Instructions: *The author should review and complete this Health and Safety Plan (HASP). All text in RED, checklists, and forms should be completed. The preparer may delete sections that are not applicable to the proposed work. Contact your Office Safety, Health, and Environment (SH&E) Representative (SHER) or Area/Regional SH&E Manager (SHEM) for assistance and for review and approval upon completion. Note: This document contain hyperlinks that require connection to the AECOM network and access to Ecosystem.*

HAZWOPER Health and Safety Plan

NYSEG Penn Yan Former MGP Site

Penn Yan Water Street MGP Site

Water Street

Penn Yan, NY 14527

Expiration Date: **August 28, 2019**
(Max. 1-Year from signature date)

Prepared for: NYSEG
18 Link Drive
Binghamton, New York 13904

Prepared by: AECOM
40 British American Blvd
Latham, NY 12110

Prepared By: *Name* Abby Chin Signature: Abby Chi

Title Civil Engineer Date: 08/30/2018

Area/Regional SHEM: *Name* Stacy Wells Signature:

Title NY Metro SH&E Manager Date: 08/30/2018

Project Manager: *Name* Matt Thorpe Signature: Matthew J Thorpe

Title Project Manager Date: 08/30/2018

Template Name:	DCS Americas HAZWOPER HASP
Template Version:	1.3
Last Modified:	November 8, 2017

AECOM Imagine it. Delivered.

HASP Summary

Note: This Summary is intended to provide key information only and cannot be substituted for reading, understanding, and complying with the full HASP. This summary may be continually updated as tasks and personnel change. Use Continuation Sheets if necessary.

Project Name:	NYSEG Penn Yan Former MGP Site	**Project Number:**	60430543
Summary Revision Date:	08/28/2018	**Client Name:**	NYSEG

Report ALL SH&E Incidents, no matter how minor, to the Incident Hotline: 800-348-5046
Injury, Property Damage, Vehicle, Security, Regulatory Inspection, Environmental Impact, and any potentially work related injury, discomfort/ pain, or damage.

Identify the nearest Occupational Clinic and Hospital to the site that accepts AECOM Workers Compensation Insurance (see **Attachment A** for instructions). If the nearest such clinic or hospital is an unreasonable distance from the site, identify nearer hospitals or clinics. Attach maps and directions to the clinics and hospitals in **Attachment A**.

Occupational Clinic:	Thompson Health Urgent Care	**Nearest Hospital:**	Soldiers and Sailor Memorial Hospital
Address:	1160 Corporate Drive Farmington, NY 14425	**Address:**	418 North Main Street Penn Yan, NY 14527
Phone Number:	585-924-1510	**Phone Number:**	315-531-2000

Key Personnel

Project Manager (PM):	Matt Thorpe	**Cell Phone:**	518-428-4383
Site Supervisor (SS)	George Fischer	**Cell Phone**	315-569-0474
Safety Officer (SSO):	George Fischer	**Cell Phone**	315-569-0474
AECOM SH&E Mgr.	Stacy Wells	**Cell Phone:**	917-324-2554
Client PM:	John Ruspantini	**Cell Phone:**	607-725-3801

List ALL Short-Service Employees, including subcontractors (<6 Months with Company in Current Area/Job Description):
Not applicable

List ALL Subcontractors and their Site Safety Officers:
Aerotek, Inc. – Graham Love
Nothnagle Drilling, Inc. – Driller in Charge

PM must positively verify subcontractors are approved in Subport for the work described. If there were any limitations/ conditions of approval, describe them and how they are being met.

☒ I have verified that all subcontractors are approved in Subport, and that all conditions of approval are met.

Matt Thorpe		08/30/2018
Project Manager Name	**Project Manager Signature**	**Date**

Table of Contents

Attachments

Attachment A. Hospital/Clinic Maps and Incident Reporting and Response Flow Chart

Attachment B. AECOM SH&E Procedures

Attachment C. Stretch/Flex Poster

Attachment D. Safety Data Sheets

Attachment E. Site Orientation

Attachment F. Project/Task-Specific Pre-Job Hazard Assessments Forms

Applicable References

This Health and Safety Plan (HASP) conforms to the regulatory requirements and guidelines established in the following documents:

- Title 29, Part 1910 of the Code of Federal Regulations (29 CFR 1910), Occupational Safety and Health Standards (with special attention to Section 120, Hazardous Waste Operations and Emergency Response).
- 29 CFR 1926, Safety and Health Regulations for Construction.
- 8 CCR, with special attention to Sub Chapter 4, Sections 1500 - 1938 Construction Safety Orders.
- 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 Safety, Health and Environment (SH&E) Manual.
- AECOM NYSEG Penn Yan Former MGP Site, Remedial Design Report, February 2015.
- AECOM NYSEG Penn Yan Former MGP Site, Work Change Directive 004 R1, February 6, 2018.
- AECOM NYSEG Penn Yan Former MGP Site, Work Change Directive 005 R1, February 6, 2018.

- Template Revision Log

Version	Revised By	Date	Summary of Revisions
1.0	Kris Brobst	October 2016	Initial Version
1.1	Patrick Walz	January 2017	Updated Procedure IDs from NA to AM. Updated QR codes for Lifeguard and IndustrySafe.
1.2	Brobst, Walz, Cristopher Altman & Maria Mirabelli	January 2018	1. Technical edits, spelling corrections, & formatting changes throughout document 2. Standardized terminology for Job Safety Analysis/Pre-Job-Hazard Analysis (JSA/Pre-JHA) throughout document. 3. Updated Header to include AECOM Logo and client name throughout document 4. Page v: Added Revision log 5. Page 3: Updated AECOM SH&E Policy statement to 2017 version 6. Page 6: Added *Section 3.5.2: Protective Health* 7. Page 7: Added *Section 3.6: Rewards and Recognition* 8. Page 11: Updated Roles & Responsibilities reference to procedure S3AM-117-PR1 9. Page 14: Added discussion of stretching & flexing to Section 5.2 and reference to new Attachment C, a stretch-flex poster. 10. Page 14: To Site-Specific Training requirements table, added training option for Field Safety where Hazwoper training is not required. Added option for Speak-up/Listen Up for Environmental Business Line field workers and supervisors. 11. Page 16: Inserted Risk Planning Elements figure 12. Page 16: Updated Hazard Categories section with new hazard categories and hazard wheel. 13. Page 17: Updated 4-Sight section with new logo 14. Page 17: Added *Section 6.5: Speak Up/Listen Up* 15. Page 20: Deleted “Maximum Concentrations found on site” column. Added note in introduction that the chemicals listed on the table are suspected to be present at the site. 16. Page 30: Updated hyperlink to Operational Security Plan template GRG-001-RP4 17. Attachment C: New Stretch/Flex poster. Revised subsequent attachment numbers.

1. Introduction

This written 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.

1.1 This section of the HASP summarizes important AECOM SH&E Procedures that apply to all Design and Consulting Services (DCS) Americas jobs. See Attachment B for complete copies of applicable field SH&E Procedures. This template has been designed primarily for use in the United States Applicable References

This Health and Safety Plan (HASP) conforms to the regulatory requirements and guidelines established in the following documents:

- Title 29, Part 1910 of the Code of Federal Regulations (29 CFR 1910), Occupational Safety and Health Standards (with special attention to Section 120, Hazardous Waste Operations and Emergency Response).
- 29 CFR 1926, Safety and Health Regulations for Construction.
- 8 CCR, with special attention to Sub Chapter 4, Sections 1500 - 1938 Construction Safety Orders.
- 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 Safety, Health and Environment (SH&E) Manual.
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- AECOM NYSEG Penn Yan Former MGP Site, Work Change Directive 005 R1, February 6, 2018.

Project Assumptions

- AECOM is performing engineering services and oversight of activities related to the remediation of the Penn Yan Former MGP Site.
- Work will be performed by Sevenson Environmental Services (SES) under direct contract to NYSEG.
- Work will be performed by CMI Structural Solutions (CMI) under direct contract to SES.
- Site management will assist in locating subsurface utilities, vessels, and structures located on the property and outside the scope of the utility locator service.
- No confined spaces will be entered on this project.
- No excavations greater than 4 feet in depth will be entered without an excavation control device (sheeting, trench box, sidewall sloping etc).
- Work will be performed during daylight hours.

2. Site Information and Scope of Work

2.1 Site Description

The Penn Yan Former MGP site is located between Water Street and the Keuka Lake Outlet in the Village of Penn Yan, New York. One vacant building is currently present which is the building formerly used for MGP process operations. A small building is currently present near Water Street which is used by NYSEG as a gas regulating station. The remaining areas of the site consist of driveways, a parking area along Water Street, a mowed, grass-covered area in the central area of the site, and a strip of land along the outlet.

The site is located in an urban setting where the surrounding land is used for residential, commercial, and industrial purposes. Immediately to the north of the site is Water Street. Farther to the north of the street are two commercial properties. A bank is present on the corner of Water and Liberty Streets. The second property is a vacant parking lot which was formerly used for automobile sales and is currently being used as a staging area for the remediation project.

The Keuka Lake Outlet bounds the site to the south. In the reach of the outlet adjacent to the site, the outlet is approximately 95 feet wide. The land on the far side of the outlet has been developed by the Village of Penn Yan as a recreational hiking and biking trail. The water level in the outlet is controlled by the Keuka Lake Outlet Compact (KLOC) organization. The average flow rate for the outlet is 206 cubic feet per second (cfs). Retail businesses and apartments lie to the east of the project property, and to the west between the site and Liberty Street is a building which is undergoing extensive renovations, which will presumably become retail space.

2.2 Site Background/History

The site was initially developed as a malt house and wood storage facility. The MGP was constructed in 1899 and operated until 1931. During this period, gas was manufactured using a coal gasification process which used coal, coke, and water. Gas was disturbed to consumers through buried mains and used primarily for illumination. Several byproducts from the MGP process including coal tar, ash, and purifier waste were stored on site.

Following the decommissioning of the MGP, the site was redeveloped as a wine sales and distribution facility. A warehouse building was constructed to the west of the MGP building. The site was later used as an auto sales and repair facility. The warehouse building was converted into a garage at that time

AECOM and SES initially began remediation activities in 2015. Remediation work was stopped temporarily in 2017 and all parties demobilized from the site. The planned work operations to complete the remediation project are included in this HASP.

2.3 Client or Third-Party Operations at Site

AECOM will be performing mobilization, oversight, and engineering services during the remedial work to be performed at the Site. This work will be performed by SES under direct contract to NYSEG. Building underpinning work will be performed by CMI Structural Solutions under direct contract to SES.

2.4 Scope of Work

AECOM will be performing 3rd party oversight at the Site. Contractors are working directly for NYSEG. As 3rd party oversight AECOM will observe the following:

- Masonry wall repairs
- Building Underpinning

- Excavation of impacted soils from beneath the building which will be processed by the remedial contractor for shipment to an off-site permitted disposal facility
- Installation of steel sheet piles and walers
- Excavation of impacted soil from the bank which will be processed by the remedial contractor for shipment to an off-site permitted disposal facility

As 3rd party oversight AECOM will conduct the following:

- Conduct a kick-off meeting with the project team to discuss scopes, schedules, and health and safety issues for the site
- Provide field oversight to perform periodic construction observation during the planned remediation to ensure that the work is being conducted pursuant to Contract Documents and Record of Decision (ROD) NYSDEC approval
- Maintain a written record and photo-documentation during each field inspection
- Update AECOMs PE and PM of field activities, observations, and schedule
- Daily community air monitoring stations will be established upwind and downwind at the site perimeter. Daily community air monitoring will commence prior to the start of any excavation of soil and continue until excavation activities have ended for the day
- Vibration/settlement monitoring will be conducted in accordance with the design specifications
- Noise monitoring will be conducted at various times throughout the project, initially to establish a baseline, then periodically thereafter to document nuisance noise levels generated by project activities.

2.5 Scope of Work Risk Assessment

☐ **Low Risk** *(examples: non-intrusive work, occasional exposure and/or low risk hazards)*

☐ **Medium Risk** *(examples: intrusive work, heavy equipment use, frequent exposure and/or moderate hazards)*

☒ **High Risk** *(examples: complicated scope, large/ multiple work crews, and/or constant exposure to hazards).*

The following tasks/ hazards automatically trigger high risk ranking. Check all which apply. Include hazard mitigation procedures later in the appropriate Physical, Chemical, or Environmental section of the HASP.

☐ Asbestos Removal / Contact
☐ ATV Use
☐ Bridge / Dam Inspections/ Snooper Truck Use
☐ Confined Space
☐ Cranes and Rigging Use
☐ Demolition
☐ Diving – Scientific or Commercial
☐ High Speed Traffic Exposure
☐ Hot Work
☐ Conditions Immediately Dangerous to Life or Health (IDLH)
☐ Laboratory Operations
☐ LOTO or Live Energy Source Work
☐ On-rail / Near Rail Work
☐ Ordinance, Munitions, Explosives Use
☒ Pile Driving
☐ Radiation or Radioactive Instrument Use
☐ Remote Location or Lone Worker
☐ Respirator Use (does not include dust mask)
☐ Scaffolding Use
☐ Use or Exposure to Toxic Chemicals
☒ Trenching / Excavation
☐ Tunnel / Underground Work
☐ UXO / MMR
☐ Work at Heights >4 ft.
☐ Work at Angle >30 deg.
☒ Work On / Over Water

3. AECOM Safety Health and Environment Program

3.1 AECOM Policy

Safety, Health and Environment Policy Statement

AECOM

Purpose

This policy establishes the framework to attain best-in-class Safety, Health and Environmental (SH&E) performance for AECOM's employees in the global marketplace.

Commitment

AECOM is committed to exceptional levels of performance in safeguarding our people and the environment as one of our Core Values. Keeping our people safe is our most important measure of success. We strive to be the beacon of safety excellence in the industries and global communities in which we work.

To advance our SH&E program, we are committed to:

- Zero work-related injuries to AECOM employees and protection of the environment as a result of our activities.
- Providing a highly effective SH&E management system that drives continual review and improvement.
- Meeting client requirements and properly incorporating all safety, health and environmental rules and regulations at the local, state, provincial and national levels.
- Developing an exceptional safety culture where our people embrace ownership for the safety of themselves and others.
- Advancing our goals of pollution prevention, resource conservation and environmental sustainability.
- Setting and meeting aggressive SH&E performance goals and Core Value Metrics to promote continuous improvement.
- Working with employees and business partners in order to continuously improve SH&E performance.
- Recognizing and celebrating those who contribute to excellent SH&E performance.
- Striving to make AECOM the provider of choice for the safe execution of design, build, finance, operate and maintenance work globally.

The commitment to this policy by the leadership, management and employees of AECOM provides the foundation for a safe workplace, operational excellence and long-term business success.

Expectations

Safety is a core value and a key to our success. We demand continuous improvement in our journey toward a zero incident culture, where everyone is committed to safety, health and environmental excellence.

To that end, we demand:

- Our leaders, managers, supervisors and employees demonstrate their commitment in their actions and decisions to assure that every person goes home safe every day.
- Our employees embrace safety as a core value both on and off the job.
- Each employee is committed to his/her own safety and that of his/her fellow employees.
- We will incorporate AECOM's Life-Preserving Principles into our work planning and execution.
- We proactively and aggressively identify, manage and eliminate hazards in the workplace.
- We train and prepare our people to have the knowledge, skills, competency and equipment required to work safely.
- We stop our employees from working if the work cannot be executed safely or if conditions or behaviors on the work activity are unsafe.
- All employees immediately report safety, health and/or environmental incidents, near-misses, unsafe conditions, and at-risk behaviors to their supervisor; and that we diligently work to correct the problem.

Our SH&E expectations will be accomplished by the demonstrated leadership of management, compliance with regulatory requirements and participation of AECOM personnel.

Communication

This Policy will be reviewed annually to ensure it meets the needs of the company, and will be made available to all persons under the control of the company.

Sincerely:

M. Burke

Michael S. Burke
Chairman and Chief Executive Officer

04 March 2017
Date

Safety for life

S1-001-PR1 Rev. 3 March 4, 2017

3.2 Safety For Life

"Safety for Life" is a comprehensive integrated AECOM Safety Management System that drives our nearly 100,000 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.

3.3 Life Preserving Principles

Demonstrated Management Commitment
Our Executive, senior and project managers will lead the SH&E improvement process and continuously demonstrate support and commitment.

Employee Participation
Our employees will be encouraged and empowered to become actively engaged in our safety processes through their active participation in safety committees, training, audits, observations and inspections. Employees will be encouraged to participate in health initiatives and adopt a healthy lifestyle.

