the entire way back to the exit hole.
 - If rotation is started when drill rod and reamer are away from the exit hole, very fast sideways movement of the rod and reamer can occur.
 - Larger reamers and longer lengths of exposed drill rod increase the speed and distance of this movement.
- 4.19.15 If working with trailing drill stem, swivels shall be verified as lubricated and rotating freely by hand prior to use:
 - A freely moving swivel prevents trailing drill stem or product from rotating / whipping.
 - If the swivel does not move freely by hand it shall be removed from service and repaired or replaced.
 - Only use swivels with limited articulation to prevent whipping or cranking action between the reamer and trailing drill pipe or product.
- 4.19.16 It is important to clean and lubricate the tool and drill stem joint threads before each use.
- 4.19.17 Any individual drill pipes that are bent or damaged shall be immediately taken out of service.
- 4.19.18 Occasionally change the order of the lead drill pipe (i.e. move the lead pipe to the end of the stem, or other pipe rotation procedures) to extend drill stem life.
- 4.19.19 Operator should avoid stalling the pipe rotation to avoid stress damage from shock loading.
- 4.20 Drilling at Potential MEC / UXO Sites
 - 4.20.1 If the project site is suspected of containing munitions and explosives of concern (MEC) or unexploded ordnance (UXO), the UXO team will conduct a reconnaissance and MEC / UXO avoidance to provide clear access routes to each site before drilling crews enter the area. The following procedures will be implemented:

- Drilling operations on an MEC / UXO site will not be conducted until a complete plan for the site is prepared and approved by the AECOM UXO Safety Officer. MEC / UXO avoidance shall be conducted during drilling operations on known or suspect MEC / UXO sites.
- The UXO team will identify and distinctly mark the boundaries of a clear approach path for the drilling crews, vehicles, and equipment to enter the site. This path will be, at a minimum, twice the width of the widest vehicle. No personnel will be allowed outside any marked boundary.
- If MEC / UXO is encountered on the ground surface, the UXO team will clearly mark the area where it is found, report it to the proper authorities, and divert the approach path around it.
- The UXO team will conduct an access survey using the appropriate geophysical instrument over the approach path for avoidance of MEC / UXO that may be in the subsurface. If a magnetic anomaly is encountered, it will be assumed to be MEC / UXO, and the approach path will be diverted around the anomaly. UXO personnel only will operate the appropriate geophysical instrument and identify MEC / UXO.
- An incremental geophysical survey of the drill-hole location(s) will be initially accomplished by the UXO team using a hand auger to install a pilot hole. If MEC / UXO is encountered or an anomaly cannot be positively identified as inert material, Hazardous, Toxic, and Radioactive Waste (HTRW) sampling personnel will select a new drill-hole location.
- Once the surface of a drilling site has been cleared and a pilot hole established as described above, the drilling contractor will be notified that the site is available for subsurface drilling.

4.21 Movement and Transport of Drilling, Boring or Direct-Push Equipment

- 4.21.1 Personnel transporting equipment shall be properly licensed and shall operate the vehicle according to Federal / State / Provincial / Territorial, and local regulations. Refer to *S3AM-005-PR1 Driving* and *S3AM-320-PR1 Commercial Motor Vehicles*.
- 4.21.2 Confirm the traveling height (overhead clearance), width, length and weight of the equipment with the carrier. Identify highway and bridge load, width and overhead limits, to confirm these limits are not exceeded and with adequate margin.
- 4.21.3 Allow for overhang of any drilling, boring or direct-push equipment when cornering or approaching other vehicles or structures.
- 4.21.4 Be aware that the canopies of service stations and motels are often too low for equipment loaded on a trailer to clear
- 4.21.5 Watch for low hanging electrical lines, particularly at the entrances to drilling sites or restaurants, motels, other commercial sites.
- 4.21.6 Never travel on a street, road, or highway with any part of the drilling, boring or direct-push equipment in a raised or partially raised position.
- 4.21.7 Remove all ignition keys if rig is left unattended unless client requirements specify that the keys remain in the ignition switch at all times.
- 4.21.8 Before moving a rig on location, the operator shall do the following:
 - To the extent practical, walk the planned route of travel and inspect it for depressions, gullies, ruts, and other obstacles.
 - Check the brakes of the truck / carrier, especially if the terrain along the route of travel is rough or sloped.
 - Discharge all passengers before moving on rough or steep terrain.
- 4.21.9 Engage the front axle (on 4x4, 6x6, etc., vehicles) before traversing rough or steep terrain
- 4.21.10 Driving drill rigs along the sides of hills or embankments should be avoided; however, if side-hill travel becomes necessary, the operator shall conservatively evaluate the ability of the rig to remain upright while on the hill or embankment. The possibility shall be considered that the presence of

drilling tools on the rig may reduce the ability of the rig to remain upright (raises the center of mass of the rig).

- 4.21.11 Logs, ditches, road curbs, and other long and horizontal obstacles should be approached and driven over squarely, not at an angle.
- 4.21.12 When close lateral or overhead clearance is encountered, or when backing up, the driver of the rig shall be guided by another person on the ground.
- 4.21.13 Loads on the drill rig and truck shall be properly stored while the truck is moving, and the mast shall be in the fully lowered position.
- 4.22 Loading and Unloading
 - 4.22.1 Consult applicable manufacturer's recommendations for loading and unloading of the equipment.
 - 4.22.2 Use ramps of adequate design that are solid and substantial enough to bear the weight of the rig with carrier, including tools.
 - 4.22.3 Load and unload on level ground.
 - 4.22.4 Use the assistance of someone on the ground as a guide.
 - 4.22.5 Check the brakes on the rig carrier before approaching loading ramps.
 - 4.22.6 Distribute the weight of the rig, carrier, and tools on the trailer so that the center of weight is approximately on the centerline of the trailer and so that some of the trailer load is transferred to the height of the pulling vehicle. Refer to the trailer manufacturer's weight distribution recommendations.
 - 4.22.7 The rig and tools should be secured to the hauling vehicle with ties, chains, and / or load binders of adequate capacity.

5.0 Records

- 5.1 All employee training files shall be maintained in accordance with *S3AM-003PR1 SH&E Training*.
- 5.2 Completed inspections and maintenance inventories shall be maintained the site or project files.

6.0 Attachments

- 6.1 [S3AM-321-ATT1 Core Drilling Machine](#)
- 6.2 [S3AM-321-ATT2 Pre-Drilling, Boring, & Direct-Push Probing Flow Chart](#)
- 6.3 [S3AM-321-FM1 Daily Drilling, Boring & Direct-Push Equipment Inspection](#)
- 6.4 [S3AM-321-FM2 Drilling, Boring & Direct-Push Equipment Maintenance Inventory](#)

Americas

Core Drilling Machine

S3AM-321-ATT1

1.0 Objective / Overview

- 1.1 Core drilling machines are used on all types of jobs. They can be electrical or gas powered and come with a stand or can be hand held. Caution should be used when operating such a machine. It may look harmless and easy to run, but drilling machines have many hazards.
- 1.2 Prior to coring activities the location should be checked for buried utilities in accordance with S3AM-331-PR1 *Underground Utilities*.

2.0 Safe Operating Guidelines

- 2.1 Clean the flanges before mounting the blade.
- 2.2 Make sure the blade is correct for the material being cut and that the arrow on the blade corresponds with the direction of rotation of the machine spindle.
- 2.3 Use built-in vacuum or bolt-down anchors depending on the type of surface to be cored. Do not bypass anchoring system.
- 2.4 Properly manage power cable for electric units to prevent slips, trips or falls by the operator or those nearby.
- 2.5 Avoid tilting the blade when cutting.
- 2.6 Use only the machines that have an approved safety guard.
- 2.7 Remove the diamond blade from the machine during transit to prevent accidental damage.
- 2.8 Inspect the blades frequently to detect cracks or undercutting of the steel center.
- 2.9 Do not let excessive heat be generated at the cutting edge of the blade.
- 2.10 Use adequate water supply to both sides of the blade.
- 2.11 Follow the manufacturers recommended pulley sizes and operating speeds for specific blade diameters.
- 2.12 Make sure to tighten drive belts to ensure full available power.
- 2.13 Don't force the blade on the blade shaft or mount blade on an undersized spindle.

3.0 Potential Hazards

- 3.1 Utilities
- 3.2 Electricity
- 3.3 Flying debris
- 3.4 Noise exposure
- 3.5 Inadequate housekeeping
- 3.6 Fumes or dust
- 3.7 Pinch points
- 3.8 Binding/biting – torque control

**4.0 Training Requirements**

- 4.1 Review of applicable SOPs (e.g., S3AM-305-PR1 *Hand & Power Tools*; S3AM-302-PR1 *Electrical Safety*).

- 4.2 Demonstrated knowledge on the use of a coring machine.
- 4.3 Review and follow manufacturers' operating guidelines.

5.0 Personal Protective Equipment (Level D PPE)

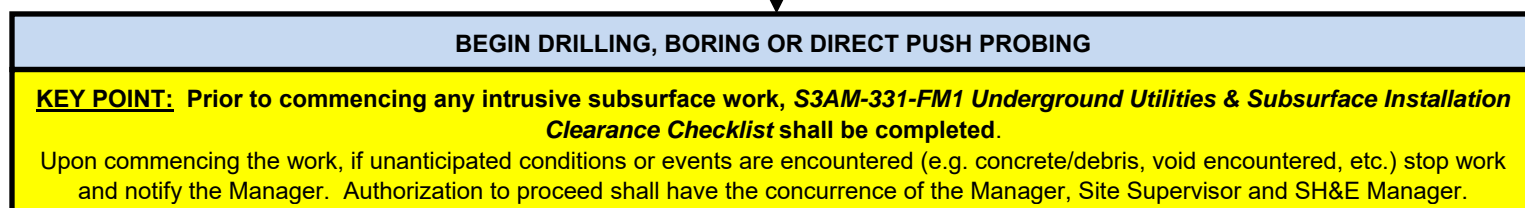
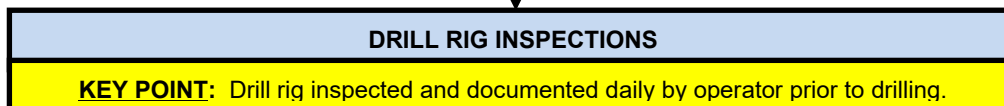
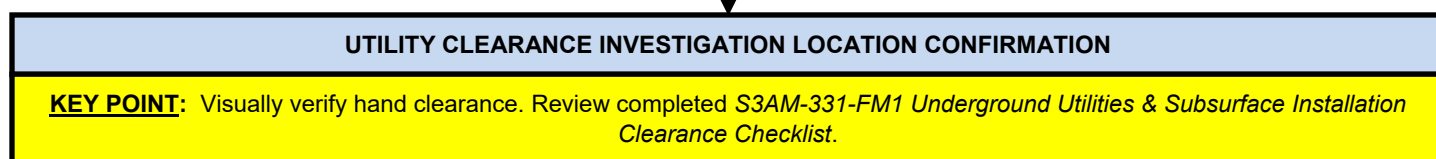
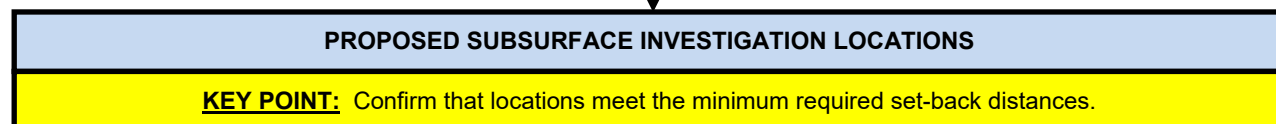
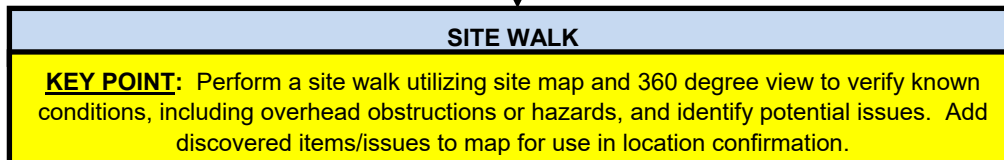
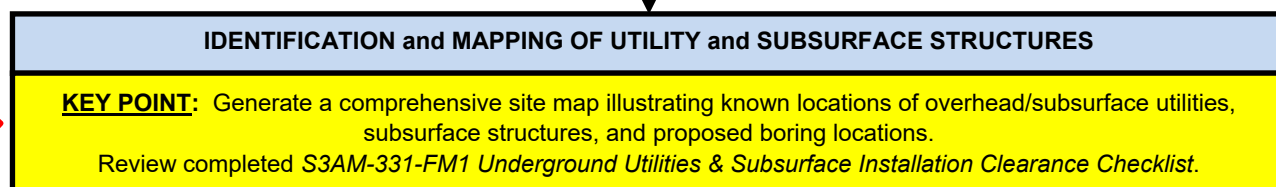
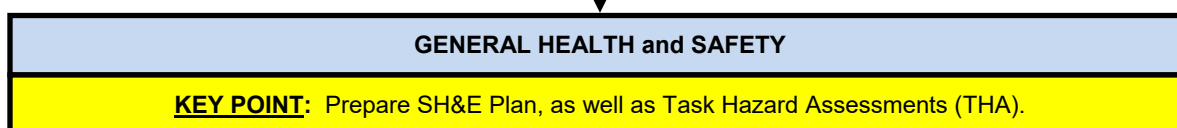
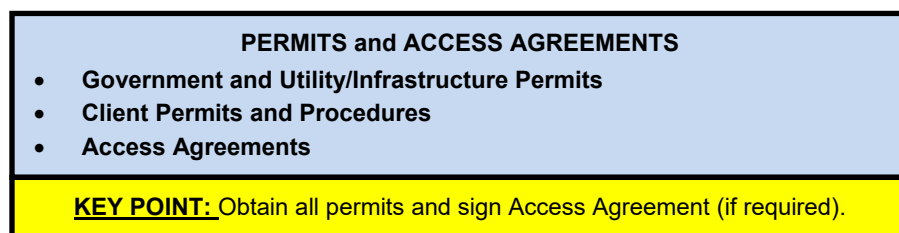
- 5.1 Hard hat
- 5.2 Safety Vest
- 5.3 Leather gloves
- 5.4 Face shield
- 5.5 Steel-toed/composite-toed boots
- 5.6 Hearing protection
- 5.7 Respirator or dust mask (as applicable to the respiratory hazards)

6.0 Other Safety Tips

- 6.1 Keep fingers and hands away from the cutting edge.
- 6.2 Hold handle firmly when operating.
- 6.3 A subsurface utility clearance shall be performed prior to initiating drilling operations.
- 6.4 Stand firmly and apply body weight at anchored side of guarded platform.

Pre-Drilling, Boring & Direct Push Probing Flow Chart

S3AM-321-ATT2

Before Any Drilling, Boring and Direct Push Probing Activities

Americas

Daily Drilling, Boring & Direct-Push Equipment Inspection

S3AM-321-FM1

Site / Project Name _____ Rig Inspector (Name/Company) _____

RIG INFORMATION:

Rig Type	Rotary/Auger Drilling Rig <input type="checkbox"/>	Direct Push Type (DPT) <input type="checkbox"/>
Owner	_____	VIN# _____
Year/Make	_____	Mileage _____
Model	_____	Drill Hrs _____

INSTRUCTIONS: Each shift shall inspect all applicable items. If an unsatisfactory condition (fail) is observed, suspend operation of the equipment and report the condition to the site supervisor immediately.

Emergency Equipment / Devices / Switches	
Kill switches are located and accessible to workers on both sides of the rotating stem. NOTE: Location and number of switches depend on the rig manufacturer; please refer to owner's manual (DPT typically has one switch on control panel).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Kill switches installed by the manufacturer, alarms and other devices (e.g. positive air shut-off valve) tested and in operable condition. All workers familiar with location and operation of devices. NEVER BYPASS, DISABLE, OR REMOVE KILL DEVICES.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
First aid kit adequate and on equipment / readily available.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Absorbent materials on equipment / readily available (spill response).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
A fire extinguisher of appropriate size is located on drill rig and readily available/accessible for drilling crew (recommended 20 lbs.).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Protective Guards	
Drive shafts, belts, chain drives, and universal joints are guarded to prevent accidental insertion of hands, fingers, or tools.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Cables	
Cables on drill rig free of kinks, frayed wires, birdcages, flat spots, grease, and worn or missing sections.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Cables are terminated at the working end with a proper eye splice; either swaged, coupled, or using cable clamps.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Cable clamps are installed with the saddle on the live or load side. Clamps are not alternated and are of the correct size and number for the cable size.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Wire ropes are not allowed to bend around sharp edges without cushion material.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Pulleys and Cable Winches	
Pulleys are not bent, cracked, or broken.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Pulleys operate smoothly and freely, without resistance.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Motor is mounted in correct location and tightly secured to drill rig.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Winch capable of being placed in the free spool (unwind smoothly) and locked position correctly, demonstrating that the cable is suitable for lifting during drilling operations.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Safety Latches	
Hooks installed on hoist cables are the safety type with a functional latch to prevent accidental separation.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Safety latches are functional and completely span the entire throat of the hook and have positive action to close the throat except when manually displaced for connecting or disconnecting a load.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Flights / Augers / Reamers	
Flights / Augers / Reamers are not bent, cracked, or broken. NOTE: Flights / Augers / Reamers failing inspection must be removed from jobsite.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A

Flights are blunt to prevent the risks of cuts.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Auger keys are not bent, cracked/fractured, excessively worn, or otherwise damaged.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Auger bolt holes and threads are not damaged.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Inspect flights/augers for metal burns. NOTE: Burrs must be filed to flat surface.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Augers / Reamers lying flat on the ground (avoid stacking).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Augers / Reamers over 50lbs (22.7kg) moved mechanically. (Avoid manual lifting).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Drill String	
Appropriate break out tool(s) available.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Rod box and power vice operating smoothly and freely.	
Drill string are not bent and do not have any cracks/fractures.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Drill string connections (e.g. pins, threads, couplers) are of the proper type, are not bent, have no cracks/fractures, and are not excessively worn.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Swivel connectors (for trailing horizontal drill stem) lubricated and freely rotating.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Mast	
Mast is free of bends, cracks, or broken sections.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
All mounting hardware (pins, bolts, etc.) in place.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
No moving of drill rig or maintenance/repairs while mast is in vertical position.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Hammering Device	
Hammer free of cracks, fatigue, or other signs of excessive wear.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Hammer connections are secure.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Leveling Devices	
Outriggers move in/out and up/down smoothly and freely while using controls on drill rig, with no hydraulics leaks.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Outriggers are extended prior to and whenever the mast is raised off its cradle. Outriggers must maintain pressure to continuously support and stabilize the drill rig (even while unattended).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Outriggers are properly supported on the ground surface to prevent setting into the soil (use of outrigger support pads).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Controls	
Controls are intact, properly labeled, have freedom of movement, and have no loose wiring or connections.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Controls are not blocked or locked into an operating position.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Installed lights, signals, gauges, and alarms operate properly.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Lifting Devices	
Slings, chokers, and lifting devices (straps, not chains) inspected before using and are in proper working order. NOTE: Damaged units are labeled and removed from jobsite.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Shackles/Clevises are in proper working order with pins/screws in place that is to be used while lifting.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Cables and lifting devices are not operated erratically or with a jerking action to overcome resistance.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Hydraulic System	
Hydraulic lines are secure, in good condition with no signs of excessive wear, and not leaking. NOTE: Check while pressurized.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Hydraulic lines are not in a bent or pinched position causing additional fluid restrictions/pressures.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Hydraulic oil reservoir has appropriate amount of oil and not leaking.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Documentation available to confirm that pressure relief valve was checked during shop maintenance activity and noted on maintenance log.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Pump Lines (water, grout, etc)	
Suction/Discharge hoses, pipes, valves, and fittings are secured and not leaking.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
High pressure hoses have a safety chain, cable, or strap at each end to prevent whipping in the event of a failure.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A

Ladders	
Drill rig has a permanently attached or proper portable ladder to be used for access to drilling platform.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Ladders and platforms not to be used for tool storage- keep ladders and operator platforms clear during drilling.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Tires / Tracks	
Tires / Tracks on rig are not excessively worn and free of any debris or foreign material.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
General	
General condition – exterior (no structural damage, no loose bolts, platform tidy, etc.)	
General condition – interior (cab clean, tidy)	
Drill rig meets regulations for transport on state/federal highways (inspection sticker, license plate, etc.).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Rig is of appropriate size to meet job requirements.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Maintenance log available for previous 3 months to confirm proper maintenance/inspection.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Exhaust	
Exhaust system is free from defect and routes engine exhaust away from drill rig workers.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Fuels	
Fuel stored in an approved and properly labeled container.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Fuel transfer lines free from signs of excessive wear and not leaking.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Refueling and transferring of fuel is performed in an approved area with sufficient containment to prevent spillage.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Exclusion/Work Zones	
The exclusion/work zone is centered over the borehole (and if applicable, bore exit point) and the radius equal to or greater than the height of the mast (measured from ground level).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
The exclusion/work zone is clear of tripping hazards or the hazards are documented with appropriate controls on the Task Hazard Assessment.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
The exclusion/work zone communicated to concurrent/adjacent operations to prevent overlap of work zones or line of fire.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Subsurface Utilities / Installations and Overhead Obstructions	
Subsurface utilities / installations have been confirmed as identified and cleared through site observation and review of the completed <i>S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist</i> .	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Except where electrical distribution and transmission lines have been de-energized and visibly grounded, drill rigs will be operated proximate to under, by, or near power lines in accordance with the Minimum Approach Distance (MAD).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Rig Repairs	
Repairs, when possible, are conducted offsite to reduce the risk of any onsite incidents.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Specialized PPE	
When working at elevated heights, workers are to wear a fall restraining device attached in a manner to restrict falls to less than six feet (1.83 meters).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
When working in wet/slippery conditions, all workers have a lug-type sole or similar slip resistant sole, on their safety footwear to prevent slipping.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A

Comments:

Signature of Inspector: _____ Date: _____

Americas

Drilling, Boring & Direct-Push Equipment Maintenance Inventory

S3AM-321-FM2

EQUIPMENT (MAKE, MODEL, SERIAL #)	EQUIPMENT OWNER	EQUIPMENT STATUS (<i>On Hire, Active, Decommissioned</i>)	FREQUENCY OF SERVICE	SERVICE TYPE	MANUFACTURER'S STANDARDS	INDUSTRY STANDARDS	LEGISLATED REQUIREMENTS	LOCATION OF EQUIPMENT

Overhead Lines & Obstructions

S3AM-322-PR1

1.0 Purpose and Scope

- 1.1 Provides the safe work requirements to be observed where overhead obstructions (e.g., cable trays, pipe racks, etc.), overhead utilities, or other lines are present at a work location, including, but not limited to electric power lines, electrical apparatus, or any energized (exposed or insulated) parts, communication wires, or any other overhead wire or cable.
- 1.2 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.

2.0 Terms and Definitions

- 2.1 **Arc Flash Hazard** – A dangerous condition associated with the possible release of energy caused by and electric arc. Arc flash is the light and heat produced from an electric arc supplied with sufficient electrical energy to cause substantial damage, harm, fire, or injury.
- 2.2 **Electrical Hazard** – A dangerous condition such that contact or equipment failure can result in electric shock, arc flash burn, thermal burn, or blast.
- 2.3 **Minimum Approach Distance (MAD)** – The MAD is the closest distance any employee or any part of the operating equipment is permitted to approach an energized or a grounded object.
- 2.4 **Qualified Person (Electrical Transmission and Distribution)** – A person trained and knowledgeable in the construction and operation of electrical transmission and distribution equipment or a specific work method, and has been trained to recognize and avoid electrical hazards that might be present with respect to that equipment or work method.
- 2.5 **Types of Overhead Lines / Obstructions (examples):**
 - Overhead electric power lines
 - Structural cable supports
 - Guy wires
 - Cable television / communication lines
 - Cable Trays
 - Pipe Racks
 - Low Clearance Overpasses

3.0 References

- 3.1 S3AM-004 PR1 Incident Reporting, Notifications & Investigation
- 3.2 S3AM-010-PR1 Emergency Response Planning
- 3.3 S3AM-209-PR1 Risk Assessment & Management
- 3.4 S3AM-302-PR1 Electrical Safety
- 3.5 S3AM-303-PR1 Excavation

4.0 Procedure

4.1 Roles & Responsibilities

4.1.1 Manager

- Identify conditions where overhead electric power lines and other overhead obstructions may be present and outline what is required in the SH&E Plan and Task Hazard Assessments. Refer to the *S3AM-209-PR1 Risk Assessment & Management*.
- Confirm electrical and communication lines, and as appropriate other overhead obstructions, are identified on all site and project drawings.
- Coordinate and communicate with overhead electrical line owner or operator to identify and implement appropriate control measures.
 - Provide adequate advance notification to the Overhead Electrical Line Owner / Operator to allow for insulation or isolation and grounding of the line(s) if required.
 - Confirm the Overhead Electrical Line Owner / Operator(s) are fully informed as to when the operations are to begin, end and when any location changes are planned if applicable.
- Confirm Employees are trained as required for the scope of work and associated hazards.
- Coordinate and communicate with subcontractors or employees working around overhead electric power lines and as applicable, other overhead obstructions.
- Confirm the *S3AM-322-FM1 Overhead Electric power lines Acknowledgement* is completed by concurrent operations working around overhead electric power lines on the worksite.

4.1.2 Safety Health & Environment (SH&E) Manager

- Assist and support the Manager in planning and responding to concerns regarding the exposure to overhead electric power lines.

4.1.3 Employees

- Maintain current training required for the scope of work and associated hazards.
- Inform the Manager of location conditions that may expose risks to overhead electric power lines.
- Comply with established minimum approach distances.

4.2 Training

4.2.1 The Manager shall confirm all Employees are oriented to the SH&E Plan and Task Hazard Assessment (THA) process, in accordance with *S3AM-209-PR1 Risk Assessment & Management*.

4.2.2 Confirm training requirements were met prior to work starting.

-
- Employee orientation shall include the Location Specific Emergency Response Plan.
- Proof of training and orientation shall be documented and retained in the project files.

4.2.3 Managers shall confirm that each Employee has received training required for the scope of work and associated hazards in accordance with *S3AM-003-PR1 SH&E Training*.

4.2.4 Additional training requirements may include, but are not limited to:

- The limitations of an insulating link / device, proximity alarm, and range control (and similar) device, if used.

- Grounding and bonding procedures.
- Client specific requirements

4.3 General Requirements

- 4.3.1 The AECOM Manager or supervisor and employees shall perform a walk-thru of the work site and / or review of the work area / travel route to identify the overhead electric power lines and any other overhead obstructions that could be impacted by the work. Consider high profile equipment, equipment in transport, swing radius of equipment, potential for shifting loads, etc. AECOM personnel may be accompanied by other applicable personnel (e.g. client representatives, contractors operating concurrently, etc.).
- 4.3.2 The location or project specific SH&E Plan shall identify all overhead line hazards and provide suitable methods of elimination or control. All involved or affected workers shall review the SH&E Plan to confirm proper communication of the overhead line hazards and awareness of the control measures associated with their work.
- 4.3.3 Assess applicable factors such as, but not limited to:
 - Scope of work (e.g. hoisting materials, excavation, grubbing, etc.).
 - Transportation route.
 - Hoisting, excavating, or other equipment to be operated.
 - Height, placement, and reach of equipment.
 - Equipment or material loading / unloading.
 - Location(s) of electric power lines, communication lines, guy wires, etc.
 - Worker training and experience.
 - Soil or ground condition and environmental conditions.
 - Interruptions to electrical services.
 - Hazard to public.
 - Use of ladders.
 - Pipe and other conducting materials.
 - Notification of electric utility owner.
 - Changing conditions.
 - Communication of all hazards to all workers including contractors, sub-contractors, and concurrent operations.
- 4.3.4 Task Hazards Assessments (THAs) shall be completed to record the hazards and control measures specific to the task, including those related to overhead line and obstructions hazards, prior to undertaking assigned tasks. THAs shall be reviewed and signed by all workers involved in the specific task.
- 4.3.5 Should adverse weather conditions cause the work associated with overhead lines to be unsafe, the activities shall be discontinued.
- 4.3.6 Managers or designated employees shall formally notify all concurrent operations, or any others who may not have had reason to review and sign the related SH&E Plan or THAs, of work that is to be done in the vicinity of overhead lines at distances less than 50 feet (15.25 meters), and for non-electrical obstructions, at distances less than 10 feet (3.05 meters) if appropriate to the obstruction's potential hazards, and obtain the operator's assistance in protecting workers involved.

- Formal notification may be accomplished through a review of the SH&E Plan or THAs by the concurrent operator and associated personnel, as evidenced by signing the respective document's acknowledgement.
 - Alternately, the concurrent operations may acknowledge having reviewed AECOM's procedures with a separate acknowledgment form. *S3AM-322-FM1 Overhead Electric Power Lines Acknowledgement Form* or equivalent may be used.
 - Prior to equipment operation within 10 feet (3.05 meters) of non-electrical obstructions, as appropriate to potential hazards associated with the obstruction, the Owner/Operator should be contacted to obtain specific details regarding the obstruction such as piping or tray contents,
- 4.3.7 Overhead lines are presumed to be energized unless the Overhead Electrical Line Owner / Operator confirms that the overhead line has been, and continues to be de-energized and visibly grounded at the worksite.
- 4.3.8 Overhead lines are presumed to be uninsulated unless the Overhead Electrical Line Owner / Operator or a registered Professional Engineer who is a Qualified Person with respect to electrical power transmission and distribution confirms that a line is insulated.
- 4.3.9 Confirm accurate measurement of load heights, maximum equipment radius and height or reach of any other equipment that could potentially encroach on the safe limit of approach for the overhead electrical line, guy wires, or other applicable overhead obstructions.
- The height of all applicable overhead lines and obstructions that pose contact or encroachment potential shall be determined prior to work commencing.
 - The height of electric power lines may only be determined by the client, utility company professional, or by using an approved electronic measuring device.
 - Awareness shall be maintained for any elements that could affect clearance (e.g. snow pack, ice or snow weighing down lines, excessive heat causing sag, etc.).
 - Caution shall be exercised when working or travelling near overhead lines having long spans, since they tend to be more prone to lateral swing in response to the wind and can present a contact hazard.
 - All low hanging communication lines in close proximity to energized lines shall be clearly identified as *Encroaching on Energized Lines*.
- 4.3.10 Managers shall contact the overhead owner/operator (i.e. local utility company) if work is to be done or before equipment is operated within 50 feet (15.25 meters) of an energized overhead line, to determine the voltage of the overhead line and establish the appropriate MAD.
- All inquiries regarding electric utilities shall be made in writing and a written confirmation of the outage / isolation shall be received by the appropriate AECOM Manager prior to the start of the task that may impact the utility.
- 4.3.11 Until the voltage of the overhead electrical line is known and the MAD established, an exclusion zone shall be created at ground level beneath and 50 feet (15 meters) perpendicular to the overhead electric power lines on each side.
- The exclusion zone shall be demarcated with visual indicators (e.g., signage, flagging, paint, cones). No equipment shall enter the exclusion zone without approval from AECOM management.
 - Unqualified employees shall maintain a safe clearance distance in accordance with the established MAD when working in an elevated position near energized overhead lines. For additional information associated with Qualified Employees refer to *S3AM-302-PR1 Electrical Safety*.

- 4.3.12 The Minimum Approach Distance (MAD) as it relates to Voltage varies from jurisdiction to jurisdiction. The MAD or the regulatory minimum distance requirements, whichever is more stringent, shall be maintained. The below chart shows the Phase-to-Phase voltage rating voltages in kilovolts and the MADs applicable to all AECOM operations:

Minimum Approach Distances (MAD)

Voltage Range (Kilovolts) (Phase-to-Phase)	Minimum Approach Distance (MAD) in Feet (Meters)
Personnel shall allow for equipment movement and electrical line swaying when establishing a M.A.D.	
0 – 50 KV	10 (3)
Over 50 – 200 KV	15 (5)
Over 200 – 350 KV	20 (6)
Over 350 – 500 KV	25 (8)
Over 500 – 750 KV	35 (11)
Over 750 – 1,000 KV	45 (14)
Note: This requirement shall apply except where client, local, or governmental regulations are more stringent.	

Source: American National Standards Institute, Publication B30.5.