Budgeting and Staffing for Safety
Our safety staff will be competent, fully trained and qualified to provide technical resources to our internal and external clients. A budget to support safety activities will be included in project proposals.

Pre-Planning
Our design, engineering, project and construction management staff will deploy effective risk mitigation efforts to design, plan and build safety into every project. Pre-Project and Pre-Task planning will be an effective tool in protecting our employees and the environment.

Contractor Management
Our project staff will work closely with our sub-consultants, subcontractors, contractors and Joint Venture Partners to provide a safe work environment for employees and members of the public. Our goal of SH&E performance excellence will be equally shared by all project participants.

Recognition and Rewards
Our employees will be recognized for their efforts in working safely and their support of our safety efforts.

Safety 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.

Incident Investigation
Our managers and safety professionals will investigate all recordable incidents and serious near misses to identify contributing factors and root causes in order to prevent a reoccurrence. Lessons learned shall be identified, communicated and implemented.

Fit for Duty
Our employees are responsible to report to work each day fit for duty and not to pose a health and safety hazard to themselves or others.

3.4 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-PR, 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. 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, 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.

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-PR and SHE Training procedure S3AM-003-PR 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.

7. Backing Up

Reversing the vehicle is to be avoided if at all possible. If backing up is necessary, use the following guidelines:

- Pre-plan all vehicle movements.
- If the pull-through method of parking is not possible, drivers will scan parking spot/area for hazards and back in; thereby, facilitating departure where the first move is forward.
- A light tap of the horn should be used to alert others of your intention to back up.
- Avoid tight spaces.
- Vehicles over 10,000 pounds gross vehicular weight are required to have a competent spotter in place when backing. A competent spotter is one that has received spotter training.
- All vehicles shall have a competent spotter in place when backing in an active work zone. Parking and public access areas are recommended but not required to have a spotter.

3.5 Fitness for Duty

One of AECOM's nine Life-Preserving Principles is Fitness for Duty (see Fitness for Duty procedure S3AM-008-PR). 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 report to work fit for duty and unimpaired by substances or fatigue. Supervisors must observe their employees 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.

3.5.1 Medical Surveillance

AECOM's S3AM-128-PR, Medical Screening and Surveillance, details the requirements to participate in a medical monitoring program. Medical Surveillance provides a streamlined process to determine if employees meet the physical requirements to perform assigned duties as defined by applicable regulations. It is also designed to provide a means to collect data relevant to exposure to chemical and physical agents for the protection of the workers and to confirm the effectiveness of health and safety programs.

3.5.2 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. 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:

- Heart health;
- Stress management;
- Smoking cessation;
- Diabetes prevention;
- Diet; and
- 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.

3.5.3 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-PR).

3.5.4 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-PR) 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 employees 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.

3.6 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.***

There are several possible appropriate methods of rewarding and recognizing employees and contractors:

1. **Informal** – recognition via verbal acknowledgment, email, spot awards, luncheons, etc.
2. **Formal** – Safety Star Award nomination (link)
3. **Formal** – SH&E Challenge Coins (see local SH&E manager for details)

3.7 Hand Safety

The hands are exposed to hazards more than any body part. SH&E Hand Safety Procedure S3AM-317-PR 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.

3.8 Hazard Communication

Hazardous materials that may be encountered on-site as existing environmental or physical/health contaminants are addressed in this HASP. Their properties, hazards, and associated required controls will be communicated to all affected staff and subcontractors in accordance with the requirements of AECOM Procedure S3AM-115-PR1 Hazardous Materials Communication including these key elements:

- All personnel shall be briefed on the hazards of any chemical product they use and shall be aware of and have access to the Safety Data Sheets (SDS).
- All containers on site shall be properly labeled to indicate their contents. Labeling on any containers not intended for single-day, individual use shall contain additional information indicating potential health and safety hazards (flammability, reactivity, etc.).

In addition, any employee or organization (contractor or subcontractor) intending to bring any hazardous material onto this AECOM-controlled work site must first provide a copy of the item's SDS to the Site Supervisor or Site Safety Officer for review and filing. The Site Supervisor or Site Safety Officer will maintain copies of all SDS on site and in **Attachment D**. SDS may not be available for locally obtained products, in which case an alternate form of product hazard documentation will be acceptable.

3.9 Hazardous Material handling and Waste Management

If hazardous, solid, and/or municipal wastes are generated during any phase of the project, the waste shall be accumulated, labeled, and disposed of in accordance with applicable Federal, State, Provincial, Territorial and/or local regulations and SH&E Procedure S3AM-116-PR Hazardous Materials Shipping. A site-specific Entity Letter may be required for the site/client; if so, only persons named on the entity letter are allowed to sign waste shipping papers "***on behalf of [client name]***". Any individual signing shipping papers must have valid Department of Transportation and Resource Conservation and Recovery Act training for waste shipment. Consult the HZM/HZW & TDG page on ecosystem or the SH&E Manager for further guidance on AECOM and regulatory procedures and training requirements.

3.10 Housekeeping and Personal Hygiene

Basic housekeeping requirements for offices and work sites, as well as personal hygiene and sanitation standards can be found in S3AM-013-PR Housekeeping. Inspections should be performed at the regular interval specified below. The housekeeping inspection form S3AM-013-FM1 is available for use.

Complete the table below regarding site-specific Housekeeping and Personal Hygiene requirements:

Housekeeping:	*Inspection Frequency:*	Daily	*Inspector:*	AECOM SSO
Eating, Drinking, Smoking:	Permitted only in designated area(s) (i.e., the office trailer)			
Handwashing:	Water, soap and paper towels or equivalent supplies are located in the office trailer. Site staff will wash hands and face after completing work activities and prior to breaks or meals.			
Toilets:	Temporary sanitary facilities will be mobilized to the site as part of the upland support area. *NOTE: A minimum of one toilet must be provided for every 20 personnel on site. For mobile crews where work activities and locations permit transportation to nearby toilet facilities on-site facilities are not required.*			

Water:	**Water** is located in the office trailers. A water supply meeting the following requirements will be utilized: *Potable Water:* An adequate supply of potable water will be available for field personnel consumption. Potable water can be provided in the form of water bottles, canteens, water coolers, or drinking fountains. Disposable drinking cups for single use and a waste receptacle will be provided as needed. Water containers will be refilled daily and disinfected regularly. Potable water containers will be properly identified in order to distinguish them from non-potable water sources. *Non-Potable Water:* Non-potable water may be used for hand washing and cleaning activities. Non-potable water will not be used for drinking purposes. All containers of non-potable water will be marked with a label stating ***"Non-Potable Water, Not Intended for Drinking Water Consumption"***
Illumination:	**Illumination** will be provided if natural light or installed lighting fixtures are not sufficient in the work area, toilet, and/or break area.

3.11 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 SH&E Procedure S3AM-314-PR, Working Alone). If lone work is to be performed, a communications/check-in plan must be developed and implemented using the table below.

Lone Worker:	Not Applicable
Justification:	Not Applicable
Check-In Requirement:	Not Applicable
Check-In Contact:	Not Applicable
Hazard Summary:	Not Applicable
Response Plan:	Not Applicable

3.12 Safety Observations

Safety observations are observations made by employees or subcontractors of a condition or behavior which could contribute to an incident, prior to the incident occurring. Observations can also identify positive behaviors or interventions which contribute to the prevention of incidents. Large, long-term projects may benefit from the use of LifeGuard to track and trend observations on

a site level. All other projects should log their observations using IndustrySafe. Both reporting systems can be accessed on any safety page of ecosystem. Or the QR codes below can be used while off the AECOM network from a smartphone/ device.

LifeGuard

IndustrySafe
Safety Management Software

3.13 Short Service Employee

A Short Service Employee is an employee with fewer than 6 months experience working on field projects or an employee who has not completed the required training or received required certifications (see the Short Service Employee procedure, S3AM-015-PR). The Project Manager will identify all Short Service Employees working on the project, and each Short Service Employee will be assigned to an experienced team member so all activities may be monitored. Short Service Employees shall be easily identified in the field environment, such as through wearing a specific colored hardhat, a manufacturer-approved orange stripe applied to their hardhat, or be clearly identified by some other system. Any new employee shall wear the designated Short Service Employee identifier until the Project Manager determines the employee has the knowledge, skills, and ability related to the specific hazard on the project.

3.14 Stop Work Authority

AECOM empowers and expects all employees to exercise their Stop Work Authority (see Stop Work Authority Procedure S3AM-002-PR) 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.

4. Roles and Responsibilities

Roles and responsibilities for the project team are defined in SH&E Procedure S3AM-117-PR1, Hazardous Waste Operations. The Project Manager (PM) is ultimately responsible for the development of this HASP and establishing a budget to implement the controls and training required. The Project Manager is also responsible for ensuring that the plan is implemented, that appropriate documentation is generated, and that records are maintained. The SH&E Manager is responsible for reviewing and approving this HASP, and assisting with other SH&E matters upon request. A Site Safety Officer may be appointed to oversee implementation of the HASP in the field. All project team members are responsible for reviewing and abiding by this HASP, performing daily (or more frequent) task hazard assessments, stopping work when necessary to correct unsafe behaviors or conditions, and reporting incidents promptly to the PM and AECOM Incident Reporting Hotline (Incident Hotline 800-348-5046).

4.1 Project Manager

The Project Manager has overall management authority and responsibility for all site operations, including safety. The Project Manager will provide the site supervisor with work plans, staff, and budgetary resources, which are appropriate to meet the safety needs of the project operations. Some of the Project Manager's specific responsibilities include:

- Verifying that personnel, to whom this HASP applies, including AECOM subcontractors, have received a copy of it, with ample opportunity to review the document and to ask questions.
- Providing the concurring SH&E Manager with updated information regarding conditions at the site and the scope of site work if changes occur that will affect the accuracy of this HASP.
- Providing adequate authority and resources to the Site Supervisor or Site Safety Officer to allow for the successful implementation of all necessary SH&E Procedures.
- Maintaining regular communications with the Site Supervisor or Site Safety Officer and, when necessary, the AECOM Client SH&E Program Manager.
- Coordinating the activities of AECOM subcontractors and ensuring that they are aware of the pertinent health and safety requirements for these projects, when applicable.
- Conducting Safety System Auditing by way of Management Site Visits and/or Project Manager Self-Assessments on a regular basis.
- Approving amendments to the HASP (in conjunction with the Site Supervisor or Site Safety Officer).
- Coordinating activities with the client as needed to ensure the safe implementation of this HASP.

4.2 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:

- Discussing deviations or drift from the work plan with the Site Safety Officer and Project Manager.
- Discussing safety issues with the Project Manager, Site Safety Officer, and field personnel.
- Assisting the Site Safety Officer with the development and implementation of corrective actions for site safety deficiencies.
- Assisting the Site Safety Officer with the implementation of this HASP and ensuring compliance.
- Assisting the Site Safety Officer with inspections of the site for compliance with this HASP and applicable SH&E Procedures.

- Reviewing Pre-Job Hazard Assessments (Pre-JHAs), Job Safety Analyses (JSAs) and Task Hazard Assessments (THAs) with the work crew.
- Reporting incidents and ensuring incidents and observations are logged into Lifeguard or IndustrySafe.
- Verifying that all operations are in compliance with the requirements of this HASP, and halting any activity that poses a potential hazard to personnel, property, or the environment.
- Temporarily suspending individuals from field activities for infractions against the HASP pending consideration by the Site Safety Officer, the SH&E Manager, and the Project Manager.

4.3 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:

- Updating the site-specific HASP to reflect changes in site conditions or the scope of work. HASP updates must be reviewed and approved by the SH&E Manager.
- Inspecting the site for compliance with this HASP and the SH&E Procedures using the appropriate field audit inspection checklist found in IndustrySafe.
- Coordinating with Site Supervisor to review JSAs/ Pre-JHAs and THAs with the work crew.
- Assisting as needed to report incidents and verify that incidents and observations are logged into Lifeguard or IndustrySafe.
- Working with the Site Supervisor and Project Manager to develop and implement corrective action plans to correct deficiencies discovered during site inspections. Deficiencies will be discussed with project management to determine appropriate corrective action(s).
- Contacting the SH&E Manager for technical advice regarding safety issues.
- Determining emergency evacuation routes, establishing and posting local emergency telephone numbers, and arranging emergency transportation.
- Checking that all site personnel and visitors have received the proper training, orientation and medical clearance prior to entering the site.
- Establishing controlled work areas (as designated in this HASP or other safety documentation).
- Facilitating or co-leading daily tailgate meetings and maintaining attendance logs and records.
- Discussing potential SH&E hazards with the Site Supervisor, the SH&E Manager and the Project Manager.
- Selecting an alternate Site Safety Officer by name and informing him/her of their duties, in the event that the Site Safety Officer must leave or is absent from the site.
- Verifying that all operations are in compliance with the requirements of this HASP.
- Issuing a "Stop Work Order" under the conditions set forth in this HASP.
- Temporarily suspending individuals from field activities for infractions against the HASP pending consideration by the SH&E Manager and the Project Manager.

4.4 Employees

Responsibilities of employees associated with this project include, but are not limited to:

- Understanding and abiding by the SH&E Procedures specified in the HASP and other applicable safety policies, and clarifying those areas where understanding is incomplete.

- Providing feedback to SH&E management for continuous improvement relating to omissions and modifications in the HASP or other safety policies and procedures.
- Notifying the Site Supervisor or Site Safety Officer of unsafe conditions and acts.
- Stopping work if there is doubt about how to safely perform a task or if unsafe acts or conditions are observed (including subcontractors or team contractors).
- Speaking up and refusing to work on any site or operation where the SH&E procedures specified in this HASP or other safety policies are not being followed.
- Contacting the Site Supervisor or Site Safety Officer or the SH&E Manager at any time to discuss potential concerns.

4.5 Subcontractors

The requirements for subcontractor selection and subcontractor safety responsibilities are outlined in AECOM Procedure *S3AM-213-PR Subcontractor Management*. Each AECOM subcontractor is responsible for assigning specific work tasks to their employees. Each subcontractor's management will provide qualified employees and allocate sufficient time, materials, and equipment to safely complete assigned tasks. In particular, each subcontractor is responsible for equipping its personnel with any required personnel protective equipment (PPE) and all required training.

AECOM considers each subcontractor to be an expert in all aspects of the work operations for which they are tasked to provide, and each subcontractor is responsible for compliance with the regulatory requirements that pertain to those services as well as all other requirements applicable to their work. Each subcontractor is expected to perform its operations in accordance with its own unique safety policies and procedures, in order to ensure that hazards associated with the performance of the work activities are properly controlled. Copies of any required safety documentation for a subcontractor's work activities will be provided to AECOM for review prior to the start of on-site activities.

Hazards not listed in this HASP but known to any subcontractor, or known to be associated with a subcontractor's services, must be identified and addressed to the AECOM Project Manager or the Site Supervisor prior to beginning work operations. The Site Supervisor or authorized representative has the authority to halt any subcontractor operations, and to remove any subcontractor or subcontractor employee from the site for failure to comply with established health and safety procedures or for operating in an unsafe manner.

4.6 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, all work activities within the EZ must be suspended.

Unauthorized visitors, and visitors not meeting the specified qualifications, will not be permitted within established controlled work areas.

5. 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.

5.1 HASP/SITE 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 E**. Participants will then sign the HASP Personnel Acknowledgement register at the end of the HASP.

5.2 Daily Tailgate Meetings and THA Review

The Site Supervisor, Site Safety Officer or designee shall facilitate a tailgate meeting to discuss the specific requirements of this HASP, review the applicable Pre-JHAs and/or complete THAs prior to the commencement of daily project activities. Attendance at the daily tailgate meeting is mandatory for all employees and subcontractors at the site contracted to AECOM. 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 supervisor will then convey the information to the work crew. The Tailgate Meeting must be documented by the Site Supervisor or Site Safety Officer on a Daily Tailgate Meeting form, a blank copy of which is included in **Attachment F**.

As part of the daily tailgate meeting, employees and subcontractors will be encouraged to voluntarily warm up and stretch select muscle groups to the best of their ability and within each person's individual limitations. Stretching 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 exercises included in Attachment C may be used to facilitate these efforts.

5.3 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-PR establishes the general training requirements for AECOM employees. In addition, S3AM-117-PR, Hazardous Waste Operations, explains the HAZWOPER training and S3AM-128-PR, Medical Screening and Surveillance, details the medical surveillance requirements.

Check all required training on the table below. Verify training records of employees and subcontractors.

Site-Specific Training Requirements	
Training	**Applies to**
☒ HASP Orientation	All Employees and Subcontractors
☒ HAZWOPER 40 –HR	On HAZWOPER sites, in EZ, exposed to hazardous contamination
☒ HAZWOPER Supervisor	Employees managing others in HAZWOPER activities
☐ Field Safety	Anyone visiting the field that does not require HAZWOPER
☒ Speak-Up/Listen Up	All Environmental Business Line Field Employees and Supervisors by end of FY2018
☐ Fit Test/ Respiratory Protection	Employees needing to wear respirators
☐ Hazardous Materials Shipping	Employee responsible for shipping HZM/HZW/DG and/or signing manifests
☐ Annual Medical Surveillance/ Clearance	Employees working in an exclusion zone and the regulatory required exposure limit **is** exceeded for 30 or more days a year

Site-Specific Training Requirements	
Training	**Applies to**
☒ Biennial Medical Surveillance/ Clearance	Working in an exclusion zone more than 30 days a year and the regulatory required exposure limit is **not** exceeded
☒ OSHA 10 hr. Construction	Employees working near heavy equipment
☒ OSHA 30 hr. Construction	Supervisor/SSO overseeing work with heavy equipment
☐ Local requirements:	
☐ Client requirements:	

5.4 Competent Person

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-PR, explains the roles, responsibilities and procedures of naming a competent person. Complete the table below and include a S3AM-202-FM1 Competent Person Designation Form for each AECOM competent person (subcontractors to use an equivalent process).

These activities require a competent person. Mark all that apply and list the name of the person.

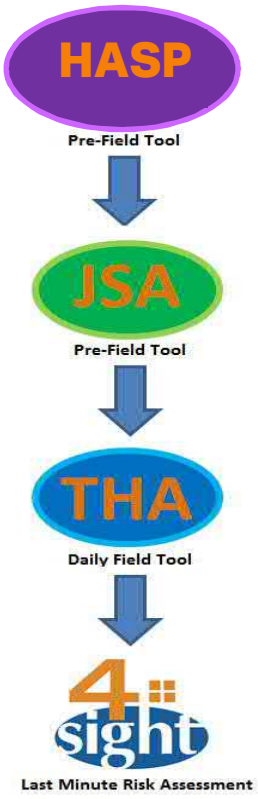
	Activity	Name of Person
☐	**Asbestos**	
☐	**Assured Equipment Grounding Conductor**	
☐	**Blasting & Explosives**	
☒	**Concrete & Masonry Construction**	CMI Competent Person
☐	**Confined Spaces**	
☐	**Control of Hazardous Energy (Lockout-Tagout)**	
☐	**Crane Assembly / Disassembly**	
☐	**Cranes & Derricks**	
☐	**Demolition**	
☐	**Electrical Wiring Design & Protections**	
☐	**Elevated Work Platforms & Aerial Lifts**	
☐	**Fall Protection**	
☒	**Hearing Protection**	SES Competent Person
☒	**Heavy Equipment**	SES Competent Person
☐	**Ionizing Radiation**	
☐	**Lead**	
☐	**Material Hoists & Personnel Hoists**	
☐	**Respiratory Protection**	
☐	**Rigging Equipment**	
☐	**Scaffolds**	
☐	**Stairways & Ladders**	
☐	**Steel Erection**	
☒	**Trench & Excavations**	CMI Competent Person
☐	**Underground Construction**	
☒	**Welding & Cutting**	SES Competent Person

6. 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-PR, Risk Assessment and Management, for details regarding AECOM's process. This approach involves the following:

6.1 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 no need to be printed for inclusion in this HASP. Only procedures that are needed for field activity reference and application MUST be printed in full and included in this HASP. The applicable field procedures checklist is in the Physical Hazards section below and procedures are included in **Attachment B**.



6.2 Job Safety analysis/ Pre-Job Hazard Assessment/

A Job Safety Analysis (JSA) or pre-job hazard assessment (Pre-JHA) is to be developed for each discrete task planned as part of the project. This assessment lays out the steps of the job, potential hazards, and mitigation measures. Form S3AM-209-FM4 or an equivalent may be used. A blank copy is included in **Attachment F**.

6.3 Task Hazard Assessment

The THA is a handwritten field form which is based on "Stop and Think" as the first thing you do before starting work activities often paired with the daily tailgate meeting or work permit issuance. Not all risks can be anticipated in this HASP or the JSA/ pre-job hazard assessment process; therefore, the THA is used to assess, mitigate, and document the site-specific conditions and changes to the hazard profile prior to and throughout the work task. Proper implementation of the THA program protects worker health and safety. A blank THA form is included in **Attachment F**. The THA must be signed by all employees each day and initialed whenever a changed condition provokes a change in hazard controls.

6.3.1 Hazard Categories

JSAs/ Pre-JHAs and THAs should include consideration of the following hazard categories when identifying hazards and task specific controls:

- Biological
- Chemical
- Electrical
- Gravity
- Mechanical
- Motion
- Pressure
- Noise
- Radiation
- Thermal

6.4 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 formal JSA/ pre-JHA or THA, will help workers identify hazards and condition changes so that they can control them or stop work to seek assistance.

1) **What am I about to do?**
2) **What could go wrong?**
3) **What could be done to make it safer?**
4) **What have I done to communicate the hazards?**

6.5 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
  - 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
  - Commit to performing the task the safer way

SULU conversations should happen consistently throughout the work day 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.

7. Physical Hazard Assessment

7.1 Physical Hazards

A physical hazard is a hazard that threatens the physical safety of an individual; contact with the hazard typically results in an injury. The following table summarizes the physical hazards or activities containing physical hazards present at the site and the associated procedures that address protection and prevention of harm.

All checked procedures MUST be included in **Attachment B** for implementation and reference.

Check all applicable hazards/ activities and add site specific description of the hazard.

	Hazard/ Activity *(note: text in this column links to procedure)*	Site Specific Description *[where, what phase of work, frequency, etc.]*	Applicable Procedure
☐	**Abrasive Blasting**		S3AM-335-PR
☐	**Aerial Work Platforms**		S3AM-323-PR
☐	**All-Terrain Vehicles**		S3AM-319-PR
☐	**Blasting and Explosives**		S3AM-336-PR
☐	**Bloodborne Pathogens**		S3AM-111-PR
☐	**Cofferdams**		S3AM-344-PR
☒	**Cold Stress**	Winter months	S3AM-112-PR
☐	**Compressed Air Systems and Testing**		S3AM-337-PR
☐	**Compressed Gases**		S3AM-114-PR
☒	**Concrete Work**	Installation of grade beams	S3AM-338-PR
☐	**Confined Spaces**		S3AM-301-PR
☐	**Corrosive Reactive Materials**		S3AM-125-PR
☐	**Cranes and Lifting Devices**		S3AM-310-PR
☐	**Demolition**		S3AM-339-PR
☐	**Diving (scientific and commercial)**		S3AM-334-PR
☒	**Drilling, Boring & Direct Push Probing**	Building underpinning	S3AM-321-PR
☒	**Electrical Safety**	Use of electric hand tools	S3AM-302-PR
☒	**Excavation**	Building underpinning and remediation, bank area remediation	S3AM-303-PR
☐	**Fall Protection**		S3AM-304-PR
☐	**Flammable and Combustible Liquids**		S3AM-126-PR
☐	**Gauge Source Radiation**		S3AM-122-PR
☒	**Hand and Power Tools**	Potentially required during construction	S3AM-305-PR
☒	**Hazardous Waste Operations**	MGP impacted soils	S3AM-117-PR
☒	**Heat Stress**	Summer months	S3AM-113-PR
☒	**Heavy Equipment**	Underpinning, excavation, dredging, sheetpiling	S3AM-309-PR
☐	**High Altitude**		S3AM-124-PR
☐	**Highway and Road Work**		S3AM-306-PR
☐	**Hoists Elevators and Conveyors**		S3AM-343-PR
☒	**Hot Work**	Potentially required during construction	S3AM-332-PR
☒	**Ladders**	Potentially required to reach elevated work surfaces	S3AM-312-PR
☒	**Lockout Tagout**		S3AM-325-PR
☐	**Machine Guarding Safe Work Practice**		S3AM-326-PR
☐	**Marine Safety and Vessel Operations**		S3AM-333-PR

	Hazard/ Activity *(note: text in this column links to procedure)*	Site Specific Description *[where, what phase of work, frequency, etc.]*	Applicable Procedure
☐	**Material Storage**		S3AM-316-PR
☐	**Mine Site Activities**		S3AM-341-PR
☐	**Mining Operations**		S3AM-345-PR
☐	**Non Ionizing Radiation**		S3AM-121-PR
☒	**Overhead Lines**	Determine location on site	S3AM-322-PR
☐	**Powder-Actuated Tools**		S3AM-327-PR
☐	**Powered Industrial Trucks**		S3AM-324-PR
☐	**Radiation**		S3AM-120-PR
☐	**Railroad Safety**		S3AM-329-PR
☐	**Respiratory Protection**		S3AM-123-PR
☐	**Scaffolding**		S3AM-311-PR
☐	**Steel Erection**		S3AM-340-PR
☐	**Temp. Floors, Stairs, Railings, Toe-boards**		S3AM-342-PR
☒	**Underground Utilities**	Determine location on site – dig safe to be coordinated by subcontractors	S3AM-331-PR
☐	**Underground Work**		S3AM-330-PR
☒	**Wildlife, Plants and Insects**	All vegetated work areas	S3AM-313-PR
☐	**Working Alone**		S3AM-314-PR
☒	**Working On and Near Water**	Working near water, no on water work is required by AECOM personnel	S3AM-315-PR

8. Chemical Hazard Assessment

AECOM will perform tasks that can expose personnel to a variety of hazards due to the operational activities, physical conditions of the work locations, and potential presence of environmental contaminants. This section presents a variety of potential chemical hazards, exposure pathways, and related mitigation actions. See S3AM-110-PR, Toxic and Hazardous Substances, for information on planning, training, monitoring, and details on several specific chemicals (Benzene, Cadmium, Chromium, Hydrogen Sulfide, Lead, and Silica).

8.1 Potential Chemical Hazards

The chemicals in the table below are known or suspected to be present at the site.

Summary of Hazardous Properties of Contaminant Exposure Hazards

PEL: ..... Permissible Exposure Limits

TLV: ..... Threshold Limit Values

** The OSHA PEL for cyanide salts or mist has been withdrawn. The OSHA STEL (15 minute) is 5 mg/m3 based on skin contact.

*** The OSHA PEL and ACGIH TLV for hydrogen cyanide vapors is 4.7 ppm based on skin contact.

		Chemical Name	Media	Primary Routes of Exposure	PEL	TLV	IP electron volts (eV)
Common Site COCs	☒	Benzene	Soil	Inhalation	1 ppm	0.5 ppm	9.25
	☒	Coal tar pitch hydrocarbons PAH	Soil	Inhalation	0.2 mg/m^3	0.2 mg/m^3	n/a
	☒	Dust	Soil	Inhalation	15 mg/m^3	10 mg/m^3	n/a
	☒	Ethylbenzene	Soil	Inhalation	100 ppm	20 ppm	8.77
	☒	Toluene	Soil	Inhalation	200 ppm	20 ppm	8.82
	☒	Xylene	Soil	Inhalation	100 ppm	100 ppm	8.45, 8.56
	☒	Napthalene	Soil	Inhalation	10	10	
	☒	Cyanide	Soil	Dermal	**	***	

8.2 Potential Exposure Pathways

Occupational exposure to chemical hazards associated with the work activities could potentially occur by two primary routes (inhalation and skin contact) and one indirect route (incidental ingestion).

8.2.1 Inhalation

The primary risks associated with AECOM's scope of work pertain to potential exposure to airborne contaminants and explosion hazards. Constituents that potentially pose an occupational concern to employees by the inhalation route are carbon monoxide, hydrogen sulfide, methane, and volatile organic compounds. Air monitoring will be performed within the employee breathing zone to assess the need to implement appropriate control measures or stop work. In addition, air monitoring will be performed at the source to assess potential explosion hazards.

8.2.2 Skin Contact

Personnel handling residual product or waste and associated equipment may be exposed to chemical hazards by skin contact or adsorption. However, exposure is expected to be limited since workers will be required to wear appropriate PPE (i.e. appropriate work gloves, body clothing, and/or face shield).

8.2.3 Ingestion

Personnel handling residual product or waste and associated equipment, including project hazardous materials, may be exposed by incidental ingestion. Typically, this exposure occurs if proper PPE was not used or personal hygiene was not practiced. Personal protection against exposure via ingestion can be accomplished by performance of proper decontamination procedures when exiting contaminated work areas as well as using the correct PPE.

8.3 Decontamination

For this project, SES will establish exclusion and support work areas including decontamination facilities for equipment and personnel. SES will provide dumpsters to manage and dispose of all general rubbish and personal protective equipment generated during the work. The decontamination facilities will include decontamination pads for cleaning trucks and heavy equipment as well as personnel decontamination stations. Decontamination fluids will be conveyed to the water treatment plant for treatment on-site prior to discharge.

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 Hazardous Waste Operations procedure S3AM-117-PR. Some key elements are as follows:

- All persons and equipment entering the EZ shall be considered contaminated, and thus, must be properly decontaminated prior to exiting to clean areas of the site.
- Avoid reactions between the solutions and contaminated materials. Review the applicable SDS.
- All contaminated PPE and decontamination materials shall be contained, stored and disposed of in accordance with site-specific requirements determined by site management.
- Use caution while working around decontamination stations, including the decontamination pad, which may be a slip or trip hazard.
- Use disposable equipment when possible and practical.
- 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 PPE required in the EZ. Other PPE may include splash protection, such as face-shields and splash suits, and knee protectors.
- All decontaminated equipment shall be visually inspected for contamination prior to leaving the Contaminant Reduction Zone (CRZ).

8.4 Air Monitoring

Monitoring shall be performed within the work area on site in order 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 in accordance with Exposure Monitoring Procedure S3AM-127-PR and specified in the work permit and/or JSAs/ Pre-JHAs for the tasks. Key elements of the procedure include:

- Calibration of monitoring equipment and/or daily bump tests to verify calibrations and confirm alarm function.
- Personal monitoring and result evaluation must be directed by a Certified Industrial Hygienist or Certified Safety Professional.

8.4.1 Real-Time Exposure Measurement/ Equipment

Monitoring shall be performed within the work area on site in order 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 JSAs/ Pre-JHAs as work is performed. All instrumentation need to be rated intrinsically safe to prevent fire or explosion.

	Instrument	Manufacturer/Model	Substances Detected
☒	**Photo Ionization Detector (PID)**	RAE Systems mini-RAE Photovac Microtip HNu Model Hnu (min. 10.6 eV bulb)	• Petroleum hydrocarbons • Organic Solvents
☒	**Multi or 4 Gas Detectors**	RAE Systems Multi-RAE	• Lower Explosive Limit • Oxygen • Carbon Monoxide • Hydrogen Sulfide
☐	**Combustible Gas Indicator (CGI)** *May be combined with individual or multi-gas detectors.*		• Explosivity
☒	**Particulate Monitor**	MIE Model PDM-3 mini-RAM	• Aerosols, mist, dust, and fumes
☐	**Personal Monitoring/ Badges**	[insert]	• [insert]

8.4.2 Health and Safety Action Levels

An action level is a point at which increased protection is required due to the concentration of contaminants in the work area or other environmental conditions. The concentration level (above background level) and the ability of the PPE to protect against that specific contaminant determine each action level. The action levels are based on concentrations in the breathing zone.

If ambient levels are measured which exceed the action levels in areas accessible to unprotected personnel, necessary control measures (barricades, warning signs, and mitigation actions to limit, etc.) must be implemented prior to commencing activities at the specific work area.

Personnel should also be able to upgrade or downgrade their level of protection with the concurrence of Site Supervisor or Site Safety Officer or the Safety Manager.

Reasons to Upgrade:

- Known or suspected presence of dermal hazards;
- Occurrence or likely occurrence of gas, vapor, or dust emission; or
- Change in work task that will increase the exposure or potential exposure to hazardous materials.

Reasons to Downgrade:

- New information indicating that the situation is less hazardous than was originally suspected;
- Change in site conditions that decrease the potential hazard; or
- Change in work task that will reduce exposure to hazardous materials.

8.4.3 Monitoring Procedures

The monitoring procedures shown below are general guidelines for sampling activities. The reviewing SH&E Manager may modify any or all of these for site-specific application. A reading in excess of action level outlined below will require additional ventilation for 30 minutes, followed by re-monitoring.