- 4.3.13 An appropriate distance shall be kept between equipment, its occupants, their tools and energized overhead lines, electrical apparatus, or any energized parts.
- 4.3.14 These minimum approach distances do not apply to a load, equipment, or building that is transported under energized overhead power lines if the total height, including equipment transporting it, is less than 13.5 feet (4.15 meters).
- If the travelling equipment, including load, is over 4.15m (13.62ft) a transportation permit shall be acquired from the appropriate jurisdiction to travel on any public road or highway.
 - Consult local jurisdiction as some US states may use heights of up to 4.45m (14.6ft).
 - Notification of appropriate utility companies may be required in conjunction with the transportation permit. Jurisdictional requirements shall be verified prior to transport.
 - Route shall be checked for clearance of overhead electrical and communication lines prior to transport.
 - A designated signaler will be utilized when the height of the equipment, buildings, tractor / trailers or any other transport equipment travelling under an overhead electrical line is greater than 4.15m (13.62ft).
- 4.3.15 Employees shall not place earth or other material under or beside an electrical overhead line if doing so reduces the safe clearance to less than 50 feet (15.25 meters) or, if appropriate to potential hazards associated with other types of overhead obstruction, less than 10 feet (3.05 meters). To maintain a safe distance:
- Install warning devices and signs (hang a sign from and mark all guy wires to warn traffic of low clearance; provide warning signage for all overhead services).
 - Install telescopic, nonconductive posts and flagging across right-of-way at the minimum allowable clearance as allowed by regulations for the line voltage.
 - Position signs or other devices to determine the "Danger Zone".

- Inform all job site personnel of the danger zone and the safe distances required.
 - Beware of atmospheric conditions, such as temperature, humidity, and wind that may dictate more stringent safety procedures.
- 4.3.16 If employees are to climb or perform work on poles or towers, the structures shall be confirmed as capable of withstanding the weight and activity without failure.
- 4.3.17 If holes are dug for poles or foundations for structures, appropriate measures shall be taken to prevent inadvertent entry by personnel or equipment. Refer to *S3AM-303-PR1 Excavation*.
- 4.3.18 Operation of heavy equipment and cranes in areas with overhead lines represents a significant arc flash and electrical hazard to all personnel on the job site.
- Accidental contact with an energized overhead line or arcing between a high power line and grounded equipment, can cause harm to nearby equipment operators or ground personnel and damage to power transmission systems and / or operating equipment.
 - Equipment will be repositioned and blocked so that no part, including cables, can come within the established minimum clearances.
- 4.3.19 Gravel trucks, cranes, boom trucks, etc. shall retract, stow and lower boxes, outriggers, booms, etc. to the travel position prior to entering municipal and client owned roads (e.g. leaving plant sites, work over rig sites, battery sites, and storage yards) and any time travel may put the equipment within the MAD of an electrical line.
- 4.3.20 When a signal person is required, the individual shall wear reflective striping (coveralls or vest) and carry an air horn or other appropriate means of emergency communication.
- 4.3.21 The signal person shall be aware of the potential electrical line hazards, be verified as competent by their supervisor and not have any other duties while acting as the signal person.
- 4.3.22 The signal person shall remain outside the MAD and in a position that allows for monitoring of equipment or loads to prevent encroachment on the MAD.
- 4.3.23 Signs, pylons, high visibility tape and / or signalers shall not be removed until the last piece of AECOM equipment has traveled under the overhead electrical line.
- 4.4 Minimum Approach Distance (MAD) Reduction
- 4.4.1 Where any work task will not allow the MAD to be maintained, an alternate means of protection shall be implemented by the Manager and approved by the SH&E Manager. In order of preference, acceptable procedures are:
- De-energize the overhead line(s) / lockout by local utility authorities; or
 - Implement alternative procedures as identified by the Overhead Electrical Line Owner / Operator or a registered professional engineer.
- 4.4.2 De-energize Overhead Lines
- Elimination of electrical power provides the most acceptable means of ensuring safety of personnel. While temporary site overhead lines are often under the control of the site manager (and can be de-energized locally), electrical distribution and transmission lines can be de-energized only by the Overhead Electrical Line Owner / Operator. De-energizing of an overhead line often requires advance coordination with the Overhead Electrical Line Owner / Operator. At least one week advance notice should be provided.
 - Managers shall confirm with the utility Overhead Electrical Line Owner / Operator that the overhead line has been de-energized and visibly grounded at the job site.
- 4.4.3 Alternative Procedures

- Managers may implement alternative procedures to prevent arc flash and electrical contact. These procedures shall be identified by the Overhead Electrical Line Owner / Operator or a registered Professional Engineer who is a Qualified Person with respect to electrical power transmission and distribution.
- A planning meeting with the Manager, SH&E Manager and the Overhead Electrical Line Owner / Operator (or registered Professional Engineer) shall be held to determine the most effective alternative procedures.
- Alternative procedures shall meet all client, local and governmental regulatory requirements.
- The work will be conducted by qualified and competent individuals, following the alternative written safe work procedures. All others are restricted from entering the MAD.
- Insulating Barriers shall be rated for the voltage line being guarded. These barriers may not be part of or attached to the equipment. The MAD shall only be reduced within the designed working dimensions of the insulating barrier. This determination shall be made by a Qualified Person in accordance with local or governmental requirements for work practices near energized equipment.
- Consult *S3AM-302-PR1 Electrical Safety* procedures to properly ground equipment and for limitations of grounding.
- Dedicated Line Spotters shall be trained to enable them to effectively perform their task, including training on the applicable local and governmental regulations.
- No work that encroaches on an energized power line will be completed outside of daylight hours.

4.5 Additional Safety Measures.

- 4.5.1 When equipment shall repeatedly travel beneath electric power lines, a route shall be plainly marked and “rider poles” of non-conductive material shall be erected on each side to confirm equipment structures are lowered into a safe position.
- 20" X 28" (50.8cm X 71.12cm) Danger Overhead Power Lines signs, which are highly visible, shall be erected at a height of 1.8 meters (6ft) on each side of the electrical line. A combination of pylons and high visibility tape shall be placed underneath the electrical line.
 - These signs shall be in plain view of equipment traveling in either direction, but no closer than the MAD.
 - If physical guards (i.e. goal posts, rider poles) are used, the guards shall be of non-conductive material and consist of a pole on each side of the approach connected by a rope.
 - The poles will be placed at the MAD from and on each side of the electrical line. The ropes will be set at a height, which will maintain the MAD from the electrical line.
- 4.5.2 Watch for uneven ground that may cause vehicles and equipment to weave, bob, or bounce.
- 4.5.3 The following additional safety measures shall be implemented as needed when working around energized power lines:
- Provide equipment with proximity warning devices. These provide an audible alarm if any part of the equipment gets too close to a line.
 - Install ground safety stops. These prevent vehicles from accidentally entering hazardous areas.
 - Equip cranes with a boom-cage guard. This prevents the boom from becoming energized if an electrical line is contacted.

- Utilize insulated links and polypropylene tag lines. These prevent the transmission of electricity to loads or tag line handlers if an electrical line is contacted.

NOTE: These additional safeguards are intended as supplemental protection. Use of these measures is not permissible as a substitute for maintaining the safe working distance or implementation of the procedures outlined in this document.

4.6 Emergency Planning

4.6.1 Managers shall complete a location specific emergency response plan as part of their location or project specific SH&E Plan for all operations during which equipment is operated within 50 feet (15.25 meters) of an energized overhead electrical line or conductor. Refer to *S3AM-010-PR1 Emergency Response Planning*. This plan shall identify the following information:

- The importance to the operator's safety of remaining inside the cab except where there is an imminent danger of fire, explosion, or other emergency that necessitates leaving the cab.
- The safest means of evacuating from equipment that may be energized.
- The potentially energized zone around the equipment.
- The need for crew in the area to avoid approaching or touching the equipment and the load.
- The means to de-energize the electrical line or live conductor.
- The contact information for the utility Overhead Electrical Line Owner / Operator and emergency services.

4.6.2 In the event of an incident, the Employee shall report it in accordance with *S3AM-004 PR1 Incident Reporting, Notifications & Investigation*.

4.6.3 All damaged utilities shall be repaired by a qualified and / or licensed professional.

5.0 Records

5.1 Retain the Overhead Electric power lines Acknowledgement forms and any document related to requests of and confirmation from the Overhead Electrical Line Owner / Operator in the project files. Documentation of employee training completed shall be retained in accordance with *S3AM-003-PR1 SH&E Training*.

6.0 Attachments

6.1 [S3AM-322-FM1 Overhead Electric Power Lines Acknowledgement Form](#)

Americas

Overhead Electrical Lines Acknowledgment

S3AM-322-FM1

Company Information		
Name of Employer or Contracting Operation:		
Address:		
City:	Province:	Postal Code:
Telephone:	Fax:	
Project / Location Name:		
AECOM Contact Name:		
Acknowledgement		
<p>I acknowledge that I have received a copy of <i>S3AM-322-PR1 Overhead Lines</i> and any other AECOM documentation related to the overhead electrical lines.</p> <p>List any additional documentation received:</p> <p>I understand that this worksite may have Overhead Electrical Hazards, and I have discussed the received documentation with all of our company staff who will be on this site.</p>		
Name & Title (Print)	Signature	Date

Underground Utilities

S3AM-331-PR1

1.0 Purpose and Scope

- 1.1 Provides procedures designed to help prevent injuries to personnel working on the location and pedestrians, property damage, and adverse environmental impact as a result of potential hazards associated with encountering underground utilities, subsurface installations, and potential overhead hazards.
- 1.2 Provides the minimum requirements to be followed for underground work (e.g., excavations, drilling, boring, and probing work) to ensure that underground installations, and subsurface structures, are identified properly before work commences.
- 1.3 This procedure applies to all Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.
- 1.4 The Manager is responsible for meeting all the requirements in this procedure.
- 1.5 AECOM's clients may have specific procedures which shall be followed to identify and map utility and subsurface structures on their properties or facilities. Provided the client's procedures meet or exceed those of AECOM, approval shall be obtained from the Manager and the SH&E Manager to follow the client's procedures.

2.0 Terms and Definitions

- 2.1 **Underground Utilities** – All utility systems located beneath grade level, including, but not limited to, gas, electrical, water, compressed air, sewage, signaling and communications, etc.
- 2.2 **Clearance** – includes the following:
 - The positive locating of underground utilities or subsurface installations in or near the work area.
 - A signed statement by an appropriate representative attesting to the location of underground utilities and/or the positive de-energizing (including lockout) and testing of electrical utilities.
- 2.3 **Ground Disturbance (GD)** – Any indentation, interruption, intrusion, excavation, construction, or other activity in the earth's surface as a result of work that results in the penetration of the ground.
- 2.4 **Hand Clearance / Tolerance Zone** – The area on either side of the locate marks of a utility that shall be maintained in order to expose the utility through the use of non-destructive ground disturbance techniques acceptable to the owner of the buried utility and applicable jurisdictional requirements. Visual exposure is required before mechanical excavation equipment may be used.
- 2.5 **Intrusive Activities** – Examples: Excavation of soil borings, installations of monitoring wells, installation of soil gas sampling probes, excavation of test pits/trenches or other man-made cuts, cavity, trench or depression in an earth surface formed by earth removal.
- 2.6 **Non-Destructive Ground Disturbance Technique** – A safe and acceptable excavation method that is used to visually expose an underground utility without causing damage. Non-destructive ground disturbance techniques may include, but are not limited to:
 - Hand digging.
 - Use of non-conductive tools.
 - Hydro-vacuum.
- 2.7 **Subsurface Installation** – Examples: Subterranean tunnels, underground parking garages and other structures beneath the surface.
- 2.8 **Utility Strikes** – Unplanned contact with utilities resulting in damage to the utility or its protective coating.

3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-303-PR1 Excavation
- 3.3 S3AM-321-PR1 Drilling, Boring & Direct-Push Probing

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 Manager

- Administer this procedure and the development of the SH&E Plan.
- Confirm the appropriate equipment and materials are available to conduct the underground utility and/or subsurface installation clearance.
- Confirm all employees involved and affected by the task review the SH&E Plan and Task Hazard Assessment (THA) prior to work commencing
- Authorize work to proceed using the *S3AM-331-FM1 Underground Utility & Subsurface Installation Clearance Checklist*.
- Confirm that employees conducting underground utilities and subsurface clearance processes possess all required training, registrations or certifications.
- Provide authorization (with the concurrence of the Site Supervisor and SH&E Manager) for work to resume if interrupted due to unexpected conditions or events.

4.1.2 Safety, Health & Environment (SH&E) Manager

- Assist AECOM management as needed by providing guidance and clarification as to issues that may arise.
- Review the SH&E Plan to confirm compliance with jurisdictional regulations. Provide technical guidance as needed when a variance is pursued related to this procedure.

4.1.3 Employees

- Maintain training as appropriate to the work to be completed (e.g. ground disturbance, lockout tagout, equipment operation, etc.). Refer to *S3AM-003-PR1 SH&E Training*.
- Review the SH&E Plan and Task Hazard Assessment (THA) prior to work commencing.
- As appropriate to the anticipated or encountered hazards and as addressed in the applicable planning documentation, utilize appropriate personal protective equipment (PPE) and applicable training, practices and operating procedures.
- Immediately notify the Manager of any unanticipated conditions or events. If assigned equipment, perform appropriate inspections and confirmations of maintenance and/or repairs.

4.2 Training

4.2.1 All on-site employees involved with the underground utility and subsurface identification and associated clearance process shall be trained, at a minimum, in these procedures.

4.2.2 Employees shall complete all required training associated with their tasks in accordance with the SH&E Training Matrix and any training assessments developed at the business group.

- Refer to *S3AM-003-PR1 SH&E Training*.
- This training may include, but is not limited to, Excavation / Trenching (Ground Disturbance), HAZWOPER, Petroleum Safety Training (or Construction Safety Training), and H2S Alive as appropriate.

4.2.3 As applicable, employees shall receive client-required training.

4.3 Planning

4.3.1 Health and Safety Plan – At a minimum, a SH&E Plan and task hazard assessments (THAs) shall be prepared prior to any underground utilities and subsurface installations clearance activities.

- The SH&E Plan will address any required environmental monitoring including gas monitoring, dust, noise, metals, radiation or other monitoring as may be appropriate for site conditions.
- Employees shall comply with all SH&E Plan requirements.
- The location specific emergency response plan shall be in place, contain procedures applicable to the potential emergencies presented by the operations, and be reviewed with all personnel potentially affected.

4.3.2 *S3AM-331-ATT2 Underground Utilities & Subsurface Installation Clearance Flow Chart* provides a summary of the key requirements addressed in this procedure.

4.3.3 Underground utilities and subsurface installations shall be investigated as being present, including the following, but not limited to:

- Steam, gas and electric.
- Sewer and water.
- Subterranean tunnels.
- Fibre optics (note: routine geophysical surveys will not identify fibre optic cables).
- Traffic control cables.

4.3.4 Location of underground utilities and subsurface installations will be confirmed by cross-referencing available information:

- Maps, as-built drawings and issued for construction (IFC) drawings.
- Plot plans, permits, crossing/encroachment agreements.
- One-Call information, locator and provided surveys.
- Private utility information, locator and provided surveys (e.g. ground penetrating radar (GPR), electromagnetic, etc.).
- Owner supplied documentation.
- Site walks.

4.3.5 As applicable, emergency shut-off locations of utilities shall be verified before work activities commence.

4.3.6 Jurisdictional, land owner, client and utility owner requirements shall be consulted to determine the minimum search zone dimensions and appropriate clearance distances.

4.3.7 As necessary and if possible, adjust locations of excavations or intrusive subsurface work away from subsurface utilities and installations

4.3.8 Prior to any excavation or intrusive subsurface work, the *S3AM-331-FM1 Underground Utility & Subsurface Installation Clearance Checklist* shall be completed. The form shall be reviewed and signed by the Manager.

- If the answer to any question in Part 1 of the checklist is “No” or “N/A”, no ground disturbance may take place without review by the Manager, in consultation with SH&E Manager, of the circumstances related to the particular item. The Manager shall initial beside each “No” or “N/A” item to indicate review and authorization.

4.4 Permits, Notifications and Access Agreements

- 4.4.1 Any required notifications shall be provided within the appropriate timeframe to the applicable organization (e.g. owner, utility company, agency, governing body, etc.).
- 4.4.2 All applicable permits (e.g. client, government, working near rail road, etc.) will be identified, obtained, and adhered to.
- 4.4.3 All access agreements will be obtained and adhered to.
- 4.5 Locating Underground Utilities and Subsurface Installations
 - 4.5.1 Utilize the appropriate call/click-before-you-dig provider. Refer to *S3AM-331-ATT1 One-Call System*.
 - 4.5.2 Federal/State/Provincial/Territorial and other “One Call” providers shall be contacted at least two working days and no more than ten working days prior to commencing the ground disturbance. Jurisdictional requirements shall be consulted to verify the appropriate advance notice. (e.g. 24 hours, two full working days, three to ten business days, etc.).
 - 4.5.3 If the location of proposed excavation or intrusive subsurface work cannot be clearly and adequately identified, the route and/or area of the proposed ground disturbance shall be identified using white flags, paint or stakes prior to the arrival of the locator. Consult jurisdictional requirements as white-lining may be a mandatory requirement on all ground disturbances.
 - 4.5.4 One Call providers shall appropriately identify and mark the subsurface utilities or installations, or otherwise provide written notification they do not have any facilities near the proposed subsurface/intrusive locations.
 - 4.5.5 Confirm all circuits were on during subsurface checks if the checks were for identifying energized lines (e.g. circuits on timers or light sensing switches).
 - 4.5.6 Areas that have a high density of sub-surface facilities may require a secondary locate by another independent locator to verify locations identified by the first locator.
- 4.6 Private Utility Locating
 - 4.6.1 One Call services may not be available in various non-urban locations. Private utility locating companies shall be utilized to identify and located any underground utilities or subsurface installations.
 - 4.6.2 Be aware urban areas (e.g. city or town) may have subsurface installations (e.g. underground garages) and utilities (e.g. public water, sewer, and gas pipelines) that are not covered by one-call systems.
 - These subsurface installations and utilities require additional investigation and diligence beyond the one-call system.
 - Additional investigation and diligence beyond the one-call system is also recommended for non-urban areas.
 - 4.6.3 In urban areas, private utility locating companies shall be called to identify and locate, through geophysical surveys and other means, the presence of private utilities installed by the property owner (e.g. irrigation systems) and to verify the presence of public utilities on the properties.
 - Hand clearance / tolerance zones shall be observed in urban areas and utilities exposed through the use of non-destructive techniques in accordance with requirements of the applicable jurisdiction and utility owner.
 - 4.6.4 Observance of hand clearance / tolerance zones and utility exposure using non-destructive techniques is also recommended for non-urban areas and may be required by the applicable jurisdiction.

- 4.6.5 Warning tape, pea gravel, sand, non-indigenous material, bentonite, red concrete (indicative of electrical duct banks) and any departure from native soil or backfill may be evidence of the presence of subsurface installations and utilities.

4.7 Surface Markings

- 4.7.1 Once the underground installation has been identified, proper surface markings shall be made in accordance with the guidelines from the One-Call System (refer to S3AM-331-ATT1), guidance contained in this procedure or as contract-specified.
- 4.7.2 Color-coded surface marks (paints or similar coatings) shall be used to indicate the type, location, and route of buried installations. Additionally, to increase visibility, color-coded vertical markers (temporary stakes or flags) shall supplement surface marks.
- 4.7.3 All marks and markers shall indicate the name, initials, or logo of the company that owns or operates the installation and the width of the installation if it is greater than 2 inches.
- 4.7.4 If the surface over the buried installation is to be removed, supplemental offset marking shall be used. Offset markings shall be on a uniform alignment and shall clearly indicate that the actual installation is a specific distance away.
- 4.7.5 Locate marks shall be re-verified as per jurisdictional requirements or no later than 14 days after the previous locate was completed, whichever interval is shorter. These locate time intervals shall be maintained for the duration of the ground disturbance.
- If the work is interrupted during the determined lifespan or work does not commence during the applicable lifespan, a new locate shall be performed.
 - Jurisdictional provisions may allow for an extension to the lifespan of the locate marks, however certain conditions may need to be met. (e.g. activities uninterrupted)
 - If locate marks are moved or destroyed the location of the buried facilities shall be re-established.

4.8 Uniform Color Coding

- 4.8.1 The colors and corresponding installation type are as follows unless otherwise contract-specified:

AMERICAN PUBLIC WORKS ASSOCIATION – APWA
Color Coding for Marking of Buried Facilities

White	Proposed Ground Disturbance Area
Pink	Temporary Survey Markings
Red	Electric Power Lines, Cables, Conduit and Lighting Cables
Yellow	Gas, Oil, Steam, Petroleum Lines or Gaseous Materials
Orange	Conduit, Cable, Communication, Alarm or Signal Lines
Blue	Potable Water
Green	Sewer, Storm Sewer and Drain Lines
Purple	Reclaimed Water, Irrigation and Slurry Lines (non-potable)

Canadian Association of Geophysical Contractors



4.9 Identification and Mapping of Utility and Subsurface Structures

- 4.9.1 The locations of subsurface utilities and subsurface installations shall be investigated, documented, and shown on a site plan (a scaled site plan shall be used when feasible). Refer to *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist*.
- 4.9.2 Documentation of utility and subsurface installation identification (calling one call, responses from utilities) along with the scaled site plan shall be available on the worksite at all times of intrusive activities.

4.10 Site Walk

- 4.10.1 A site walk shall be conducted by the AECOM Manager and any other appropriate personnel with the objectives of reviewing all planned intrusive activity locations, the locations of subsurface and overhead utilities, overhead obstructions, and the potential for subsurface installations, to determine the appropriate utility clearance activities, and to observe other physical hazards.
- Walk the area at least 50 feet (15.2 meters) from perimeter of the site to observe physical hazards.
 - Walk the area of at least 50 feet (15.2 meters) radius from each proposed subsurface intrusion location.
 - If possible, particularly at urban and industrial sites, the client/property owner or an individual knowledgeable about the site and site utilities will attend the site walk.
 - Add discovered items/issues to map for use in location confirmation.
- 4.10.2 The Site Walk further supplements the Identification and Mapping of Utility and Subsurface Structures procedure. Site Walks should be repeated as necessary following the Identification and Mapping of Utility and Subsurface Structures as visual verification of the hazards. Examples include:
- Proposed location(s) does not lie on a line connecting two similar manhole covers (e.g. sanitary sewer or storm drain).
 - Proposed subsurface location(s) has not subsided, been excavated and patched, nor gives the appearance it may be covering a former trench (e.g. linear cracks, sagging curbs, linear re-pavements, etc.).
 - Proposed subsurface location(s) does not lie on a line with any water, gas, electrical meters, utility cleanouts, or other utility boxes in the surrounding areas.

4.11 Proposed Subsurface Investigation Locations

- 4.11.1 All proposed subsurface locations will be reviewed in comparison to subsurface and overhead utilities and subsurface installations and adjustments made as necessary.
- 4.11.2 Minimum set back distances from subsurface and overhead utilities and subsurface installations will be established including 5 feet (1.5 meters) from any subsurface utility, 7 feet (2.1 meters) from the pad surrounding any underground storage tanks, and 10 feet (3 meters) from any overhead energized electrical line (or further depending on line voltage). These set back distances are a minimum; government regulations and utility requirements may dictate a greater set back distance.

4.12 Utility Clearance Investigation Location Confirmation

- 4.12.1 As applicable, all client on-site safety procedures shall be understood and adhered to.
- 4.12.2 Hand exposure or non-destructive ground disturbance techniques to expose an underground utility or subsurface installation are necessary to accurately determine size, location and alignment prior to mechanical excavation or intrusive subsurface work in the vicinity of that utility or installation.
- 4.12.3 Non-destructive ground disturbance techniques shall be acceptable to the owner of the buried utility (i.e. hydro-vacuum temperature or pressure).
- 4.12.4 Hydro-vacuum or air-knife require proper grounding equipment at sites where the subsurface may contain flammable gases, liquids, or vapors
- 4.12.5 Jurisdictional, land owner, client and utility owner requirements shall be consulted to determine the distance of the hand exposure zone, and what requirements, when met, may allow mechanical excavation within these zones.
- 4.12.6 At a minimum, all underground utilities and subsurface installations within a 5 feet (1.5 meter) radius of the work site shall be identified and physically located (seen) before use of mechanical excavation equipment is permitted. Jurisdictional, client, land owner and utility owner requirements shall be consulted as the required hand exposure radius may be larger.
- 4.12.7 In urban areas, proposed subsurface locations will be cleared by hand / non-destructive technique to 5 feet (1.5 meters) (soil borings and wells) or 12 inches (30 centimeters) (soil gas sampling probes) using non-mechanical methods.
 - In non-urban areas, clearing by hand / non-destructive technique should be conducted if possible and shall be conducted as required by the given jurisdiction.
 - Hand / non-destructive technique clearance should be extended if locations of deep utilities and structures are not known.
 - Hand exposure or non-destructive ground disturbance techniques should extend a minimum of 24 inches (60 centimeters) below the intended ground disturbance depth to minimize the hazard of mechanical equipment contact with any utility or installation.
- 4.12.8 Mechanical equipment and attachment dimensions shall be considered when establishing the zone in which all underground utilities and subsurface installations are physically located (seen) prior to the use of that equipment. The radius may require expanding to maintain safe distances when using large equipment.

4.13 Utility Strikes

- 4.13.1 Utility strikes shall be reported in accordance with *S3AM-004-PR1 Incident Reporting, Notifications & Investigation*.
- 4.13.2 All damaged utilities shall be repaired by a qualified and/or licensed professional.

5.0 Records

- 5.1 Retain completed *S3AM-331-FM1 Underground Utility & Subsurface Installation Clearance Checklist* and documents related the clearance process (e.g. Utility Owner communication, etc.) in the site or project files.
- 5.2 Documentation of employee training completed shall be retained in accordance with *S3AM-003-PR1 SH&E Training*.

6.0 Attachments

- 6.1 [S3AM-331-ATT1 One-Call System](#)
- 6.2 [S3AM-331-ATT2 Underground Utilities & Subsurface Installation Flow Chart](#)
- 6.3 [S3AM-331-FM1 Underground Utility & Subsurface Installation Clearance Checklist](#)

Americas

One-Call System

S3AM-331-ATT1

1.0 What Is It?

- 1.1 One-call systems are established across the Americas to provide one telephone number for excavating contractors and the general public to call for notification of their intent to use equipment for excavating, tunneling, demolition, or any other similar work. This one-call system provides the participating members an opportunity to identify and locate their underground facilities.
- 1.2 As described on their web site (<http://www.call811.com>), Common Ground Alliance (CGA) was “created specifically to work with all industry stakeholders in an effort to prevent damage to underground utility infrastructure and ensure public safety and environmental protection.” CGA also serves as an organization to continuously update best practices amongst the growing underground industry. The CGA web site provides current one-call information for all states and provinces.

2.0 Why Is It Needed?

- 2.1 Damage to underground facilities increased considerably following the building boom of the 1950s, 1960s, and early 1970s when the trend was to go underground with utilities. Thousands of miles of underground facilities are vulnerable to excavating machines such as backhoes, and the resulting damage can interrupt utility service and threaten life, health, and property.

3.0 How to Get It

- 3.1 In the United States 811 is the Federally-mandated national “Call Before Your Dig” number that connects directly to the local one-call center. Each state has different rules and regulations governing digging, some stricter than others. The CGA web site provides current contact information to find state-specific information as well as links to submit an online digging request where available. Canadian one-call numbers vary by jurisdiction. One-call services are not available in Canada’s Atlantic provinces (New Brunswick, Newfoundland, Nova Scotia) or in the three Northern Territories (Nunavut, Northwest Territories, Yukon).

4.0 Disclaimer

- 4.1 The purpose of this directory is to illustrate the extent of one-call service available. Some jurisdictions have a list of “Tier 1” subscriber utilities notified by 811, and a “Tier 2” list that the excavator/contractor is responsible for contacting directly. Users shall verify information is current including the extent and limit of service from local sources.

Province/State		One-Call Agency	Number
Canada		www.clickbeforeyoudig.com	
Alberta	Alberta One Call	www.albertaonecall.com	1.800.242.3447
British Columbia	BC One Call	www.bconeall.bc.ca	1.800.474.6886
Manitoba	Click Before You Dig	www.clickbeforeyoudigmb.com	Various – see website
Ontario	Ontario One Call	www.on1call.com	1.800.400.2255
Québec	Info Excavation	www.info-ex.com	1.800.663.9228
Saskatchewan	Sask 1 st Call	www.sask1stcall.com	1.866.828.4888

United States		www.call811.com	811
Alabama	Alabama 811		1.800.292.8525
Alaska	Alaska Digline, Inc.		1.800.478.3121
Arizona	Arizona 811		1.800.782.5348
Arkansas	Arkansas One Call		1.800.482.8998
California	(North & Central) USA North 811		1.800.227.2600
	(South) Dig Alert		1.800.227.2600
Colorado	Colorado 811		1.800.922.1987
Connecticut	Call Before You Dig		1.800.922.4455
Delaware	Miss Utility of Delmarva		1.800.282.8555
District of Columbia	District One Call		1.202.265.7177
Florida	Sunshine 811		1.800.432.4770
Georgia	Georgia 811		1.800.282.7411
Hawaii	Hawaii One Call		1.866.423.7287
Idaho	Dig Line, Inc.		1.800.342.1585
	(Bonner/Boundary) Pass Word		1.800.626.4950
	(Kootenai County) Pass Word		1.800.428.4950
	(Shoshone-Benewah) Pass Word		1.800.398.3285
Illinois	(Chicago) Digger -Chicago Utility Alert Network		312.744.7000
	(Outside of Chicago) JULIE		1.800.892.0123
Indiana	Indiana 811		1.800.382.5544
Iowa	Iowa One Call		1.800.292.8989
Kansas	Kansas 811		1.800.344.7233
Kentucky	Kentucky 811		1.800.752.6007
Louisiana	LA One Call		1.800.272.3020
Maine	Dig Safe		1.888.344.7233
Maryland	(West of Chesapeake Bay) Miss Utility of Maryland		1.800.257.7777
	(East of Chesapeake Bay) Miss Utility of Delmarva		1.800.282.8555
Massachusetts	Dig Safe System, Inc.		1.888.344.7233
Michigan	Miss Dig		1.800.482.7171
Minnesota	Gopher State One Call		1.800.252.1166
Mississippi	Mississippi 811		1.800.227.6477

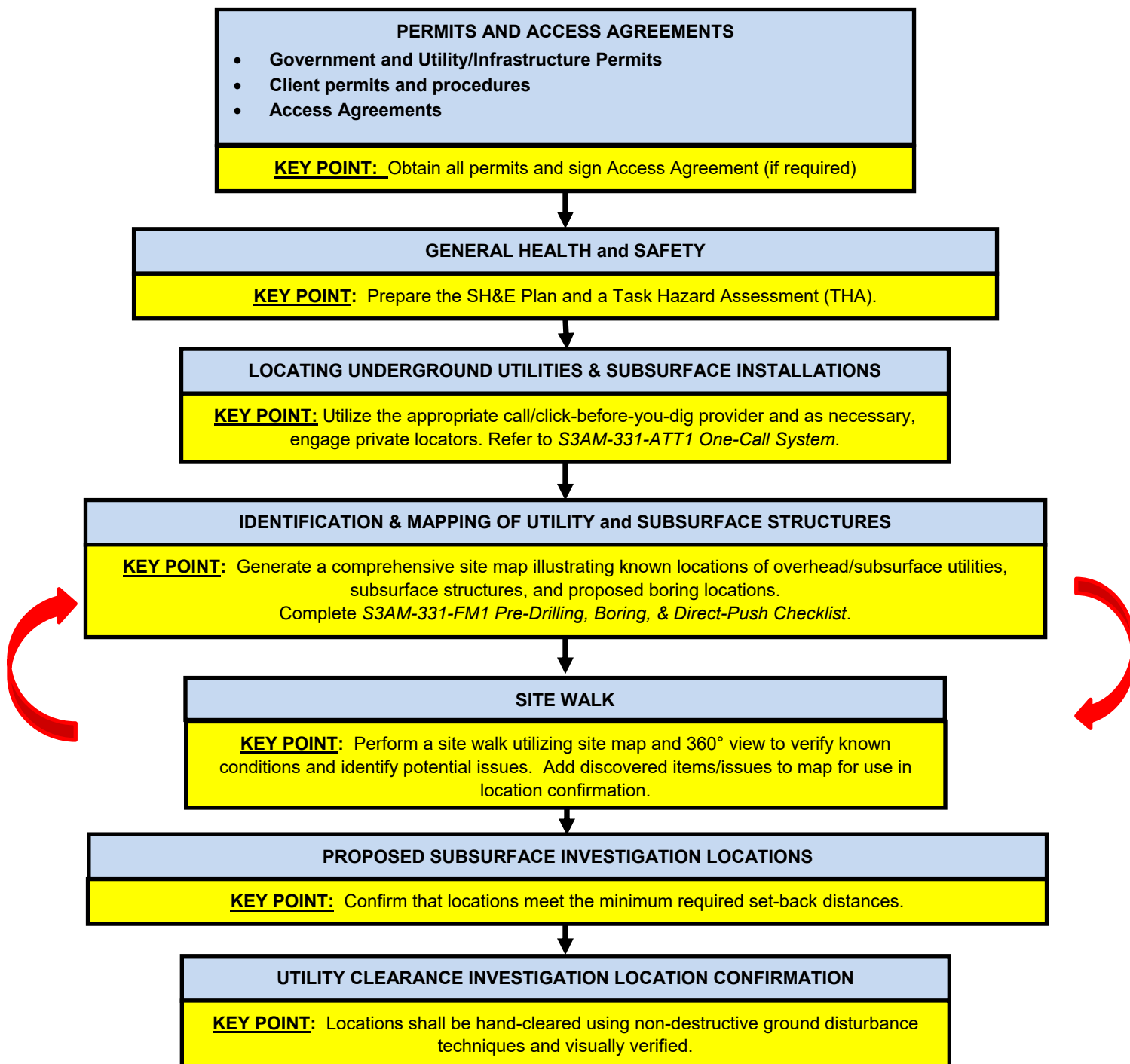
Missouri	Missouri One Call System	1.800.344.7483
Montana	Montana 811	1.800.424.5555
	(Flathead and Lincoln Counties) Montana One Call Center	1.800.551.8344
Nebraska	Nebraska 811	1.800.331.5666
Nevada	USA North 811	1.800.227.2600
New Hampshire	Dig Safe System, Inc.	1.888.344.7233
New Jersey	New Jersey One Call	1.800.272.1000
New Mexico	New Mexico 811	1.800.321.2537
New York	(North of 5 Boroughs) Dig Safely New York	1.800.962.7962
	(5 Boroughs and Long Island) New York 811, Inc.	1.800.272.4480
North Carolina	North Carolina 811	1.800.632.4949
North Dakota	North Dakota One Call	1.800.795.0555
Ohio	Ohio Utilities Protection Service	1.800.362.2764
Oklahoma	Call Okie	1.800.522.6543
Oregon	Oregon Utilities Notification Center	1.800.332.2344
Pennsylvania	Pennsylvania One Call System, Inc.	1.800.242.1776
Puerto Rico	Puerto Rico Public Service Commission 811	
Rhode Island	Dig Safe System, Inc.	1.888.344.7233
South Carolina	South Carolina 811	1.888.721.7877
South Dakota	South Dakota One Call	1.800.781.7474
Tennessee	Tennessee 811	1.800.351.1111
Texas	Texas 811	1.800.545.6005
	Lone Star 811	1.800.669.8344
Utah	Blue Stakes of Utah	1.800.662.4111
Vermont	Dig Safe System, Inc.	1.888.344.7233
Virginia	Virginia 811	1.800.552.7001
Washington	Utility Notification Center	1.800.424.5555
West Virginia	WV 811	1.800.245.4848
Wisconsin	Diggers Hotline	1.800.242.8511
Wyoming	One-Call Of Wyoming	1.800.849.2476

Americas

Underground Utilities & Subsurface Installation Clearance Flow Chart

S3AM-331-PR1

Before Any Underground Utilities and Subsurface Installation Clearance



Americas

Underground Utilities & Subsurface Installation Clearance Checklist

S3AM-331-FM1

Location:	Project #:	Date & Time:
Manager:	Contractor (if applicable):	Weather:
Client:	Inspector:	
Notes:		

Part 1

Part 1 and Part 2 shall be completed prior to any intrusive subsurface work. DO NOT DISTURB GROUND if a "No" or "N/A" answer to any of the Part 1 questions has not been initialed as authorized by the AECOM Manager.