Monitoring Procedures and Action Levels

Parameter	Zone Location and Monitoring Interval	Response 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	< 5 ppm	Continue monitoring, may continue work in required PPE
		5- 25 ppm (sustained for 5 minutes)	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 (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.
Benzene (by PID with benzene-specific separation tube)	Breathing zone, continuously where indicated by VOC readings	> 0.25 ppm	Cease work, exit the area, and contact the Site Safety Officer, Site Supervisor and Project Manager.
Hydrogen Sulfide (multi-gas detector or individual H_2S meter)	Breathing zone, continuously during tasks where exposure to hydrogen sulfide is possible	< 5 ppm	Continue work activities. Contact the Site Safety Officer to investigate the potential for contributing factors.
		> 5 ppm	Cease work, exit the area or confined space, and contact the Site Safety Officer, Site Supervisor and Project Manager..
Combustible Gas (multi-gas meter or individual combustible gas indicator, CGI)	Breathing zone or in the immediate work area continuously during tasks where explosive atmospheres are possible	> 5% of LEL	Cease work, exit, and contact the Site Safety Officer, Site Supervisor and Project Manager..
Oxygen (O_2) (multi-gas detector or individual O_2 meter)	Breathing zone, continuously during tasks were oxygen enriched or deficient atmospheres are possible	< 19.5 % O_2	Cease work deficient atmosphere), exit the area or confined space, and contact the Site Safety Officer, Site Supervisor and Project Manager..
		> 23.5 % O_2	Cease work enriched atmosphere) , exit the area or confined space, and contact the Site Safety Officer, Site Supervisor and Project Manager..
Carbon Monoxide (CO) (multi-gas detector or individual CO meter)	Breathing zone, continuously during tasks where exposure to CO is possible	< 10 ppm	Continue work in Level D and continue monitoring
		> 10 ppm	Cease work, exit the area or confined space, and contact the Site Safety Officer, Site Supervisor and Project Manager..
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, every 30 minutes during excavation activities	< 5 mg/m^3	Continue work in required PPE, monitor air, and implement engineering controls
		> 5 mg/m^3	Cease activities and contact the Site Safety Officer & Site Supervisor.

9. Environmental Impact Prevention

AECOM strives to avoid or control environmental impacts from our operations through planning and implementation of best practices as well as preparing responses to react to environmental incidents. Environmental Compliance procedure S3AM-204-PR provides details on permitting and planning requirements.

	Potential Environmental Impact	Description of Hazard and Permit or Control Being Implemented
☒	**Air Emissions**	Any operations where air emissions may negatively impact the surrounding environment, air emission permits, etc. and discuss associated control
☒	**Hazardous Waste Management**	Storage, treatment, or disposal of hazardous waste at the project site, RCRA Part B permits or equivalent, 90-day storage procedures, etc.
☒	**Storm Water Pollution**	Operations that may generate/discharge storm water from the project site, NPDES/general construction storm water discharge permits, etc.
☐	**Wetlands**	Use the FWS online wetlands mapper (http://www.fws.gov/wetlands/Data/mapper.html) to determine if any wetlands exists on your project site, are adjacent to your project, or may be negatively impacted by your project, any regulatory permits and control measures
☐	**Critical Habitat**	Use the FWS online critical habitat mapper tool (http://criticalhabitat.fws.gov/) to determine if any plant or animal critical habitats exists on, adjacent to, or may be otherwise impacted by your project, any regulatory permits and control measures
☐	**Other:**	

9.1 Incidental Spill Prevention and Containment

Spill prevention and containment planning must be conducted and appropriate control measures established, consistent with regulatory requirements. Personnel are not expected to perform a response action related to an uncontrolled release of a hazardous substance. However, in the event of an incidental release of a hazardous material, a response will be performed to absorb, neutralize or otherwise control the release within the immediate work area. Procedures contained in the SDS of the hazardous material will be implemented to perform the response. The Emergency Response section of this HASP contains information on spill reporting, pre- and post- spill evaluation, and response

9.1.1 Spill Prevention and Containment Practices

Work activities may involve the use of hazardous materials (i.e. fuels, solvents) or work involving drums or other containers. When these activities exist the procedures outlined below will be used to prevent or contain spills:

- All hazardous material will be stored in appropriate containers and labelled.
- Tops/lids will be placed back on containers after use.
- Containers of hazardous materials will be stored appropriately away from moving equipment.
- Containers shall only be lifted using equipment specifically manufactured for that purpose.
- Drums/containers will be secured and handled in a manner which minimizes spillage and reduces the risk of musculoskeletal injuries.
- Equipment will be inspected daily for signs of leaks, wear, or strain on parts that, if ruptured or broken, would result in a spill.

- Refueling should occur in designated areas where incidental spills can be prevented from reaching permeable ground surfaces.
- Whenever possible, position parked or stationary equipment over secondary containment and/ or absorbent materials to prevent spills from reaching permeable ground surfaces.
- A spill response kit, to include an appropriate empty container, materials to allow for booming or diking the area to minimize the size of the spill, and appropriate clean-up material (i.e. speedy dri, absorbent pads, etc.) will be available on the project site and positioned for quick and easy access.

10. Personal Protective Equipment

PPE is considered the last line of defense in hazard control. PPE is meant to protect workers when all other methods (elimination, substitution, engineering, and administrative) have been exhausted. All employees must be trained in the proper use and maintenance of PPE. See Procedure S3AM-208-PR, Personal Protective Equipment.

A PPE assessment (see S3AM-208-FM1) can be performed to help determine PPE requirements. PPE upgrades for individual tasks or steps of a task are to be identified in JSAs/ Pre-JHAs or THAs.

Minimum Required PPE (per AECOM PPE and HAZWOPER Procedures):

- Hard hat
- Safety glasses w/ side shields (may be clear or shaded)
- Safety toe work boots
- Long pants and shirts with sleeves (short or long- cover shoulders no tank or muscle shirt styles)

Complete the table below for site-specific PPE:

Additional PPE Needed On Site

(to encompass all task specific additions and upgrades)

Face/ Eyes

- ☐ Spoggles (Safety Glasses with foam liner for dust protection)
- ☐ Welding Mask/Goggles
- ☐ Chemical Goggles
- ☐ Face Shield (splash)
- ☐ Face Shield (impact)

Head/ Ears

- ☐ Helmet with Chin Strap
- ☐ Wide Brimmed Hat
- ☒ Earplugs
- ☒ Over-ear Hearing Protection

Hands

- ☒ Nitrile
- ☐ Leather
- ☐ Cut, Abrasion and Puncture Resistant
- ☐ Impact-resistant
- ☐ Other Chemical Resistant : *(specify)* _____

Legs/ Feet

- ☒ High Ankle Boots
- ☐ Snake Guards
- ☐ Rubber Boots/Waders
- ☐ Metatarsal Guards
- ☐ Electrically-resistant boots

Body

- ☒ Sunscreen
- ☒ Insect Repellent (DEET)
- ☐ Permethrin Applied to Clothing
- ☐ Long-sleeved Shirt
- ☒ High-visibility Vest
- ☐ High-visibility Pants
- ☐ Disposable Coveralls
- ☐ Flame Retardant Clothing
- ☐ Fall Protection
- ☒ Personal Floatation Device
- ☐ Other: *(specify)*

Equipment

- ☒ **Air/Noise Monitoring Equipment:** *(specify)* PID and particulate monitor
- ☐ **Traffic/Work Zone Control Equipment:** *(specify)*
- ☐ **Communication Beyond Cell Phones:** *(specify)*
- ☐ **Fire Controls:** *(specify)*

11. Site Control

The purpose of site control is to protect the public from inadvertently coming into contact with site hazards and to protect AECOM employees being impacted by hazards. This section details the equipment and actions needed to promote optimal site control.

11.1 Site Work Zones

Site layout and site control need to be coordinated 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:

- "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

Check the description of the site controls **already** in place:

☒ Work area is within a facility/ property with secure and restricted access provided by client or third party

☐ Work area is enclosed within facility/ property but access is not restricted via locks, guards, or gates

☐ Work area is on a property that is open and access by the public is likely

☐ Work area is on a property that is open but access by the public is unlikely

☐ Work area is in a roadway or right of way of a roadway (Traffic Control Plan required S3AM-306-PR)

☐ Work area is on or near railroad (including right of way, active lines, and crossings)

☐ Other: *(describe)*

_____

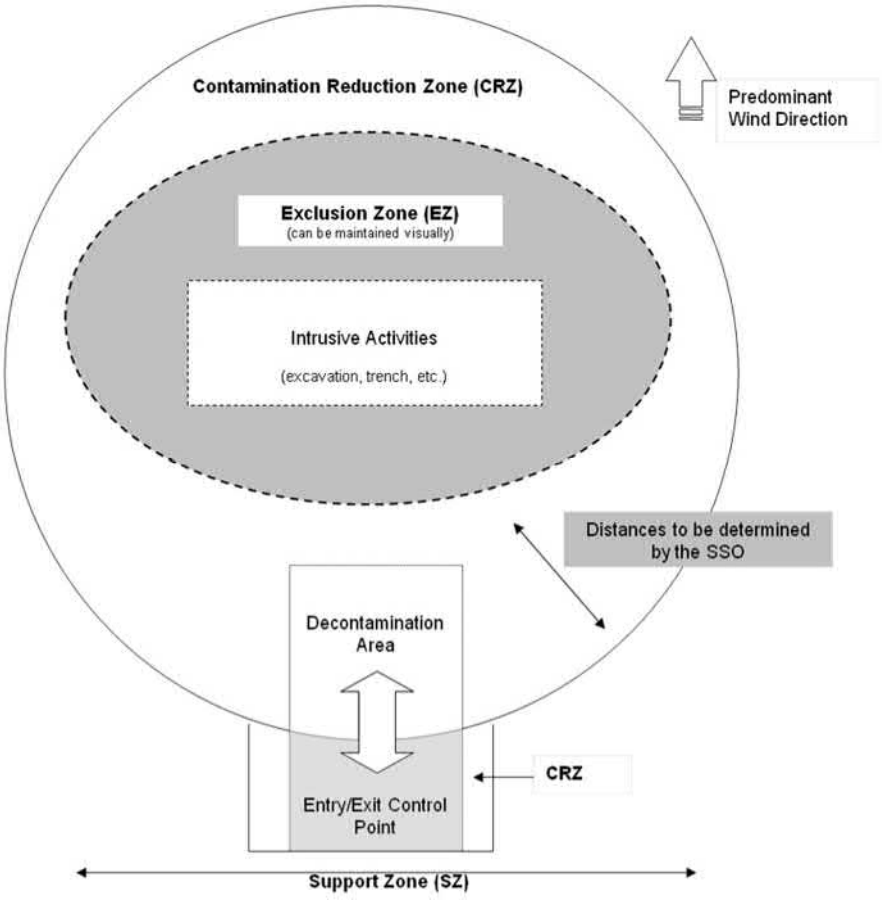
_____

Check and describe the site controls that need to be added to protect the public and the AECOM work team.

	Control Item	Description of Type and Application
☐	**Fence**	
☐	**Locks**	
☐	**Barricades**	
☐	**Cones**	
☐	**Tape**	
☐	**Hole Covers**	
☒	**Other:**	The contractor will install warning buoys in the outlet to prevent public boat access near the work area.

11.2 Site Control Map/ Diagram

The diagram below will be used to assist in setting up the Exclusion Zone and Contamination Reduction Zone if necessary during the remediation work.



11.3 Simultaneous and Neighboring Operations

Simultaneous and neighboring operations present a need for added coordination and communication to address hazards that are presented by multiple operations.

	Activity/ Company	Hazard	Controls/Mitigations and Communication Methods
Simultaneous Operation *(within the site)*	N/A		
Neighboring Operation *(outside/ bordering the site)*	N/A		

11.4 Site Security

All projects should be reviewed for the potential for personal security issues (e.g., assault, robbery, threat, etc.). Check all of the following that apply:

- ☐ Project site located in a higher crime area or has a history of security incidents
- ☐ Working outside of regular cellular telephone service
- ☐ Idle property with potential for trespasser(s) to shelter in buildings/structures and assault personnel
- ☐ Working at night

Detail the security measures to address the above risks: "N/A"

12. Emergency Response

AECOM requires that all projects plan for reasonably foreseeable emergencies (see Emergency Response Planning Procedure S3AM-010-PR). Prior to the start of site operations, all personnel shall review the table below for site-specific information regarding evacuations, muster points, communication, and other site-specific emergency procedures. An Incident Response Flow Chart is included in **Attachment A**.

12.1 Incident/ Emergency Contact Information

AECOM Contacts			
Name	**Title**	**Telephone Number**	**Mobile Phone**
Matt Thorpe	Project Manager		518-428-4383
George Fischer	Site Supervisor		315-569-0474
George Fischer	Site Safety Officer		315-569-0474
Peter Gregory	Region SH&E Manager	973-883-8683	201-602-3511
Stacy Wells	Area SH&E Manager	212-377-8583	917-324-2554
Incident Reporting	DCS Incident Reporting & Help Line	800-348-5046	
AECOM Nurse direct	Use only after incident reporting line	877-878-9525	
Client Contacts			
Name	**Title**	**Telephone Number**	**Mobile Phone**
John Ruspantini	Client Project Manager	585-484-6787	607-725-3801
Organization/Agency			
Police Department (local)			911
Fire Department (local)			911
Ambulance Service (EMT will determine appropriate hospital for treatment)			911
Hospital: (Site personnel to use for emergency care) Soldiers and Sailor Memorial Hospital 418 North Main Street Penn Yan, NY 14527			315-531-2000
Occupational Clinic: (Site personnel to use for non-emergency care) Thompson Health Urgent Care 1160 Corporate Drive Farmington, NY 14425			585-924-1510
Poison Control Center			(800) 222-1222
Pollution Emergency (obtain state spill response number from S3AM-117-ATT1)			800-484-8802
INFOTRAC (AECOM's account number 74984)			800-535-5053
AECOM Hazardous Material Shipping Help Line			800-381-0664
Public Utilities			
Call Before You Dig			811

12.2 Muster Location

In the event of an emergency where the active work site needs to be evacuated, the muster location will be the site trailers located on the north side of Water Street, across the street from the Site.

12.3 Communication Procedures

Use cell phone or air horn as appropriate.

12.4 CPR/ First Aid Trained Personnel

CPR/First Aid Trained personnel that will be on-site will be identified on a placard posted in the office trailer.

12.5 Incident Reporting

Incidents involving or affecting an AECOM employee or subcontractor will be reported in a prompt manner verbally to the site supervisor and project manager.

1. If the incident is a significant or life-threatening emergency, the employee or supervisor shall immediately dial 911 or the appropriate emergency contact phone number for your site.
2. The employee or supervisor shall contact the Incident Hotline (800-348-5046).
3. The employee or supervisor must notify their operational leaders and the Area SH&E Manager.
4. The supervisor, or delegate, must make initial notification in IndustrySafe within 4 hours for significant incidents, or 24 hours for less significant events event.
5. Client and account management notifications may also apply. The Project Manager will make any necessary notifications.

Any injury, even if no treatment is required, and any incident for which assistance by SH&E Management is needed must be immediately communicated to the Incident Hotline at 1-800-348-5046.

All incidents are also to be reported to IndustrySafe within the timeframes listed below:

Incident Type	IndustrySafe Reporting Time Frame
Significant Incident, including any injury	➔ 4 Hours
All Other Incidents	➔ 24 Hours

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 more than one employee being away from work more than 3 days;
- Any SH&E-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 event that may have resulted in any of the above consequences but because of "luck" did not result in harm to persons, property or the environment.

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.
- Scan the QR code below to access IndustrySafe reporting system from your smartphone/ device.

IndustrySafe
Safety Management Software

12.6 Medical Emergencies

In the event of a life-threatening or critical emergency, AECOM employees should dial 911 and follow the recommended instructions. However, in less serious situations, an injured employee or a co-worker should contact the Incident Hotline at 800-348-5046 to ensure that the employee receives the best care at the best time (i.e., within the first hour following an injury or potential injury). By contacting the Incident Hotline, the worker can be connected with AECOM's nurses for first aid advice. If recommended by the nurse, the supervisor or a co-worker should drive the injured employee to the project-designated clinic or hospital. A map to the designated hospital and clinic is attached as **Attachment A** and the locations and addresses are included in the table above as well as in the HASP Summary on Page i.