Any variance from these procedures requires approval of the Vice President of the applicable business group.

	Yes	No	N/A
I. Permits and Access Agreements			
1. Have all appropriate permits and agreements been identified and obtained (e.g. client, drilling, encroachment, working near railroads, etc.)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Have all client requirements been identified and obtained?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. If working off-site is (are) site access agreement(s) executed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
II. General Health and Safety			
1. Has a Health and Safety Plan (HASP) been prepared for AECOM employees?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Do on-site personnel have required-level PPE?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Do on-site personnel have required-level of training?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Is appropriate monitoring equipment as specified in HASP/THAs available at each clearance location?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Has the field screening equipment been calibrated as required by the HASP?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Are calibration gases available at the site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
III. Identification and Mapping of Utility and Subsurface Structures			
1. Is a Site Plan showing proposed subsurface locations and utility locations attached to this check list?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Have above/below ground utilities & subsurface installations been investigated (Part 2 of this form)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Have all Federal/State/Provincial/Territorial and other "One Call" providers marked their facilities or otherwise notified they do not have any facilities near the proposed subsurface/intrusive locations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Have Federal/State/Provincial/Territorial or other "One Call" providers identified what utilities and underground structures are <u>not</u> included in their provider system (e.g. underground structures)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. As noted in the exception at the bottom of Section VI of this checklist, has a utility locating contractor performed geophysical and/or other surveys of the proposed subsurface/intrusive locations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Part 1 and Part 2 shall be completed prior to any intrusive subsurface work. DO NOT DISTURB GROUND if a "No" or "N/A" answer to any of the Part 1 questions has not been initialed as authorized by the AECOM Manager.

Any variance from these procedures requires approval of the Vice President of the applicable business group.

	Yes	No	N/A
6. Visual verification that each of the proposed locations does not lie on a line connecting two similar manhole covers (e.g. sanitary sewer or storm drain)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Visual verification that the ground in the vicinity of each of the proposed subsurface locations has not subsided, been excavated and patched, give the appearance it may be covering a former trench (e.g. linear cracks, sagging curbs, linear re-pavements, etc.) and does not lie on a line with any water, gas, electrical meters, utility cleanouts, or other utility boxes in the surrounding areas?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IV. Site Walk			
1. Has a site walk been performed that includes the following:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
a. Reviewing all planned intrusive locations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Adjusting locations away from subsurface utilities and installations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Determining the appropriate utility clearance activities for each location?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Determining the presence and location of overhead utilities and obstructions?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Walk around perimeter of the site to observe physical hazards?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Includes 50 feet (15.2 meters) from perimeter of the site to observe physical hazards and 50 feet (15.2 meters) radius from each proposed subsurface location?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
V. Proposed Subsurface Investigation Locations*			
1. Are all of the proposed subsurface locations at least 5 feet (1.5 meters) from any identified subsurface utility?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Are all of the proposed subsurface locations at least 7 feet (2.1 meters) from the pad surrounding any underground storage tanks (USTs) shown on the Site Plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Are all of the proposed subsurface locations at least 5 feet (1.5 meters) from any subsurface utilities shown on the Public Right-of-Way street improvements?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>* These set back distances are a minimum; government regulations and utility requirements may dictate a greater set back distance.</i>			
VI. Utility Clearance Investigation Location Confirmation*			
1. Have the hand clearance / tolerance zones of subsurface locations been observed and utilities exposed through the use of non-destructive techniques as follows? Hand / non-destructive technique clearance should be extended if locations of deep utilities and structures are not known. In non-urban areas hand clearing should be conducted if possible and according to local requirements.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
a. For soil borings/monitoring wells; excavated to a minimum of 5 feet (1.5 meters) below ground surface using non-mechanical methods?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. For soil gas sampling; excavated to 2 foot (0.6 meter) below grade or below the bottom of a concrete floor prior to the installation of soil gas sample probe points?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>* Exceptions to requirements of the utility clearance process, as permitted by the applicable jurisdiction, include the following:</i> <ul style="list-style-type: none"> <i>Sites where extensive utility mapping (e.g. geophysical survey) has been completed and/or where extensive activities have already been performed.</i> <i>Locations where facility layout is well documented and understood.</i> <i>Sites or portions of large sites where utilities are known not to exist currently or to not have ever existed throughout the life of the facility, property or site.</i> 			

Part 1 and Part 2 shall be completed prior to any intrusive subsurface work. DO NOT DISTURB GROUND if a "No" or "N/A" answer to any of the Part 1 questions has not been initialed as authorized by the AECOM Manager.

Any variance from these procedures requires approval of the Vice President of the applicable business group.

	Yes	No	N/A
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Comments:

Documentation supplied by one-call or private utility and installation locators, including email or written field confirmation / maps of mark-out requests and status shall accompany this form. If this form is supporting multiple ground disturbance activities, a copy of this completed form should be provided to each activity.

Part 2

Public Utility Locate (OneCall)			Prior Locate Ticket #	
Date Called:		Called By:		Valid Until:
Ticket Number:		Area Requested To Be Cleared:		
Private Utility Locate			Prior Locate Ticket #	
Company Performing Locate:		Date Completed:		
Area(s) Requested To Be Cleared (including distance around marked locations):				
Method(s) Used (e.g., GPR, EM):				
Confirm Area(s) Cleared:				
OneCall Utilities			Field Observation	
Utility	Notified by	Comments	Marked (mains & services)	
Electric (Red)	<input type="checkbox"/> OneCall <input type="checkbox"/> Other		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above	
Gas/Petroleum Pipeline (Yellow)	<input type="checkbox"/> OneCall <input type="checkbox"/> Other		<input type="checkbox"/> Yes <input type="checkbox"/> No	
Sewer/Drainage (Green)	<input type="checkbox"/> OneCall <input type="checkbox"/> Other		<input type="checkbox"/> Yes <input type="checkbox"/> No	
Water (Blue)	<input type="checkbox"/> OneCall <input type="checkbox"/> Other		<input type="checkbox"/> Yes <input type="checkbox"/> No	
Communications (Orange)	<input type="checkbox"/> OneCall <input type="checkbox"/> Other		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above	
Other	<input type="checkbox"/> OneCall <input type="checkbox"/> Other		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above	
Were all circuits on during subsurface checks if the checks were for identifying energized lines (e.g., circuits on timers or light sensing switches)?			<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Utilities Not Identified By OneCall (Includes both Public and Private along with Regional and Site Utilities)			Field Observation	
Utility (Colors may vary)	Owner / Contact / Phone #	Notified	Marked	
Communications: (Orange) TV, computer, phone, cell towers, site communication, cameras, security, etc.		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above	
Electricity: (Red) Mains / Supplies / Interior / Exterior (signs, fuel pumps, low voltage security perimeters, gates, property light posts, equipment, substations, etc.)		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above	
Gas: (Yellow) Mains / Supplies / Equipment / Pipelines (Natural, Process, Oil, Crude, Refined (Gas, Diesel, Jet), etc.)		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above	
Steam: (Yellow)		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above	

Structures: Possible horizontally installed facilities, vaults, basements, tunnels, sub-grade structures, foundations, overhead obstructions, etc.		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above
UST Systems (Tanks / piping / electric)		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Sewer: (Green) Sanitary, storm, combined, septic, drainage (parking, buildings, fields), irrigation		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Water: (Blue) Process, Plant, potable, well, cooling, return/makeup, fire, sprinkler, landscape irrigation, reclaim (Purple) other		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above
Other: Abandoned lines, invisible dog fences, shopping cart perimeter monitoring, traffic lights		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above

Manager:

Print

Sign

Date

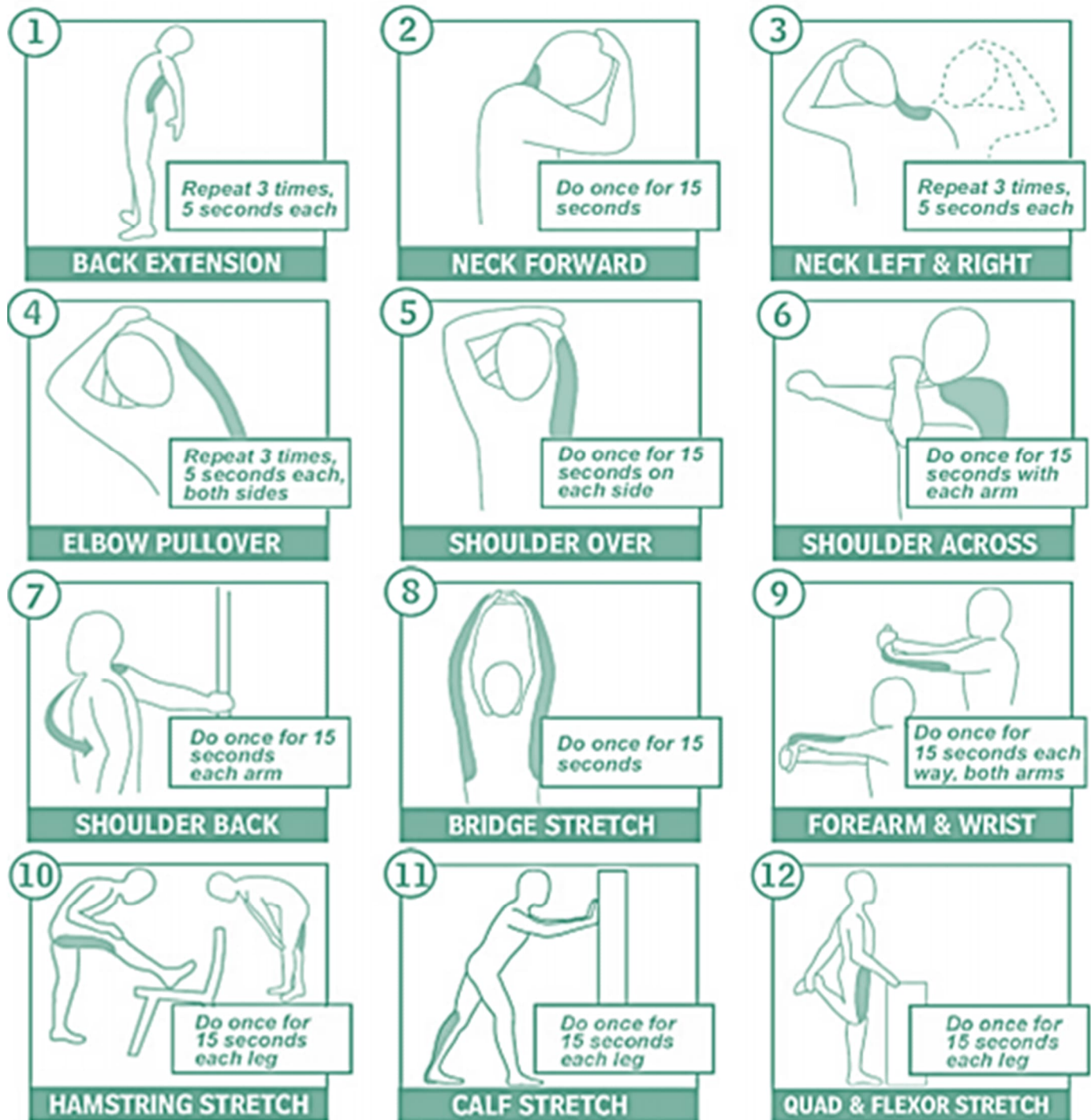
Attachment **C**

Stretch/Flex Poster



Attachment C: Stretch/Flex Poster

Examples of Stretches



Attachment D

Site Safety Orientation



Attachment D: Site Safety Orientation

AECOM will conduct a site safety briefing for a person's initial visit to the site. The briefing will be conducted:

- Prior to the start of work;
- For any new AECOM or subconsultant personnel;
- For Site Visitors; and
- At each mobilization, or whenever there is a change in task or significant change in task location.

All personnel working on the project who have received the site briefing (including the SWP review) will sign the Personal Acknowledgement located in **Section 20**. Visitors may receive a shortened version to address the hazards specific to their visit.

The following topics, at minimum, will be discussed during the site safety briefing:

- Contents of this SWP;
- The Emergency Response Plan ([Section 4](#));
- Contractor SHE Management expectations;
- Injury management, including notification and hospital and occupational clinic locations;
- The AECOM 4-Sight program;
- Stop Work authority;
- The THAs (**Attachment A**) for the activities that will be performed on a given job;
- Types of hazards at the site and means for minimizing exposure to them;
- Instructions for new operations to be conducted, and safe work practices;
- PPE that must be used;
- Lone worker check-in procedures;
- Emergency evacuation routes, muster points, and tornado/storm shelters; and
- Location and use of emergency equipment.
- **These briefings must be documented and maintained in the project files.**

Attachment **E**

NYSDOH Generic Community Air Monitoring Plan



Attachment E: NYSDOH Generic Community Air Monitoring Plan

Appendix 1A
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical-specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. Periodic monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed $150 \text{ mcg}/\text{m}^3$ above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than $150 \text{ mcg}/\text{m}^3$ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within $150 \text{ mcg}/\text{m}^3$ of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

Appendix 1B

Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.
2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.
3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:
 - (a) Objects to be measured: Dust, mists or aerosols;
 - (b) Measurement Ranges: 0.001 to 400 mg/m³ (1 to 400,000 :ug/m³);
 - (c) Precision (2-sigma) at constant temperature: +/- 10 :g/m³ for one second averaging; and +/- 1.5 g/m³ for sixty second averaging;
 - (d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
 - (e) Resolution: 0.1% of reading or 1g/m³, whichever is larger;
 - (f) Particle Size Range of Maximum Response: 0.1-10;
 - (g) Total Number of Data Points in Memory: 10,000;
 - (h) Logged Data: Each data point with average concentration, time/date and data point number
 - (i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
 - (j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
 - (k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
 - (l) Operating Temperature: -10 to 50° C (14 to 122° F);
 - (m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.
4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.
5. The action level will be established at 150 ug/m³ (15 minutes average). While conservative,

this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m³, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m³ above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m³ continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM₁₀ at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential-- such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

- (a) Applying water on haul roads;
- (b) Wetting equipment and excavation faces;
- (c) Spraying water on buckets during excavation and dumping;
- (d) Hauling materials in properly tarped or watertight containers;
- (e) Restricting vehicle speeds to 10 mph;
- (f) Covering excavated areas and material after excavation activity ceases; and (g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m³ action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

Attachment **F**

Project Hazardous Materials Communication Plan



Attachment F-1: Project Hazardous Materials Communication Plan

Materials to be brought or encountered onsite will have a Safety Data Sheet (SDS) maintained in an accessible location for workers to review. Applicable SDSs are presented in **Attachment F-2**. Materials to be brought or encountered onsite will include:

- Arsenic
- Barium
- Chromium
- Lead
- Benzene
- N-Propylbenzene
- N-Butylbenzene
- Sec-Butylbenzene
- Isopropylbenzene
- Cis-1,2-Dichloroethylene
- Diesel
- Gasoline
- Petroleum
- Tetrachloroethylene (PCE)
- Trichloroethylene (TCE)
- Toluene
- Alconox
- Bentonite
- Hydrochloric Acid
- Isobutylene

As part of the Site Safety Officer (SSO) daily activities, an inventory of hazardous materials will be prepared with the quantities expected to be on site. The inventory will be updated if any additional materials are brought on site and as frequently as necessary to reflect accurate quantities. This chemical inventory list will be readily available for review (usually kept with the SDSs).

Unless each container has appropriate labeling, all chemical containers will be labeled with the following information:

- Product name and identity of the hazardous chemical(s).
- Appropriate hazard warnings.
- Name and address of the chemical manufacturer, importer, or other responsible party.

Labels on incoming containers of hazardous materials will not be removed or defaced. Labels are also required when a hazardous substance is transferred from a primary container to a secondary container. Labels on secondary containers must indicate the product name or the names of the hazardous substances contained therein as well as related physical and health



hazards and their associated target organs. Labels may incorporate words, pictures, symbols, or combinations thereof to ensure the appropriate information is provided to the end user.

Examples of acceptable labeling systems include the National Fire Protection Association Diamond, the Hazardous Materials Identification System, the Chemical Hazard Identification and Training system, or similar.

Employee requirements for reviewing SDSs for specific safety and health protection procedures are presented below.

- AHAs will incorporate information contained in the SDSs.
- SDS information will be followed in the use and disposal of material and selection of hazard control and emergency response measures.
- The SSO will obtain an SDS for each chemical before it is used. SDSs will generally be received by the person ordering the product. SDSs for products frequently used should be kept on file because additional copies may not be included in repeat shipments.
- The SSO will review each SDS when it is received to evaluate whether the information is complete and to determine whether existing protective measures are adequate.
- The SSO will maintain a collection of all applicable and relevant SDSs in an area that is accessible to all employees at all times. An electronic database is an acceptable method of maintaining the SDSs.
- The SSO will replace SDSs when updated sheets are received and will communicate any significant changes to those who work with the chemical.
- SDSs are required for all hazardous materials brought on site by project personnel.

General household products to be used for their specific purpose, food, drugs, and cosmetics brought into the workplace for employee use and consumption are all exempt, as are supplies in the first-aid kit, such as isopropyl alcohol and antibacterial wipes.

Employees bringing hazardous materials on to a site or project must submit SDSs to the SSO. The SSO may restrict the use of certain hazardous materials on a site or project due to occupational health risk, hazardous physical properties of the material, or potential employee sensitivity to odor or irritating properties of the material.

Other personnel working in the same area shall be provided with the following information on chemicals used by or provided to AECOM personnel:

- Names of hazardous chemicals to which they may be exposed while on the jobsite.
- Precautions the employees may take to lessen the possibility of exposure by usage of appropriate protective measures, such as ventilation or isolation of the work. In some cases, as an administrative control measure, a task may be delayed to a time when a minimal number of employees are present in the area.
- Location of SDSs.

As discussed in Section 5.1 of the HASP, employees will be trained initially and periodically when use of hazardous or toxic agents is altered or modified to accommodate changing on-site work procedures. Training shall cover the following topics:

- Requirements and use of the hazard communications program on the project.
- The location of all hazardous or toxic agents at the project.
- Identification and recognition of hazardous or toxic agents on the project.
- Physical and health hazards of the hazardous or toxic agents pertinent to project activities.
- Protective measures employees can implement when working with project-specific hazardous or toxic agents.

Site Specific Health & Safety Plan

For use on all high-risk, industrial and HAZWOPER projects



Provide training to all employees who have the potential to be exposed to hazardous materials: a) at the time of the initial task assignment, b) whenever new chemicals are introduced into the workplace, and c) more frequently where required by site-specific conditions or client-specific requirements. This training will include the following:

- Applicable regulatory requirements.
- Location of the program, inventory, and SDS.
- Site-specific chemicals used and their hazards (chemical, physical, and health), including the general characteristics of the chemicals and signs and symptoms of exposure.
- How to detect the presence or release of chemicals including the location, types, and usage of any portable and fixed monitoring or detection equipment and their associated alarms, where applicable.
- Safe work practices ([S3AM-001-PR1](#)) and methods employees can take to protect themselves from chemical hazards (metals or explosives constituents in soil).
- How to read an SDS.
- Site- or project-specific information on hazard warnings and labels in use at the location, if applicable.
- Site-specific evacuation and rescue procedures in the event of chemical release, including the location of staging areas and personnel accounting procedures.

The following documentation will be maintained in the project file:

- Chemical inventory list;
- SDSs; and
- Training records.



Attachment F-2: Safety Data Sheets

SAFETY DATA SHEET

Version 6.4
Revision Date 01/28/2022
Print Date 02/26/2022

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1 Product identifiers**

Product name : Arsenic

Product Number : 267961
Brand : Aldrich
Index-No. : 033-001-00-X
CAS-No. : 7440-38-2

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-
527-3887 CHEMTREC (International) 24
Hours/day; 7 Days/week

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Acute toxicity, Oral (Category 3), H301
Acute toxicity, Inhalation (Category 3), H331
Skin irritation (Category 2), H315
Serious eye damage (Category 1), H318
Carcinogenicity (Category 1A), H350
Short-term (acute) aquatic hazard (Category 1), H400
Long-term (chronic) aquatic hazard (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H301 + H331

Toxic if swallowed or if inhaled.

H315

Causes skin irritation.

H318

Causes serious eye damage.

H350

May cause cancer.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201

Obtain special instructions before use.

P202

Do not handle until all safety precautions have been read and understood.

P261

Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.

P264

Wash skin thoroughly after handling.

P270

Do not eat, drink or smoke when using this product.

P271

Use only outdoors or in a well-ventilated area.

P273

Avoid release to the environment.

P280

Wear protective gloves/ protective clothing/ eye protection/ face protection.

P301 + P310 + P330

IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.

P302 + P352

IF ON SKIN: Wash with plenty of soap and water.

P304 + P340 + P311

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor.

P305 + P351 + P338 + P310

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor.

P308 + P313

IF exposed or concerned: Get medical advice/ attention.

P332 + P313

If skin irritation occurs: Get medical advice/ attention.

P362

Take off contaminated clothing and wash before reuse.

P391

Collect spillage.

P403 + P233

Store in a well-ventilated place. Keep container tightly closed.

P405

Store locked up.

P501

Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula : As
Molecular weight : 74.92 g/mol
CAS-No. : 7440-38-2
EC-No. : 231-148-6
Index-No. : 033-001-00-X

Component	Classification	Concentration
arsenic		
	Acute Tox. 3; Skin Irrit. 2;	<= 100 %

Aldrich - 267961

Page 2 of 11

	Eye Dam. 1; Carc. 1A; Aquatic Acute 1; Aquatic Chronic 1; H301, H331, H315, H318, H350, H400, H410 M-Factor - Aquatic Acute: 10 M-Factor - Aquatic Chronic: 1	
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For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice

First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance.

If inhaled

After inhalation: fresh air. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact

After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses.

If swallowed

If swallowed: give water to drink (two glasses at most). Seek medical advice immediately. In exceptional cases only, if medical care is not available within one hour, induce vomiting (only in persons who are wide awake and fully conscious), administer activated charcoal (20 - 40 g in a 10% slurry) and consult a doctor as quickly as possible.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media

For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Nature of decomposition products not known.

Not combustible.

Ambient fire may liberate hazardous vapours.

5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Avoid generation and inhalation of dusts in all circumstances. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.

For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling

Work under hood. Do not inhale substance/mixture.

Hygiene measures

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions

Tightly closed. Dry. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorized persons.

Storage class

Storage class (TRGS 510): 6.1A: Combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
arsenic	7440-38-2	TWA	0.01 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Lung cancer Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed human carcinogen		
		C	0.0020 mg/m ³	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A 15 minute ceiling value		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
arsenic	7440-38-2	inorganic arsenic plus methylated metabolites	35µg As/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of the workweek (After four or five consecutive working days with exposure)			

8.2 Exposure controls

Appropriate engineering controls

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Tightly fitting safety goggles

Skin protection

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatrill® L

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please

contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatrill® L

Body Protection

protective clothing

Respiratory protection

required when dusts are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure

Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: powder
Color: gray |
| b) Odor | No data available |
| c) Odor Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 817 °C (1503 °F) - lit. |
| f) Initial boiling point and boiling range | 613 °C 1135 °F - lit. |
| g) Flash point | ()Not applicable |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapor pressure | No data available |
| l) Vapor density | No data available |
| m) Density | 5.727 g/mL at 25 °C (77 °F) - lit. |
| Relative density | 5.622.4 °C - OECD Test Guideline 109 |
| n) Water solubility | ca.0.0106 g/l at 20 °C (68 °F) - OECD Test Guideline 105 - slightly soluble |
| o) Partition coefficient: n-octanol/water | Not applicable for inorganic substances |

- | | |
|------------------------------|-------------------------------------|
| p) Autoignition temperature | > 430 °C (> 806 °F) does not ignite |
| q) Decomposition temperature | No data available |
| r) Viscosity | No data available |
| s) Explosive properties | No data available |
| t) Oxidizing properties | none |

9.2 Other safety information

No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

No data available

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions

Exothermic reaction with:

Aluminum

Bromine

bromates

chlorates

iodates

Nitric acid

Risk of ignition or formation of inflammable gases or vapours with:

nitrates

Alkali metals

Zinc

Reducing agents

Strong oxidizing agents

Risk of explosion with:

potassium permanganate

azides

halogen-halogen compounds

Peroxides

nitrogen trichloride

10.4 Conditions to avoid

Heat. Exposure to air may affect product quality.

no information available

10.5 Incompatible materials

No data available

10.6 Hazardous decomposition products

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Mouse - 145 mg/kg

Remarks: Behavioral:Ataxia.

Diarrhea

(RTECS)

Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

Skin - In vitro study

Result: Irritating to skin. - 15 min

Remarks: (ECHA)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Causes serious eye damage. - 24 h

(OECD Test Guideline 405)

Respiratory or skin sensitization

Maximization Test - Guinea pig

Result: negative

(OECD Test Guideline 406)

Germ cell mutagenicity

Test Type: Ames test

Test system: Escherichia coli

Result: negative

Remarks: (ECHA)

Carcinogenicity

May cause cancer. Positive evidence from human epidemiological studies.

IARC: 1 - Group 1: Carcinogenic to humans (arsenic)

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

11.2 Additional Information

RTECS: CG0525000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

The following applies to arsenic and its compounds in general: they take effect as capillary and enzyme toxins. Symptoms of arsenic poisoning: acute: after inhalation, mucosal irritations with coughing, dyspnoea, pain in the thorax. Perforations within the respiratory tract are possible. After oral uptake, gastrointestinal disorders with vomiting, diarrhoea, and spasms, CNS disorders with headache, confusion, shaking fits and disturbed consciousness, cardiovascular disorders all the way to circulatory collapse. Chronic: exanthema, dermal lesions in the form of hyperkeratosis and hypermelanosis, loss of hair, conjunctivitis and polyneuropathy, impaired hepatic function, and renal damage. After accumulation in the liver, kidneys, and skin, arsenic is eliminated from the organism only slowly. Experience has shown arsenic compounds to be carcinogenic in man.

Other dangerous properties can not be excluded.

This substance should be handled with particular care.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	static test LC50 - <i>Oreochromis mossambicus</i> (Mozambique tilapia) - 28.68 mg/l - 96 h Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - <i>Bosmina longirostris</i> (water flea) - 0.85 mg/l - 48 h Remarks: (ECHA)
Toxicity to algae	static test NOEC - <i>Macrocystis pyrifera</i> (brown algae) - 0.04 mg/l - 42 h Remarks: (ECHA)
Toxicity to bacteria	static test EC50 - activated sludge - 10.6 mg/l - 10 Days Remarks: (ECHA)

12.2 Persistence and degradability

The methods for determining biodegradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties

No data available

12.7 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)

UN number: 1558 Class: 6.1 Packing group: II
Proper shipping name: Arsenic
Reportable Quantity (RQ): 1 lbs
Reportable Quantity (RQ): 1 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1558 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: ARSENIC
Marine pollutant : yes

IATA

UN number: 1558 Class: 6.1 Packing group: II
Proper shipping name: Arsenic

SECTION 15: Regulatory information

SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
arsenic	7440-38-2	2015-11-23

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard
:

Reportable Quantity D004 lbs

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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The branding on the header and/or footer of this document may temporarily not visually match the product purchased as we transition our branding. However, all of the information in the document regarding the product remains unchanged and matches the product ordered. For further information please contact mlsbranding@sial.com.

Version: 6.4

Revision Date: 01/28/2022

Print Date: 02/26/2022

SAFETY DATA SHEET

Version 6.7
Revision Date 10/28/2021
Print Date 02/05/2022

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1 Product identifiers**

Product name : Barium

Product Number : 237094
Brand : Aldrich
CAS-No. : 7440-39-3

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-
527-3887 CHEMTREC (International) 24
Hours/day; 7 Days/week

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable solids (Category 1), H228
Chemicals which, in contact with water, emit flammable gases (Category 1), H260
Acute toxicity, Oral (Category 3), H301
Skin corrosion (Category 1B), H314
Serious eye damage (Category 1), H318

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)	
H228	Flammable solid.
H260	In contact with water releases flammable gases which may ignite spontaneously.
H301	Toxic if swallowed.
H314	Causes severe skin burns and eye damage.
Precautionary statement(s)	
P210	Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P223	Do not allow contact with water.
P231 + P232	Handle under inert gas. Protect from moisture.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P260	Do not breathe dusts or mists.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor.
P335 + P334	Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages.
P363	Wash contaminated clothing before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P402 + P404	Store in a dry place. Store in a closed container.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	: Ba
Molecular weight	: 137.33 g/mol
CAS-No.	: 7440-39-3
EC-No.	: 231-149-1

Component	Classification	Concentration
barium		
	Flam. Sol. 1; 1; Acute Tox. 3; Skin Corr. 1B; Eye Dam. 1; H228, H260,	<= 100 %

Aldrich - 237094

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	H301, H314, H318	
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For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice

First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance.

If inhaled

After inhalation: fresh air. Call in physician.

In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Call a physician immediately.

In case of eye contact

After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses.

If swallowed

If swallowed: give water to drink (two glasses at most). Seek medical advice immediately. In exceptional cases only, if medical care is not available within one hour, induce vomiting (only in persons who are wide awake and fully conscious), administer activated charcoal (20 - 40 g in a 10% slurry) and consult a doctor as quickly as possible. Do not attempt to neutralise.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Carbon dioxide (CO₂) Dry powder

Unsuitable extinguishing media

Water Foam

5.2 Special hazards arising from the substance or mixture

Barium oxide

Combustible.

May not get in touch with: Water

Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Avoid inhalation of dusts. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition. Evacuate the danger area, observe emergency procedures, consult an expert. For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling

Keep workplace dry. Do not allow product to come into contact with water.

Advice on protection against fire and explosion

Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharge.

Hygiene measures

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions

Tightly closed. Keep away from heat and sources of ignition. Keep locked up or in an area accessible only to qualified or authorized persons.

Never allow product to get in contact with water during storage.

Store under inert gas.

Storage class

Storage class (TRGS 510): 4.3: Hazardous materials, which set free flammable gases upon contact with water

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
barium	7440-39-3	TWA	0.5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Not classifiable as a human carcinogen		
		TWA	0.5 mg/m3	USA. NIOSH Recommended Exposure Limits
		PEL	0.5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Tightly fitting safety goggles

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the EC approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our

customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Flame retardant antistatic protective clothing.

Respiratory protection

required when dusts are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure

Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance	Form: Rods Color: gray
b) Odor	No data available
c) Odor Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 725 °C (1337 °F) - lit.
f) Initial boiling point and boiling range	1,640 °C 2,984 °F - lit.
g) Flash point	()Not applicable
h) Evaporation rate	No data available
i) Flammability (solid, gas)	The substance or mixture is a flammable solid with the category 1.
j) Upper/lower flammability or explosive limits	No data available
k) Vapor pressure	No data available
l) Vapor density	No data available
m) Density	3.6 g/mL at 25 °C (77 °F) - lit.
Relative density	No data available
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	Not applicable for inorganic substances
p) Autoignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available

s) Explosive properties No data available

t) Oxidizing properties none

9.2 Other safety information

No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

The following applies in general to flammable organic substances and mixtures: in correspondingly fine distribution, when whirled up a dust explosion potential may generally be assumed.

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

Heat.

Moisture.

10.5 Incompatible materials

Oxidizing agents, Water, acids, Oxygen, Chlorinated solvents, Carbon dioxide (CO₂), Halogens, Halogenated hydrocarbon, Alcohols, Sulfur compounds, Hydrogen sulfide gas

10.6 Hazardous decomposition products

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Oral: No data available

Inhalation: No data available

Dermal: No data available

Skin corrosion/irritation

Causes severe burns. (ECHA)

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitization

No data available

Germ cell mutagenicity

Test Type: In vitro mammalian cell gene mutation test

Test system: mouse lymphoma cells

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 476

Result: negative

Test Type: Chromosome aberration test in vitro

Test system: Chinese hamster ovary cells

Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 473
Result: negative
Test Type: Ames test
Test system: *S. typhimurium*
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative

Carcinogenicity

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

11.2 Additional Information

RTECS: CQ8370000

Stomach/intestinal disorders, Nausea, Vomiting, Drowsiness, Dizziness, Gastrointestinal disturbance, Weakness, Tremors, Seizures.

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	static test LC50 - <i>Danio rerio</i> (zebra fish) - > 3.5 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - <i>Daphnia magna</i> (Water flea) - 14.5 mg/l - 48 h Remarks: (ECHA)
Toxicity to algae	Growth inhibition ErC50 - <i>Pseudokirchneriella subcapitata</i> (green algae) - > 1.15 mg/l - 72 h (OECD Test Guideline 201)
Toxicity to bacteria	static test EC50 - activated sludge - > 1,000 mg/l - 3 h (OECD Test Guideline 209)

12.2 Persistence and degradability

The methods for determining the biological degradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties

No data available

12.7 Other adverse effects

Biological effects:

Product reacts with water.

Hazardous decomposition products

Harmful effect due to pH shift.

Discharge into the environment must be avoided.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)

UN number: 1400 Class: 4.3

Packing group: II

Proper shipping name: Barium

Reportable Quantity (RQ): 1000 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1400 Class: 4.3

Packing group: II

EMS-No: F-G, S-O

Proper shipping name: BARIUM

IATA

UN number: 1400 Class: 4.3

Packing group: II

Proper shipping name: Barium

SECTION 15: Regulatory information

SARA 302 Components

Aldrich - 237094

Page 9 of 10

This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

barium	CAS-No. 7440-39-3	Revision Date 2007-07-01
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SARA 311/312 Hazards

Reactivity Hazard

Reportable Quantity : D005 lbs

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.7

Revision Date: 10/28/2021

Print Date: 02/05/2022



SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

Version 6.4
Revision Date 25.10.2021
Print Date 01.03.2022

GENERIC EU MSDS - NO COUNTRY SPECIFIC DATA - NO OEL DATA

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Chromium

Product Number : GF15631534

Brand : Aldrich

REACH No. : A registration number is not available for this substance as the substance or its uses are exempted from registration, the annual tonnage does not require a registration or the registration is envisaged for a later registration deadline.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765

Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Not a hazardous substance or mixture according to Regulation (EC) No. 1272/2008.

2.2 Label elements

Not a hazardous substance or mixture according to Regulation (EC) No. 1272/2008.

2.3 Other hazards

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

SECTION 3: Composition/information on ingredients

3.1 Substances

Molecular weight : 52 g/mol

Component		Classification	Concentration
Chromium			
CAS-No.	7440-47-3		<= 100 %
EC-No.	231-157-5		

SECTION 4: First aid measures

4.1 Description of first-aid measures

If inhaled

After inhalation: fresh air.

In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact

After eye contact: rinse out with plenty of water. Remove contact lenses.

If swallowed

After swallowing: make victim drink water (two glasses at most). Consult doctor if feeling unwell.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Unsuitable extinguishing media

For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Chromium oxides

Combustible.

5.3 Advice for firefighters

In the event of fire, wear self-contained breathing apparatus.

5.4 Further information

Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Avoid inhalation of dusts. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert. For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up dry. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions

Tightly closed. Dry.

Storage class

Storage class (TRGS 510): 11: Combustible Solids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

8.2 Exposure controls

Personal protective equipment

Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

Skin protection

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0,11 mm

Break through time: 480 min

Material tested:KCL 741 Dermatril® L

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0,11 mm

Break through time: 480 min

Material tested:KCL 741 Dermatril® L

Respiratory protection

required when dusts are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Recommended Filter type: Filter type P2

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

Control of environmental exposure

Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: crystalline |
| b) Odor | No data available |
| c) Odor Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 1.900 °C |
| f) Initial boiling point and boiling range | No data available |
| g) Flash point | Not applicable |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapor pressure | No data available |
| l) Vapor density | No data available |
| m) Density | 7,14 g/cm ³ |
| Relative density | No data available |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | Not applicable for inorganic substances |
| p) Autoignition temperature | No data available |

- | | |
|------------------------------|--|
| q) Decomposition temperature | No data available |
| r) Viscosity | Viscosity, kinematic: No data available
Viscosity, dynamic: No data available |
| s) Explosive properties | No data available |
| t) Oxidizing properties | none |

9.2 Other safety information

No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

No data available

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

no information available

10.5 Incompatible materials

Oxidizing agents

10.6 Hazardous decomposition products

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Oral: No data available

Inhalation: No data available

Dermal: No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitization

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

11.2 Additional Information

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 12: Ecological information**12.1 Toxicity**

No data available

12.2 Persistence and degradability

Not applicable for inorganic substances

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6 Endocrine disrupting properties

No data available

12.7 Other adverse effects

No data available

SECTION 13: Disposal considerations**13.1 Waste treatment methods****Product**

See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information**14.1 UN number**

ADR/RID:

IMDG:

IATA:

14.2 UN proper shipping name

ADR/RID:

IMDG:

IATA:

14.3 Transport hazard class(es)

ADR/RID:

IMDG:

IATA:

14.4 Packaging group

ADR/RID:

IMDG:

IATA:

14.5 Environmental hazards

ADR/RID:

IMDG Marine pollutant:

IATA:

14.6 Special precautions for user

No data available

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This material safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006.

Authorisations and/or restrictions on use

REACH - Restrictions on the manufacture, : 231-157-5
placing on the market and use of certain
dangerous substances, preparations and articles
(Annex XVII)

15.2 Chemical Safety Assessment

For this product a chemical safety assessment was not carried out

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Lead

Product Number : GF47460753

Brand : Aldrich

CAS-No. : 7439-92-1

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765

Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Carcinogenicity (Category 2), H351

Reproductive toxicity (Category 1A), H360

Effects on or via lactation, H362

Specific target organ toxicity - repeated exposure, Oral (Category 1), Central nervous system, Blood, Immune system, Kidney, H372

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger



Hazard statement(s)	
H351	Suspected of causing cancer.
H360	May damage fertility or the unborn child.
H362	May cause harm to breast-fed children.
H372	Causes damage to organs (Central nervous system, Blood, Immune system, Kidney) through prolonged or repeated exposure if swallowed.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.
P263	Avoid contact during pregnancy/ while nursing.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Molecular weight : 207.20 g/mol
CAS-No. : 7439-92-1

Component	Classification	Concentration
Lead		
	Carc. 2; Repr. 1A; Lact. ; STOT RE 1; H351, H360, H362, H372 Concentration limits: >= 2.5 %: Repr. 2, H361f; >= 0.5 %: STOT RE 2, H373; >= 0.03 %: Repr. 1A, H360;	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice

Show this material safety data sheet to the doctor in attendance.



If inhaled

After inhalation: fresh air. Call in physician.

In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact

After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures**5.1 Extinguishing media****Unsuitable extinguishing media**

For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Nature of decomposition products not known.
Not combustible.

5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Suppress (knock down) gases/vapors/mists with a water spray jet.

SECTION 6: Accidental release measures**6.1 Personal precautions, protective equipment and emergency procedures**

Advice for non-emergency personnel: Avoid generation and inhalation of dusts in all circumstances. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

No special precautionary measures necessary.

6.3 Methods and materials for containment and cleaning up

Observe possible material restrictions (see sections 7 and 10). Take up carefully. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections

For disposal see section 13.

Aldrich - GF47460753

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SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling

Work under hood. Do not inhale substance/mixture.

Hygiene measures

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions

Tightly closed. Dry. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorized persons.

Storage class

Storage class (TRGS 510): 6.1C: Combustible, acute toxic Cat.3 / toxic compounds or compounds which causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Lead	7439-92-1	TWA	0.05 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Confirmed animal carcinogen with unknown relevance to humans		
		PEL	0.05 mg/m ³	OSHA Specifically Regulated Chemicals/Carcinogens
		OSHA specifically regulated carcinogen		
		TWA	0.05 mg/m ³	USA. NIOSH Recommended Exposure Limits
		PEL	0.05 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Lead	7439-92-1	Lead	200 µg/l	In blood	ACGIH - Biological Exposure Indices (BEI)



	Remarks	Not critical
--	---------	--------------

8.2 Exposure controls

Appropriate engineering controls

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

Skin protection

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatrill® L

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatrill® L

Body Protection

protective clothing

Respiratory protection

required when dusts are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure

No special precautionary measures necessary.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

- | | |
|-------------------|-------------------|
| a) Appearance | Form: solid |
| b) Odor | No data available |
| c) Odor Threshold | No data available |



d) pH	No data available
e) Melting point/freezing point	Melting point: 326 °C (619 °F) at ca.1,013 hPa - OECD Test Guideline 102
f) Initial boiling point and boiling range	1,740 °C 3,164 °F
g) Flash point	()Not applicable
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapor pressure	No data available
l) Vapor density	No data available
m) Density	11.45 g/cm ³ at 23.8 °C (74.8 °F) at 1,013 hPa - OECD Test Guideline 109
Relative density	11.45 at 23.8 °C (74.8 °F) - OECD Test Guideline 109
n) Water solubility	0.185 g/l at 20 °C (68 °F) at 1,013 hPa - OECD Test Guideline 105 - partly soluble
o) Partition coefficient: n-octanol/water	Not applicable for inorganic substances
p) Autoignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	none

9.2 Other safety information

No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

No data available

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

no information available



10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - male and female - > 2,000 mg/kg

(OECD Test Guideline 423)

LC50 Inhalation - Rat - male and female - 4 h - > 5.05 mg/l

(OECD Test Guideline 403)

LD50 Dermal - Rat - male and female - > 2,000 mg/kg

(OECD Test Guideline 402)

Skin corrosion/irritation

Skin - Rabbit

Result: No skin irritation - 4 h

(OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: No eye irritation - 72 h

(OECD Test Guideline 405)

Respiratory or skin sensitization

Maximization Test - Guinea pig

Result: negative

(OECD Test Guideline 406)

Germ cell mutagenicity

Test Type: Micronucleus test

Species: Rat

Cell type: Red blood cells (erythrocytes)

Application Route: Oral

Result: positive

Remarks: (ECHA)

Test Type: comet assay

Species: Mouse

Cell type: Liver cells

Application Route: Inhalation

Result: negative

Remarks: (ECHA)

Test Type: Micronucleus test

Species: Mouse

Cell type: Bone marrow

Application Route: Oral



Result: Positive results were obtained in some in vivo tests.
Remarks: (ECHA)

Test Type: Chromosome aberration test in vitro
Species: Monkey
Cell type: lymphocyte
Application Route: Oral

Result: Positive results were obtained in some in vivo tests.
Remarks: (ECHA)

Carcinogenicity

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Lead)
NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

May damage the unborn child. Positive evidence from human epidemiological studies.
May damage fertility. Positive evidence from human epidemiological studies. Studies indicating a hazard to babies during the lactation period

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Oral - Causes damage to organs through prolonged or repeated exposure. - Central nervous system, Blood, Immune system, Kidney

Aspiration hazard

No data available

11.2 Additional Information

anemia

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

On the basis of the morphology of the product, no hazardous properties are to be expected when it is handled and used with appropriate care.

The following applies to lead compounds in general: Due to the poor absorbability via the gastrointestinal tract, only very high doses lead to acute cases of intoxication. After a latency period of several hours, metallic taste, nausea, vomiting, and colics occur, in many instances followed by shock. Chronic uptake causes peripheral muscular weakness ("drop-wrist"), anaemia, and central-nervous disorders. Women of child-bearing age should not be exposed to the substance over longer periods of time (observe critical threshold).

Handle in accordance with good industrial hygiene and safety practice.



SECTION 12: Ecological information

12.1 Toxicity

No data available

12.2 Persistence and degradability

Biodegradability

Result: - According to the results of tests of biodegradability this product is not readily biodegradable.

Remarks: The methods for determining biodegradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential

Bioaccumulation

Oncorhynchus kisutch - 2 Weeks
- 150 µg/l(Lead)

Bioconcentration factor (BCF): 12

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

Discharge into the environment must be avoided.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)

Not dangerous goods

IMDG

Not dangerous goods

IATA

Not dangerous goods

Further information

Not classified as dangerous in the meaning of transport regulations.



SECTION 15: Regulatory information

SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

Lead	CAS-No. 7439-92-1	Revision Date 2015-11-23
------	----------------------	-----------------------------

Reportable Quantity : D008 lbs

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 8.2

Revision Date: 08/20/2021

Print Date: 03/01/2022



SAFETY DATA SHEET

Version 6.9
Revision Date 04/15/2023
Print Date 04/29/2023

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1 Product identifiers**

Product name : Benzene

Product Number : 319953
Brand : SIGALD
Index-No. : 601-020-00-8
CAS-No. : 71-43-2

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-
527-3887 CHEMTREC (International) 24
Hours/day; 7 Days/week

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable liquids (Category 2), H225
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Germ cell mutagenicity (Category 1B), H340
Carcinogenicity (Category 1A), H350
Specific target organ toxicity - repeated exposure (Category 1), Blood, H372
Aspiration hazard (Category 1), H304
Short-term (acute) aquatic hazard (Category 2), H401
Long-term (chronic) aquatic hazard (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal Word

Danger

Hazard statement(s)

H225	Highly flammable liquid and vapor.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H340	May cause genetic defects.
H350	May cause cancer.
H372	Causes damage to organs (Blood) through prolonged or repeated exposure.
H401	Toxic to aquatic life.
H412	Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe mist or vapors.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/ doctor.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P331	Do NOT induce vomiting.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	: C ₆ H ₆
Molecular weight	: 78.11 g/mol
CAS-No.	: 71-43-2
EC-No.	: 200-753-7
Index-No.	: 601-020-00-8

Component	Classification	Concentration
benzene		
	Flam. Liq. 2; Skin Irrit. 2; Eye Irrit. 2A; Muta. 1B; Carc. 1A; STOT RE 1; Asp. Tox. 1; Aquatic Acute 2; Aquatic Chronic 3; H225, H315, H319, H340, H350, H372, H304, H401, H412	< = 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice

Show this material safety data sheet to the doctor in attendance.

If inhaled

After inhalation: fresh air. Call in physician.

In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact

After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed

After swallowing: caution if victim vomits. Risk of aspiration! Keep airways free. Pulmonary failure possible after aspiration of vomit. Call a physician immediately.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Carbon dioxide (CO₂) Foam Dry powder

Unsuitable extinguishing media

For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Carbon oxides

Flash back possible over considerable distance., Container explosion may occur under fire conditions.

Combustible.

Pay attention to flashback.

Vapors are heavier than air and may spread along floors.

Development of hazardous combustion gases or vapours possible in the event of fire.

Forms explosive mixtures with air at ambient temperatures.

5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition.

Evacuate the danger area, observe emergency procedures, consult an expert.

For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion

Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharge.

Hygiene measures

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions

Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition. Keep locked up or in an area accessible only to qualified or authorized persons.

Storage class

Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
benzene	71-43-2	TWA	0.5 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Leukemia Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed human carcinogen Danger of cutaneous absorption		
		STEL	2.5 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Leukemia Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed human carcinogen Danger of cutaneous absorption		
		TWA	10 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.40-1969		
		CEIL	25 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.40-1969		
		Peak	50 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.40-1969		
		See 1910.1028. See Table Z-2 for the limits applicable in the operations or sectors excluded in 1910.1028 The final benzene standard in 1910.1028 applies to all occupational exposures to benzene except some		

		subsegments of industry where exposures are consistently under the action level (i.e., distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures); for the excepted subsegments, the benzene limits in Table Z-2 apply.		
		TWA	0.1 ppm	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		ST	1 ppm	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		

8.2 Exposure controls

Appropriate engineering controls

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the EC approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Flame retardant antistatic protective clothing.

Respiratory protection

required when vapours/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure

Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance	Form: liquid Color: clear, colorless
b) Odor	No data available
c) Odor Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 5.5 °C (41.9 °F) - lit.
f) Initial boiling point and boiling range	80 °C 176 °F - lit.
g) Flash point	-11 °C (12 °F) - DIN 51755 Part 1
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	Upper explosion limit: 8.0 %(V) Lower explosion limit: 1.2 %(V)
k) Vapor pressure	100 hPa at 20 °C (68 °F)
l) Vapor density	No data available
m) Density	0.874 g/cm ³ at 25 °C (77 °F) - lit.
Relative density	No data available
n) Water solubility	ca.1.88 g/l at 23.5 °C (74.3 °F) - soluble
o) Partition coefficient: n-octanol/water	log Pow: 2.13 at 25 °C (77 °F) - Bioaccumulation is not expected., (ECHA)
p) Autoignition temperature	498 °C (928 °F) at 1,013.5 hPa
q) Decomposition temperature	No data available
r) Viscosity	0.604 mm ² /s at 25 °C (77 °F) -
s) Explosive properties	No data available
t) Oxidizing properties	none

9.2 Other safety information

No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

Vapors may form explosive mixture with air.

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions

Exothermic reaction with:

halogens

Halogenated hydrocarbon

in the presence of:

Light metals

Risk of explosion with:

halogen-halogen compounds

Nitric acid

Boranes

Ozone

peroxi compounds

perchlorates

permanganic acid

perchloryl fluoride

Strong oxidizing agents

Chlorine

fluorides

uranium hexafluoride

Oxygen

liquid

Risk of ignition or formation of inflammable gases or vapours with:

chromium(VI) oxide

Fluorine

nitryl compounds

Oxygen

oxyhalogenic compounds

Violent reactions possible with:

mineral acids

sulfur

10.4 Conditions to avoid

Warming.

10.5 Incompatible materials

rubber, various plastics

10.6 Hazardous decomposition products

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - male - > 2,000 mg/kg
(OECD Test Guideline 401)

Symptoms: Nausea

LC50 Inhalation - Rat - female - 4 h - 43.7 mg/l - vapor

(OECD Test Guideline 403)

LD50 Dermal - Rabbit - male and female - > 8,260 mg/kg

(OECD Test Guideline 402)

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Irritating to skin. - 4 h

(OECD Test Guideline 404)

Remarks: Drying-out effect resulting in rough and chapped skin.

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Eye irritation

Remarks: (ECHA)

Respiratory or skin sensitization

Maximization Test - Guinea pig

Result: negative

(OECD Test Guideline 406)

Germ cell mutagenicity

May cause genetic defects.

Test Type: Ames test

Test system: Salmonella typhimurium

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 471

Result: negative

Test Type: Mutagenicity (mammal cell test): chromosome aberration.

Test system: Chinese hamster lung cells

Metabolic activation: with and without metabolic activation

Method: US-EPA

Result: positive

Test Type: In vitro mammalian cell gene mutation test

Metabolic activation: with and without metabolic activation

Method: US-EPA

Result: positive

Test Type: Mutagenicity (mammal cell test): micronucleus.

Species: Mouse

Cell type: Bone marrow

Application Route: inhalation (vapor)

Method: OECD Test Guideline 474

Result: positive

Carcinogenicity

May cause cancer. Positive evidence from human epidemiological studies.

IARC: 1 - Group 1: Carcinogenic to humans (benzene)
NTP: Known - Known to be human carcinogen (benzene)
OSHA: OSHA specifically regulated carcinogen (benzene)

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Causes damage to organs through prolonged or repeated exposure.

- Blood

Aspiration hazard

May be fatal if swallowed and enters airways.

11.2 Additional Information

Repeated dose toxicity - Rat - male and female - Oral - 120 d - NOAEL (No observed adverse effect level) - 100 mg/kg - LOAEL (Lowest observed adverse effect level) - 25 mg/kg

Remarks: Subchronic toxicity

RTECS: CY1400000

Nausea, Dizziness, Headache, narcosis, Inhalation of high concentrations of benzene may have an initial stimulatory effect on the central nervous system characterized by exhilaration, nervous excitation and/or giddiness, depression, drowsiness, or fatigue. The victim may experience tightness in the chest, breathlessness, and loss of consciousness. Tremors, convulsions, and death due to respiratory paralysis or circulatory collapse can occur in a few minutes to several hours following severe exposures. Aspiration of small amounts of liquid immediately causes pulmonary edema and hemorrhage of pulmonary tissue. Direct skin contact may cause erythema. Repeated or prolonged skin contact may result in drying, scaling dermatitis, or development of secondary skin infections. The chief target organ is the hematopoietic system. Bleeding from the nose, gums, or mucous membranes and the development of purpuric spots, pancytopenia, leukopenia, thrombocytopenia, aplastic anemia, and leukemia may occur as the condition progresses. The bone marrow may appear normal, aplastic or hyperplastic, and may not correlate with peripheral blood-forming tissues. The onset of effects of prolonged benzene exposure may be delayed for many months or years after the actual exposure has ceased., Blood disorders

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Systemic effects:

After absorption:

agitation
Headache
Dizziness
inebriation
Tiredness
CNS disorders
narcosis
respiratory arrest

Subacute toxicity

After a latency period:

Changes in the blood count
haemolysis

Other dangerous properties can not be excluded.

This substance should be handled with particular care.

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - <i>Oncorhynchus mykiss</i> (rainbow trout) - 5.3 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - <i>Daphnia magna</i> (Water flea) - 10 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	static test ErC50 - <i>Pseudokirchneriella subcapitata</i> (green algae) - 100 mg/l - 72 h (OECD Test Guideline 201)
Toxicity to bacteria	static test IC50 - - 13 mg/l - 24 h Remarks: (ECHA)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 28 d Result: 96 % - Readily biodegradable. (OECD Test Guideline 301F)
------------------	---

12.3 Bioaccumulative potential

Bioaccumulation	<i>Leuciscus idus</i> (Golden orfe) - 3 d - 0.05 mg/l(benzene)
	Bioconcentration factor (BCF): 10

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties

No data available

12.7 Other adverse effects

Endangers drinking-water supplies if allowed to enter soil or water.
Discharge into the environment must be avoided.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations.
Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

SECTION 14: Transport information

DOT (US)

UN number: 1114 Class: 3 Packing group: II
Proper shipping name: Benzene
Reportable Quantity (RQ): 10 lbs
Reportable Quantity (RQ): 10 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1114 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: BENZENE

IATA

UN number: 1114 Class: 3 Packing group: II
Proper shipping name: Benzene

SECTION 15: Regulatory information

SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
benzene	71-43-2	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard
:

Reportable Quantity D018 lbs

Massachusetts Right To Know Components

	CAS-No.	Revision Date
benzene	71-43-2	2007-07-01

Pennsylvania Right To Know Components

benzene

CAS-No.
71-43-2

Revision Date
2007-07-01

California Prop. 65 Components

, which is/are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov/benzene

CAS-No.
71-43-2

Revision Date
2009-02-01

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.9

Revision Date: 04/15/2023

Print Date: 04/29/2023

SAFETY DATA SHEET

Version 6.11
Revision Date 03/19/2024
Print Date 07/13/2024

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1 Product identifiers**

Product name : *cis*-1,2-Dichloroethylene

Product Number : D62004
Brand : Aldrich
Index-No. : 602-026-00-3
CAS-No. : 156-59-2

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-
527-3887 CHEMTREC (International) 24
Hours/day; 7 Days/week

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable liquids (Category 2), H225
Acute toxicity, Oral (Category 4), H302
Acute toxicity, Inhalation (Category 4), H332
Skin irritation (Category 2), H315
Short-term (acute) aquatic hazard (Category 3), H402
Long-term (chronic) aquatic hazard (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Aldrich - D62004

Page 1 of 10

Pictogram



Signal Word

Danger

Hazard Statements

H225

Highly flammable liquid and vapor.

H302 + H332

Harmful if swallowed or if inhaled.

H315

Causes skin irritation.

H412

Harmful to aquatic life with long lasting effects.

Precautionary Statements

P210

Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.

P233

Keep container tightly closed.

P240

Ground/bond container and receiving equipment.

P241

Use explosion-proof electrical/ ventilating/ lighting/ equipment.

P242

Use only non-sparking tools.

P243

Take precautionary measures against static discharge.

P261

Avoid breathing mist or vapors.

P264

Wash skin thoroughly after handling.

P270

Do not eat, drink or smoke when using this product.

P271

Use only outdoors or in a well-ventilated area.

P273

Avoid release to the environment.

P280

Wear protective gloves/ eye protection/ face protection.

P301 + P312 + P330

IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.

P303 + P361 + P353

IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.

P304 + P340 + P312

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.

P332 + P313

If skin irritation occurs: Get medical advice/ attention.

P362

Take off contaminated clothing and wash before reuse.

P370 + P378

In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.

P403 + P235

Store in a well-ventilated place. Keep cool.

P501

Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms : cis-Acetylene dichloride

Formula : $C_2H_2Cl_2$

Molecular weight : 96.94 g/mol

CAS-No. : 156-59-2

EC-No. : 205-859-7

Index-No. : 602-026-00-3

Component	Classification	Concentration
cis-Dichloroethylene		
	Flam. Liq. 2; Acute Tox. 4; Skin Irrit. 2; Aquatic Acute 3; Aquatic Chronic 3; H225, H302, H332, H315, H402, H412	< = 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice

Show this material safety data sheet to the doctor in attendance.

If inhaled

After inhalation: fresh air. If breathing stops: mouth-to-mouth breathing or artificial respiration. Oxygen if necessary. Immediately call in physician.

In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact

After eye contact: rinse out with plenty of water. Remove contact lenses.

If swallowed

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Water Foam Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media

For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Carbon oxides

Hydrogen chloride gas

Combustible.

Aldrich - D62004

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Pay attention to flashback.
Vapors are heavier than air and may spread along floors.
Development of hazardous combustion gases or vapours possible in the event of fire.
Forms explosive mixtures with air at ambient temperatures.

5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Remove container from danger zone and cool with water. Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition. Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemisorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion

Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharge.

Hygiene measures

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions

Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.

Handle and store under inert gas. Air and moisture sensitive. Light sensitive.

Storage class

Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
cis-Dichloroethylene	156-59-2	TWA	200 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Eye irritation		

8.2 Exposure controls

Appropriate engineering controls

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

Skin protection

required

Body Protection

Flame retardant antistatic protective clothing.

Respiratory protection

Recommended Filter type: Filter type AX

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

required when vapours/aerosols are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure

Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance	Form: liquid Color: light yellow
b) Odor	No data available
c) Odor Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: -80 °C (-112 °F) - lit.
f) Initial boiling point and boiling range	60 °C 140 °F - lit.
g) Flash point	6.0 °C (42.8 °F) - closed cup
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapor pressure	No data available
l) Vapor density	No data available
m) Density	1.284 g/cm ³ at 25 °C (77 °F) - lit.
Relative density	No data available
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Autoignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	none

9.2 Other safety information

No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

Vapors may form explosive mixture with air.

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions

Violent reactions possible with:
Oxidizing agents

10.4 Conditions to avoid

Warming.

10.5 Incompatible materials

No data available

10.6 Hazardous decomposition products

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 770 mg/kg

Remarks: (RTECS)

Acute toxicity estimate Inhalation - 4 h - 11.1 mg/l - vapor

(Expert judgment)

Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Dermal: No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Moderate skin irritation - 24 h

Remarks: (RTECS)

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitization

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

11.2 Additional Information

RTECS: KV9420000

narcosis

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish

LC50 - Lepomis macrochirus (Bluegill sunfish) - 140 mg/l - 96 h
Remarks: (ECOTOX Database)

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties

No data available

12.7 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

SECTION 14: Transport information

DOT (US)

UN number: 1150 Class: 3 Packing group: II
Proper shipping name: 1,2-Dichloroethylene
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG

UN number: 1150 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: 1,2-DICHLOROETHYLENE

IATA

UN number: 1150 Class: 3 Packing group: II
Proper shipping name: 1,2-Dichloroethylene

SECTION 15: Regulatory information

SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards

Fire Hazard

Massachusetts Right To Know Components

cis-Dichloroethylene	CAS-No. 156-59-2	Revision Date 1993-04-24
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Pennsylvania Right To Know Components

cis-Dichloroethylene	CAS-No. 156-59-2	Revision Date 1993-04-24
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SECTION 16: Other information

Further information

The information is believed to be correct but is not exhaustive and will be used solely as a guideline, which is based on current knowledge of the chemical substance or mixture and is applicable to appropriate safety precautions for the product. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.11

Revision Date: 03/19/2024

Print Date: 07/13/2024

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1 Product identifiers**

Product name : Diesel

Product Number : CRMMPGO

Brand : Sigma-Aldrich

Index-No. : 649-224-00-6

CAS-No. : 68334-30-5

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-
527-3887 CHEMTREC (International) 24
Hours/day; 7 Days/week

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable liquids (Category 3), H226
Acute toxicity, Inhalation (Category 4), H332
Skin irritation (Category 2), H315
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure (Category 2), H373
Aspiration hazard (Category 1), H304
Short-term (acute) aquatic hazard (Category 2), H401
Long-term (chronic) aquatic hazard (Category 2), H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H226	Flammable liquid and vapor.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H332	Harmful if inhaled.
H351	Suspected of causing cancer.
H373	May cause damage to organs through prolonged or repeated exposure.
H411	Toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/ doctor.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P331	Do NOT induce vomiting.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P391	Collect spillage.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none



SECTION 3: Composition/information on ingredients

3.1 Substances

CAS-No. : 68334-30-5
EC-No. : 269-822-7
Index-No. : 649-224-00-6

Component	Classification	Concentration
Diesel fuel		
	Flam. Liq. 3; Acute Tox. 4; Skin Irrit. 2; Carc. 2; STOT RE 2; Asp. Tox. 1; Aquatic Acute 2; Aquatic Chronic 2; H226, H332, H315, H351, H373, H304, H401, H411	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice

Consult a physician. Show this material safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Dry powder Dry sand

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Unsuitable extinguishing media

Do NOT use water jet.

5.2 Special hazards arising from the substance or mixture

Carbon oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

SECTION 6: Accidental release measures**6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage**7.1 Precautions for safe handling****Advice on safe handling**

Avoid contact with skin and eyes. Avoid inhalation of vapor or mist.

Advice on protection against fire and explosion

Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Hygiene measures

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities**Storage conditions**

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Storage class

Storage class (TRGS 510): 3: Flammable liquids



7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Diesel fuel	68334-30-5	TWA	100 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.



SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance	Form: liquid
b) Odor	No data available
c) Odor Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	No data available
f) Initial boiling point and boiling range	141 - 462 °C 286 - 864 °F at 1,013 hPa
g) Flash point	>= 56 °C (>= 133 °F) - closed cup
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapor pressure	400 hPa at 40 °C (104 °F)
l) Vapor density	No data available
m) Density	0.8 - 0.91 g/cm ³ at 15 °C (59 °F)
Relative density	No data available
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Autoignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	>= 1.5 mm ² /s at 40 °C (104 °F) -
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety information

No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.



10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 17,900 mg/kg

(OECD Test Guideline 401)

Inhalation: No data available

LD50 Dermal - Rabbit - > 4,300 mg/kg

(OECD Test Guideline 402)

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Irritating to skin. - 24 h

(OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: No eye irritation - 24 h

(OECD Test Guideline 405)

Respiratory or skin sensitization

Maximization Test - Guinea pig

Result: Did not cause sensitization on laboratory animals.

(OECD Test Guideline 406)

Germ cell mutagenicity

No data available

Carcinogenicity

Limited evidence of carcinogenicity in animal studies

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available



Specific target organ toxicity - repeated exposure

The substance or mixture is classified as specific target organ toxicant, repeated exposure, category 2. **Aspiration hazard**

May be fatal if swallowed and enters airways.