12.7 Vehicle Incidents

All vehicles should be rented through Carson Wagonlit Travel (accessible via Ecosystem) to ensure that AECOM insurance is included in the rental rate. All other insurances should be declined. AECOM's rental vehicle insurance policy for National/Enterprise or Avis can be found on the DCS Americas United States or Canada travel pages. **Drivers MUST print and carry the applicable insurance policy for the rental**.

In the event of a vehicle incident (including collisions as well as mechanical difficulties such as breakdowns and flat tires) the following responses are 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 800-348-5046 as soon as practical. If appropriate, wait for police to arrive before moving

vehicles. Provide insurance information to other drivers if necessary or requested and collect the same. If possible, obtain names and phone numbers of witnesses. Take photographs of the scene if possible. DO NOT ADMIT LIABILITY, AGREE TO PAY FOR DAMAGE, OR SIGN A DOCUMENT RELATED TO AN INCIDENT EXCEPT AS REQUIRED BY LAW.

12.8 Spill or Release

AECOM employees are not expected to take action or to participate in rescues or responses to chemical releases (including of petroleum products) 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), unless there is a contractual provision for this response and specially trained employees.

12.8.1 Environmental Spill/Release Reporting

All environmental spills or releases of hazardous materials (e.g., fuels, solvents, etc.), whether in excess of the Reportable Quantity or not, will be reported according to the incident reporting procedure. In determining whether a spill or release must be reported to a regulatory agency, the Site Supervisor or qualified worker will assess the quantity of the spill or release and evaluate the reporting criteria against the state-specific reporting requirements, applicable regulatory permit, and/or client-specific reporting procedures. **If reporting to a US state or Federal regulatory agency is required, AECOM has 15 minutes from the time of the spill/release to officially report it.**

Chemical-specific Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Reportable Quantities for the known chemicals onsite are shown in the table below.

CERCLA Reportable Quantities

Hazardous Substance	Regulatory Synonyms	Final RQ (lbs)
1,1,1-Trichloroethane	TCA	1,000
Arsenic	N/A	1
Benzene	N/A	10
Cadmium	N/A	10
Carbon Tetrachloride	N/A	10
Chromium	N/A	5,000
Ethyl Benzene	N/A	1,000
Lead	N/A	10
Mercury	N/A	1
Methyl Ethyl Ketone	MEK	5,000
Nickel	N/A	100
Pentachlorophenol	PCP	10
Selenium	N/A	100
Tetrachloroethylene	Perchloroethylene, PCE	100
Toluene	N/A	1,000
Trichloroethylene	Trichloroethene, TCE	100
Xylene	N/A	100

CERCLA RQ's can be found at: http://www.epa.gov/oem/docs/er/302table01.pdf

The spill containment program addresses the following site-specific information:

- Potential hazardous substance spills and available controls;
- Initial notification and response;
- Spill evaluation and response; and

- Post-spill evaluation.

12.8.2 Spill Evaluation and Response

The SSO is responsible for evaluating spills and determining the appropriate response. When this evaluation is being made, the spill area is isolated and demarcated to the extent possible. When an incidental release occurs, clean-up personnel receive instructions in a pre-clean-up meeting as to spill conditions, PPE, response activities, decontamination, and waste handling.

The procedures of the Emergency Response section of this HASP are immediately implemented when the spill is determined to require emergency precautions and action. If necessary to protect those outside the clean-up area, notification of the appropriate authorities is made. Table 10-2 lists the spill conditions that trigger notification of Federal, state, and local agencies.

The following are general measures that response/clean-up personnel take when responding to a spill:

- To minimize the potential for a hazardous spill, hazardous substances, control/absorbent media, drums and containers, and other contaminated materials are properly stored and labeled;
- When a spill occurs, only those persons involved in overseeing or performing spill containment operations will be allowed within the designated hazard areas. If necessary, the area will be roped or otherwise blocked off. Unauthorized personnel are kept clear of the spill area;
- Appropriate PPE is donned before entering the spill area;
- Appropriate spill control measures are applied during spill response;
- Whenever possible without endangerment of personnel, the spill is stopped at the source or as close to the source as possible;
- Ignition points are removed if fire or explosion hazards exist;
- Surrounding reactive materials are removed;
- Drains or drainage in the spill area are blocked or surrounded by berms to exclude the spilled waste and any materials applied to it;
- Provisions are made to contain and recover a neutralizing solution, if used;
- Small spills or leaks from a drum, tank, or pipe will require evacuation of at least Enter Distance feet in all directions to allow clean-up and to prevent employee exposure. For small spills, sorbent materials such as sand, sawdust, or commercial sorbents (see Table 10-1 above for site-specific sorbent media) are placed directly on the spill to prevent further spreading and aid in recovery;
- Spill area is sprayed with appropriate foam where the possibility of volatile emissions exists;
- If the spill results in the formation of a toxic vapor cloud, from vaporization, reaction with surrounding materials, or the outbreak of fire, further evacuation may be required;
- To dispose of spill waste, all contaminated sorbents, liquid waste, or other spill clean-up will be placed in small quantities Enter QTY pounds) in approved drums for proper storage or disposal as hazardous waste; and

12.8.3 Post Spill Evaluation

As part of the incident investigation and reporting documentation, a written spill response report shall be prepared at the conclusion of clean-up operations. The report will include, at a minimum, the following information:

- Date of spill incident;
- Cause of incident;
- Spill response actions;
- Any outside agencies involved, including their incident reports; and

- Lessons learned or suggested improvements.

The spill area is inspected to ensure the area has been satisfactorily cleaned. The use of surface and air sampling is utilized in this determination as necessary. The root cause of the spill is examined and corrective steps taken to ensure the engineering and control measures in place have performed as required. If alternative precautions or measures are needed, they are made available and implemented.

All durable equipment placed into use during clean-up activities is decontaminated for future utilization. All spill response equipment and supplies are re-stocked as required.

12.9 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, provided that 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 (i.e., presence of chemicals, especially dry grass, etc.)
- Above all, if in doubt, the employee must not attempt to fight the fire

13. Personnel Acknowledgement

By signing below, the undersigned acknowledges that he/she has reviewed the AECOM Health and Safety Plan for the Penn Yan Water Street former MGP 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	Signature	Organization	Date

Attachment A

Hospital and Clinic Directions/ Maps
Incident Reporting and Response Flow Chart

Attachment A. Hospital and Clinic Directions/ Maps Incident Reporting and Response Flow Chart

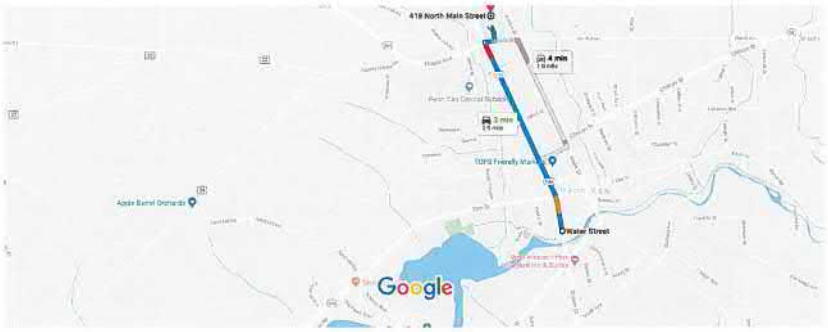
Hospital- Address, written directions, and mapped route from site

Soldiers and Sailor Memorial Hospital - 315-531-2000418 North Main Street

Penn Yan, NY 14527

Water St, Penn Yan, NY 14527 to 418 North Main Street, Penn Yan, NY - Google Maps Page 1 of 4

Google Maps Water St, Penn Yan, NY 14527 to 418 North Main Street, Penn Yan, NY Drive 0.9 mile, 3 min



Map data ©2018 Google 1000 ft

Water St
Penn Yan, NY 14527

1. Head north on Liberty St toward Wagener St — 0.8 mi
2. Turn right onto North Ave — 217 ft
3. Turn left — 328 ft
   Destination will be on the right

418 N Main St
Penn Yan, NY 14527

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

https://www.google.com/maps/dir/Water+St,+Penn+Yan,+NY+14527/418+North+Main+... 8/27/2018

Occupational Clinic- Address, written directions, and mapped route from site

Thompson Health Urgent Care - 585-924-1510

1160 Corporate Drive

Farmington, NY 14425

Google Maps

Water St, Penn Yan, NY 14527 to 1160 Corporate Drive, Farmington, NY

Drive 30.7 miles, 46 min

Water St

Penn Yan, NY 14527

1. Head north on NY-14A N/Liberty St toward Wagener St
   Continue to follow NY-14A N

9 min (6.7 mi)

Continue on Ferguson Corners Rd. Take Co Rd 29 to NY-245 S in Gorham

7 min (5.4 mi)

2. Turn left onto Ferguson Corners Rd

2.0 mi

3. Continue straight onto County Rd 2

0.7 mi

4. Continue onto Co Rd 29

2.7 mi

Take Co Rd 18, Hwy 20 W and NY-332 N to Corporate Dr in Farmington

30 min (18.6 mi)

5. Turn left onto NY-245 S

0.4 mi

6. Turn right onto Co Rd 18

4.7 mi

7. Turn right onto NY-247 N

1.9 mi

8. Turn left onto Hwy 20 W

3.3 mi

9. Use the right 2 lanes to turn right onto NY-332 N/S Main St
   Continue to follow NY-332 N

7.5 mi

10. Keep right to stay on NY-332 N

0.8 mi

11. Turn right onto Corporate Dr
    Destination will be on the left

16 s (256 ft)

1160 Corporate Dr

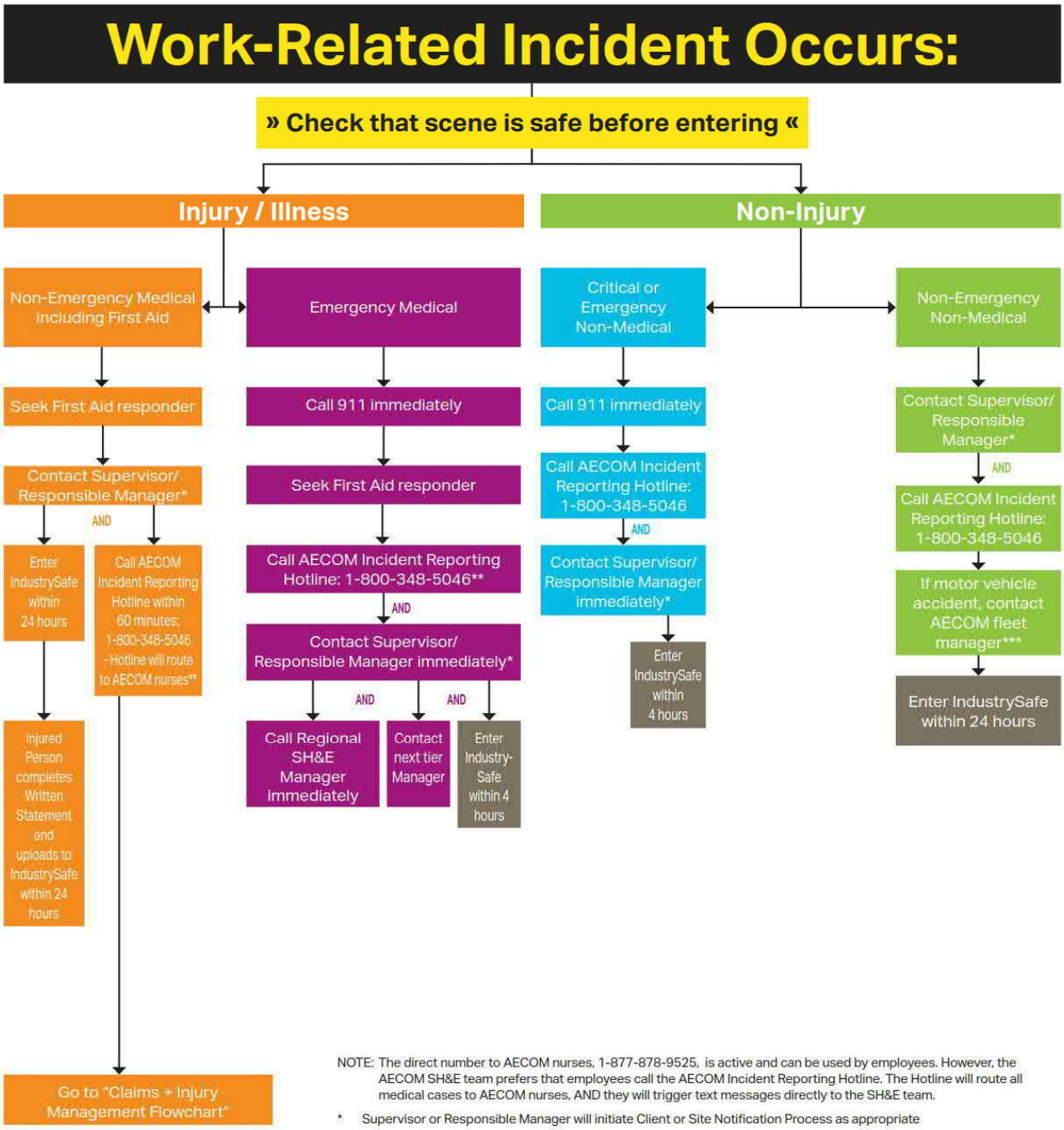
Farmington, NY 14425

[

AECOM

Work-Related Incident Flowchart for Employees | *Updated October 2016*

DCS - Americas



NOTE: The direct number to AECOM nurses, 1-877-878-9525, is active and can be used by employees. However, the AECOM SH&E team prefers that employees call the AECOM Incident Reporting Hotline. The Hotline will route all medical cases to AECOM nurses, AND they will trigger text messages directly to the SH&E team.

* Supervisor or Responsible Manager will initiate Client or Site Notification Process as appropriate

** If injured person is an AECOM subcontractor, call AECOM's nurses at 877-878-9525, or direct sub to their own provider.

*** For all AECOM vehicles, call Element at 1-800-446-7052.

Updated October 2016

Attachment B

AECOM SH&E Field Applicable Procedures

Attachment B. AECOM SH&E Field Applicable 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. Only procedures that are needed for field activity reference and application **MUST** be printed in full and included in this section.

Copy the Field Procedure Checklist from the Physical Hazards Section 7.1 to become your table of contents for these attachments. Include only those procedures checked as applicable to this project.

	Hazard/ Activity *(note: text in this column links to procedure)*	Site Specific Description *[where, what phase of work, frequency, etc.]*	Applicable Procedure
☐	**Abrasive Blasting**		S3AM-335-PR
☐	**Aerial Work Platforms**		S3AM-323-PR
☐	**All-Terrain Vehicles**		S3AM-319-PR
☐	**Blasting and Explosives**		S3AM-336-PR
☐	**Bloodborne Pathogens**		S3AM-111-PR
☐	**Cofferdams**		S3AM-344-PR
☒	**Cold Stress**	Winter months	S3AM-112-PR
☐	**Compressed Air Systems and Testing**		S3AM-337-PR
☐	**Compressed Gases**		S3AM-114-PR
☒	**Concrete Work**	Installation of grade beams	S3AM-338-PR
☐	**Confined Spaces**		S3AM-301-PR
☐	**Corrosive Reactive Materials**		S3AM-125-PR
☐	**Cranes and Lifting Devices**		S3AM-310-PR
☐	**Demolition**		S3AM-339-PR
☐	**Diving (scientific and commercial)**		S3AM-334-PR
☒	**Drilling, Boring & Direct Push Probing**	Building underpinning	S3AM-321-PR
☒	**Electrical Safety**	Use of electric hand tools	S3AM-302-PR
☒	**Excavation**	Building underpinning and remediation, bank area remediation	S3AM-303-PR
☐	**Fall Protection**		S3AM-304-PR
☐	**Flammable and Combustible Liquids**		S3AM-126-PR
☐	**Gauge Source Radiation**		S3AM-122-PR
☒	**Hand and Power Tools**	Potentially required during construction	S3AM-305-PR
☒	**Hazardous Waste Operations**	MGP impacted soils	S3AM-117-PR
☒	**Heat Stress**	Summer months	S3AM-113-PR
☒	**Heavy Equipment**	Underpinning, excavation, dredging, sheetpiling	S3AM-309-PR
☐	**High Altitude**		S3AM-124-PR
☐	**Highway and Road Work**		S3AM-306-PR
☐	**Hoists Elevators and Conveyors**		S3AM-343-PR
☒	**Hot Work**	Potentially required during construction	S3AM-332-PR
☒	**Ladders**	Potentially required to reach elevated work surfaces	S3AM-312-PR
☒	**Lockout Tagout**		S3AM-325-PR
☐	**Machine Guarding Safe Work Practice**		S3AM-326-PR
☐	**Marine Safety and Vessel Operations**		S3AM-333-PR

	Hazard/ Activity *(note: text in this column links to procedure)*	Site Specific Description *[where, what phase of work, frequency, etc.]*	Applicable Procedure
☐	**Material Storage**		S3AM-316-PR
☐	**Mine Site Activities**		S3AM-341-PR
☐	**Mining Operations**		S3AM-345-PR
☐	**Non Ionizing Radiation**		S3AM-121-PR
☒	**Overhead Lines**	Determine location on site	S3AM-322-PR
☐	**Powder-Actuated Tools**		S3AM-327-PR
☐	**Powered Industrial Trucks**		S3AM-324-PR
☐	**Radiation**		S3AM-120-PR
☐	**Railroad Safety**		S3AM-329-PR
☐	**Respiratory Protection**		S3AM-123-PR
☐	**Scaffolding**		S3AM-311-PR
☐	**Steel Erection**		S3AM-340-PR
☐	**Temp. Floors, Stairs, Railings, Toe-boards**		S3AM-342-PR
☒	**Underground Utilities**	Determine location on site – dig safe to be coordinated by subcontractors	S3AM-331-PR
☐	**Underground Work**		S3AM-330-PR
☒	**Wildlife, Plants and Insects**	All vegetated work areas	S3AM-313-PR
☐	**Working Alone**		S3AM-314-PR
☒	**Working On and Near Water**	Working near water, no on water work is required by AECOM personnel	S3AM-315-PR

Americas

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 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^{o}F (35^{o}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^{o}F or -12^{o}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^{o}F (15^{o}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^{o}F (-1^{o} C).
- If the air temperature falls below 60^{o}F (15^{o}C) for sedentary work, 40^{o}F (4.4^{o} C) for light work, or 20^{o}F (-6^{o}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^{o}F (4.4^{o}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^{o}F (-12^{o}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 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

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.