11.2 Additional Information

Cough, Difficulty in breathing, chest congestion, Shortness of breath, Fever, defatting, Dermatitis, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information**12.1 Toxicity**

Toxicity to fish static test LC50 - Oncorhynchus mykiss (rainbow trout) - 21 mg/l - 96 h
(OECD Test Guideline 203)

Toxicity to algae Growth inhibition EC50 - Pseudokirchneriella subcapitata (green algae) - 10 mg/l - 72 h
(OECD Test Guideline 201)

12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 28 d
Result: 57.5 % - According to the results of tests of biodegradability this product is not readily biodegradable.
(OECD Test Guideline 301)

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Toxic to aquatic life with long lasting effects.

No data available



SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information

DOT (US)

UN number: 1202 Class: 3 Packing group: III
Proper shipping name: Diesel fuel
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG

UN number: 1202 Class: 3 Packing group: III EMS-No: F-E, S-E
Proper shipping name: DIESEL FUEL

IATA

UN number: 1202 Class: 3 Packing group: III
Proper shipping name: Diesel fuel

SECTION 15: Regulatory information

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

Diesel fuel

CAS-No.
68334-30-5

Revision Date
1989-08-11



Diesel fuel

CAS-No.
68334-30-5

Revision Date
1989-08-11

New Jersey Right To Know Components

Diesel fuel

CAS-No.
68334-30-5

Revision Date
1989-08-11

SECTION 16: Other information

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Print Date: 12/14/2022



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MATERIAL SAFETY DATA SHEET

(SOLAS regulation VI/5-1 format)

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: GASOLINE
Product Description: Hydrocarbons and Additives
Product Code: 708439
Intended Use: Fuel
MARPOL Annex I Category: Gasoline and spirits
See Section 14 for transportation information related to the Bill of Lading, other shipping documents

COMPANY IDENTIFICATION

Country	Company	Emergency Telephone Number
International Sales	ExxonMobil Marine Fuels Ermyn House MP 31 Ermyn Way Leatherhead, KT22 8UX UK	(UK) (+44) (0) 23 8089 1558
Australia	MOBIL OIL AUSTRALIA PTY LTD A.B.N. 88 004 052 984 12 Riverside Quay Southbank Victoria 3006 Australia	+1 609 737 4411
Belgium	ExxonMobil Petroleum & Chemical BVBA Polderdijkweg Haven 447 - 2030 Antwerpen, Belgium	+32 (0) 487 545 780
Canada	Imperial Oil 505 Quarry Park Boulevard SE Calgary, AB T2C 5N1 Canada	1-866-232-9563
Fiji	Mobil Oil Australia Pty Ltd - t/a Mobil Oil Fiji Level 6, ANZ House, 25 Victoria Parade, Suva, Fiji Islands	+1 609 737 4411
France	Esso SAF Tour Manhattan La Defense 2 5/6 Place de l'Iris 92400 Courbevoie France	+33 08 1000 3353
Hong Kong	ExxonMobil Hong Kong Limited: 2201, 22/F, Central Plaza 18 Harbour Road, Wanchai, Hong Kong	+1 609 737 4411
Italy	Esso Italiana SRL Viale Castello della Magliana 25 Rome 00148 Italy	+39 0382 24444
New Zealand	Mobil Oil New Zealand Limited Vero Centre 48 Shortland Street Auckland 1140	National Poison Center +64 3 479 7248 Freephone 0800 764 766

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	New Zealand	
Norway	Esso Norge AS Drammensveien 149 Skøyen N-0213 Oslo, Norway	Emergency: (NO) +47 33 37 73 00 Poison: (NO) +47 22 59 13 00
Singapore	ExxonMobil Asia Pacific Pte Limited 1 HarbourFront Place #06-00 HarbourFront Tower One Singapore 098633	01-609-737-4411
Thailand	Esso (Thailand) Public Company Limited 3195/17-29 Rama 4 Road, Klong Ton, Klong Toey District Bangkok, Thailand 10110	+1-609-737-4411
United Kingdom	Esso Petroleum Company Limited Ermyn House MP 31 Ermyn Way Leatherhead, KT22 8UX UK	+32 (0) 487 545 780
United States	ExxonMobil Oil Corporation 22777 Springwoods Village Parkway Spring, TX 77389 USA	+1 609 737 4411

This (M)SDS is a document with no country specific information included.

SECTION 2 HAZARDS IDENTIFICATION

This material is hazardous according to UN GHS Criteria. Classification includes all GHS hazard classes. For hazard categories with two cut-off/concentration limits, classification was based on the higher limit.

GHS CLASSIFICATION:

Flammable liquid: Category 1.
Skin irritation: Category 2.
Germ Cell Mutagen: Category 1B.
Carcinogen: Category 1B.
Reproductive toxicant (developmental): Category 2.
Specific target organ toxicant (central nervous system): Category 3.
Aspiration toxicant: Category 1.
Acute aquatic toxicant: Category 2.
Chronic aquatic toxicant: Category 2.

GHS Label Elements:

Pictogram:



Signal Word: Danger

Hazard Statements:

Physical: H224: Extremely flammable liquid and vapour.
Health: H304: May be fatal if swallowed and enters airways. H315: Causes skin irritation. H336: May cause drowsiness or dizziness. H340: May cause genetic defects. H350: May cause cancer. H361: Suspected

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of damaging the unborn child.

Environmental: H411: Toxic to aquatic life with long lasting effects.

Precautionary Statements:

Prevention: P201: Obtain special instructions before use. P202: Do not handle until all safety precautions have been read and understood. P210: Keep away from heat/sparks/open flames/hot surfaces. -- No smoking.

P233: Keep container tightly closed. P240: Ground/bond container and receiving equipment. P241: Use explosion-proof electrical, ventilating and lighting equipment. P242: Use only non-sparking tools. P243: Take precautionary measures against static discharge. P261: Avoid breathing mist / vapours. P264: Wash skin thoroughly after handling. P271: Use only outdoors or in a well-ventilated area. P273: Avoid release to the environment. P280: Wear protective gloves/protective clothing/eye protection/face protection.

Response: P301 + P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. P303 + P361 + P353: IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. P304 + P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing. P308 + P313: IF exposed or concerned: Get medical advice/attention. P312: Call a POISON CENTER or doctor/physician if you feel unwell. P331: Do NOT induce vomiting. P332 + P313: If skin irritation occurs: Get medical advice/attention. P362 + P364: Take off contaminated clothing and wash it before reuse. P370 + P378: In case of fire: Use water fog, foam, dry chemical or carbon dioxide (CO₂) to extinguish. P391: Collect spillage. Storage: P403 + P235: Store in a well-ventilated place. Keep cool. P405: Store locked up. Disposal: P501: Dispose of contents and container in accordance with local regulations.

Contains: GASOLINE

Other hazard information:

PHYSICAL / CHEMICAL HAZARDS

Material can accumulate static charges which may cause an ignition. Material can release vapours that readily form flammable mixtures. Vapour accumulation could flash and/or explode if ignited. Small leaks of this material can result in groundwater contamination levels above taste and odor thresholds for ether oxygenates (methyl tertiary butyl ether, ethyl tertiary butyl ether, tertiary amyl methyl ether or diisopropyl ether). Groundwater becomes unpalatable well below ether oxygenate concentrations that could affect human health.

HEALTH HAZARDS

High-pressure injection under skin may cause serious damage. May be irritating to the eyes, nose, throat, and lungs. Exposure to benzene is associated with cancer (acute myeloid leukaemia and myelodysplastic syndrome), damage to the blood-producing system, and serious blood disorders (see Section 11).

ENVIRONMENTAL HAZARDS

Ether oxygenates are significantly more soluble than other components of gasoline like benzene, toluene, ethyl benzene and xylenes (BTEX) if released into groundwater. Ether oxygenates may also biodegrade more slowly, have the potential to move farther and faster in groundwater and have the potential to contaminate larger areas of groundwater than BTEX if released into groundwater.

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

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This material is defined as a mixture.

Hazardous Substance(s) or Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
ETHYL ALCOHOL	64-17-5	0 - 5%	H225, H319(2A)
ETHYL TERT-BUTYL ETHER	637-92-3	0 - 15%	H225, H336, H402
GASOLINE	86290-81-5	> 85 %	H224, H304, H336, H340(1B), H350(1B), H361(D), H315, H401, H411
ISOBUTYL ALCOHOL	78-83-1	0 - 10%	H226, H335, H336, H315, H318
ISOPROPYL ALCOHOL	67-63-0	0 - 10%	H225, H305, H336, H319(2A)
METHYL ALCOHOL	67-56-1	0 - < 3%	H225, H301, H311, H331, H370
METHYL-TERT-BUTYL ETHER	1634-04-4	0 - 15%	H225, H303, H305, H315
TERT-BUTYL ALCOHOL	75-65-0	0 - 7%	H225, H303, H305, H332, H335, H336

Hazardous Constituent(s) Contained in Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
Benzene	71-43-2	0.1 - 1.0%	H225, H303, H304, H340(1B), H350(1A), H315, H319(2A), H372, H401
Toluene	108-88-3	> 5.0 %	H225, H304, H336, H361(D), H315, H373, H401, H412

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

NOTE: Oxygenates may be present up to the maximum permitted by European Standard EN228.

SECTION 4 FIRST AID MEASURES

INHALATION

Immediately remove from further exposure. Get immediate medical assistance. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. Give supplemental oxygen, if available. If breathing has stopped, assist ventilation with a mechanical device.

SKIN CONTACT

Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

Seek immediate medical attention. Do not induce vomiting.

ACUTE AND DELAYED SYMPTOMS/EFFECTS

See Toxicological Section

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NOTE TO PHYSICIAN

If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately. This material, or a component, may be associated with cardiac sensitization following very high exposures (well above occupational exposure limits) or with concurrent exposure to high stress levels or heart-stimulating substances like epinephrine. Administration of such substances should be avoided.

SECTION 5	FIRE FIGHTING MEASURES
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EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO₂) to extinguish flames.

Inappropriate Extinguishing Media: Straight streams of water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. If a leak or spill has not ignited, use water spray to disperse the vapours and to protect personnel attempting to stop a leak. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. Fire-fighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Extremely Flammable. Vapour is flammable and heavier than air. Vapour may travel across the ground and reach remote ignition sources, causing a flashback fire danger. Hazardous material. Firefighters should consider protective equipment indicated in Section 8.

Hazardous Combustion Products: Aldehydes, Incomplete combustion products, Oxides of carbon, Smoke, Fume, Sulphur oxides

FLAMMABILITY PROPERTIES

Flash Point [Method]: <-35°C (-31°F) [IP 170/70]

Flammable Limits (Approximate volume % in air): LEL: 1.4 UEL: 7.6

Autoignition Temperature: >250°C (482°F)

SECTION 6	ACCIDENTAL RELEASE MEASURES
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NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

PROTECTIVE MEASURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required, due to toxicity or flammability of the material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

For emergency responders: Respiratory protection: half-face or full-face respirator with filter(s) for organic vapor and, when applicable, H₂S, or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an

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oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Work gloves that are resistant to aromatic hydrocarbons are recommended. Note: gloves made of polyvinyl acetate (PVA) are not water-resistant and are not suitable for emergency use. Chemical goggles are recommended if splashes or contact with eyes is possible. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic material is recommended.

SPILL MANAGEMENT

Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do so without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapour-suppressing foam may be used to reduce vapour. Use clean non-sparking tools to collect absorbed material. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Large Spills: Water spray may reduce vapour, but may not prevent ignition in enclosed spaces.

Water Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do so without risk. Do not confine in area of spill. Advise occupants and shipping in downwind areas of fire and explosion hazard and warn them to stay clear. Allow liquid to evaporate from the surface. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken. This product contains ether oxygenates and it is important to respond quickly to any spills or leaks. Even a small release, if not quickly cleaned up, can contaminate large volumes of surface or groundwater. Personnel handling, transferring or dispensing this product should be trained to respond immediately to any spills or leaks to prevent contamination of groundwater.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dyke far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7

HANDLING AND STORAGE

HANDLING

Avoid all personal contact. Prevent exposure to ignition sources, for example use non-sparking tools and explosion-proof equipment. Potentially toxic/irritating fumes/vapour may be evolved from heated or agitated material. Do not siphon by mouth. Use only with adequate ventilation. Do not use as a cleaning solvent or other non-motor fuel uses. For use as a motor fuel only. It is dangerous and/or unlawful to put petrol into unapproved containers. Do not fill container while it is in or on a vehicle. Static electricity may ignite vapour and cause fire. Place container on ground when filling and keep nozzle in contact with container. Do not use electronic devices (including but not limited to cellular phones, computers, calculators, pagers or other electronic devices etc) in or around any fuelling operation or storage area unless the devices are certified intrinsically safe by an approved national testing agency and to the safety standards required by national and/or local laws and regulations. Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

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Static Accumulator: This material is a static accumulator. A liquid is typically considered a nonconductive, static accumulator if its conductivity is below 100 pS/m (100x10E-12 Siemens per meter) and is considered a semiconductive, static accumulator if its conductivity is below 10,000 pS/m. Whether a liquid is nonconductive or semiconductive, the precautions are the same. A number of factors, for example liquid temperature, presence of contaminants, anti-static additives and filtration can greatly influence the conductivity of a liquid.

STORAGE

Ample fire water supply should be available. A fixed sprinkler/deluge system is recommended. The type of container used to store the material may affect static accumulation and dissipation. Consistent with regulatory control requirements, storage and handling equipment and systems should be capable of preventing soil and groundwater contamination by liquid spills and vapor emissions. Leak detection systems and programs are recommended. Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Outside or detached storage preferred. Keep away from incompatible materials. Storage containers should be earthed and bonded. Fixed storage containers, transfer containers and associated equipment should be earthed and bonded to prevent accumulation of static charge.

SECTION 8

EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Substance Name	Form	Limit/Standard			Note	Source	Year
Benzene		TWA	3.25 mg/m ³	1 ppm	Skin	EU. Dir. 04/37/EC Annex III A	2017
Benzene		STEL	1 ppm			ExxonMobil	2019
Benzene		TWA	0.5 ppm			ExxonMobil	2019
ETHYL ALCOHOL		STEL	1000 ppm			ACGIH	2018
ETHYL TERT-BUTYL ETHER		TWA	25 ppm			ACGIH	2018
GASOLINE		STEL	200 ppm			ExxonMobil	2019
GASOLINE		TWA	100 ppm			ExxonMobil	2019
ISOBUTYL ALCOHOL		TWA	50 ppm			ACGIH	2018
ISOPROPYL ALCOHOL		STEL	400 ppm			ACGIH	2018
ISOPROPYL ALCOHOL		TWA	200 ppm			ACGIH	2018
METHYL ALCOHOL		STEL	250 ppm		Skin	ACGIH	2018
METHYL ALCOHOL		TWA	200 ppm		Skin	ACGIH	2018
METHYL-TERT-BUTYL ETHER		TWA	50 ppm			ACGIH	2018
TERT-BUTYL ALCOHOL		TWA	100 ppm			ACGIH	2018
Toluene		TWA	20 ppm			ACGIH	2018

Biological limits

Substance Name	Specimen	Sampling Time	Limit	Determinant	Source
Benzene	Creatinine in urine	End of shift	500 ug/g	t,t-Muconic acid	ACGIH BELs (BEIs)

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Benzene	Creatinine in urine	End of shift	25 ug/g	S-Phenylmercapturic acid	ACGIH BELs (BEIs)
ISOPROPYL ALCOHOL	Urine	End of shift at end of work wk	40 mg/l	Acetone	ACGIH BELs (BEIs)
METHYL ALCOHOL	Urine	End of shift	15 mg/l	Methanol	ACGIH BELs (BEIs)
Toluene	Blood	Prior to last shift of work wk	0.02 mg/l	Toluene	ACGIH BELs (BEIs)
Toluene	Creatinine in urine	End of shift	0.3 mg/g	o-Cresol, with hydrolysis	ACGIH BELs (BEIs)
Toluene	Urine	End of shift	0.03 mg/l	Toluene	ACGIH BELs (BEIs)

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

Use explosion-proof ventilation equipment to stay below exposure limits.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

Half-face filter respirator

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

Chemical resistant gloves are recommended. Nitrile, Viton

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

Chemical/oil resistant clothing is recommended.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after

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handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

Consistent with regulatory control requirements, storage and handling equipment and systems should be capable of preventing soil and groundwater contamination by liquid spills and vapor emissions. Leak detection systems and programs are recommended. Personnel handling, transferring or dispensing this product should be trained to respond immediately to any spills or leaks to prevent contamination of groundwater.

SECTION 9

PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Liquid

Colour: Pale Yellow

Odour: Characteristic

Odour Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): < 1

Density (at 15 °C): 620 kg/m³ (5.17 lbs/gal, 0.62 kg/dm³) - 880 kg/m³ (7.34 lbs/gal, 0.88 kg/dm³)

Flammability (Solid, Gas): N/A

Flash Point [Method]: <-35°C (-31°F) [IP 170/70]

Flammable Limits (Approximate volume % in air): LEL: 1.4 UEL: 7.6

Autoignition Temperature: >250°C (482°F)

Boiling Point / Range: 28°C (82°F) - 210°C (410°F) [ASTM D86]

Decomposition Temperature: N/D

Vapour Density (Air = 1): > 1 at 101 kPa

Vapour Pressure: [N/D at 20°C] | 4 kPa (30 mm Hg) at 37.8 °C - 240 kPa (1800 mm Hg) at 37.8°C

Evaporation Rate (n-butyl acetate = 1): N/D

pH: N/A

Log Pow (n-Octanol/Water Partition Coefficient): > 3.5

Solubility in Water: Negligible for the hydrocarbon components. Ether oxygenates are significantly more soluble.

Viscosity: <1 cSt (1 mm²/sec) at 40°C

Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION

Freezing Point: N/D

Melting Point: N/D

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SECTION 10	STABILITY AND REACTIVITY
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STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Heat, sparks, flame, and build up of static electricity.

MATERIALS TO AVOID: Alkalies, Halogens, Strong Acids, Strong oxidisers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

POSSIBILITY OF HAZARDOUS REACTIONS: Hazardous polymerization will not occur.

SECTION 11	TOXICOLOGICAL INFORMATION
------------	---------------------------

ACUTE TOXICITY

<u>Route of Exposure</u>	<u>Conclusion / Remarks</u>
Inhalation	
Toxicity (Rat): LC50 > 5000 mg/m3	Minimally Toxic. Based on test data for structurally similar materials.
Irritation: No end point data for material.	Elevated temperatures or mechanical action may form vapours, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs.
Ingestion	
Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Skin	
Toxicity (Rabbit): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation (Rabbit): Data available.	Irritating to the skin. Based on test data for structurally similar materials.
Eye	
Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials.

OTHER HEALTH EFFECTS FROM SHORT AND LONG TERM EXPOSURE

Anticipated health effects from sub-chronic, chronic, respiratory or skin sensitization, mutagenicity, reproductive toxicity, carcinogenicity, target organ toxicity (single exposure or repeated exposure), aspiration toxicity and other effects based on human experience and/or experimental data.

For the product itself:

Laboratory animal studies have shown that prolonged and repeated inhalation exposure to light hydrocarbon vapours in the same boiling range as this product can produce adverse kidney effects in male rats. However, these effects were not observed in similar studies with female rats, male and female mice, or in limited studies with other animal species. Additionally, in a number of human studies, there was no clinical evidence of such effects at normal occupational levels. In 1991, The U.S. EPA determined that the male rat kidney is not useful for assessing human risk. Vapour concentrations above recommended exposure levels are irritating to the

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eyes and the respiratory tract, may cause headaches and dizziness, are anaesthetic and may have other central nervous system effects. Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema. Exposure to this material, or one of its components, in situations where there is the potential for high levels, such as in confined spaces or with abuse, may result in abnormal heart rhythm (arrhythmia). High-level exposure to hydrocarbons (above occupational exposure limits) may initiate arrhythmia in a worker that is undergoing stress or is taking a heart-stimulating substance such as epinephrine, a nasal decongestant, or an asthma or cardiovascular drug.

Gasoline unleaded: Carcinogenic in animal tests. Chronic inhalation studies resulted in liver tumours in female mice and kidney tumours in male rats. Neither result considered significant for human health risk assessment by the United States EPA and others. Did not cause mutations in-vitro or in-vivo. Negative in inhalation developmental studies and reproductive tox studies. Inhalation of high concentrations in animals resulted in reversible central nervous system depression, but no persistent toxic effect on the nervous system. Non-sensitizing in test animals. Caused nerve damage in humans from abusive use (sniffing).

Contains:

BENZENE: Caused cancer (acute myeloid leukemia and myelodysplastic syndrome), damage to the blood-producing system, and serious blood disorders in human studies. Caused genetic effects and effects on the immune system in laboratory animal and some human studies. Caused toxicity to the fetus and cancer in laboratory animal studies. **ETHANOL:** Prolonged or repeated exposure to high concentrations of ethanol vapour or overexposure by ingestion may produce adverse effects to brain, kidney, liver, and reproductive organs, birth defects in offspring, and developmental toxicity in offspring. **METHANOL:** Human exposure to methanol may result in illness, systemic poisoning, blindness, optic nerve damage and perhaps death, after being ingested, absorbed through the skin or inhaled. Death due to cardiac or respiratory failure has been reported in some cases from consumption of as little as 30 mls. Exposure to high concentrations of methanol has been shown to cause developmental effects in rodent offspring.

Methyl tertiary butyl ether (MTBE): Carcinogenic in animal tests. Inhalation exposure to high concentrations resulted in higher than expected mortality in male mice due to urinary tract obstructions and female mice displayed benign liver tumors. Inhalation exposure to high concentrations resulted in higher than expected mortality in male rats due to progressive kidney damage as well as increased benign and malignant kidney tumors, and benign testicular tumors. Drinking water exposure to high concentrations resulted in progressive kidney damage in rats and a marginally increased statistical trend of brain tumors in male rats. Tumor incidence was within historical control levels and concluded to not be related to MTBE exposure. Did not cause mutations In Vitro or In vivo. Rabbits exposed to high vapor concentrations did not have any offspring with adverse developmental effects. Mice exposed to high vapor concentrations (maternally toxic) had offspring with embryo/fetal toxicity and birth defects. Rats exposed to high vapor concentrations did not display any treatment-related effects in a two generation reproduction study. The significance of the animal findings at high exposures are not believed to be directly related to potential human health hazards. **TOLUENE :** Concentrated, prolonged or deliberate inhalation may cause brain and nervous system damage. Prolonged and repeated exposure of pregnant animals (> 1500 ppm) have been reported to cause adverse fetal developmental effects.

IARC Classification:

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
Benzene	71-43-2	1
GASOLINE	86290-81-5	3

--REGULATORY LISTS SEARCHED--

1 = IARC 1

2 = IARC 2A

3 = IARC 2B

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SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data for the material, components of the material, or for similar materials, through the application of bridging principals.

ECOTOXICITY

Material -- Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

MOBILITY

Majority of components -- Highly volatile, will partition rapidly to air. Not expected to partition to sediment and wastewater solids.

Low molecular wt. component -- Moderate potential to migrate through soil.

High molecular wt. component -- Low potential to migrate through soil.

Components -- Ether oxygenates are significantly more soluble than other components of gasoline like benzene, toluene, ethyl benzene and xylenes (BTEX) if released into groundwater. Ether oxygenates have the potential to move farther and faster in groundwater and have the potential to contaminate larger areas of groundwater than BTEX if released into groundwater.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Material -- Expected to be inherently biodegradable

Components -- Ether oxygenates may biodegrade slowly.

Atmospheric Oxidation:

Majority of components -- Expected to degrade rapidly in air

BIOACCUMULATION POTENTIAL

Majority of components -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

ECOLOGICAL DATA

Ecotoxicity

Test	Duration	Organism Type	Test Results
Aquatic - Acute Toxicity	48 hour(s)	Daphnia magna	EL50 1 - 100 mg/l: data for similar materials
Aquatic - Acute Toxicity	96 hour(s)	Fish	LL50 1 - 100 mg/l: data for similar materials
Aquatic - Acute Toxicity	72 hour(s)	Pseudokirchneriella subcapitata	EL50 1 - >1000 mg/l: data for similar materials
Aquatic - Chronic Toxicity	21 day(s)	Daphnia magna	NOELR 1 - 10 mg/l: data for similar materials
Aquatic - Chronic Toxicity	72 hour(s)	Pseudokirchneriella subcapitata	NOELR 1 - 100 mg/l: data for similar materials

Persistence, Degradability and Bioaccumulation Potential

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Media	Test Type	Duration	Test Results
Water	Ready Biodegradability	28 day(s)	Percent Degraded < 60 : similar material

INTERNATIONAL OIL POLLUTION COMPENSATION (IOPC)

Material is considered a non-persistent oil.

SECTION 13 DISPOSAL CONSIDERATIONS

DISPOSAL METHODS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

MARPOL - see International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) which provides technical aspects at controlling pollutions from ships.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

SEA (IMDG)

Proper Shipping Name: MOTOR SPIRIT or GASOLINE or PETROL

Hazard Class & Division: 3

EMS Number: F-E, S-E

UN Number: 1203

Packing Group: II

Marine Pollutant: Yes

Label(s): 3

Transport Document Name: UN1203, MOTOR SPIRIT or GASOLINE or PETROL, 3, PG II, (-35°C c.c.), MARINE POLLUTANT

Note - this material is being carried under the scope of MARPOL Annex I

SECTION 15 REGULATORY INFORMATION

REGULATORY STATUS AND APPLICABLE LAWS AND REGULATIONS

Listed or exempt from listing/notification on the following chemical inventories (May contain substance(s) subject to notification to the EPA Active TSCA inventory prior to import to USA): KECI,

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NDSL, TSCA

SECTION 16

OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):

H224: Extremely flammable liquid and vapor; Flammable Liquid, Cat 1

H225: Highly flammable liquid and vapor; Flammable Liquid, Cat 2

H226: Flammable liquid and vapour; Flammable Liquid, Cat 3

H301: Toxic if swallowed; Acute Tox Oral, Cat 3

H303: May be harmful if swallowed; Acute Tox Oral, Cat 5

H304: May be fatal if swallowed and enters airways; Aspiration, Cat 1

H305: May be harmful if swallowed and enters airways; Aspiration, Cat 2

H311: Toxic in contact with skin; Acute Tox Dermal, Cat 3

H315: Causes skin irritation; Skin Corr/Irritation, Cat 2

H318: Causes serious eye damage; Serious Eye Damage/Irr, Cat 1

H319(2A): Causes serious eye irritation; Serious Eye Damage/Irr, Cat 2A

H331: Toxic if inhaled; Acute Tox Inh, Cat 3

H332: Harmful if inhaled; Acute Tox Inh, Cat 4

H335: May cause respiratory irritation; Target Organ Single, Resp Irr

H336: May cause drowsiness or dizziness; Target Organ Single, Narcotic

H340(1B): May cause genetic defects; Germ Cell Mutagenicity, Cat 1B

H350(1A): May cause cancer; Carcinogenicity, Cat 1A

H350(1B): May cause cancer; Carcinogenicity, Cat 1B

H361(D): Suspected of damaging the unborn child; Repro Tox, Cat 2 (Develop)

H370: Causes damage to organs; Target Organ, Single, Cat 1

H372: Causes damage to organs through prolonged or repeated exposure; Target Organ, Repeated, Cat 1

H373: May cause damage to organs through prolonged or repeated exposure; Target Organ, Repeated, Cat 2

H401: Toxic to aquatic life; Acute Env Tox, Cat 2

H411: Toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 2

H412: Harmful to aquatic life with long lasting effects; Chronic Env Tox, Cat 3

THIS MATERIAL SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

Composition: Component Table information was modified.

GHS Physical Hazards information was modified.

GHS Precautionary Statements - Prevention information was modified.

Hazard Identification: Physical/Chemical Hazard information was modified.

Section 01: IMO R&S Emergency Numbers information was modified.

Section 04: First Aid Notes information was modified.

Section 05: Fire Fighting Measures - Fire Fighting Instruction information was modified.

Section 06: Accidental Release - Spill Management - Water information was modified.

Section 06: Protective Measures information was modified.

Section 06: Spill Management Recommendations - Default information was modified.

Section 07: Handling and Storage - Handling information was modified.

Section 07: Handling and Storage - Storage Phrases information was modified.

Section 08: Biological Limits - Table information was modified.

Section 08: Exposure Limits Table information was modified.

Section 10: Materials To Avoid information was modified.

Section 11: Chronic Tox - Component information was modified.

Section 11: Other Health Effects information was modified.

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Section 11: Tox List Cited Table information was modified.

Section 12: Environmental tox table in section 12 information was modified.

Section 12: information was modified.

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DGN: 70958771 (1017738)

Safety Data Sheet



Section 1: Identification

Product identifier

Product Name • **Petroleum Crude Oil**
Synonyms • Crude Oil
SDS Number/Grade • 0011NOR001

Relevant identified uses of the substance or mixture and uses advised against

Recommended use • Natural mineral for refining into fuels and asphalt.

Details of the supplier of the safety data sheet

Manufacturer • Northern Tier Energy
 301 St. Paul Park Road
 St. Paul Park, MN 55071
 United States
 www.ntenergy.com

Telephone (General) • 651-459-9771

Emergency telephone number

Chemtrec • 800-424-9300

Section 2: Hazard Identification

United States (US)

According to: OSHA 29 CFR 1910.1200 HCS

Classification of the substance or mixture

OSHA HCS 2012 • Flammable Liquids 2
 Aspiration 1
 Skin Irritation 2
 Eye Irritation 2
 Specific Target Organ Toxicity Single Exposure 3: Narcotic Effects
 Germ Cell Mutagenicity 1B
 Carcinogenicity 2
 Reproductive Toxicity 1B
 Specific Target Organ Toxicity Repeated Exposure 1
 Specific Target Organ Toxicity Repeated Exposure 2

Label elements

OSHA HCS 2012

DANGER



- Hazard statements •**
- Highly flammable liquid and vapour
 - May be fatal if swallowed and enters airways
 - Causes skin irritation
 - Causes serious eye irritation
 - May cause drowsiness or dizziness
 - May cause genetic defects.
 - Suspected of causing cancer.
 - May damage fertility or the unborn child.
 - Causes damage to organs through prolonged or repeated exposure.
 - May cause damage to organs through prolonged or repeated exposure.

Precautionary statements

- Prevention •**
- Obtain special instructions before use.
 - Do not handle until all safety precautions have been read and understood.
 - Keep away from heat, sparks, open flames and/or hot surfaces. - No smoking.
 - Keep container tightly closed.
 - Ground and/or bond container and receiving equipment.
 - Use explosion-proof electrical/ventilating/lighting/equipment.
 - Use only non-sparking tools.
 - Take precautionary measures against static discharge.
 - Do not breathe mists, vapours, and/or spray.
 - Wash thoroughly after handling.
 - Do not eat, drink or smoke when using this product.
 - Use only outdoors or in a well-ventilated area.
 - Wear protective gloves/protective clothing/eye protection/face protection.
- Response •**
- In case of fire: Use appropriate media for extinction.
 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
 - Call a POISON CENTER or doctor/physician if you feel unwell.
 - If on skin: Wash with plenty of water .
 - Specific treatment, see supplemental first aid information.
 - Take off contaminated clothing and wash before reuse.
 - If skin irritation occurs: Get medical advice/attention.
 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
 - If eye irritation persists: Get medical advice/attention.
 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
 - Do NOT induce vomiting.
 - IF exposed or concerned: Get medical advice/attention.
 - Get medical advice/attention if you feel unwell.
- Storage/Disposal •**
- Store in a well-ventilated place. Keep container tightly closed.
 - Keep cool.
 - Store locked up.
 - Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Other hazards

OSHA HCS 2012

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.

Canada

According to: WHMIS

Classification of the substance or mixture

WHMIS

- Flammable Liquids - B2
- Very Toxic - D1A
- Other Toxic Effects - D2A
- Other Toxic Effects - D2B

Label elements

WHMIS



- Flammable Liquids - B2
- Very Toxic - D1A
- Other Toxic Effects - D2A
- Other Toxic Effects - D2B

Other hazards

WHMIS

- In Canada, the product mentioned above is considered hazardous under the Workplace Hazardous Materials Information System (WHMIS).

Section 3 - Composition/Information on Ingredients

Substances

- Material does not meet the criteria of a substance.

Mixtures

Composition					
Chemical Name	Identifiers	%	LD50/LC50	Classifications According to Regulation/Directive	Comments
Petroleum	CAS:8002-05-9 EC Number:232-298-5 EU Index:649-049-00-5	98% TO 100%	Ingestion/Oral-Rat LD50 • >4300 mg/kg	OSHA HCS 2012: Flam. Liq. 2; Eye Irrit. 2; Skin Irrit. 2; STOT SE 3: Narc.; Asp. Tox. 1; Muta. 1B (Orl, Inhl); Carc. 1A (Inhl); Repr. 1B (Inhl); STOT RE 1 (CNS, Inhl); (Blood, Bone marrow, Inhl); STOT RE 2 (Nervous System)	NDA
Xylene	CAS:1330-20-7 EC Number:215-535-7 EU Index:601-022-00-9	0% TO 5%	Ingestion/Oral-Rat LD50 • 4300 mg/kg Inhalation-Rat LC50 • 5000 ppm 4 Hour(s) Skin-Rabbit LD50 • >1700 mg/kg	OSHA HCS 2012: Flam. Liq. 3; Acute Tox. 4 (Inhl); Skin Irrit. 2; Eye Irrit. 2; Repr. 1B (Inhl); STOT SE 3: Narc.; STOT SE 3: Resp. Irrit.	NDA
Toluene	CAS:108-88-3 EC Number:203-625-9 EU Index:601-021-00-3	0% TO 5%	Ingestion/Oral-Rat LD50 • 636 mg/kg Inhalation-Rat LC50 • 49 g/m³ 4 Hour(s) Skin-Rabbit LD50 • 14100 µL/kg	OSHA HCS 2012: Flam. Liq. 2; Acute Tox. 4 (Orl); Skin Irrit. 2; Eye Irrit. 2; Muta. 1B; Repr. 2; STOT SE 3: Narc.; STOT RE 1 (CNS, Inhl); Asp. Tox. 1	NDA
Hydrogen sulfide	CAS:7783-06-4 EC Number:231-977-3 EU Index:016-001-00-4	0% TO 4%	Inhalation-Rat LC50 • 444 ppm 4 Hour(s)	OSHA HCS 2012: Flam. Gas 1; Press. Gas; Eye Irrit. 2; Acute Tox. 2 (inhl); STOT SE 3: Resp. Irrit.	NDA
Sulfur Compounds	NDA	0% TO 3%	NDA	OSHA HCS 2012: Not Classified	NDA

Hexane	CAS:110-54-3 EC Number:203-777-6 EU Index:601-037-00-0	0% TO 3%	Ingestion/Oral-Rat LD50 • 25 g/kg Inhalation-Rat LC50 • 48000 ppm 4 Hour (s)	OSHA HCS 2012: Flam. Liq. 2; Repr. 2; STOT RE 2 (CNS & Nervous System); Skin Irrit. 2; Eye Irrit. 2B; STOT SE 3: Narc. & Resp. Irrit.; Asp. Tox. 1	NDA
Benzene	CAS:71-43-2 EC Number:200-753-7 EU Index:601-020-00-8	0% TO 2%	Ingestion/Oral-Rat LD50 • 930 mg/kg Skin-Rabbit LD50 • >9400 µg/kg	OSHA HCS 2012: Flam. Liq. 2; Acute Tox. 4 (Orl); Acute Tox. 4 (Inhl); Skin Irrit. 2; Eye Irrit. 2; Muta. 1B (Orl, Inhl); Carc. 1A (Inhl); Repr. 2 (Inhl); STOT SE 3: Narc. (Inhl); STOT RE 1 (Blood, Bone marrow, Inhl); Asp. Tox. 1	NDA

Section 4: First-Aid Measures

Description of first aid measures

Inhalation

- Move victim to fresh air. Administer oxygen if breathing is difficult. Give artificial respiration if victim is not breathing. Get medical attention if symptoms occur.

Skin

- In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Remove and isolate contaminated clothing. Wash skin with soap and water. If irritation develops and persists, get medical attention.

Eye

- In case of contact with substance, immediately flush eyes with running water for at least 20 minutes. If eye irritation persists: Get medical advice/attention.

Ingestion

- Do NOT induce vomiting. Obtain medical attention immediately if ingested.

Most important symptoms and effects, both acute and delayed

- Refer to Section 11 - Toxicological Information.

Indication of any immediate medical attention and special treatment needed

Notes to Physician

- All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred.

Section 5: Fire-Fighting Measures

Extinguishing media

- Suitable Extinguishing Media** • For small fires, Class B fire extinguishing media such as CO₂, dry chemical, foam (AFFF/ATC) or water spray.
For large fires, water spray, fog or foam (AFFF/ATC)

Unsuitable Extinguishing Media

- Avoid using straight water streams.

Special hazards arising from the substance or mixture

Unusual Fire and Explosion Hazards

- HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames. Containers may explode when heated. Many liquids are lighter than water. Vapors may form explosive mixtures with air. Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks). Vapors may travel to source of ignition and flash back. Vapor explosion hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard.

Hazardous Combustion Products

- No data available

Advice for firefighters

- Structural firefighters' protective clothing will only provide limited protection. Wear positive pressure self-contained breathing apparatus (SCBA). Move containers from fire area if you can do it without risk.
- LARGE FIRES: Cool containers with flooding quantities of water until well after fire is out.

Section 6 - Accidental Release Measures

Personal precautions, protective equipment and emergency procedures

Personal Precautions

- Ventilate enclosed areas. Do not walk through spilled material. Wear appropriate personal protective equipment, avoid direct contact. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

Emergency Procedures

- As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions. If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. LARGE SPILL: Consider initial downwind evacuation for at least 300 meters (1000 feet) ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Keep unauthorized personnel away. Stay upwind. Keep out of low areas. Ventilate closed spaces before entering.

Environmental precautions

- Prevent entry into waterways, sewers, basements or confined areas.

Methods and material for containment and cleaning up

Containment/Clean-up Measures

- Stop leak if you can do it without risk. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material. A vapor suppressing foam may be used to reduce vapors. All equipment used when handling the product must be grounded. LARGE SPILLS: Dike far ahead of liquid spill for later disposal. LARGE SPILLS: Water spray may reduce vapor; but may not prevent ignition in closed spaces.

Section 7 - Handling and Storage

Precautions for safe handling

Handling

- Use only in well ventilated areas. Avoid contact with heat and ignition sources. Do not use sparking tools. Take precautionary measures against static charges. All equipment used when handling the product must be grounded. Do not cut, drill, grind or weld on empty containers since they may contain explosive residues. Harmful concentrations of hydrogen sulfide (H₂S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. Stay upwind and vent open hatches before unloading. Wear appropriate personal protective equipment, avoid direct contact. Avoid breathing mist, vapours and/or spray. Avoid contact with skin, eyes, and clothing. Wash thoroughly with soap and water after handling and before eating, drinking, or using tobacco.

Conditions for safe storage, including any incompatibilities

Storage

- Keep container tightly closed. Store in appropriately labeled containers. Store in a cool/low-temperature, well-ventilated place.

Section 8 - Exposure Controls/Personal Protection

Control parameters

Exposure Limits/Guidelines			
Result	ACGIH	NIOSH	OSHA

Hydrogen sulfide (7783-06-4)	Ceilings	Not established	10 ppm Ceiling (10 min); 15 mg/m ³ Ceiling (10 min)	20 ppm Ceiling
	STELs	5 ppm STEL	Not established	Not established
	TWAs	1 ppm TWA	Not established	Not established
Toluene (108-88-3)	Ceilings	Not established	Not established	300 ppm Ceiling
	TWAs	20 ppm TWA	100 ppm TWA; 375 mg/m ³ TWA	200 ppm TWA
	STELs	Not established	150 ppm STEL; 560 mg/m ³ STEL	Not established
Benzene (71-43-2)	Ceilings	Not established	Not established	25 ppm Ceiling
	STELs	2.5 ppm STEL	1 ppm STEL	5 ppm STEL (see 29 CFR 1910.1028)
	TWAs	0.5 ppm TWA	0.1 ppm TWA	10 ppm TWA (applies to industry segments exempt from the benzene standard at 29 CFR 1910.1028); 1 ppm TWA
Xylene (1330-20-7)	TWAs	100 ppm TWA	Not established	100 ppm TWA; 435 mg/m ³ TWA
	STELs	150 ppm STEL	Not established	Not established
Hexane (110-54-3)	TWAs	50 ppm TWA	50 ppm TWA; 180 mg/m ³ TWA	500 ppm TWA; 1800 mg/m ³ TWA
Petroleum (8002-05-9)	Ceilings	Not established	1800 mg/m ³ Ceiling (15 min)	Not established
	TWAs	Not established	350 mg/m ³ TWA	Not established

Exposure controls

Engineering Measures/Controls

- Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Use explosion-proof electrical/ventilating/lighting/equipment.

Personal Protective Equipment

Respiratory

- In case of insufficient ventilation, wear suitable respiratory equipment.

Eye/Face

- Wear safety goggles.

Skin/Body

- Wear appropriate gloves.

Environmental Exposure Controls

- Follow best practice for site management and disposal of waste. Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways.

Key to abbreviations

ACGIH = American Conference of Governmental Industrial Hygiene

NIOSH = National Institute of Occupational Safety and Health

OSHA = Occupational Safety and Health Administration

STEL = Short Term Exposure Limits are based on 15-minute exposures

TWA = Time-Weighted Averages are based on 8h/day, 40h/week exposures

Section 9 - Physical and Chemical Properties

Information on Physical and Chemical Properties

Material Description			
Physical Form	Liquid	Appearance/Description	Amber to black viscous liquid.
Color	Amber to black.	Odor	No data available
Odor Threshold	No data available		
General Properties			
Boiling Point	100 to 1000 F(37.7778 to 537.7778 C)	Melting Point/Freezing Point	No data available

Decomposition Temperature	No data available	pH	Neutral
Specific Gravity/Relative Density	0.8 to 1 Water=1	Water Solubility	Slightly Soluble 0.1 to 1 %
Viscosity	No data available		
Volatility			
Vapor Pressure	No data available	Vapor Density	No data available
Evaporation Rate	No data available		
Flammability			
Flash Point	20 to 100 F(-6.6667 to 37.7778 C)	UEL	No data available
LEL	No data available	Autoignition	No data available
Flammability (solid, gas)	No data available		
Environmental			
Octanol/Water Partition coefficient	No data available		

Section 10: Stability and Reactivity

Reactivity

- No dangerous reaction known under conditions of normal use.

Chemical stability

- Stable under normal temperatures and pressures.

Possibility of hazardous reactions

- Hazardous polymerization will not occur.

Conditions to avoid

- Excessive heat, sources of ignition and open flames.

Incompatible materials

- Strong oxidizers such as nitrates, chlorates, peroxides.

Hazardous decomposition products

- Combustion produces carbon monoxide, aldehydes, aromatic and other hydrocarbons.

Section 11 - Toxicological Information

Information on toxicological effects

Components		
Petroleum (98% TO 100%)	8002-05-9	Acute Toxicity: Ingestion/Oral-Rat LD50 • >4300 mg/kg; Skin-Rabbit LD50 • >2000 mg/kg; Irritation: Eye-Rabbit • 100 mg • Mild irritation; Skin-Rabbit • 500 mg 24 Hour(s) • Moderate irritation; Reproductive: Skin-Rat TDLo • 200 mg/kg (1-19D preg); <i>Reproductive Effects:Maternal Effects:Other effects; Reproductive Effects:Effects on Embryo or Fetus:Fetotoxicity (except death, e.g., stunted fetus)</i>
Toluene (0% TO 5%)	108-88-3	Acute Toxicity: Ingestion/Oral-Rat LD50 • 636 mg/kg; Inhalation-Rat LC50 • 49 g/m ³ 4 Hour(s); Inhalation-Human TCLo • 200 ppm; <i>Brain and Coverings:Recordings from specific areas of CNS; Behavioral:Antipsychotic; Blood:Changes in bone marrow not included above;</i> Inhalation-Human TCLo • 1500 mg/m ³ 8 Hour(s); <i>Sense Organs and Special Senses:Eye:Lacrimation; Sense Organs and Special Senses:Eye:Conjunctive irritation; Behavioral:Ataxia;</i> Inhalation-Man TCLo • 50 ppm; <i>Kidney, Ureter, and Bladder:Other changes in urine composition;</i> Skin-Rabbit LD50 • 14100 µL/kg; Irritation: Eye-Rabbit • 2 mg 24 Hour(s) • Severe irritation; Skin-Rabbit • 20 mg 24 Hour(s) • Moderate irritation; Multi-dose Toxicity: Inhalation-Mouse TCLo • 250 ppm 4 Day(s)-Continuous; <i>Behavioral:Convulsions or effect on seizure threshold; Behavioral:Abuse;</i> Inhalation-Mouse TCLo • 50 ppm 12 Week(s)-Intermittent; <i>Brain and Coverings:Other degenerative changes;</i> Inhalation-Rat TCLo • 10 ppm 6 Hour(s) 13 Week(s)-Intermittent; <i>Brain and Coverings:Other degenerative changes; Biochemical:Enzyme inhibition, induction, or change in blood or tissue</i>

		<p>levels:Multiple enzyme effects;</p> <p>Mutagen: Micronucleus test • Ingestion/Oral-Mouse • 200 mg/kg; Sister chromatid exchange • Inhalation-Human • 252 µg/L 19 Year(s); Cytogenetic analysis • Inhalation-Rat • 5400 µg/m³ 16 Week(s)-Intermittent;</p> <p>Reproductive: Inhalation-Mouse TCLo • 500 mg/m³ 24 Hour(s)(6-13D preg); <i>Reproductive Effects:Effects on Embryo or Fetus:Fetotoxicity (except death, e.g., stunted fetus)</i>; Inhalation-Mouse TCLo • 200 ppm 7 Hour(s)(7-16D preg); <i>Reproductive Effects:Specific Developmental Abnormalities:Urogenital system</i></p>
Xylene (0% TO 5%)	1330-20-7	<p>Acute Toxicity: Ingestion/Oral-Rat LD50 • 4300 mg/kg; Liver:Other changes; Kidney, Ureter, and Bladder:Other changes; Inhalation-Rat LC50 • 5000 ppm 4 Hour(s); Inhalation-Man LCLo • 10000 ppm 6 Hour(s); Behavioral:General anesthetic; Lungs, Thorax, or Respiration:Cyanosis; Blood:Other changes; Inhalation-Human TCLo • 200 ppm; Sense Organs and Special Senses:Olfaction:Other changes; Sense Organs and Special Senses:Eye:Conjunctive irritation; Lungs, Thorax, or Respiration:Other changes; Skin-Rabbit LD50 • >1700 mg/kg;</p> <p>Irritation: Eye-Rabbit • 5 mg 24 Hour(s) • Severe irritation; Skin-Rabbit • 500 mg 24 Hour(s) • Moderate irritation;</p> <p>Reproductive: Inhalation-Mouse TCLo • 1 g/m³ 12 Hour(s)(6-15D preg); <i>Reproductive Effects:Effects on Embryo or Fetus:Fetotoxicity (except death, e.g., stunted fetus)</i>; <i>Reproductive Effects:Specific Developmental Abnormalities:Musculoskeletal system</i>; Inhalation-Rat TCLo • 50 mg/m³ 6 Hour(s)(1-21D preg); <i>Reproductive Effects:Effects on Fertility:Post-implantation mortality</i>; <i>Reproductive Effects:Effects on Embryo or Fetus:Fetotoxicity (except death, e.g., stunted fetus)</i>; <i>Reproductive Effects:Specific Developmental Abnormalities:Craniofacial (including nose and tongue)</i></p>
Hydrogen sulfide (0% TO 4%)	7783-06-4	<p>Acute Toxicity: Inhalation-Rat LC50 • 444 ppm 4 Hour(s);</p> <p>Irritation: Eye-Human • 0.000125 ppm 5 Hour(s);</p> <p>Reproductive: Inhalation-Rat TCLo • 10 mg/m³ (48D pre/1-22D preg); <i>Reproductive Effects:Effects on Fertility:Pre-implantation mortality</i>; <i>Reproductive Effects:Effects on Fertility:Post-implantation mortality</i>; <i>Reproductive Effects:Specific Developmental Abnormalities:Urogenital system</i></p>
Hexane (0% TO 3%)	110-54-3	<p>Acute Toxicity: Ingestion/Oral-Rat LD50 • 25 g/kg; Inhalation-Rat LC50 • 48000 ppm 4 Hour(s);</p> <p>Irritation: Eye-Rabbit • 10 mg • Mild irritation;</p> <p>Reproductive: Inhalation-Rat TCLo • 5000 ppm (6-19D preg); <i>Reproductive Effects:Specific Developmental Abnormalities:Musculoskeletal system</i>; <i>Reproductive Effects:Specific Developmental Abnormalities:Urogenital system</i></p>
Benzene (0% TO 2%)	71-43-2	<p>Acute Toxicity: Ingestion/Oral-Rat LD50 • 930 mg/kg; Behavioral:Tremor; Behavioral:Convulsions or effect on seizure threshold; Inhalation-Rat LC50 • 10000 ppm 7 Hour(s); Inhalation-Human TCLo • 50 mg/m³ 2 Hour(s); Behavioral:Changes in psychophysiological tests; Behavioral:Muscle weakness; Inhalation-Rat TCLo • 1 ppm 6 Hour(s); Kidney, Ureter, and Bladder:Other changes in urine composition; Skin-Rabbit LD50 • >9400 µL/kg;</p> <p>Irritation: Eye-Rabbit • 2 mg 24 Hour(s) • Severe irritation; Skin-Rabbit • 20 mg 24 Hour(s) • Moderate irritation;</p> <p>Multi-dose Toxicity: Inhalation-Mouse TCLo • 100 ppm 2 Week(s)-Intermittent; Endocrine:Differential effect of sex or castration on observed toxicity; Blood:Leukopenia; Blood:Changes in bone marrow not included above; Inhalation-Mouse TDLo • 100 ppm 6 Hour(s) 10 Day(s)-Intermittent; Blood:Changes in bone marrow not included above; Blood:Changes in platelet count;</p> <p>Mutagen: Dominant lethal test • Ingestion/Oral-Mouse • 1 mg/kg; Cytogenetic analysis • Inhalation-Human • 125 ppm 1 Year (s); Cytogenetic analysis • Inhalation-Human • 0.1 ppm; Sister chromatid exchange • Inhalation-Mouse • 10 ppm 6 Hour (s); Micronucleus test • Inhalation-Rat • 1 ppm 6 Hour(s);</p> <p>Reproductive: Inhalation-Mouse TCLo • 5 ppm (6-15D preg); <i>Reproductive Effects:Effects on Embryo or Fetus:Cytological changes;</i> <i>Reproductive Effects:Specific Developmental Abnormalities:Blood and lymphatic system</i>; Inhalation-Mouse TCLo • 20 ppm 6 Hour(s)(6-15D preg); <i>Reproductive Effects:Specific Developmental Abnormalities:Blood and lymphatic system</i>; Inhalation-Rat TCLo • 670 mg/m³ 24 Hour(s)(15D pre/1-22D preg); <i>Reproductive Effects:Effects on Fertility:Female fertility index</i>; Parenteral-Mouse TDLo • 4 g/kg (12D preg); <i>Reproductive Effects:Effects on Newborn:Weaning or lactation index</i></p>

GHS Properties	Classification
Respiratory sensitization	OSHA HCS 2012 • No data available
Serious eye damage/Irritation	OSHA HCS 2012 • Eye Irritation 2
Acute toxicity	OSHA HCS 2012 • No data available
Aspiration Hazard	OSHA HCS 2012 • Aspiration 1
Carcinogenicity	OSHA HCS 2012 • Carcinogenicity 2
Skin corrosion/Irritation	OSHA HCS 2012 • Skin Irritation 2

Skin sensitization	OSHA HCS 2012 • No data available
STOT-RE	OSHA HCS 2012 • Specific Target Organ Toxicity Repeated Exposure 1; Specific Target Organ Toxicity Repeated Exposure 2
STOT-SE	OSHA HCS 2012 • Specific Target Organ Toxicity Single Exposure 3: Narcotic Effects
Toxicity for Reproduction	OSHA HCS 2012 • Toxic to Reproduction 1B
Germ Cell Mutagenicity	OSHA HCS 2012 • Germ Cell Mutagenicity 1B

Potential Health Effects

Inhalation

- Acute (Immediate)**
 - May affect the central nervous system. Symptoms may include dizziness, drowsiness, lethargy, coma and death.
- Chronic (Delayed)**
 - CNS depression has been reported to occur in chronic abusers exposed to high levels of toluene. Symptoms include drowsiness, ataxia, tremors, cerebral atrophy, nystagmus (involuntary eye movements), and impaired speech, hearing, and vision. Neurobehavioral effects have been observed in occupationally exposed workers. Chronic exposure to benzene, a component of this material, results primarily in hematotoxicity, including aplastic anemia, pancytopenia, or any combination of anemia, leukopenia, and thrombocytopenia. Chronic benzene exposure is associated with an increased risk of leukemia.

Skin

- Acute (Immediate)**
 - Causes skin irritation.
- Chronic (Delayed)**
 - No data available.

Eye

- Acute (Immediate)**
 - Causes serious eye irritation.
- Chronic (Delayed)**
 - No data available.

Ingestion

- Acute (Immediate)**
 - Material may be aspirated into lungs during ingestion and/or subsequent vomiting. Aspiration of this material will cause severe lung injury, chemical pneumonitis, pulmonary edema or death.
- Chronic (Delayed)**
 - No data available.

Other

- Chronic (Delayed)**
 - Chronic exposure to Hexane may produce important peripheral neuropathy (motor sensory) and CNS abnormalities.

Mutagenic Effects

- Repeated and prolonged exposure may cause mutagenic effects.

Carcinogenic Effects

Carcinogenic Effects				
	CAS	OSHA	IARC	NTP
Benzene	71-43-2	Specifically Regulated Carcinogen	Group 1-Carcinogenic	Known Human Carcinogen

- Reproductive Effects**
 - Repeated and prolonged exposure may cause reproductive effects.

Key to abbreviations

LC = Lethal Concentration
LD = Lethal Dose
TC = Toxic Concentration
TD = Toxic Dose

Section 12 - Ecological Information

Toxicity

- Non-mandatory section - information about this substance not compiled for this reason.

Persistence and degradability

- Non-mandatory section - information about this substance not compiled for this reason.

Bioaccumulative potential

- Non-mandatory section - information about this substance not compiled for this reason.

Mobility in Soil

- Non-mandatory section - information about this substance not compiled for this reason.

Other adverse effects

- Non-mandatory section - information about this substance not compiled for this reason.

Section 13 - Disposal Considerations

Waste treatment methods

Product waste

- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Packaging waste

- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Section 14 - Transport Information

	UN number	UN proper shipping name	Transport hazard class(es)	Packing group	Environmental hazards
DOT	UN1267	Petroleum crude oil	3	II	NDA
TDG	UN1267	PETROLEUM CRUDE OIL	3	II	NDA

Special precautions for user • None specified.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code • No data available

Section 15 - Regulatory Information

Safety, health and environmental regulations/legislation specific for the substance or mixture

SARA Hazard Classifications • Acute, Chronic, Fire

Inventory				
Component	CAS	Canada DSL	Canada NDSL	TSCA
Benzene	71-43-2	Yes	No	Yes
Hexane	110-54-3	Yes	No	Yes
Hydrogen sulfide	7783-06-4	Yes	No	Yes
Petroleum	8002-05-9	Yes	No	Yes
Toluene	108-88-3	Yes	No	Yes
Xylene	1330-20-7	Yes	No	Yes

Canada

Labor

Canada - WHMIS - Classifications of Substances

• Hydrogen sulfide	7783-06-4	A, B1, D1A, D2B
• Toluene	108-88-3	B2, D2A, D2B
• Xylene	1330-20-7	B2, D2A, D2B
• Benzene	71-43-2	B2, D2A, D2B
• Hexane	110-54-3	B2, D2A, D2B
• Petroleum	8002-05-9	B2

Canada - WHMIS - Ingredient Disclosure List

• Hydrogen sulfide	7783-06-4	1 %
• Toluene	108-88-3	1 %
• Xylene	1330-20-7	Not Listed
• Benzene	71-43-2	0.1 %
• Hexane	110-54-3	1 %
• Petroleum	8002-05-9	Not Listed

Environment

Canada - CEPA - Priority Substances List

• Hydrogen sulfide	7783-06-4	Not Listed Priority Substance List 1 (substance not considered toxic)
• Toluene	108-88-3	Priority Substance List 1 (substance not considered toxic)
• Xylene	1330-20-7	Priority Substance List 1 (substance considered toxic)
• Benzene	71-43-2	Not Listed
• Hexane	110-54-3	Not Listed
• Petroleum	8002-05-9	Not Listed

United States

Labor

U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals

• Hydrogen sulfide	7783-06-4	1500 lb TQ
• Toluene	108-88-3	Not Listed
• Xylene	1330-20-7	Not Listed
• Benzene	71-43-2	Not Listed
• Hexane	110-54-3	Not Listed
• Petroleum	8002-05-9	Not Listed

U.S. - OSHA - Specifically Regulated Chemicals

• Hydrogen sulfide	7783-06-4	Not Listed
• Toluene	108-88-3	Not Listed
• Xylene	1330-20-7	Not Listed
• Benzene	71-43-2	5 ppm STEL (See 29 CFR 1910.1028, 15 min); 0.5 ppm Action Level; 1 ppm TWA
• Hexane	110-54-3	Not Listed
• Petroleum	8002-05-9	Not Listed

Environment

U.S. - CAA (Clean Air Act) - 1990 Hazardous Air Pollutants

• Hydrogen sulfide	7783-06-4	Not Listed
• Toluene	108-88-3	
• Xylene	1330-20-7	(isomers and mixtures)
• Benzene	71-43-2	(including Benzene from gasoline)
• Hexane	110-54-3	
• Petroleum	8002-05-9	Not Listed

U.S. - CERCLA/SARA - Hazardous Substances and their Reportable Quantities

• Hydrogen sulfide	7783-06-4	100 lb final RQ; 45.4 kg final RQ
• Toluene	108-88-3	1000 lb final RQ; 454 kg final RQ
• Xylene	1330-20-7	100 lb final RQ; 45.4 kg final RQ
• Benzene	71-43-2	10 lb final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule); 4.54 kg final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule)
• Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ
• Petroleum	8002-05-9	Not Listed

U.S. - CERCLA/SARA - Radionuclides and Their Reportable Quantities

• Hydrogen sulfide	7783-06-4	Not Listed
• Toluene	108-88-3	Not Listed
• Xylene	1330-20-7	Not Listed
• Benzene	71-43-2	Not Listed
• Hexane	110-54-3	Not Listed
• Petroleum	8002-05-9	Not Listed

U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances EPCRA RQs

• Hydrogen sulfide	7783-06-4	100 lb EPCRA RQ
• Toluene	108-88-3	Not Listed
• Xylene	1330-20-7	Not Listed
• Benzene	71-43-2	Not Listed
• Hexane	110-54-3	Not Listed
• Petroleum	8002-05-9	Not Listed

U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances TPQs

• Hydrogen sulfide	7783-06-4	500 lb TPQ
• Toluene	108-88-3	Not Listed
• Xylene	1330-20-7	Not Listed
• Benzene	71-43-2	Not Listed
• Hexane	110-54-3	Not Listed
• Petroleum	8002-05-9	Not Listed

U.S. - CERCLA/SARA - Section 313 - Emission Reporting

• Hydrogen sulfide	7783-06-4	1.0 % de minimis concentration
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• Toluene	108-88-3	1.0 % de minimis concentration
• Xylene	1330-20-7	1.0 % de minimis concentration
• Benzene	71-43-2	0.1 % de minimis concentration
• Hexane	110-54-3	1.0 % de minimis concentration
• Petroleum	8002-05-9	Not Listed

U.S. - CERCLA/SARA - Section 313 - PBT Chemical Listing

• Hydrogen sulfide	7783-06-4	Not Listed
• Toluene	108-88-3	Not Listed
• Xylene	1330-20-7	Not Listed
• Benzene	71-43-2	Not Listed
• Hexane	110-54-3	Not Listed
• Petroleum	8002-05-9	Not Listed

United States - California

Environment

U.S. - California - Proposition 65 - Carcinogens List

• Hydrogen sulfide	7783-06-4	Not Listed
• Toluene	108-88-3	Not Listed
• Xylene	1330-20-7	Not Listed
• Benzene	71-43-2	carcinogen, initial date 2/27/87
• Hexane	110-54-3	Not Listed
• Petroleum	8002-05-9	Not Listed

U.S. - California - Proposition 65 - Developmental Toxicity

• Hydrogen sulfide	7783-06-4	Not Listed
• Toluene	108-88-3	developmental toxicity, initial date 1/1/91
• Xylene	1330-20-7	Not Listed
• Benzene	71-43-2	developmental toxicity, initial date 12/26/97
• Hexane	110-54-3	Not Listed
• Petroleum	8002-05-9	Not Listed

U.S. - California - Proposition 65 - Maximum Allowable Dose Levels (MADL)

• Hydrogen sulfide	7783-06-4	Not Listed
• Toluene	108-88-3	7000 µg/day MADL (level represents absorbed dose)
• Xylene	1330-20-7	Not Listed
• Benzene	71-43-2	24 µg/day MADL (oral); 49 µg/day MADL (inhalation)
• Hexane	110-54-3	Not Listed
• Petroleum	8002-05-9	Not Listed

U.S. - California - Proposition 65 - No Significant Risk Levels (NSRL)

• Hydrogen sulfide	7783-06-4	Not Listed
• Toluene	108-88-3	Not Listed
• Xylene	1330-20-7	Not Listed
• Benzene	71-43-2	6.4 µg/day NSRL (oral); 13 µg/day NSRL (inhalation)
• Hexane	110-54-3	Not Listed

• Petroleum	8002-05-9	Not Listed
U.S. - California - Proposition 65 - Reproductive Toxicity - Female		
• Hydrogen sulfide	7783-06-4	Not Listed
• Toluene	108-88-3	female reproductive toxicity, initial date 8/7/09
• Xylene	1330-20-7	Not Listed
• Benzene	71-43-2	Not Listed
• Hexane	110-54-3	Not Listed
• Petroleum	8002-05-9	Not Listed
U.S. - California - Proposition 65 - Reproductive Toxicity - Male		
• Hydrogen sulfide	7783-06-4	Not Listed
• Toluene	108-88-3	Not Listed
• Xylene	1330-20-7	Not Listed
• Benzene	71-43-2	male reproductive toxicity, initial date 12/26/97
• Hexane	110-54-3	Not Listed
• Petroleum	8002-05-9	Not Listed

Other Information

- WARNING: This product contains a chemical known to the State of California to cause cancer, birth defects, or other reproductive harm.

Section 16 - Other Information

Revision Date	• 13/November/2015
Preparation Date	• 30/November/2010
Disclaimer/Statement of Liability	• The information and recommendations contained herein are based upon tests believed to be reliable. However, Northern Tier Energy does not guarantee their accuracy or completeness nor shall any of this information constitute a warranty, whether expressed or implied, as to the safety of the goods, the merchantability of the goods, or the fitness of the goods for a particular purpose. Adjustment to conform to actual conditions of usage maybe required. Northern Tier Energy assumes no responsibility for results obtained or for incidental or consequential damages, including lost profits arising from the use of these data. No warranty against infringement of any patent, copyright or trademark is made or implied.

Key to abbreviations

NDA = No data available

SAFETY DATA SHEET

Version 8.10
Revision Date 09/06/2024
Print Date 09/07/2024

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1 Product identifiers**

Product name : Tetrachloroethylene

Product Number : 371696
Brand : Sigma-Aldrich
Index-No. : 602-028-00-4
CAS-No. : 127-18-4

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

Uses advised against : The product is being supplied under the TSCA R&D Exemption (40 CFR Section 720.36). It is the recipient's responsibility to comply with the requirements of the R&D exemption. The product may not be used for a non-exempt commercial purpose under TSCA unless appropriate consent is granted in writing by MilliporeSigma.

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Skin sensitization (Category 1), H317

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Carcinogenicity (Category 2), H351

Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

Short-term (acute) aquatic hazard (Category 2), H401

Long-term (chronic) aquatic hazard (Category 2), H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal Word

Warning

Hazard Statements

H315

Causes skin irritation.

H317

May cause an allergic skin reaction.

H319

Causes serious eye irritation.

H336

May cause drowsiness or dizziness.

H351

Suspected of causing cancer.

H411

Toxic to aquatic life with long lasting effects.

Precautionary Statements

P201

Obtain special instructions before use.

P202

Do not handle until all safety precautions have been read and understood.

P261

Avoid breathing mist or vapors.

P264

Wash skin thoroughly after handling.

P271

Use only outdoors or in a well-ventilated area.

P272

Contaminated work clothing must not be allowed out of the workplace.

P273

Avoid release to the environment.

P280

Wear protective gloves/ protective clothing/ eye protection/ face protection.

P302 + P352

IF ON SKIN: Wash with plenty of soap and water.

P304 + P340 + P312

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.

P305 + P351 + P338

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P308 + P313

IF exposed or concerned: Get medical advice/ attention.

P333 + P313

If skin irritation or rash occurs: Get medical advice/ attention.

P337 + P313

If eye irritation persists: Get medical advice/ attention.

P362

Take off contaminated clothing and wash before reuse.

P391

Collect spillage.

P403 + P233

Store in a well-ventilated place. Keep container tightly closed.

P405

Store locked up.