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 Temperature Thresholds*.

4.2.3 Clothing corrections shall be applied in accordance with the tables provided in *S3AM-113-ATT1 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 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 devises, 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 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 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 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 risks need to be planned using the SH&E Plan 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 70ºF (21°C).
- Use the collected information to develop appropriate work to rest schedules as detailed in *S3AM-113-ATT1 Temperature Threshold*.

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 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 Anyone exhibiting symptoms of heat stroke (red dry skin, or unconsciousness) 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.).

4.5.4 Severe heat stress (heat stroke) is a life-threatening condition that shall be treated by a competent medical authority.

4.6 Prevention

4.6.1 Requirements for working in extreme heat may be triggered by a 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 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 Safe Work 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 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 Replacement fluids 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 will 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 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 Temperature Thresholds

6.2 S3AM-113-ATT2 Symptoms & Treatment

6.3 S3AM-113-ATT3 Dehydration Chart

6.4 S3AM-113-FM1 Heat Stress Monitoring Log

Americas

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.

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.htmwastes); 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 RS2-003-PR1 Disruptive Event Response Standard

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 *RS2-003-PR1 Disruptive Event Standard*.

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.) 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; and[1]
- 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]
- Plaind (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:

- o 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;
- o 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;
- o 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 *RS2-003-PR1 Disruptive Event Standard*;
- "Dangerous occurrences" shall be reported immediately to the police, employer, vehicle owner/leaser 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

Electrical Safety

S3AM-302-PR1

1.0 Purpose and Scope

1.1 Outline the safe working requirements for working with and near electric equipment and installations to minimize and control electrical hazards such as electrical shock, arc flash, and electrical fires in the workplace.

1.2 This procedure applies to all AECOM Americas-based employees and operations.

1.3 As a general rule, AECOM employees shall not work on exposed, energized systems with a potential greater than 50 volts. This work should be performed by a qualified electrician.

2.0 Terms and Definitions

2.1 **Arc Flash –** A dangerous condition associated with the release of energy during an electrical arc.

2.2 **Arc Flash Analysis –** A mathematical determination of the energy released by an electric arc and the distance from the source that a flash hazard exists. The process for an Arc Flash Analysis is defined in National Fire Protection Act 70E of the National Electric Code and Canadian Standards Association Z462.

2.3 **Arc Rating** – The maximum incident energy resistance demonstrated by a material prior to breakdown or at the onset of a second-degree skin burn (expressed in cal/cm2).

2.4 **Circuit Protective Device –** A load-rated switch, circuit breaker, or other device specifically designed as a disconnecting means for opening, reversing, or closing of live circuits.

2.5 **Energized Electrical Equipment –** Electrically connected to or having a source of voltage.

2.6 **Flash Hazard –** A dangerous situation associated with the release of energy caused by an electric arc.

2.7 **Ground Fault Circuit Interrupter (GFCI) –** An electrical device that protects the users of all devices connected to it from electrical shock. The GFCI is part of the circuit or device in use and continuously measures the current in that circuit. If a leakage of current is detected, as in the case of an electrical short circuit, the circuit is opened at the GFCI and current cannot flow beyond the GFCI.

2.8 **Licensed Electrician –** A person who possesses the local licenses and certifications to work on electrical circuitry, panels or equipment if full compliance with local legislation.

2.9 **Portable Electric Equipment –** Cord- and plug-connected equipment and extension cords.

2.10 **Qualified Persons** – Individuals who have specific and documented training and has demonstrated skills and knowledge in the construction and operation of electric equipment and installations to avoid the hazards of working on or near energized electrical equipment. Qualified Persons shall have been specifically permitted to near exposed energized and parts. Even an experienced electrician is unqualified unless he or she knows the particular equipment and has received specific safety training on the potential hazards involved.

2.11 **Shock Hazard –** A dangerous situation associated with the possible release of energy caused by contact or approach to live parts**.**

3.0 References

3.1 S3AM-003-PR1 SH&E Training

3.2 S3AM-202-PR1 Competent Person Designation

3.3 S3AM-208-PR1 Personal Protective Equipment

3.4 S3AM-209-PR1 Risk Asssessment & Management

3.5 S3AM-218-PR1 Permit to Work

3.6 S3AM-305-PR1 Hand & Power Tools

3.7 S3AM-322-PR1 Overhead Lines

3.8 S3AM-325-PR1 Lockout Tagout

3.9 S3AM-410-PR1 Hazardous Energy Control

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Manager / Supervisor**

- Approve all Energized Electrical Work Permits.
- Confirm that all projects under their direct control or authority have a written SH&E Plan prepared for the activity.
- Confirm communication with client / owner of hazards presented by the work conducted by AECOM and controls measures in place.
- Provide technical guidance in support of this procedure.
- Confirming employees are informed of and comply with the provisions of this procedure.
- Supporting employees in the reporting of 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).

4.1.2 **SH&E Manager**

- Provide technical guidance and support to the Manager or Supervisor.
- Assist the Manager or Supervisor in compliance with the requirements of this procedure.
- Assist in the incident investigation and review process

4.1.3 **Employees**

- Comply with requirements of this procedure.
- Stop work if workers, other than Qualified Persons, are exposed to live electrical systems at unknown voltages or potentials greater than 50 volts.
- Only open electrical panels only if they are a Qualified Person.
- Employees designated as a Qualified Person, conduct work on or near energized electrical equipment in accordance with applicable training and jurisdictional requirements.
- Employees designated as a competent person in relation to the Assured Equipment Grounding Conductor Program, administer testing and recording in accordance with jurisdictional requirements.
- Immediately report 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).

4.2 Training

4.2.1 Employees who have potential exposures to electrical hazards shall be trained in and be familiar with the electrical safety-related work practices required by the applicable regulations. Refer to the *S3AM-003-PR1 SH&E Training* for specific required training.

4.2.2 Employees shall have reviewed and acknowledged the applicable SH&E plan specific to the project or location.

4.2.3 Refer to *S3AM-302-ATT1 Live Electrical Work* for qualifications if working on or near exposed electric conductors or circuit parts that can be energized.

4.3 General Requirements

4.3.1 Electrical outlets utilized to supply power for electrical equipment during field operations shall be of the three-wire grounding type. They should be tested for correct polarity and adequacy of the ground with a circuit analyzer. If it is determined that the outlet is incorrectly wired or inadequately grounded, it must not be used until serviced by a licensed electrician.

4.3.2 GFCI devices will be in place between the equipment and power source for all temporary circuits unless protected by an assured equipment grounding program as defined in this procedure (i.e., circuits that are not part of a permanently installed facility electrical system, such as on a construction site or temporary field installation).

4.3.3 Unqualified personnel are not permitted to work on electrical equipment unless it has been de-energized, verified as being free of hazardous energy and locked and tagged out in accordance with *S3AM-325-PR1 Lockout Tagout*.

- Electrical equipment that has been de-energized but not locked and tagged out shall be treated as energized.

4.3.4 After a circuit is de-energized by a circuit protective device, the circuit may not be repeatedly manually reenergized until it has been determined that the equipment and circuit can be safely energized.

4.3.5 Temporary or permanent light fixtures that present a shock or burn hazard shall be guarded.

4.3.6 Confirm power switches are properly labeled to identify what they control, unless this is clearly confirmed through switch proximity or location. Electric conductors shall be protected from damage.

4.4 Classified Locations

Electrical equipment and wiring may be installed in locations where any of the following may be present: flammable vapors, liquids, or gases; combustible dusts or fibers; or a concentration or quantity of flammable or combustible material. Below is a list of each type of location and the associated hazards.

4.4.1 Class I Locations

Class I locations are those in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitable mixtures. Class I locations include the following:

A. Class I, Division 1 location is a location:

1. In which ignitable concentrations of flammable gases or vapors may exist under normal operating conditions; or
2. In which ignitable concentrations of such gases or vapors may exist frequently because of repair or maintenance operations or because of leakage; or
3. In which breakdown or faulty operation of equipment or processes might release ignitable concentrations of flammable gases or vapors, and might also cause simultaneous failure of electric equipment.

B. Class I, Division 2 location is a location:

1. In which volatile flammable liquids or flammable gases are handled, processed, or used, but in which the hazardous liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in case of abnormal operation of equipment; or

2. In which ignitable concentrations of gases or vapors are normally prevented by positive mechanical ventilation, and which might become hazardous through failure or abnormal operations of the ventilating equipment; or

3. That is adjacent to a Class I, Division 1 location, and to which ignitable concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

4.4.2 Class II Locations

Class II locations are those that are hazardous because of the presence of combustible dust. Class II locations include the following:

A. Class II, Division 1 location is a location:

1. In which combustible dust is or may be in suspension in the air under normal operating conditions, in quantities sufficient to produce explosive or ignitable mixtures; or

2. There mechanical failure or abnormal operation of machinery or equipment might cause such explosive or ignitable mixtures to be produced, and might also provide a source of ignition through simultaneous failure of electric equipment, operation of protection devices, or from other causes, or

3. In which combustible dusts of an electrically conductive nature may be present.

B. B. Class II, Division 2 location is a location in which:

1. Combustible dust will not normally be in suspension in the air in quantities sufficient to produce explosive or ignitable mixtures, and dust accumulations are normally insufficient to interfere with the normal operation of electrical equipment or other apparatus; or

2. Dust may be in suspension in the air as a result of infrequent malfunction of handling or processing equipment, and dust accumulations resulting therefrom may be ignitable by abnormal operation or failure of electrical equipment or other apparatus.

4.4.3 Class III Locations

Class III locations are those that are hazardous because of the presence of easily ignitable fibers or flyings but in which such fibers or flyings are not likely to be in suspension in the air in quantities sufficient to produce ignitable mixtures. Class III locations include the following:

A. Class III, Division 1 location is a location in which easily ignitable fibers or materials producing combustible flyings are handled, manufactured, or used.

B. Class III, Division 2 location is a location in which easily ignitable fibers are stored or handled, except in process of manufacture.

4.5 Distribution System Setup

4.5.1 Under no circumstances shall electrical lines be routed through doorways, hatches, windows, or other openings.

4.5.2 Electric lines crossing work areas, personnel, or vehicular traffic areas shall be either fastened securely overhead (at a height that provides safe clearance for work operations), or protected by a cover capable of withstanding the imposed loads without creating a trip hazard.

4.5.3 Circuit breakers shall be labeled to indicate their use.

4.5.4 All circuit breaker panels shall have no openings or uncovered knockouts and shall be kept covered when not in use.

4.5.5 All live parts of electrical equipment operating at 50 volts or more shall be properly guarded against accidental contact.

4.5.6 Extension Cord Use

- Extension cords and electrical connections on handheld and other power tools will be inspected prior to use for cuts, kinks, frayed wires, etc. If any deficiency is noted, the equipment will be tagged “OUT OF SERVICE” and removed from service. Manufacturer-installed insulated electrical cords will not be repaired except by a licensed electrician.
- Extension cords are not to be placed across aisles, through doors, through holes in a wall, or in areas where the cord may be damaged or create a tripping hazard.
- Extension cord sets for use in field operations should be of the three-wire grounding type and will be rated for the intended load.
- Use of extension cords is allowed only for temporary installations not to exceed 90 days.
- Extension cords shall be provided with a plug cap that is either molded to the cord or equipped with a cord clamp to prevent strain on the terminal screws.
- Extension cords shall not be fastened with staples or otherwise hung in a manner that could damage the outer jacket or insulation.
- Ground fault circuit interrupters shall be used or, if permitted by legislation, an “assured equipment grounding conductor program” is to be established for all nonpermanent wiring needed for construction purposes or when working outdoors, in wet or moist areas or elsewhere as required by legislation.

4.5.7 Temporary Lights/Task Lights

- A temporary light shall not be suspended by the cord unless the cord and light are designed for suspension.
- Temporary lights shall be equipped with bulb protectors unless they are installed at least 7 or more feet overhead.

4.6 Working on or Near Energized Parts

4.6.1 Working on or near energized parts covers either potential direct physical contact or contact by means of tools or equipment and working close enough to the energized part to draw an arc.

4.6.2 Any work on exposed, live electrical systems above 50 volts shall be conducted by a licensed electrician who is a Qualified Person.

4.6.3 Refer to *S3AM-302-ATT1 Live Electrical Work*.

4.6.4 Prior to performing any work near exposed, energized systems, the Qualified Person shall:

- Confirm with the Licensed Electrician that it is safe to do so.
- Perform a Shock Hazard Analysis.
- Perform an Arc Flash Analysis.
- Establish emergency contacts.
- Complete and have approved the Energized Electrical Work Permit. Refer also to *S3AM-218-PR1 Permit to Work* for additional guidance related to Safe Work Permits.
- Have all required personal protective equipment (PPE), insulated tools, and test equipment tested and ready to use.
- Know and understand the procedures to be followed.
- Ensure that adequate lighting and clearance space is available.
- Remove all conductive clothing and jewelry.

4.6.5 Working Near Overhead Power Lines

- Personnel working in the vicinity of overhead power lines, either on the ground or elevated, shall comply with *S3AM-322-PR1 Overhead Lines.*

- All workers and equipment including cranes and drill rigs shall maintain a clearance distance of at least 50 feet (15.24m meters) from overhead power lines unless a detailed assessment has been completed demonstrating that a smaller clearance distance provides protection.

4.7 Grounding

4.7.1 “Ground fault protection” is required on construction sites. To provide this protection, either “ground fault circuit interrupters” (GFCI) are to be used with temporary receptacles, or if permitted by legislation an “assured equipment grounding conductor program” is to be established in which plug-connected electrical equipment, extension cords, and temporary receptacles are tested on a periodic basis.

4.7.2 Ground Fault Circuit Interrupters

- A GFCI is an electrical device that is designed to prevent electrocution from electrical leakage. It is designed to measure the difference in amperage between the “hot” wire and the “neutral” wire in a circuit. Under ideal conditions, the amperage should be the same in both wires. If there is electrical leakage (a ground-fault), the amperages will be different. If the difference is more than a predetermined amount, the GFCI “trips” and stops the flow of electricity.
- GFCIs may trip from many causes including but not limited to:
    - Electrical leakage in the tool from internal defects, damaged insulation or from normal leakage in long runs of cords.
    - Moisture in the air or cords lying in water or on moist dirt.
    - Too many tools on one GFCI circuit.
    - Faulty wiring of the GFCI into the circuit.
    - Defective GFCI.
    - Any such tripping will require the problem to be corrected before the protected circuit can be re-set.

4.7.3 All 120-volt, single-phase, 15- and 20-ampere temporary receptacles shall be protected with “approved” GFCIs. “Approved” means listed by Underwriters Laboratories.

4.7.4 There are several types of GFCIs.

- A combination circuit breaker and GFCI that is installed in place of the ordinary circuit breaker.
- A receptacle containing a built-in GFCI.
- A portable GFCI that plugs into a receptacle and allows the extension cord or tool to be plugged into the GFCI.
- A portable unit containing several GFCI protected receptacles.

4.7.5 GFCIs contain a test button and a reset button. Each GFCI needs to be tested prior to use and on a periodic basis depending upon the manufacturer's recommendations (at a minimum monthly).

4.7.6 Assured Equipment Grounding Conductor Program

- If allowed by local legislation, assured equipment grounding conductor program is to be used instead of GFCIs to provide ground fault protection, the program shall be governed by the following requirements.
- Temporary receptacles shall be electrically grounded in accordance with the temporary wiring requirements of the National Electrical Code (United States)/Canadian Electrical Code.
- Extension cords shall be three-wire cords containing an equipment grounding conductor (ground wire).
- Electrical equipment that is plugged into a receptacle or extension cord (portable electrical tools, bench grinders, electric heaters, etc.) shall have a ground wire properly attached to the

non-current-carrying metal parts of the equipment. (Double-insulated tools have no ground wire and are therefore exempt from these testing and recording requirements but still need to be inspected for defects.)

- The Manager or Supervisor is required to designate one or more competent persons to administer this testing and recording program. Refer to S3AM-202-PR1 Competent Person Designation.
- Periodic testing of all plug connected equipment, all extension cords, and all temporary receptacles is to be conducted at the following times:
  - Before a new item (equipment, cord, or receptacle) is put into use.
  - After any repairs to the item.
  - After any incident in which the item may have been damaged.
  - Within three months of the last test. (An exception is allowed in the Standard in which extension cords, and temporary receptacles, which are fixed in place and are not exposed to damage, may be tested every months months.)
- The purpose of the test is to determine the following:
  - Temporary receptacles—to be sure that the receptacle is grounded.
  - Extension Cords—to be sure that the ground wire is connected to the proper terminal at each end and that the ground wire is continuous throughout the length of the cord.
  - Plug Connected Equipment—to be sure that the ground wire is connected to the proper terminal and to the non-current carrying metal parts of the equipment and that the ground wire is continuous from the equipment to the plug.
- The tests may be conducted using the following instruments:
  - A receptacle tester may be used to test receptacles and to test extension cords when plugged into a receptacle.
  - A continuity tester, or a volt-ohm meter, may be used to test equipment and to test extension cords when not plugged into a receptacle.
- Records must be kept to show which items have passed the test and when the test was conducted. These records may be either written inspection logs, a color-coding system using colored tape attached to the item, or some other effective means.
- Color coding shall be used in the following manner:
  - After a plug-connected piece of equipment or an extension cord has been inspected and passed the test, colored tape is to be placed around the cord near the plug. After a temporary receptacle has passed the test, colored tape is to be placed on the cover plate.
  - Any set of colors may be used, with the exception of white, black, or silver.
  - If there has been no overall site requirements established by the general contractor, use the following colors for the test periods.

January, February, March	Red
April, May, June	Blue
July, August, September	Orange
October, November, December	Green

- The tests administered every three months are to begin on the first working day of each quarter. Testing and color coding are to be continued until all items covered by this program have been tested. The test administered every six months, for those receptacles and extension

cords needing only semi-annual testing, are to be color coded using the quarterly color current at the time of the semi-annual test.

- A visual inspection of plug-connected equipment, extension cords, and temporary receptacles is to be made by the user before each use. The purpose of the visual inspection is to look for damage or defects that could affect the safe use of the item. (Exception: extension cords and temporary receptacles that are fixed in place and not exposed to damage are not required to be given a daily visual inspection, but it is a good idea to do the daily visual inspection anyway.)
- Equipment, cords, or receptacles showing damage or defects that could affect its safe operation are not to be used. This applies not only to the visual inspection before each use but also applies to any evidence of damage observed any time during use. Damaged items are to be taken out of service and are not to be used until properly repaired and retested.
- Equipment covered by this program is not to be used until the equipment has been tested and color coded according to the requirements of this program.
- A copy of this program is to be kept at the worksite.

4.8 PPE/Work Practices

4.8.1 PPE requirements shall be determined based on the results of each of the following: Task Hazard Analysis, Shock Hazard Analysis, and Arc Flash Analysis. Refer to the *S3AM-208-PR1 Personal Protective Equipment* and *S3AM-302-ATT1 Live Electrical Work*.

4.8.2 PPE

2 – Required PPE (range based on maximum voltage)	
50 to 240 volts	• **Eye/Face: Safety glasses with side shields or goggles and Arc-Flash Face Shield *or* Arc-Flash Suit Hood (4 cal/cm^2)** • **Body: Flame-Retardant long-sleeved shirt/pants or coverall (4 cal/cm^2)** • **Hand: Electrical Hazard (EH) gloves (Class 00 with leather protectors)** • **Foot: EH-rated footwear** • **Head/Ears: Class E hard hat, hearing protection (ear canal inserts)** • **Tools: ANSI/CSA-approved, voltage-rated**
Above 240 to 480 volts	• **Eye/Face: Safety glasses with side shields or goggles and Arc-Flash Face Shield and Sock Hood (8 cal/cm^2) *or* Arc-Flash Suit Hood (8 cal/cm^2)** • **Body: Flame-Retardant long-sleeved shirt/pants or coverall (8 cal/cm^2)** • **Hand: EH gloves (Class 00 with leather protectors)** • **Foot: EH-rated footwear** • **Head/Ears: Class E Hard hat, hearing protection (ear canal inserts** • **Tools: ANSI/CSA-approved, voltage-rated**
480 to 600 volts	• **Eye/Face: Safety glasses with side shields or goggles and Arc-Flash Suit Hood (8 cal/cm^2)** • **Body: Flame-Retardant long-sleeved shirt/pants or coverall (8 cal/cm^2)** • **Hand: EH gloves (Class 0 or higher with leather protectors)** • **Foot: EH-rated footwear (carbon fiber recommended)** • **Head/Ears: Class E Hard hat, hearing protection (ear canal inserts)** • **Tools: ANSI/CSA-approved, voltage-rated**

4.9 Portable Electrical Equipment

4.9.1 Refer to *S3AM-305-PR1 Hand & Power Tools*.

5.0 Records

5.1 The Shock Hazard Analysis and the Arc Flash Analysis forms shall be retained in the project file.

5.2 The completed *S3AM-302-FM1 Energized Electrical Work Permit* or equivalent shall be retained in the project file.

6.0 Attachments

6.1 S3AM-302-FM1 Energized Electrical Work Permit

6.2 S3AM-302-FM2 Electrical Hazard Checklist

6.3 S3AM-302-ATT1 Live Electrical Work

6.4 S3AM-302-ATT2 Generator Safety

Americas

Excavation

S3AM-303-PR1

1.0 Purpose and Scope

1.1 To evaluate all excavation operations to provide proper protective systems for employee protection from associated hazards.

1.2 This procedure applies to all AECOM Americas-based employees and operations.

2.0 Terms and Definitions

2.1 **Benching (Benching system)** – One or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels to protect employee from cave-ins.

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

2.3 **Competent person** – Person, who, by way of training, knowledge, and/or experience, is capable of classifying soils and is also capable of identifying existing and predictable hazards in excavation/trenching work area and who has the authority to take prompt corrective measures to eliminate them. The person shall also be familiar with the requirements in the regulation.

2.4 **Excavation** – A manmade cut, cavity, trench, or depression in an earth surface formed by earth removal. Examples include trenches, tunnels, shafts, caissons and open cut holes.

2.5 **Faces (or sides) –** The vertical or inclined earth surfaces formed as a result of excavation work.

2.6 **Failure** – A structural member's integrity and supportive capabilities is compromised, causing a breakage, displacement, or permanent deformation.

2.7 **Hazardous Atmosphere** – An atmosphere that by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen-deficient, toxic, or otherwise harmful may cause death, illness, or injury.

2.8 **Protective Systems** – Devices or methods in protecting employees in an excavation from cave-ins, a collapse or falling material. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

2.9 **Ramp** – An inclined walking or working surface that is used to gain access to one point from another and is constructed from earth or from structural materials such as steel or wood.

2.10 **Professional Engineer** – A registered engineer who can authorize any state of work by his professional designation. A **Professional Engineer** registered in the State, Province, or territory is deemed to be a "registered professional engineer" within the meaning of this standard when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce.

2.11 **Shield (Shield system)** – A structure that is able to withstand the forces imposed on it by a cave-in and thereby protects employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shields can be either pre-manufactured or job-built. Shields used in trenches are usually referred to as "trench boxes" or "trench shields."

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

2.13 **Sloping (Sloping system)** – An alternative to shoring is trench sloping. This means that the trench walls are cut back to decrease the possibility of cave-ins. The angle of incline required to prevent a cave-in varies with such factors as soil type, environmental conditions of exposure, and application of surcharge loads.

2.14 **Stable rock** – A natural solid mineral material that can be excavated with vertical side wall; unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against cave-in or movement by rock bolts or by another protective system that has been designed by a **Professional Engineer**.

2.15 **Support system** – A structure such as underpinning, bracing, or shoring that provides support to an adjacent structure, underground installation, or the sides of an excavation.

2.16 **Trench** – An open narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width (measured at the bottom) is often not greater than 15 feet (4.57 meters). If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet (4.57 meters) or less (measured at the bottom of the excavation), the excavation is also considered a trench.

2.17 **Trench Box –** A trench box is a unit of shoring that is an engineered shoring system capable of protecting workers in case of cave-in of trench walls. The space between the trench wall and the trench box shall be backfilled.

3.0 References

3.1 S3AM-003-PR1 SH&E Training

3.2 S3AM-202-PR1 Competent Person Designation

3.3 S3AM-218-PR1 Permit to Work

3.4 S3AM-322-PR1 Overhead Lines

3.5 S3AM-331-PR1 Underground Utilities

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Managers**

- Shall confirm that all projects under their direct control or authority and which involve excavations or trenching are conducted in a safe and efficient manner and in accordance with the requirements of this procedure and local legislation.
- Shall confirm that all projects under their direct control or authority have a written Safe Work Plan (SWP)/Health and Safety Plan (HASP) prepared for the activity.
- Confirm the applicable *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* or equivalent has been completed and is reviewed prior to commencing any excavation activities.

4.1.2 **Professional Engineer**

- The professional status and the actual practice of professional engineering is legally defined and protected by law. In some jurisdictions, only licensed engineers (sometimes called registered engineers) are permitted to "practice engineering.
- For the purposes of this procedure, determination of soil condition and the safe management of the shoring, sloping or benching may require consultation, specifications and/or design by a Professional Engineer.

4.1.3 **Competent Person**

- Shall be present during all work that involves entry by AECOM personnel into trenches or excavations greater than 5 feet (1.52 meters) in depth (as above).
- Does not have to be an AECOM employee; however, an AECOM competent person shall be qualified per *S3AM-202-PR1 Competent Person Designation*.
- Shall identify prompt corrective measures to eliminate recognized present or anticipated hazards.
- The competent person shall be identified in the SH&E Plan for the location or project, and the Task Hazard Assessment for the particular task.
- The competent person:
  - Will determine the maximum allowable slope for the walls of the trench or excavation.
  - Will classify the soil in the trench or excavation in accordance with the requirements specified in the applicable legislation prior to determining that a maximum allowable slope, other than 34 degrees with the horizontal is selected.
  - Will inspect the excavation or trench on a daily basis when the potential for employee exposure to the hazards of the trench or excavation exists (*S3AM-303-FM1 Daily Excavation Checklist*).

4.1.4 **Employees**

- Maintain appropriate training for the excavation and the applicable tasks, and competency in the associated procedures (e.g. communication, rescue, etc.) and use of the necessary personal protective equipment (PPE). Refer to *S3AM-003-PR1 SH&E Training* and *S3AM-208-PR1 Personal Protective Equipment.*
- Know the location specific Emergency Response Plan and be able to recognize the potential for real hazards associated with the Excavation.
- Refrain from making any attempt to enter an excavation without approval and first meeting the requirements of this procedure and the applicable SH&E Plan (SWP)/Health and Task Hazard Assessment (THA).

4.2 Restrictions

4.2.1 Because of their inherent dangers, entry into trenches and excavations shall not be performed if there are means other than entry to perform the work. Where entry into trenches and excavations is necessary, strict adherence to the procedures specified below is extremely important. Whenever there are questions regarding the safety of trench or excavation entry, contact shall be made with the Competent Person or the SH&E Manager.

4.2.2 No one shall enter any trench or excavation until the walls have been adequately cut back or temporary protective structures have been installed unless the trench or excavation is shallower than stabilized.

4.2.3 Excavation work shall be completed and inspected in accordance with the written instructions of a qualified professional and in accordance with jurisdictional legislative regulations.

4.3 Excavation and Trenching Permit

4.3.1 If required by the applicable jurisdiction, confirm notification of the proposed excavation is provided within the required timeframe to the appropriate agencies or governing bodies prior to commencing excavation (e.g. California – CAL/ASHA Excavation Permit for the construction of trenches or excavations that are 5 feet (1.5 meters) or deeper that will be entered; Manitoba WHS Branch notification in order to obtain registration number, etc.).

4.3.2 An Excavation and Trenching Permit (*S3AM-303-FM2 Excavation & Trenching Permit* or equivalent) shall be completed prior to all excavation or trenching activities

4.3.3 The Excavation and Trenching Permit shall be completed and signed by all applicable parties as indicated on the permit. The Project Manager shall determine which signatures are required.

4.3.4 Excavation and Trenching Permits may be valid for up to one week; however the permit shall be reviewed at the beginning of each shift.

4.3.5 Refer also to *S3AM-218-PR1 Permit to Work* for additional guidance related to Safe Work Permits.

4.4 Planning and Preparation

4.4.1 Prior to beginning any excavation work at a site, the location of all underground and overhead utilities shall be identified and work locations will be carefully planned to avoid any potential for inadvertent contact with them.

4.4.2 Clearance, including hand exposure, of underground utilities shall be completed in accordance with *S3AM-331-PR1 Underground Utilities*. The associated *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* or equivalent shall be available and reviewed with all employees expected to be involved in the excavation prior to commencing any excavation activities.

4.4.3 Identify any overhead power lines and de-energize or protect by other appropriate means. Refer to *S3AM-322-PR1 Overhead Lines*.

4.5 Excavation Requirements

4.5.1 A Professional Engineer shall be engaged if specified by the applicable jurisdiction and as appropriate to the soil conditions and proposed excavation considerations (e.g. wall slope, shoring requirements, load calculations, etc.).

4.5.2 All personnel involved in the excavation activities shall be appropriately trained to their respective activities and associated hazards. Refer to *S3AM-003-PR1 SH&E Training*.

4.5.3 All personnel involved in the excavation activities shall wear the required PPE, including reflective clothing if mobile equipment or vehicular traffic. Refer to *S3AM-208-PR1 Personal Protective Equipment.*

4.5.4 The Task Hazard Assessment (THA) or Safe Work Plan (SWP) identifying applicable hazards and appropriate control measures shall be completed and clearly communicated to all involved personnel as well as to any concurrent operations potentially affected. The work environment shall be monitored for changing conditions and the THA / SWP updated accordingly.

4.5.5 Excavation shall be conducted in a manner that minimizes environmental impact.

4.5.6 Excavated (spoil) material shall be kept at least 3.2 feet (1 meter) from the edge of the excavation, or further if local regulations are more stringent.

- Excavated (spoil) material shall be piled in a manner to prevent sloughing of loose material. Various jurisdictions provide specific spoil pile sloping requirements.

4.5.7 If the walls of an excavation or trench are not sloped or cutback, barriers shall be placed around the perimeter. The barrier shall be at least 3.6 feet (1.10 meters) in height.

4.5.8 If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations shall be monitored regularly to confirm proper operation.

4.5.9 If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains will require regular inspections.

4.5.10 All excavations shall be appropriately secured at the end of the day to prevent unauthorized entry or inadvertent entry into the excavation. This may require a protective covering, barriers, fencing, signage or other measures appropriate to the excavation and associated conditions.

4.5.11 Backfill trenches as soon as reasonably possible after work is complete.

4.6 Soils Classifications

4.6.1 Soil classification shall be conducted to confirm appropriate measures are taken to protect workers and to secure excavation walls. Measures may include, but are not limited to:

- Sloping, shoring or shielding.
- Relocation of equipment or materials.
- Scheduling to minimize concurrent operations.