P501

Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	Perchloroethylene PCE
Formula	:	C ₂ Cl ₄
Molecular weight	:	165.83 g/mol
CAS-No.	:	127-18-4
EC-No.	:	204-825-9
Index-No.	:	602-028-00-4

Component	Classification	Concentration
Tetrachlorethylene		
	Skin Irrit. 2; Eye Irrit. 2A; Skin Sens. 1; Carc. 2; STOT SE 3; Aquatic Acute 2; Aquatic Chronic 2; H315, H319, H317, H351, H336, H401, H411 Concentration limits: >= 20 %: STOT SE 3, H336;	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice

Show this material safety data sheet to the doctor in attendance.

If inhaled

After inhalation: fresh air. Call in physician.

In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact

After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Water Foam Carbon dioxide (CO₂) Dry powder

Unsuitable extinguishing media

For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Carbon oxides

Hydrogen chloride gas

Combustible.

Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.

For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

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Hygiene measures

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions

Tightly closed. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorized persons.

Storage class

Storage class (TRGS 510): 6.1C: Combustible, acute toxic Cat.3 / toxic compounds or compounds which causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Tetrachlorethylen	127-18-4	TWA	25 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Confirmed animal carcinogen with unknown relevance to humans		
		STEL	100 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Confirmed animal carcinogen with unknown relevance to humans		
		Potential Occupational Carcinogen		

		TWA	100 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		CEIL	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Peak	300 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		PEL	25 ppm 170 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	100 ppm 685 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	300 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Tetrachlorethylene	127-18-4	Tetrachlorethylene	3parts per million	In end-exhaled air	ACGIH - Biological Exposure Indices (BEI)
	Remarks	Prior to shift (16 hours after exposure ceases)			
		Tetrachlorethylene	0.5 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
		Prior to shift (16 hours after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

Skin protection

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN 16523-1 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Full contact

Material: Viton®

Minimum layer thickness: 0.7 mm

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Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN 16523-1 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 240 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

Body Protection

protective clothing

Respiratory protection

Recommended Filter type: Filter A (acc. to DIN 3181) for vapours of organic compounds

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

required when vapours/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure

Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

- | | |
|--|---|
| a) Appearance | Form: liquid, clear
Color: colorless |
| b) Odor | No data available |
| c) Odor Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/ range: -22 °C (-8 °F) - lit. |
| f) Initial boiling point and boiling range | 121 °C 250 °F - lit. |
| g) Flash point | ()No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower | No data available |

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	flammability or explosive limits	
k)	Vapor pressure	25.3 hPa at 25.0 °C (77.0 °F) 17.3 hPa at 20.0 °C (68.0 °F)
l)	Vapor density	No data available
m)	Density	1.623 g/cm ³ at 25 °C (77 °F) - lit.
	Relative density	No data available
n)	Water solubility	0.15 g/l at 25 °C (77 °F)
o)	Partition coefficient: n-octanol/water	log Pow: 2.53 at 23 °C (73 °F) - Bioaccumulation is not expected.
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

Surface tension	32.1 mN/m at 20 °C (68 °F)
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SECTION 10: Stability and reactivity

10.1 Reactivity

No data available

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions

Risk of explosion with:

Alkali metals

Aluminum

sodium amide

Barium

nitrogen dioxide

Oxygen

with

alkali hydroxides

Exothermic reaction with:

strong alkalis

Alkaline earth metals

strong alkalis

Light metals

Powdered metals

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Oxidizing agents
Strong acids
Strong bases
nitrous gases
Risk of ignition or formation of inflammable gases or vapours with:
zinc oxide
with
Aluminum

10.4 Conditions to avoid

no information available

10.5 Incompatible materials

various plastics

10.6 Hazardous decomposition products

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - male and female - 3,420 mg/kg
(OECD Test Guideline 401)
Remarks: (ECHA)
Inhalation: No data available
Dermal: No data available
No data available

Skin corrosion/irritation

Skin - Rabbit
Result: Skin irritation - 4 h
(OECD Test Guideline 404)
Remarks: (ECHA)

Serious eye damage/eye irritation

Eyes - Rabbit
Result: Mild eye irritation - 24 h
(Draize Test)
Remarks: (RTECS)

Respiratory or skin sensitization

Local lymph node assay (LLNA) - Mouse
Result: May cause sensitization by skin contact.
(OECD Test Guideline 429)
Remarks: (ECHA)

Germ cell mutagenicity

Test Type: Chromosome aberration test in vitro
Test system: Chinese hamster ovary cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 473

Result: negative
Remarks: (ECHA)
Test Type: Ames test
Test system: Salmonella typhimurium
Metabolic activation: without metabolic activation
Method: OECD Test Guideline 471
Result: negative
Remarks: (ECHA)

Test Type: Micronucleus test
Species: Mouse

Application Route: Intraperitoneal
Method: OECD Test Guideline 474
Result: negative
Remarks: (ECHA)

Carcinogenicity

Suspected of causing cancer.

IARC: 2A - Group 2A: Probably carcinogenic to humans (Tetrachlorethylene)
NTP: RAHC - Reasonably anticipated to be a human carcinogen (Tetrachlorethylene)
OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

11.2 Additional Information

Repeated dose toxicity - Mouse - female - Oral - LOAEL (Lowest observed adverse effect level) - 390 mg/kg

RTECS: KX3850000
narcosis, Liver injury may occur., Kidney injury may occur.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Oncorhynchus mykiss (rainbow trout) - 5 mg/l - 96 h Remarks: (ECHA)
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Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 7.50 mg/l - 48 h
Toxicity to algae	ErC50 - Chlamydomonas reinhardtii (green algae) - 3.64 mg/l - 72 h Remarks: (ECHA)
Toxicity to fish(Chronic toxicity)	flow-through test NOEC - Jordanella floridae - 1.99 mg/l - 10 d Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	semi-static test NOEC - Daphnia magna (Water flea) - 0.51 mg/l - 28 d Remarks: (ECHA)

12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 28 d
Result: 11 % - Not readily biodegradable.
(OECD Test Guideline 301C)

12.3 Bioaccumulative potential

Bioaccumulation Lepomis macrochirus (Bluegill) - 21 d
- 0.00343 mg/l(Tetrachlorethylene)

Bioconcentration factor (BCF): 49

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties

No data available

12.7 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

SECTION 14: Transport information

DOT (US)

UN number: 1897 Class: 6.1 Packing group: III
Proper shipping name: Tetrachloroethylene
Reportable Quantity (RQ): 100 lbs
Reportable Quantity (RQ): 100 lbs
Reportable Quantity (RQ): 10 lbs
Reportable Quantity (RQ): 10 lbs
Marine pollutant: yes Poison Inhalation Hazard: No

IMDG

UN number: 1897 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TETRACHLOROETHYLENE
Marine pollutant : yes
Marine pollutant : yes

IATA

UN number: 1897 Class: 6.1 Packing group: III
Proper shipping name: Tetrachloroethylene

SECTION 15: Regulatory information

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
Tetrachlorethylene	127-18-4	100	100
Tetrachlorethylene	127-18-4	100	100 (D039)
Tetrachlorethylene	127-18-4	10	10 (F001)
Tetrachlorethylene	127-18-4	10	10 (F002)

SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

SARA 302 Extremely Hazardous Substances Threshold Planning Quantity

This material does not contain any components with a section 302 EHS TPQ.

SARA 311/312 Hazards : Acute Health Hazard
Chronic Health Hazard

SARA 313 : The following components are subject to reporting levels established by SARA Title III, Section 313:

Tetrachlorethyl 127-18-4 >= 90 - <= 100 %
ene

US State Regulations

Massachusetts Right To Know

Tetrachlorethylene 127-18-4

Pennsylvania Right To Know

Tetrachlorethylene

127-18-4

Maine Chemicals of High Concern

Product does not contain any listed chemicals

Vermont Chemicals of High Concern

Tetrachlorethylene

127-18-4

Washington Chemicals of High Concern

Tetrachlorethylene

127-18-4

California Prop. 65

WARNING: This product can expose you to chemicals including Tetrachlorethylene, which is/are known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

The ingredients of this product are reported in the following inventories:

TSCA : All substances listed as active on the TSCA inventory

TSCA list

No substances are subject to a Significant New Use Rule.

No substances are subject to TSCA 12(b) export notification requirements.

SECTION 16: Other information**Further information**

The information is believed to be correct but is not exhaustive and will be used solely as a guideline, which is based on current knowledge of the chemical substance or mixture and is applicable to appropriate safety precautions for the product. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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SAFETY DATA SHEET

Creation Date 03-Feb-2010

Revision Date 26-Mar-2024

Revision Number 3

1. Identification

Product Name Trichloroethylene

Cat No. : L14474

CAS No 79-01-6

Synonyms Triclene; Trichloroethene; Ethylene trichloride

Recommended Use Laboratory chemicals.

Uses advised against .

Details of the supplier of the safety data sheet

Company

Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757

Emergency Telephone Number

For information **US** call: 001-800-227-6701 / **Europe** call: +32 14 57 52 11
Emergency Number **US**:001-201-796-7100 / **Europe**: +32 14 57 52 99
CHEMTREC Tel. No. **US**:001-800-424-9300 / **Europe**:001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Skin Sensitization	Category 1
Germ Cell Mutagenicity	Category 2
Carcinogenicity	Category 1A
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Kidney, Liver, Heart, spleen, Blood.	

Label Elements

Signal Word

Danger

Hazard Statements

Causes skin irritation
Causes serious eye irritation
May cause an allergic skin reaction
May cause drowsiness or dizziness
Suspected of causing genetic defects
May cause cancer
May cause damage to organs through prolonged or repeated exposure

**Precautionary Statements****Prevention**

Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Contaminated work clothing should not be allowed out of the workplace
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear protective gloves/protective clothing/eye protection/face protection

Response

IF exposed or concerned: Get medical attention/advice

Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Skin

IF ON SKIN: Wash with plenty of soap and water
Take off contaminated clothing and wash before reuse
If skin irritation or rash occurs: Get medical advice/attention

Eyes

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention

Storage

Store locked up
Store in a well-ventilated place. Keep container tightly closed

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

Harmful to aquatic life with long lasting effects
WARNING. Cancer and Reproductive Harm - <https://www.p65warnings.ca.gov/>.

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Trichloroethylene	79-01-6	<=100

4. First-aid measures

General Advice

Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.

Eye Contact	In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.
Inhalation	Remove to fresh air. If not breathing, give artificial respiration. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required.
Ingestion	Do NOT induce vomiting. Call a physician or poison control center immediately.
Most important symptoms and effects	May cause allergic skin reaction. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Water spray, carbon dioxide (CO ₂), dry chemical, alcohol-resistant foam.
Unsuitable Extinguishing Media	No information available
Flash Point	No information available
Method -	No information available
Autoignition Temperature	410 °C / 770 °F
Explosion Limits	
Upper	44.8 vol %
Lower	8 vol %
Oxidizing Properties	Not oxidising
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

Thermal decomposition can lead to release of irritating gases and vapors. Containers may explode when heated. Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products

Chlorine. Phosgene. Carbon monoxide (CO). Carbon dioxide (CO₂). Hydrogen chloride gas.

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health
2

Flammability
1

Instability
0

Physical hazards
N/A

6. Accidental release measures

Personal Precautions	Ensure adequate ventilation. Use personal protective equipment as required. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas.
Environmental Precautions	Should not be released into the environment. Do not flush into surface water or sanitary sewer system.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Use only under a chemical fume hood. Do not breathe mist/vapors/spray. Do not ingest. If swallowed then seek immediate medical assistance.

Storage. Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from light. Do not store in aluminum containers. Incompatible Materials. Strong oxidizing agents. Strong bases. Amines. Alkali metals. Metals. .

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH	Mexico OEL (TWA)
Trichloroethylene	TWA: 10 ppm STEL: 25 ppm	(Vacated) TWA: 50 ppm (Vacated) TWA: 270 mg/m ³ Ceiling: 200 ppm (Vacated) STEL: 200 ppm (Vacated) STEL: 1080 mg/m ³ TWA: 100 ppm	IDLH: 1000 ppm	TWA: 10 ppm STEL: 25 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures Use only under a chemical fume hood. Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Recommended Filter type: Organic gases and vapours filter. Type A. Brown. conforming to EN14387.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	Characteristic
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-85 °C / -121 °F
Boiling Point/Range	87 °C / 188.6 °F

Flash Point	No information available
Evaporation Rate	0.69 (Carbon Tetrachloride = 1.0)
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	44.8 vol %
Lower	8 vol %
Vapor Pressure	77.3 mbar @ 20 °C
Vapor Density	4.5 (Air = 1.0)
Specific Gravity	1.460
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	410 °C / 770 °F
Decomposition Temperature	> 120°C
Viscosity	0.55 mPa.s (25°C)
Molecular Formula	C ₂ H Cl ₃
Molecular Weight	131.39

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Light sensitive.
Conditions to Avoid	Incompatible products. Excess heat. Exposure to light. Exposure to moist air or water.
Incompatible Materials	Strong oxidizing agents, Strong bases, Amines, Alkali metals, Metals,
Hazardous Decomposition Products	Chlorine, Phosgene, Carbon monoxide (CO), Carbon dioxide (CO ₂), Hydrogen chloride gas
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Trichloroethylene	LD50 = 4920 mg/kg (Rat)	LD50 = 29000 mg/kg (Rabbit)	LC50 = 26 mg/L (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation	Irritating to eyes and skin
Sensitization	May cause sensitization by skin contact
Carcinogenicity	The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Trichloroethylene	79-01-6	Group 1	Known	A2	X	A2

IARC (International Agency for Research on Cancer)

IARC (International Agency for Research on Cancer)

Group 1 - Carcinogenic to Humans

Group 2A - Probably Carcinogenic to Humans

Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)

Known - Known Carcinogen

Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

NTP: (National Toxicity Program)

ACGIH: (American Conference of Governmental Industrial Hygienists)

A1 - Known Human Carcinogen
 A2 - Suspected Human Carcinogen
 A3 - Animal Carcinogen
 ACGIH: (American Conference of Governmental Industrial Hygienists)

Mutagenic Effects	Mutagenic effects have occurred in humans.
Reproductive Effects	No information available.
Developmental Effects	No information available.
Teratogenicity	No information available.
STOT - single exposure	Central nervous system (CNS)
STOT - repeated exposure	Kidney Liver Heart spleen Blood
Aspiration hazard	No information available
Symptoms / effects, both acute and delayed	Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting. Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing
Endocrine Disruptor Information	No information available
Other Adverse Effects	The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Do not empty into drains. The product contains following substances which are hazardous for the environment. Contains a substance which is: Harmful to aquatic organisms. Toxic to aquatic organisms.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Trichloroethylene	EC50: = 175 mg/L, 96h (Pseudokirchneriella subcapitata) EC50: = 450 mg/L, 96h (Desmodesmus subspicatus)	LC50: 31.4 - 71.8 mg/L, 96h flow-through (Pimephales promelas) LC50: 39 - 54 mg/L, 96h static (Lepomis macrochirus)	EC50 = 0.81 mg/L 24 h EC50 = 115 mg/L 10 min EC50 = 190 mg/L 15 min EC50 = 235 mg/L 24 h EC50 = 410 mg/L 24 h EC50 = 975 mg/L 5 min	EC50: = 2.2 mg/L, 48h (Daphnia magna)

Persistence and Degradability Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its volatility.

Component	log Pow
Trichloroethylene	2.4

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Trichloroethylene - 79-01-6	U228	-

14. Transport information

DOT

UN-No

UN1710

Proper Shipping Name	TRICHLOROETHYLENE
Hazard Class	6.1
Packing Group	III
TDG	
UN-No	UN1710
Proper Shipping Name	TRICHLOROETHYLENE
Hazard Class	6.1
Packing Group	III
IATA	
UN-No	UN1710
Proper Shipping Name	TRICHLOROETHYLENE
Hazard Class	6.1
Packing Group	III
IMDG/IMO	
UN-No	UN1710
Proper Shipping Name	TRICHLOROETHYLENE
Hazard Class	6.1
Packing Group	III

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Trichloroethylene	79-01-6	X	ACTIVE	R;S

Legend:

TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

'-' - Not Listed

R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

TSCA - Per 40 CFR 751, Regulation of Certain Chemical Substances & Mixtures, Under TSCA Section 6(h) (PBT) Not applicable

TSCA 12(b) - Notices of Export

Component	CAS No	TSCA 12(b) - Notices of Export
Trichloroethylene	79-01-6	Section 5 Section 6

International Inventories

Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Trichloroethylene	79-01-6	X	-	201-167-4	X	X	X	X	X	X

KECL - NIER number or KE number (<http://ncis.nier.go.kr/en/main.do>)

U.S. Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

Component	CAS No	Weight %	SARA 313 - Threshold Values %	SARA 313 - Reporting thresholds
Trichloroethylene	79-01-6	<=100	0.1 %	-

SARA 311/312 Hazard Categories

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications.

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Trichloroethylene	X	100 lb	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Trichloroethylene	X		-

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355).

Component	Hazardous Substances RQs	CERCLA Extremely Hazardous Substances RQs	SARA Reportable Quantity (RQ)
Trichloroethylene	100 lb	-	100 lb 45.4 kg

California Proposition 65

This product contains the following Proposition 65 chemicals.

Component	CAS No	California Prop. 65	Prop 65 NSRL	Category
Trichloroethylene	79-01-6	Carcinogen Developmental Male Reproductive	14 µg/day 50 µg/day	Developmental Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Trichloroethylene	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Authorisation/Restrictions according to EU REACH

Component	CAS No	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Trichloroethylene	79-01-6	Carcinogenic Category 1B, Article 57 Application date: October	Use restricted. See item 28. (see link for restriction)	SVHC Candidate list - 201-167-4 - Carcinogenic, Article 57a

		21, 2014 Sunset date: April 21, 2016 Exemption - None	details) Use restricted. See item 75. (see link for restriction details)	
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After the sunset date the use of this substance requires either an authorization or can only be used for exempted uses, e.g. use in scientific research and development which includes routine analytics or use as intermediate.

REACH links

<https://echa.europa.eu/authorisation-list>

<https://echa.europa.eu/substances-restricted-under-reach>

<https://echa.europa.eu/candidate-list-table>

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Trichloroethylene	79-01-6	Listed	Not applicable	Not applicable	Not applicable

Contains component(s) that meet a 'definition' of per & poly fluoroalkyl substance (PFAS)?

Not applicable

Other International Regulations

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Trichloroethylene	79-01-6	Not applicable	Not applicable	Not applicable	Annex I - Y45

16. Other information

Prepared By

Health, Safety and Environmental Department
Email: chem.techinfo@thermofisher.com
www.thermofisher.com

Creation Date

03-Feb-2010

Revision Date

26-Mar-2024

Print Date

26-Mar-2024

Revision Summary

New emergency telephone response service provider.

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Creation Date 11-Jun-2009

Revision Date 13-Oct-2023

Revision Number 9

1. Identification

Product Name	Toluene
Cat No. :	T290-1; T290-1LC; T290-4; T290RS-19; T290RS-28; T290RS-200; T290N2-19; T290SK-1; T290SK-4; T290SS-28; T290SS-50; T290SS-115; T290SS-200; NC0112455; NC1089193; T290RS1350; T290RS50
CAS No	108-88-3
Synonyms	Tol; Methylbenzene
Recommended Use	Laboratory chemicals.
Uses advised against	Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company

Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number

CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids	Category 2
Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Reproductive Toxicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system, Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Kidney, Liver, spleen, Blood, Neurological effects, Eyes, Ears.	
Aspiration Toxicity	Category 1

Label Elements

Signal Word

Danger

Hazard Statements

Highly flammable liquid and vapor
May be fatal if swallowed and enters airways
Causes skin irritation
Causes serious eye irritation
May cause drowsiness or dizziness
Suspected of damaging the unborn child
May cause damage to organs through prolonged or repeated exposure

**Precautionary Statements****Prevention**

Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Wear eye/face protection
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Keep cool

Response

IF exposed or concerned: Get medical attention/advice

Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Skin

If skin irritation occurs: Get medical advice/attention

IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower

Wash contaminated clothing before reuse

Eyes

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

If eye irritation persists: Get medical advice/attention

Ingestion

IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician

Do NOT induce vomiting

Fire

In case of fire: Use CO₂, dry chemical, or foam for extinction

Storage

Store locked up

Store in a well-ventilated place. Keep container tightly closed

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

Harmful to aquatic life with long lasting effects

WARNING. Reproductive Harm - <https://www.p65warnings.ca.gov/>.

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Toluene	108-88-3	<=100

4. First-aid measures

General Advice	If symptoms persist, call a physician.
Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.
Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician.
Inhalation	Remove to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur. Risk of serious damage to the lungs (by aspiration).
Ingestion	Clean mouth with water and drink afterwards plenty of water. Do NOT induce vomiting. Call a physician or poison control center immediately. If vomiting occurs naturally, have victim lean forward.
Most important symptoms and effects	Difficulty in breathing. Causes central nervous system depression: Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Water spray, carbon dioxide (CO ₂), dry chemical, alcohol-resistant foam. Water mist may be used to cool closed containers.
Unsuitable Extinguishing Media	No information available
Flash Point	4 °C / 39.2 °F
Method -	No information available
Autoignition Temperature	535 °C / 995 °F
Explosion Limits	
Upper	7.1 vol %
Lower	1.1 vol %
Oxidizing Properties	Not oxidising
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

Flammable. Containers may explode when heated. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back.

Hazardous Combustion Products

Carbon monoxide (CO). Carbon dioxide (CO₂).

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPAHealth
3Flammability
3Instability
0Physical hazards
N/A**6. Accidental release measures****Personal Precautions**

Use personal protective equipment as required. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.

Environmental Precautions

Do not flush into surface water or sanitary sewer system.

Methods for Containment and Clean Up

Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage**Handling**

Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Ensure adequate ventilation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded. Take precautionary measures against static discharges.

Storage.

Keep containers tightly closed in a dry, cool and well-ventilated place. Flammables area. Keep away from heat, sparks and flame. Incompatible Materials. Strong oxidizing agents. Strong acids. Strong bases. Halogenated compounds.

8. Exposure controls / personal protection**Exposure Guidelines**

Component	ACGIH TLV	OSHA PEL	NIOSH	Mexico OEL (TWA)
Toluene	TWA: 20 ppm	(Vacated) TWA: 100 ppm (Vacated) TWA: 375 mg/m ³ Ceiling: 300 ppm (Vacated) STEL: 150 ppm (Vacated) STEL: 560 mg/m ³ TWA: 200 ppm	IDLH: 500 ppm TWA: 100 ppm TWA: 375 mg/m ³ STEL: 150 ppm STEL: 560 mg/m ³	TWA: 20 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures

Ensure that eyewash stations and safety showers are close to the workstation location. Use explosion-proof electrical/ventilating/lighting equipment. Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment**Eye/face Protection**

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection

Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection

Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Recommended Filter type:

Organic gases and vapours filter. Type A. Brown. conforming to EN14387.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	aromatic
Odor Threshold	1.74 ppm
pH	No information available
Melting Point/Range	-95 °C / -139 °F
Boiling Point/Range	111 °C / 231.8 °F @ 760 mmHg
Flash Point	4 °C / 39.2 °F
Evaporation Rate	2.4 (Butyl acetate = 1.0)
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	7.1 vol %
Lower	1.1 vol %
Vapor Pressure	29 mbar @ 20 °C
Vapor Density	3.1
Specific Gravity	0.866
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	535 °C / 995 °F
Decomposition Temperature	No information available
Viscosity	0.6 mPa.s @ 20 °C
Molecular Formula	C7 H8
Molecular Weight	92.14

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable under normal conditions.
Conditions to Avoid	Incompatible products. Excess heat. Keep away from open flames, hot surfaces and sources of ignition.
Incompatible Materials	Strong oxidizing agents, Strong acids, Strong bases, Halogenated compounds
Hazardous Decomposition Products	Carbon monoxide (CO), Carbon dioxide (CO ₂)
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information**Acute Toxicity****Product Information****Component Information**

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Toluene	> 5000 mg/kg (Rat)	12000 mg/kg (Rabbit)	26700 ppm (Rat) 1 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes, respiratory system and skin

Sensitization	No information available					
Carcinogenicity	The table below indicates whether each agency has listed any ingredient as a carcinogen.					
Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Toluene	108-88-3	Not listed	Not listed	Not listed	Not listed	Not listed
Mutagenic Effects	Not mutagenic in AMES Test					
Reproductive Effects	Experiments have shown reproductive toxicity effects on laboratory animals.					
Developmental Effects	Developmental effects have occurred in experimental animals.					
Teratogenicity	Possible risk of harm to the unborn child.					
STOT - single exposure	Respiratory system Central nervous system (CNS)					
STOT - repeated exposure	Kidney Liver spleen Blood Neurological effects Eyes Ears					
Aspiration hazard	No information available					
Symptoms / effects,both acute and delayed	Causes central nervous system depression: Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting					
Endocrine Disruptor Information	No information available					
Other Adverse Effects	The toxicological properties have not been fully investigated.					

12. Ecological information

Ecotoxicity

The product contains following substances which are hazardous for the environment. Contains a substance which is: Toxic to aquatic organisms.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Toluene	EC50: = 12.5 mg/L, 72h static (Pseudokirchneriella subcapitata) EC50: > 433 mg/L, 96h (Pseudokirchneriella subcapitata)	50-70 mg/L LC50 96 h 5-7 mg/L LC50 96 h 15-19 mg/L LC50 96 h 28 mg/L LC50 96 h 12 mg/L LC50 96 h	EC50 = 19.7 mg/L 30 min	EC50: = 11.5 mg/L, 48h (Daphnia magna) EC50: 5.46 - 9.83 mg/L, 48h Static (Daphnia magna)

Persistence and Degradability	Persistence is unlikely
Bioaccumulation/ Accumulation	No information available.
Mobility	Is not likely mobile in the environment due its low water solubility.

Component	log Pow
Toluene	2.73

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Toluene - 108-88-3	U220	-

14. Transport information

DOT

UN-No	UN1294
Proper Shipping Name	TOLUENE

Hazard Class	3
Packing Group	II
TDG	
UN-No	UN1294
Proper Shipping Name	TOLUENE
Hazard Class	3
Packing Group	II
IATA	
UN-No	UN1294
Proper Shipping Name	TOLUENE
Hazard Class	3
Packing Group	II
IMDG/IMO	
UN-No	UN1294
Proper Shipping Name	TOLUENE
Hazard Class	3
Packing Group	II

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Toluene	108-88-3	X	ACTIVE	-

Legend:

TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

'-' - Not Listed

TSCA - Per 40 CFR 751, Regulation of Certain Chemical Substances & Mixtures, Under TSCA Section 6(h) (PBT)

Not applicable

TSCA 12(b) - Notices of Export

Not applicable

International Inventories

Canada (DSL/NDL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Toluene	108-88-3	X	-	203-625-9	X	X	X	X	X	KE-33936

KECL - NIER number or KE number (<http://ncis.nier.go.kr/en/main.do>)

U.S. Federal Regulations

SARA 313

Component	CAS No	Weight %	SARA 313 - Threshold Values %
Toluene	108-88-3	<=100	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Toluene	X	1000 lb	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
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Toluene	X		-
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OSHA - Occupational Safety and Health Administration

Not applicable

CERCLA

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Toluene	1000 lb 1 lb	-

California Proposition 65

This product contains the following Proposition 65 chemicals.

Component	CAS No	California Prop. 65	Prop 65 NSRL	Category
Toluene	108-88-3	Developmental	-	Developmental

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Toluene	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security

This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade

Serious risk, Grade 3

Authorisation/Restrictions according to EU REACH

Component	CAS No	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Toluene	108-88-3	-	Use restricted. See item 48. (see link for restriction details) Use restricted. See item 75. (see link for restriction details)	-

REACH links

<https://echa.europa.eu/substances-restricted-under-reach>

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Toluene	108-88-3	Listed	Not applicable	Not applicable	Not applicable

Contains component(s) that meet a 'definition' of per & poly fluoroalkyl substance (PFAS)?

Not applicable

Other International Regulations

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Toluene	108-88-3	Not applicable	Not applicable	Not applicable	Annex I - Y42

16. Other information**Prepared By**

Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date

11-Jun-2009

Revision Date

13-Oct-2023

Print Date

13-Oct-2023

Revision Summary

This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Alconox® detergent

Product Number : Z273228
Brand : Aldrich

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Skin irritation (Category 2), H315

Serious eye damage (Category 1), H318

Specific target organ toxicity - repeated exposure (Category 2), Respiratory Tract, H373

Short-term (acute) aquatic hazard (Category 3), H402

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal Word

Danger

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Hazard Statements

H315	Causes skin irritation.
H318	Causes serious eye damage.
H373	May cause damage to organs (Respiratory Tract) through prolonged or repeated exposure.
H402	Harmful to aquatic life.

Precautionary Statements

P260	Do not breathe dust.
P264	Wash skin thoroughly after handling.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor.
P314	Get medical advice/ attention if you feel unwell.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.2 Mixtures

Component		Classification	Concentration
n-alkylbenzenesulfonic acid, sodium salts			
CAS-No.	68411-30-3	Acute Tox. 4; Skin Irrit. 2; Eye Dam. 1; Aquatic Acute 2; Aquatic Chronic 3; H302, H315, H318, H401, H412	>= 10 - < 20 %
EC-No.	270-115-0		
Registration number	01-2119489428-22-XXXX		
sodium carbonate			
CAS-No.	497-19-8	Eye Irrit. 2A; H319	>= 10 - < 20 %
EC-No.	207-838-8		
Index-No.	011-005-00-2		
Registration number	01-2119485498-19-XXXX		
tetrasodium diphosphate			
CAS-No.	7722-88-5	Acute Tox. 4; Eye Dam. 1; H302, H318	>= 10 - < 20 %
EC-No.	231-767-1		
Registration number	01-2119489794-17-XXXX		



Sulfuric acid, mono-C12-14-alkyl esters, sodium salts			
CAS-No.	85586-07-8	Aquatic Acute 2; Aquatic Chronic 3; H401, H412	>= 1 - < 5 %
EC-No.	287-809-4		
Ethylenedinitrilotetraacetic acid,Tetrasodiumsalt			
CAS-No.	64-02-8	Acute Tox. 4; Eye Dam. 1; STOT RE 2; H302, H332, H318, H373	>= 1 - < 5 %
EC-No.	200-573-9		
Index-No.	607-428-00-2		
Registration number	01-2119486762-27-XXXX		

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice

Show this material safety data sheet to the doctor in attendance.

If inhaled

After inhalation: fresh air.

In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact

After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses.

If swallowed

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Water Foam Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media

For this substance/mixture no limitations of extinguishing agents are given.

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5.2 Special hazards arising from the substance or mixture

Carbon oxides

Oxides of phosphorus

Sodium oxides

Carbon oxides

Nitrogen oxides (NO_x)

Oxides of phosphorus

Sodium oxides

Mixture with combustible ingredients.

Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Avoid inhalation of dusts. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.

For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up dry. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions

Tightly closed. Dry.

Storage class

Storage class (TRGS 510): 11: Combustible Solids



7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
tetrasodium diphosphate	7722-88-5	TWA	5 mg/m ³	USA. NIOSH Recommended Exposure Limits
		PEL	5 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Tightly fitting safety goggles

Skin protection

Handle with impervious gloves.

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN 16523-1 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatril® L

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatril® L



Body Protection

protective clothing

Respiratory protection

Recommended Filter type: Filter type P2

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

required when dusts are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure

Do not let product enter drains.

SECTION 9: Physical and chemical properties**9.1 Information on basic physical and chemical properties**

a) Appearance	Form: solid
b) Odor	No data available
c) Odor Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	No data available
f) Initial boiling point and boiling range	No data available
g) Flash point	()No data available
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapor pressure	No data available
l) Vapor density	No data available
m) Density	No data available
Relative density	No data available
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Autoignition	No data available

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temperature

- q) Decomposition temperature No data available
- r) Viscosity No data available
- s) Explosive properties Not classified as explosive.
- t) Oxidizing properties none

9.2 Other safety information

No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

The following applies in general to flammable organic substances and mixtures: in correspondingly fine distribution, when whirled up a dust explosion potential may generally be assumed.

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

no information available

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Mixture

Acute toxicity

Oral: No data available

Acute toxicity estimate Oral - 2,173 mg/kg

(Calculation method)

Symptoms: Irritations of mucous membranes in the mouth, pharynx, oesophagus and gastrointestinal tract.

Acute toxicity estimate Inhalation - 4 h - 150 mg/l - dust/mist(Calculation method)

Symptoms: Possible symptoms:, mucosal irritations

Dermal: No data available



Acute toxicity estimate Dermal - > 5,000 mg/kg
(Calculation method)

Skin corrosion/irritation

Remarks: Mixture causes skin irritation.

Serious eye damage/eye irritation

Remarks: Mixture causes serious eye damage.

Respiratory or skin sensitization

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Mixture may cause damage to organs through prolonged or repeated exposure.

- Respiratory Tract

Aspiration hazard

No data available

11.2 Additional Information

irritant effects, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.
Other dangerous properties can not be excluded.

Handle in accordance with good industrial hygiene and safety practice.

Components

n-alkylbenzenesulfonic acid, sodium salts

Acute toxicity

LD50 Oral - Rat - male and female - 1,080 mg/kg

(OECD Test Guideline 401)

Inhalation: No data available



LD50 Dermal - Rat - male and female - > 2,000 mg/kg
(OECD Test Guideline 402)

Skin corrosion/irritation

Skin - Rabbit

Result: irritating - 4 h

(OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Irreversible effects on the eye - 72 h

(OECD Test Guideline 405)

Respiratory or skin sensitization

Maximization Test - Guinea pig

Result: Does not cause skin sensitization.

(OECD Test Guideline 406)

Germ cell mutagenicity

Test Type: In vitro mammalian cell gene mutation test

Result: negative

Test Type: Ames test

Test system: Salmonella typhimurium

Result: negative

Test Type: Mutagenicity (mammal cell test): chromosome aberration.

Result: Positive results were obtained in some in vitro tests.

Species: Mouse - male - Bone marrow

Result: negative

Remarks: (ECHA)

Carcinogenicity

No data available

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Aspiration hazard

No data available

sodium carbonate

Acute toxicity

LD50 Oral - Rat - male and female - 2,800 mg/kg

Remarks: (ECHA)

Inhalation: No data available



LD50 Dermal - Rabbit - > 2,000 mg/kg
(US-EPA)

Skin corrosion/irritation

Skin - Rabbit

Result: No skin irritation - 4 h
(OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Eye irritation
(US-EPA)

Respiratory or skin sensitization

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

tetrasodium diphosphate

Acute toxicity

LD50 Oral - Rat - female - > 300 - < 2,000 mg/kg
(OECD Test Guideline 420)

LC50 Inhalation - Rat - male and female - 4 h - > 0.58 mg/l - dust/mist
(OECD Test Guideline 403)

Remarks: (highest concentration to be prepared)

The value is given in analogy to the following substances: Disodium pyrophosphate

LD50 Dermal - Rabbit - male and female - > 2,000 mg/kg
(US-EPA)

Skin corrosion/irritation

Skin - Rabbit

Result: No skin irritation - 4 h
(OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Irreversible effects on the eye - 4 h



(OECD Test Guideline 405)

Respiratory or skin sensitization

Local lymph node assay (LLNA) - Mouse

Result: negative

(OECD Test Guideline 429)

Remarks: The value is given in analogy to the following substances: Disodium pyrophosphate

Germ cell mutagenicity

Test Type: gene mutation test

Test system: Mouse lymphoma test

Result: negative

Test Type: Micronucleus test

Test system: lymphocyte

Result: negative

Carcinogenicity

No data available

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Aspiration hazard

No data available

Sulfuric acid, mono-C12-14-alkyl esters, sodium salts

Acute toxicity

LD50 Oral - Rat - female - > 2,000 mg/kg

(OECD Test Guideline 420)

Inhalation: No data available

LD50 Dermal - Rat - > 2,000 mg/kg

(OECD Test Guideline 402)

Skin corrosion/irritation

Remarks: No data available

Serious eye damage/eye irritation

Remarks: No data available

Respiratory or skin sensitization

- Rabbit



Does not cause skin sensitization.
(OECD Test Guideline 406)

Germ cell mutagenicity

Test Type: Ames test
Test system: S. typhimurium
Result: negative

Carcinogenicity

No data available

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Aspiration hazard

No data available

Ethylenedinitrilotetraacetic acid, Tetrasodiumsalt

Acute toxicity

LD50 Oral - Rat - female - 1,780 mg/kg
Remarks: (ECHA)
Inhalation: No data available
Dermal: No data available
No data available

Skin corrosion/irritation

Skin - Rabbit
Result: No skin irritation - 4 h
(OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit
Result: Risk of serious damage to eyes.
(OECD Test Guideline 405)
Remarks: (Regulation (EC) No 1272/2008, Annex VI)

Respiratory or skin sensitization

Maximization Test - Guinea pig
Result: negative
(OECD Test Guideline 406)
Remarks: The value is given in analogy to the following substances:
Ethylenedinitrilotetraacetic acid disodium salt

Germ cell mutagenicity

Test Type: Ames test
Test system: Escherichia coli/Salmonella typhimurium
Result: negative
Remarks: (in analogy to similar products)



Test Type: In vitro mammalian cell gene mutation test

Test system: mouse lymphoma cells

Result: negative

Remarks: (in analogy to similar products)
(ECHA)

Test Type: Chromosome aberration test in vitro

Test system: Chinese hamster ovary cells

Result: negative

Remarks: (in analogy to similar products)
(ECHA)

Method: OECD Test Guideline 474

Species: Mouse - male - Bone marrow

Result: negative

Remarks: (in analogy to similar products)

The value is given in analogy to the following substances: Ethylenedinitrilotetraacetic acid disodium salt

Carcinogenicity

No data available

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

May cause damage to organs through prolonged or repeated exposure.

- Respiratory Tract

Aspiration hazard

No data available

SECTION 12: Ecological information

12.1 Toxicity

Mixture

No data available

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties

No data available

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12.7 Other adverse effects

No data available

Components

n-alkylbenzenesulfonic acid, sodium salts

Toxicity to fish	static test LC50 - <i>Lepomis macrochirus</i> (Bluegill sunfish) - 1.67 mg/l - 96 h (US-EPA)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - <i>Daphnia magna</i> (Water flea) - 2.9 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	static test ErC50 - <i>Pseudokirchneriella subcapitata</i> (green algae) - 235 mg/l - 72 h Remarks: (ECHA)
Toxicity to fish(Chronic toxicity)	flow-through test NOEC - <i>Oncorhynchus tshawytscha</i> (chinook salmon) - 0.23 mg/l - 72 d (OECD Test Guideline 210)
Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	flow-through test NOEC - <i>Daphnia magna</i> (Water flea) - 1.18 mg/l - 21 d (OECD Test Guideline 211)

sodium carbonate

Toxicity to fish	static test LC50 - <i>Lepomis macrochirus</i> (Bluegill sunfish) - 300 mg/l - 96 h Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	semi-static test EC50 - <i>Ceriodaphnia</i> (water flea) - 220 - 227 mg/l - 48 h Remarks: (ECHA)

tetrasodium diphosphate

Toxicity to fish	semi-static test LC50 - <i>Oncorhynchus mykiss</i> (rainbow trout) - > 100 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - <i>Daphnia magna</i> (Water flea) - > 100 mg/l - 48 h (US-EPA)
Toxicity to algae	static test ErC50 - <i>Desmodesmus subspicatus</i> (green algae) - > 100 mg/l - 72 h (OECD Test Guideline 201) static test NOEC - <i>Desmodesmus subspicatus</i> (green algae) - > 100 mg/l - 72 h

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(OECD Test Guideline 201)

Toxicity to bacteria static test EC50 - activated sludge - > 1,000 mg/l - 3 h
(OECD Test Guideline 209)
Remarks: The value is given in analogy to the following substances: dipotassium hydrogen phosphate

Sulfuric acid, mono-C12-14-alkyl esters, sodium salts

Toxicity to daphnia and other aquatic invertebrates static test EC50 - Daphnia magna (Water flea) - 2.9 mg/l - 48 h
(OECD Test Guideline 202)

Toxicity to algae EC50 - Pseudokirchneriella subcapitata (green algae) - 29 mg/l - 96 h
(US-EPA)

Toxicity to bacteria static test EC50 - activated sludge - 220 mg/l - 3 h
(OECD Test Guideline 209)

Toxicity to fish(Chronic toxicity) NOEC - Pimephales promelas (fathead minnow) - 0.96 mg/l - 196 d

Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity) flow-through test LC50 - Daphnia magna (Water flea) - 1.67 mg/l - 21 d
(OECD Test Guideline 211)

Ethylenedinitrilotetraacetic acid,Tetrasodiumsalt

Toxicity to fish static test LC50 - Oncorhynchus mykiss (rainbow trout) - > 100 mg/l - 96 h
(OECD Test Guideline 203)

Toxicity to daphnia and other aquatic invertebrates static test EC50 - Daphnia magna (Water flea) - > 114 mg/l - 48 h
(OECD Test Guideline 202)

Toxicity to bacteria static test EC10 - activated sludge - > 500 mg/l - 30 min
(OECD Test Guideline 209)
Remarks: (in analogy to similar products)
The value is given in analogy to the following substances: Ethylenedinitrilotetraacetic acid disodium salt
The value is given in analogy to the following substances: Sodium feredetate

Toxicity to fish(Chronic toxicity) flow-through test NOEC - Danio rerio (zebra fish) - >= 35.1 mg/l - 35 d
(OECD Test Guideline 210)
Remarks: The value is given in analogy to the following substances: Sodium calcium edetate hydrate

Toxicity to daphnia semi-static test NOEC - Daphnia magna (Water flea) - 25 mg/l

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and other aquatic
invertebrates(Chronic
toxicity)

- 21 d

Remarks: The value is given in analogy to the following
substances: Ethylenedinitrilotetraacetic acid disodium salt

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

SECTION 14: Transport information

DOT (US)

Not dangerous goods

IMDG

Not dangerous goods

IATA

Not dangerous goods

Further information

Not classified as dangerous in the meaning of transport regulations.

SECTION 15: Regulatory information

SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards

Acute Health Hazard

Massachusetts Right To Know Components

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CAS-No.

Revision Date

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The life science business of Merck KGaA, Darmstadt, Germany
operates as MilliporeSigma in the US and Canada



pentasodium triphosphate	7758-29-4	1993-04-24
tetrasodium diphosphate	7722-88-5	1993-02-16

Pennsylvania Right To Know Components

pentasodium triphosphate	CAS-No. 7758-29-4	Revision Date 1993-04-24
tetrasodium diphosphate	7722-88-5	1993-02-16

SECTION 16: Other information

Further information

The information is believed to be correct but is not exhaustive and will be used solely as a guideline, which is based on current knowledge of the chemical substance or mixture and is applicable to appropriate safety precautions for the product. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.7

Revision Date: 12/21/2023

Print Date: 01/28/2024



SAFETY DATA SHEET

Creation Date 22-Sep-2009

Revision Date 24-Dec-2021

Revision Number 5

1. Identification

Product Name Bentonite

Cat No. : B235-500

CAS No 1302-78-9
Synonyms tixoton; Southern bentonite; Bentonite magma

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company

Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification

Classification under 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

This chemical is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Label Elements

Hazard Statements

Precautionary Statements

Hazards not otherwise classified (HNOC)

None identified

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Bentonite	1302-78-9	>95

4. First-aid measures

Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.
Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Get medical attention.
Inhalation	Remove to fresh air. Get medical attention. If not breathing, give artificial respiration.
Ingestion	Do NOT induce vomiting. Get medical attention.
Most important symptoms and effects	. No information available
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.
Unsuitable Extinguishing Media	No information available
Flash Point	Not applicable
Method -	No information available
Autoignition Temperature	No information available
Explosion Limits	
Upper	No data available
Lower	No data available
Oxidizing Properties	Not oxidising
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products

None known.

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health
0

Flammability
1

Instability
1

Physical hazards
N/A

6. Accidental release measures

Personal Precautions	Ensure adequate ventilation. Use personal protective equipment as required. Avoid dust formation. Avoid contact with skin, eyes or clothing.
Environmental Precautions	Should not be released into the environment. See Section 12 for additional Ecological Information.
Methods for Containment and Clean Up	Sweep up and shovel into suitable containers for disposal. Avoid dust formation. Provide adequate ventilation.

7. Handling and storage

Handling Wear personal protective equipment/face protection. Ensure adequate ventilation. Avoid contact with skin, eyes or clothing. Avoid ingestion and inhalation. Avoid dust formation. Handle under inert gas, protect from moisture.

Storage. Keep container tightly closed in a dry and well-ventilated place. Store under an inert atmosphere. Incompatible Materials. Strong oxidizing agents. Strong acids.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Bentonite	TWA: 1 mg/m ³			TWA: 1 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

Engineering Measures None under normal use conditions.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection No protective equipment is needed under normal use conditions.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Solid
Appearance	Beige
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	No data available
Boiling Point/Range	No information available
Flash Point	Not applicable
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	Not applicable
Specific Gravity	No information available
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	Not applicable

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Hygroscopic. Moisture sensitive.
Conditions to Avoid	Incompatible products. Excess heat. Avoid dust formation. Exposure to moist air or water.
Incompatible Materials	Strong oxidizing agents, Strong acids
Hazardous Decomposition Products	None under normal use conditions
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Bentonite	LD50 > 5000 mg/kg (Rat)	Not listed	Not listed

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes, respiratory system and skin

Sensitization No information available

Carcinogenicity Possible cancer hazard. May cause cancer based on animal data. The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Bentonite	1302-78-9	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects, both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Do not empty into drains. Do not flush into surface water or sanitary sewer system.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
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Bentonite	Not listed	LC50: = 19000 mg/L, 96h static (Oncorhynchus mykiss)	Not listed	Not listed
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Persistence and Degradability Insoluble in water

Bioaccumulation/ Accumulation No information available.

Mobility Is not likely mobile in the environment due its low water solubility.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT Not regulated
TDG Not regulated
IATA Not regulated
IMDG/IMO Not regulated

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Bentonite	1302-78-9	X	ACTIVE	-

Legend:

TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories

Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Bentonite	1302-78-9	X	-	215-108-5	X	-		X	X	KE-02119

KECL - NIER number or KE number (<http://ncis.nier.go.kr/en/main.do>)

U.S. Federal Regulations

SARA 313 Not applicable

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

Clean Air Act Not applicable

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA Not applicable

California Proposition 65 This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations Not applicable

U.S. Department of Transportation

Reportable Quantity (RQ): N

DOT Marine Pollutant N

DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Authorisation/Restrictions according to EU REACH

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Bentonite	1302-78-9	Listed	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Bentonite	1302-78-9	Not applicable	Not applicable	Not applicable	Not applicable

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 22-Sep-2009

Revision Date 24-Dec-2021

Print Date 24-Dec-2021

Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

SECTION 1:**PRODUCT AND COMPANY IDENTIFICATION**

Hydrochloric Acid, 31 – 36%

Product Name: Hydrochloric Acid, 31 – 36.7%

Identified Uses: acid etching, steel pickling, oil and gas, ore and mineral, food processing, pharmaceutical, organic chemical synthesis

Company Information:

ASHTA Chemicals Inc.

P.O. Box 858

Ashtabula Ohio 44005

Phone: (440) 997-5221

Fax: (440) 998-0286

24-hour Emergency Phone: CHEMTREC: (800) 424-9300

SECTION 2:**HAZARDS IDENTIFICATION**

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

GHS label elements, including precautionary statements:

Signal Word: **Danger**

Pictogram(s):

**Hazard Statements**

H290	May be corrosive to metals.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H335	May cause respiratory irritation.

Precautionary Statements

P234	Keep only in original container.
P261	Avoid breathing dust/ fume/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water. Shower.



P304 + P340 + P310	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/ physician.
P363	Wash contaminated clothing before reuse.
P390	Absorb spillage to prevent material damage.
P403 + P233	Store in a well-ventilated place. Keep container with a resistant inner liner.
P405	Store locked up.
P406	Store in corrosive resistant stainless steel container with a resistant inner liner.
P501	Dispose of contents/ container to an approved waste disposal plant.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms:

CHEMICAL NAME:	Hydrochloric acid
TRADE NAME:	Hydrochloric acid, 31 – 36%
SYNONYMS:	Muriatic acid, Chlorohydric acid, Hydrogen Chloride

C.A.S:	7647-01-0
EC:	231-595-7
WHMIS:	D2A, E

CHEMICAL FORMULA:	HCl (in aqueous solution)
CHEMICAL FAMILY:	Inorganic Acid

SECTION 4 FIRST AID MEASURES

Description of first aid measures:

Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. If breathing is difficult, give humidified air. Give oxygen, but only by a certified physician. Consult a physician.

In case of skin contact

Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Remove contact lenses if present and easy to do. Continue rinsing eyes during transport to medical facility.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth thoroughly with water. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Consult a physician.

SECTION 5	FIRE FIGHTING MEASURES
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Flash Point (Method):	Non-combustible.
Extinguishing Media:	Use extinguishing agents compatible with acid and appropriate for the burning material. Use water spray to keep fire-exposed containers cool.
Auto Ignition Temp:	Non-combustible.
Special Fire Fighting Procedures:	Wear self-contained breathing apparatus and full protective clothing. In case of fire and/or explosion do not breathe fumes. Use standard firefighting procedures and consider the hazards of other involved materials.
Unusual Fire/Explosion Hazards:	Releases flammable hydrogen gas when reacting with metals.

SECTION 6	ACCIDENTAL RELEASE MEASURES
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Environmental Precautions:

Use closed systems when possible. Provide local exhaust ventilation where vapor or mist may be generated. Avoid discharge into drains, water courses or onto the ground.

Containment and Cleaning:

Follow preplanned emergency procedures. Only properly equipped, trained, functional personnel should attempt to contain a leak. All other personnel should be evacuated from the danger area. Using full protective equipment, apply appropriate emergency device or other securement technology to stop the leak if possible.

Small Spill:	Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: neutralize the residue with a dilute solution of sodium carbonate.
Large Spill:	Corrosive liquid. Stop leak if without risk. Do not touch spilled material. Use water spray curtain to knock down vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that vapor is not present at a concentration level above TLV.

SECTION 7:	HANDLING AND STORAGE
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Precautions to be taken for handling and storage:

Wear appropriate personal protective equipment. Do not get in eyes, on skin, on clothing. Do not breathe mist or vapor. Observe good industrial hygiene practices. Do not empty into drains. Use caution when combining with water; DO NOT add water to acid, ALWAYS add acid to water while stirring to prevent release of heat, steam and fumes. Store in a well-ventilated place. Store away from incompatible materials. Store closed containers in a clean, cool, open or well ventilated area. Keep out of sun.

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Principal Component: Hydrochloric Acid

Occupational Exposure Limits:

Regulatory Limits:

Component	OSHA Final PEL TWA	OSHA Final PEL STEL	OSHA Final PEL Ceiling
Hydrochloric Acid Mixture	---	---	5 ppm 7.59 mg/m ³

ACGIH TLV = 5 ppm (7.59 mg/m³) TWA

NIOSH IDLH = 50 ppm (as HCl, 2010)

Exposure Controls:

Eye Protection:

Tightly fitting safety goggles. Face shield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Respiratory Protection:

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multipurpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Other Protection:

Complete suit protecting against chemicals. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Ventilation Recommended:

Exhaust ventilation is required to meet PEL limits.

Glove Type Recommended:

Wear neoprene, nitrile, butyl rubber or PVC gloves to prevent exposure.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties:

Appearance	Colorless to light yellow liquid
Odor	Pungent (irritating/strong)
Odor Threshold	0.3ppm (can cause olfactory fatigue)
pH	<1 (in aqueous solution)
Melting point/freezing point	-30°C (-22°F)
Initial boiling point	>100°C (>212°F)
Flash point	Not applicable
Auto-ignition Temp	Not applicable
Evaporation rate	No data available



Decomposition temperature	No data available
Flammability (solid, gas)	Not combustible
Upper/lower flammability or explosive limits	Not combustible
Water solubility	100%
Molecular Weight	36.46
Relative Density (Specific Gravity)	1.16 (32% HCl solution) 1.19 (36.5% HCl solution)
Bulk Density	8.75 lbs/gal (32% HCl solution) 9.83 lbs/gal (36.5% HCl solution)
Vapor Density (air = 1)	1.267 at 20 °C
Vapor Pressure	84 mm Hg @ 20°C
Partition Coefficient: n-octanol/water	No data available

SECTION 10:	STABILITY AND REACTIVITY
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Stability:	Hydrochloric acid is stable under normal conditions and pressures.
Conditions to avoid:	Incompatible materials, metals, excess heat, bases.
Incompatibility:	Bases, amines, metals, permanganates, (e.g. potassium permanganate), fluorine, metal acetylides, hexalithium disilicide.
Hazardous decomposition products:	Hydrogen chloride, chlorine, hydrogen gas.
Polymerization:	Hazardous polymerization WILL NOT occur.

SECTION 11:	TOXICOLOGICAL INFORMATION
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Information on likely routes of exposure:

Inhalation:	Vapors and mist will irritate throat and respiratory system and cause coughing.
Skin contact:	Causes skin burns.
Eye contact:	Causes eye burns.
Ingestion:	Harmful if swallowed. Causes digestive tract burns. Ingestion may produce burns to the lips, oral cavity, upper airway, esophagus and possibly the digestive tract.

Symptoms related to the physical, chemical and toxicological characteristics:

Contact with this material will cause burns to the skin, eyes and mucous membranes. Permanent eye damage including blindness could result.

Information on toxicological effects:

Acute toxicity:	Harmful if swallowed.
Skin corrosion/irritation:	Causes severe skin burns and eye damage.
Serious eye damage/eye	
Irritation:	Causes serious eye damage.
Respiratory sensitization:	Not available.



Skin sensitization:	No data available.
Germ cell mutagenicity:	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity:	This product is not considered to be a carcinogen by IARC, ACGIH, NTP or OSHA.
Reproductive toxicity:	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure:	May cause respiratory irritation.
Specific target organ toxicity - repeated exposure:	No data available.
Aspiration hazard:	Not available.
Chronic effects:	Prolonged inhalation may be harmful.

Components Species Test Results:

Hydrochloric acid (CAS# 7647-01-0)

Rat - Inhalation LC ₅₀ :	3124 ppm, (1 hour)
Rabbit - Dermal LD ₅₀ :	5010 mg/kg

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity:	Because of the low pH of this product, it would be expected produce significant ecotoxicity upon exposure to aquatic organisms and aquatic systems.
Aquatic Toxicity:	This material is toxic to fish and aquatic organisms. Most aquatic species do not tolerate pH lower than 5.5 for any extended period.
Fish Toxicity:	Fish LC ₅₀ Mosquito fish: 282 mg/l, 96 hours Fish LC ₅₀ Bluegill: 3.6 mg/l, 48 hours
Persistence and degradability:	Not biodegradable. Hydrochloric acid will likely be neutralized to chloride by alkalinity present in natural environment..
Bioaccumulative Potential:	No data available.
Mobility in soil:	Hydrochloric acid will be neutralized by naturally occurring alkalinity. The acid will permeate soil, dissolving some soil material and will then neutralize.
Other adverse effects:	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation)

SECTION 13: DISPOSAL CONSIDERATIONS

Collect and reclaim or dispose in sealed containers at a properly licensed waste disposal site. This material , if not neutralized, must be disposed of as hazardous waste. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national or international regulations.



SECTION 14:	TRANSPORT INFORMATION
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Shipping:

Usual Shipping Containers:	Tank cars, bulk tankers.
Usual Shelf Life:	Indefinite (life of containers).
Storage/Transport Temperatures:	Ambient.

Suitable Storage:

Materials/Coatings:	Teflon, Tygon, Rubber, PVC and polypropylene materials.
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D.O.T. Information:

Labeling:	Corrosive
D.O.T. Identification Number	UN 1789
D.O.T. Shipping Name:	Hydrochloric Acid
Hazard Class:	8
Packing Group:	II
Hazard Guide:	157
Placard:	UN 1789

SECTION 15	REGULATORY INFORMATION
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SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

Hydrochloric Acid	CAS#: 7647-01-0
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SARA 311/312 Hazards

Acute health hazard, reactive hazard.

Massachusetts Right To Know Components

Hydrochloric Acid	CAS#: 7647-01-0
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Pennsylvania Right To Know Components

Hydrochloric Acid	CAS#: 7647-01-0
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New Jersey Right To Know Components

Hydrochloric Acid	CAS#: 7647-01-0
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California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects or any other reproductive harm.

OSHA PSM/RMP Threshold for Accidental Release:

CAS# 7647-01-0 is regulated under OSHA PSM *only* if anhydrous HCl.

CAS# 7647-01-0 is regulated under EPA RMP *only* if $\geq 37\%$ HCl.



Toxic Substances Control Act (TSCA):

Hydrochloric Acid

CAS#: 7647-01-0

Comprehensive Environmental Response Compensation Liability Act: (CERCLA)

Hydrochloric Acid

CAS#: 7647-01-0

SECTION 16

OTHER INFORMATION

NFPA Rating:

Health hazard: 3

Fire Hazard: 0

Reactivity Hazard: 1

This information is drawn from recognized sources believed to be reliable. ASHTA Chemicals, Inc. Makes no guarantees or assumes any liability in connection with this information. The user should be aware of changing technology, research, regulations, and analytical procedures that may require changes herein. The above data is supplied upon the condition that persons will evaluate this information and then determine its suitability for their use. Only U.S.A regulations apply to the above.

Version 1.0	For the new GHS SDS Standard
Version 1.1	Graphics updated
Version 1.2	Title updated
Version 1.3	Section 9 changes
Version 1.4	Section 1, 15 changes

Revision Date: 12/31/2014
Revision Date: 3/9/2015
Revision Date: 6/2/2015
Revision Date: 7/30/2015
Revision Date: 4/15/2016

SAFETY DATA SHEET

Isobutylene

Airgas
an Air Liquide company

Section 1. Identification

GHS product identifier	: Isobutylene
Chemical name	: 2-methylpropene
Other means of identification	: 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene); 1, 1-Dimethylethylene; Isopropylidenemethylene; iso-Butene; i-Butene; 2-Methylpropylene; 2-Methyl-2-propene; 2-Methyl-1-propene
Product type	: Gas.
Product use	: Synthetic/Analytical chemistry.
Synonym	: 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene); 1, 1-Dimethylethylene; Isopropylidenemethylene; iso-Butene; i-Butene; 2-Methylpropylene; 2-Methyl-2-propene; 2-Methyl-1-propene
SDS #	: 001031
Supplier's details	: Airgas USA, LLC and its affiliates 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
24-hour telephone	: 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status	: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Classification of the substance or mixture	: FLAMMABLE GASES - Category 1 GASES UNDER PRESSURE - Liquefied gas

GHS label elements

Hazard pictograms



Signal word : Danger

Hazard statements : Extremely flammable gas.
May form explosive mixtures with air.
Contains gas under pressure; may explode if heated.
May displace oxygen and cause rapid suffocation.

Precautionary statements

General

: Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.

Prevention

: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Response

: Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Storage

: Protect from sunlight. Store in a well-ventilated place.

Disposal

: Not applicable.

Hazards not otherwise classified

: In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture	: Substance
Chemical name	: 2-methylpropene
Other means of identification	: 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene); 1, 1-Dimethylethylene; Isopropylidenemethylene; iso-Butene; i-Butene; 2-Methylpropylene; 2-Methyl-2-propene; 2-Methyl-1-propene
Product code	: 001031

CAS number/other identifiers

CAS number : 115-11-7

Ingredient name	%	CAS number
Isobutylene	100	115-11-7

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact	: Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.
Inhalation	: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
Skin contact	: Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.
Ingestion	: As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact	: No known significant effects or critical hazards.
Inhalation	: No known significant effects or critical hazards.
Skin contact	: No known significant effects or critical hazards.
Frostbite	: Try to warm up the frozen tissues and seek medical attention.
Ingestion	: As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact	: No specific data.
Inhalation	: No specific data.
Skin contact	: No specific data.
Ingestion	: No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician	: Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
Specific treatments	: No specific treatment.

Section 4. First aid measures

- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

- Suitable extinguishing media** : Use an extinguishing agent suitable for the surrounding fire.
- Unsuitable extinguishing media** : None known.

- Specific hazards arising from the chemical** : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

- Hazardous thermal decomposition products** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

- Special protective actions for fire-fighters** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

- For non-emergency personnel** : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.
- For emergency responders** : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

- Environmental precautions** : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

- Small spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.
- Large spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

- Protective measures** : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
Use only non-sparking tools. Avoid contact with eyes, skin and clothing. Empty containers retain product residue and can be hazardous. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment.
- Advice on general occupational hygiene** : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.
- Conditions for safe storage, including any incompatibilities** : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F). Keep container tightly closed and sealed until ready for use. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Isobutylene	ACGIH TLV (United States, 3/2017). TWA: 250 ppm 8 hours.

- Appropriate engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.
- Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

- Hygiene measures** : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.
- Eye/face protection** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Section 8. Exposure controls/personal protection

- Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
- Body protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.
- Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory protection** : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

- Physical state** : Gas. [Compressed gas.]
- Color** : Colorless.
- Odor** : Characteristic.
- Odor threshold** : Not available.
- pH** : Not available.
- Melting point** : -140.7°C (-221.3°F)
- Boiling point** : -6.9°C (19.6°F)
- Critical temperature** : 144.75°C (292.6°F)
- Flash point** : Closed cup: -76.1°C (-105°F)
- Evaporation rate** : Not available.
- Flammability (solid, gas)** : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.
- Lower and upper explosive (flammable) limits** : Lower: 1.8%
Upper: 9.6%
- Vapor pressure** : 24.3 (psig)
- Vapor density** : 1.94 (Air = 1)
- Specific Volume (ft³/lb)** : 6.6845
- Gas Density (lb/ft³)** : 0.1496 (25°C / 77 to °F)
- Relative density** : Not applicable.
- Solubility** : Not available.
- Solubility in water** : 0.26 g/l
- Partition coefficient: n-octanol/water** : 2.34
- Auto-ignition temperature** : 465°C (869°F)
- Decomposition temperature** : Not available.
- Viscosity** : Not applicable.
- Flow time (ISO 2431)** : Not available.
- Molecular weight** : 56.12 g/mole
- Aerosol product**
- Heat of combustion** : -45029034 J/kg

Section 10. Stability and reactivity

- Reactivity** : No specific test data related to reactivity available for this product or its ingredients.
- Chemical stability** : The product is stable.
- Possibility of hazardous reactions** : Under normal conditions of storage and use, hazardous reactions will not occur.
- Conditions to avoid** : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.
- Incompatible materials** : Oxidizers
- Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Isobutylene	LC50 Inhalation Vapor	Rat	550000 mg/m ³	4 hours

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Section 11. Toxicological information

- Inhalation** : No known significant effects or critical hazards.
Skin contact : No known significant effects or critical hazards.
Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

- Eye contact** : No specific data.
Inhalation : No specific data.
Skin contact : No specific data.
Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

- Potential immediate effects** : Not available.
Potential delayed effects : Not available.

Long term exposure

- Potential immediate effects** : Not available.
Potential delayed effects : Not available.

Potential chronic health effects

Not available.

- General** : No known significant effects or critical hazards.
Carcinogenicity : No known significant effects or critical hazards.
Mutagenicity : No known significant effects or critical hazards.
Teratogenicity : No known significant effects or critical hazards.
Developmental effects : No known significant effects or critical hazards.
Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	LogP _{ow}	BCF	Potential
Isobutylene	2.34	-	low

Mobility in soil

- Soil/water partition coefficient (K_{oc})** : Not available.






Section 12. Ecological information

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1055	UN1055	UN1055	UN1055	UN1055
UN proper shipping name	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE
Transport hazard class(es)	2.1 	2.1 	2.1 	2.1 	2.1 
Packing group	-	-	-	-	-
Environmental hazards	No.	No.	No.	No.	No.

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Additional information

DOT Classification

: **Limited quantity** Yes.
Quantity limitation Passenger aircraft/rail: Forbidden. Cargo aircraft: 150 kg.
Special provisions 19, T50

TDG Classification

: Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2).
Explosive Limit and Limited Quantity Index 0.125
ERAP Index 3000
Passenger Carrying Ship Index Forbidden
Passenger Carrying Road or Rail Index Forbidden
Special provisions 29

IATA

: **Quantity limitation** Passenger and Cargo Aircraft: Forbidden. Cargo Aircraft Only: 150 kg.

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : TSCA 8(a) CDR Exempt/Partial exemption: Not determined
Clean Air Act (CAA) 112 regulated flammable substances: Isobutylene

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Refer to Section 2: Hazards Identification of this SDS for classification of substance.

State regulations

Massachusetts : This material is listed.

New York : This material is not listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia : This material is listed or exempted.

Canada : This material is listed or exempted.

China : This material is listed or exempted.

Europe : This material is listed or exempted.

Japan : **Japan inventory (ENCS):** This material is listed or exempted.
Japan inventory (ISHL): Not determined.

Malaysia : Not determined.

New Zealand : This material is listed or exempted.

Philippines : This material is listed or exempted.

Republic of Korea : This material is listed or exempted.

Section 15. Regulatory information

Taiwan	: This material is listed or exempted.
Thailand	: Not determined.
Turkey	: Not determined.
United States	: This material is listed or exempted.
Viet Nam	: Not determined.

Section 16. Other information

Hazardous Material Information System (U.S.A.)

Health	/ 1
Flammability	4
Physical hazards	3

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

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



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Procedure used to derive the classification

Classification	Justification
FLAMMABLE GASES - Category 1	Expert judgment
GASES UNDER PRESSURE - Liquefied gas	Expert judgment

History

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Key to abbreviations

: ATE = Acute Toxicity Estimate
 BCF = Bioconcentration Factor
 GHS = Globally Harmonized System of Classification and Labelling of Chemicals
 IATA = International Air Transport Association
 IBC = Intermediate Bulk Container
 IMDG = International Maritime Dangerous Goods
 LogPow = logarithm of the octanol/water partition coefficient
 MARPOL = International Convention for the Prevention of Pollution From Ships, 1973

Section 16. Other information

as modified by the Protocol of 1978. ("Marpol" = marine pollution)

UN = United Nations

References

: Not available.

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