4.6.2 Soil characteristics evaluated when classifying include, but are not limited to:

- Cohesiveness / compaction / compressive strengths (e.g. fissured, hardpan, fractured rock, etc.).
- Composition (sand, clay, gravel, layered, etc.).
- Moisture content / submersion.
- Compaction.
- Exposure to vibration (e.g. traffic, pile driving, etc.).
- Previous disturbances.

4.6.3 Consult the applicable jurisdictional requirements as classification methods, definitions and terms can vary. In general classifications or types include:

- Stable soil that is dense and heavy and consists primarily of clay.
- Soil with a medium level of stability and generally includes soils such as silt, sandy loam, and medium clay.
- Unstable soil which generally includes gravel, loamy sand, and soft clay.

4.7 Protective System Requirements

4.7.1 Protective systems shall be used to protect workers entering an excavation when there is a potential for cave in, and is required when:

- An excavation is greater than 4 feet (1.22 meters) in depth and is not entirely in stable rock.
- A worker is required to be closer to a trench wall than the height of the trench wall.
- A worker will approach closer to the side or edge of the excavation that the distance equal to the depth of the excavation.

4.7.2 The protective system may include sloping the excavation walls, shoring the excavation walls, and/or installing a shielding system. The protective system(s) chosen shall have the capacity to resist, without failure, all loads to be applied to the system.

4.7.3 Slope angle, or type of shoring or shielding shall be determined by:

- Soil classification – including structure, strength, moisture content.
- Depth of the excavation
- Weather and environmental conditions.
- Anticipated duration of excavation activities.
- Loading of soil and soil stress (e.g. proximity of structures, location of equipment, stored material, anticipated vibration, etc.)

Factor	Description / Examples
Soil Structure and Strength	Proper classification of soil is necessary in order to select appropriate protection methods. Trench walls, at first glance, may appear to have strength, particularly if rock is encountered. Fractures in the rock can develop because of construction and soil strength may fail when subjected to undercutting or high-energy impacts. Irregular slopes on stratified soils that appear stable can fail if lower materials do not have adequate strength.
Excavation Depth	Jurisdictional requirements may specify the type of protective methods that are required at given depths. Additionally, consultation of a professional engineer may be necessary.
Soil Moisture Content	Soil may be moist even though the weather has been dry. Care shall be taken and appropriate protection methods employed if the soil appears to be moist.
Weather and Humidity	These can have a significant impact on excavation wall stability and effectiveness of protection methods. Frozen stable soil may collapse if warm mild weather persists. Percolation of water into the soil can increase the load on shoring due to the increased weight and mobility of saturated soils. Frozen ground does not preclude the need to appropriately slope, shore or shield unless the freezing process is designed and approved by a Professional Engineer.
Loading and Soil Stress	Stress can originate from many sources. Heavy machinery passing close to the excavation creates vibrations that decrease the soil strength and can result in wall collapse or shoring failure if it is inadequate to these conditions. Stationary equipment at the edges of the excavation can transmit loads and additional stresses to the excavation wall and method of protection.
Trench Depth and Width	These directly influence the choice of materials and the spacing of support bracing. The shoring requirements of a wide and deep trench differ substantially from those of a narrower trench.
Erosion Time	If excavations are to be left for extended periods, different methods of protection may be required and shoring materials may have to be increased.

4.7.4 If an excavation may affect the stability of an adjacent building or structure, precautions shall be taken to prevent damage to the structure. The precautions shall be specified in writing by a Professional Engineer.

4.7.5 All sloping, shielding, or shoring shall be conducted in accordance with applicable Federal, State, Provincial, Territorial or Legislative regulations.

4.7.6 Exceptions. Each individual in an excavation shall be protected from cave-ins and trench collapse by an adequate protective system except when:

- Excavations are made entirely in stable rock.
- Excavations are less than 4 feet (1.22 meters) in depth and an examination of the excavation by a Competent Person reveals no indication of a potential cave-in.

4.7.7 The depth of the excavation or trench is to be measured at its greatest vertical dimension. Be aware that crouching or kneeling in a trench that is less than 3 feet (0.91 meter) in depth may still pose significant hazard for the employee involved.

4.7.8 Consult the applicable jurisdiction's requirements concerning the standards that protective systems shall meet; this may include design and certification by a Professional Engineer.

4.7.9 A Professional Engineer can properly assess the need for and the type of shoring required for specific applications. Shoring may not be needed in all cases, but failure to recognize the need for shoring can be catastrophic.

4.8 Use of Sloping as a Means of Protection

4.8.1 Sloping the walls of the trench or excavation is the preferred, and typically simplest, means of protecting employees who shall enter trenches or excavations which are greater than 4 feet (1.22 meters) in depth or where there is danger of collapse.

4.8.2 If sloping is used as the means of protection, the trench or excavation walls shall be sloped back so that the ratio of the horizontal distance to the vertical rise (H:V ratio) of the sloped wall or degree from horizontal is appropriate to the soil type and in compliance with jurisdictional requirements.

4.8.3 In many cases, determining the maximum allowable slope may allow the use of a steeper slope, which will result in a narrower excavation. However, determination of soil classification is complicated and requires that the Competent Person be familiar with the manual and visual tests. Since incorrect soil classification may result in the use of a steeper, and potentially unsafe, slope, it

is recommended that an angle of 34 degrees (or less given specific jurisdictional requirements and unstable soil types) with the horizontal typically be selected.

4.9 Use of Shoring or Shielding as a Means of Protection

4.9.1 Where sloping the walls of the trench or excavation is unfeasible (e.g., when there are dimensional constraints or adjacent structures), the use of shoring or shield systems (e.g., trench boxes) may be necessary.

4.9.2 Soil classification is required. The excavation shall comply with one of the four options below:

- The soil shall be classified and the timber shoring be constructed in accordance with applicable legislative regulations.
- Other protective systems meeting applicable legislative regulations shall be utilized (e.g., shield systems, trench jacks, aluminum hydraulic shoring, etc.) and the manufacturer's data shall be explicitly followed.
- A protective system meeting applicable legislative regulations shall be utilized based on tabulated data which has been approved by a Professional Engineer.
- A protective system meeting applicable jurisdictional requirements and designed by a Professional Engineer shall be utilized and installed in accordance with the engineer’s written plans.

4.9.3 In all cases listed above, the SH&E Manager shall be contacted before proceeding.

4.9.4 Workers shall be protected whenever shoring is being installed or removed.

4.9.5 Shoring, stringers or bracing shall be installed from the top of the trench or excavation down. Removal shall be completed from the bottom up unless conditions exist that would make doing so unsafe. A removal method shall be developed that does not require worker entry.

4.9.6 Check hydraulic shoring once per shift at a minimum (leaking hoses and/or cylinders, broken connections, cracked nipples, bent bases, other damaged or defective parts) and more frequently as required.

4.9.7 Hydraulic or pneumatic trench jacks shall have a means of ensuring that they will not collapse in the event of loss of internal pressure.

4.9.8 Shielding and Trench Boxes differ from shoring in that their design is intended primarily to protect workers from cave-ins and similar incidents. They may be used in combination with sloping and benching.

- The excavated area between the outside of the trench box and the face of the trench should be as small as possible and may be backfilled to prevent lateral movement of the shield.
- The box shall extend at least 18 inches (0.45m) above the surrounding area, or as specified by the applicable jurisdiction, if there is sloping toward excavation. This can be accomplished by providing a benched area adjacent to the box.
- Earth excavation below the shield is permitted only if:
  - The excavation does not exceed a depth of 2ft (0.61m) below the shield,
  - The shield is capable of withstanding the forces calculated for the full depth of the trench, and
  - There are no indications while the trench is open of possible loss of soil from behind or below the bottom of the support system.
- A shield shall not be subjected to loads exceeding those for which it was designed to withstand.

4.9.9 Bell-bottom pier holes that are to be entered by workers shall be designed and supported according to written instructions of a registered professional engineer.

- Employees entering bell-bottom pier holes, or other similar deep and confined footing excavations, should wear a harness with a retrieval line securely attached to it.
    - Retrieval lines shall not be used to handle materials.
    - Rescue equipment shall be individually attended at all times while the employee wearing the retrieval line is in the excavation.

4.10 Work Around the Trench/Excavation

4.10.1 Structural ramps used for excavation access or egress of equipment shall be constructed in accordance with jurisdictional requirements and the instructions or designs of an individual competent and qualified in structural design.

4.10.2 If the ramp has an open side, it shall have a curb or a restraining device.

4.10.3 Confirm equipment placement does not compromise the integrity of the excavation wall and optimizes visibility of work zone and any contact hazards (spoil placement should also take these into consideration). Use wheel chocking or barricades as necessary to prevent encroachment of edge.

4.10.4 If the appropriate setback of equipment is not possible confirm appropriate blocking or matting is used to disperse weight. These requirements may need to be determined by a professional engineer.

4.10.5 While workers are in a trench, an aboveground observer or spotter shall be present to warn of earth movements and to advise equipment operators of the presence and location of those in the trench so as to avoid vibrating equipment near trenches or excavations.

4.10.6 If there is a danger of a worker or equipment falling into an excavation, or whenever the edge is not clearly visible, identify the trench or excavation perimeter with visual markers (e.g., barricade tape, wooden railings, stop logs, etc). If the trench or excavation is 4 feet (1.22 meters) or greater in depth, the visual barrier shall be a minimum of 6 feet (1.83 meters) from the edge.

4.10.7 Personnel shall notify workers of the excavation through flagging, marking, safeguards, or other appropriate and effective means.

4.10.8 If walkways are permitted over excavations or trenches (e.g. trench over 6 feet [1.8 meters] in depth and wider than 30 inches [76 centimeters]), the installation shall be in such a manner as to not compromise the stability of the excavation.

4.10.9 Walkways shall be equipped with guardrails and constructed in accordance with jurisdictional requirements.

4.10.10 If vehicle crossings over excavations are required, they shall be designed by and installed under the direction of a Professional Engineer.

4.10.11 Precautions shall be taken to isolate or remove loose rocks, trees, or other materials that may slide, roll, or fall into the trench and onto workers prior to entry by workers into an excavation.

4.10.12 While operating heavy equipment in the work area, the equipment operator shall maintain communication with a designated signal person through either direct voice contact or approved standard hand signals.

4.10.13 When mobile equipment is operated adjacent to an excavation or when such equipment is required to approach the edge of an excavation and the operator does not have a clear and direct view of the edge of the excavation, a warning system such as barricades, hand or mechanical signals, or stop logs shall be used. If possible, the grade should be away from the excavation.

4.10.14 All site personnel should maintain a safe distance and remain clear of the swing of operating excavation equipment.

4.10.15 Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles

being loaded or unloaded when the vehicles are equipped to provide adequate protection for the operator during loading and unloading operations.

4.10.16 All materials such as pipe, rebar, etc., shall be kept out of traffic lanes and access ways. Materials and equipment shall be stored in a designated area so as not to endanger personnel at any time.

4.10.17 A flagman with roadwork, signs, cones, and high-level warning signs shall be provided when it is necessary to control normal vehicular traffic due to vehicles, such as end-dumps, entering, or leaving the site.

4.11 Work Within the Trench/Excavation

4.11.1 Personnel shall not be permitted on the faces of sloped or benched excavations at levels above other workers unless those workers at lower levels are adequately protected from the hazard of falling, rolling, or sliding material or equipment.

4.11.2 Employees shall not work in excavations in which there is accumulated water or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. The precautions necessary to protect employees adequately vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and retrieval line.

4.11.3 A stairway, ladder, ramp, or other safe means of egress shall be located in excavations or trenches that are 4 feet (1.22 meters) or more in depth so as to minimize lateral travel for employees. Jurisdictional maximum lateral travel distances vary between 25 feet (7.6 meters) and 49 feet (15 meters). In the absence of jurisdictional specification, travel distance shall not exceed 25 feet (7.6 meters). Ladders should extend at least 3 feet (0.91 meters) above the trench top.

4.11.4 Structural ramps that are used solely by employees as a means of access or egress from excavations shall be designed by a competent person. Structural ramps used for access or egress of equipment shall be designed by a competent person qualified in structural design and shall be constructed in accordance with the design.

4.11.5 Ramps and runways constructed of two or more structural members shall have the structural members connected together to prevent displacement. Structural members used for ramps and runways shall be of uniform thickness. Cleats or other appropriate means used to connect runway structural members shall be attached to the bottom of the runway or shall be attached in a manner to prevent tripping. Structural ramps used in lieu of steps shall be provided with cleats or other surface treatments on the top surface to prevent slipping.

4.12 Confined Spaces and Hazardous Atmospheres

4.12.1 An excavation may contain hazardous gases, vapors, dusts, fumes or an oxygen deficient or enriched atmosphere.

- To prevent exposure to harmful levels of atmospheric contaminants, the hazard assessment shall evaluate atmospheric hazards when workers are required to enter trenches and excavations:
    - Greater than 4 feet (1.22 meters) in depth in which a hazardous atmosphere exists, or could reasonably be expected to exist, such as in excavations in landfill areas, where equipment is exhausting nearby, or where hazardous substances are stored nearby.
    - Less than 4 feet (1.22 meters) in depth if workers could be exposed to a hazardous atmosphere (e.g. crouching).
- Appropriate atmospheric testing is necessary to accurately identify these hazards. Ongoing atmospheric monitoring, use of attendants and rescue equipment may be necessary to address the identified hazards.

4.12.2 Confined spaces may exist in excavations where there is limited access or egress and in which a hazardous gas, vapor, dust, or fume or an oxygen-deficient atmosphere may occur. Confined

space entry shall be performed in accordance with the requirements specified in *S3AM-301-PR1 Confined Spaces*. Consult the applicable jurisdictional requirements as the excavation may or may not be subject to confined space requirements.

4.12.3 Adequate precautions, such as mechanical ventilation or appropriate respiratory protection, shall be taken prior to entry into trenches and excavations in which hazardous atmospheres exist or could reasonably be expected to exist.

4.12.4 When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, testing shall be conducted as often as necessary to confirm that the atmosphere remains safe. Atmospheric testing will be conducted in the anticipated breathing zone of the work area to determine oxygen content, combustible gas, and toxic gases and vapors, if applicable.

4.12.5 Appropriate respiratory protection shall be donned prior to entry into any trench or excavation in which airborne levels of toxic substances are present at concentrations in excess of their Threshold Limit Value/Occupational Exposure Limit or Permissible Exposure Limit.

4.12.6 Confirm appropriate emergency response measures are in place as necessary, including but not limited to:

- Location Specific Emergency Response Plan shall include procedures applicable to the potential emergencies the excavation work may present.
- Communication methods shall be established.
- Equipment such as spill kits, breathing apparatus, and retrieval equipment, shall be readily available.
- Where hazardous atmospheres are present rescue equipment shall be attended when workers have entered the excavation.

4.13 Stability of Adjacent Structures

4.13.1 Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided to confirm the stability of such structures for the protection of employees.

4.13.2 Excavation below the level of the base or footing of any foundation or retaining wall that could reasonably be expected to pose a hazard to employees shall not be permitted except when:

- A support system, such as underpinning, is provided to confirm the safety of employees and the stability of the structure; or
- The excavation is in stable rock; or
- A Professional Engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity; or
- A Professional Engineer has approved the determination that such excavation work will not pose a hazard to employees.

4.13.3 In addition, sidewalks, pavements, and secondary structures shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

4.14 Inspections

4.14.1 Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a Competent Person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. Refer to *S3AM-303-FM1 Daily Excavation Checklist.*

4.14.2 An inspection shall be conducted by the Competent Person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard-

increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated.

4.14.3 Where the Competent Person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to confirm their safety and the permit reissued or revised.

4.15 Backfilling

4.15.1 Perform any required notifications within the necessary timeframes prior to backfilling.

4.15.2 Confirm accurate classification of soil types of backfill material and absence of signs of contamination, discoloration and smell.

4.15.3 Confirm the re-establishment of the original soil integrity using the original material (if suitable) or designated fill material(s). A small cap of material on top of the ditch/hole should be left to allow for sloughing and settling of material.

4.15.4 Backfilling shall be done with care to prevent damage to any exposed utilities or facilities.

4.15.5 A spotter may be necessary to avoid encroachment (e.g. working around other equipment, traveling under overhead lines, working in close conjunction to underground facilities and other workers, compromised line of vision) and to watch for any rocks falling into the excavation, which may damage exposed facilities. If fill contains rocks or hard material, a shield or alternate fill material may be used to protect the facilities

4.15.6 Confirm piping or facilities are properly supported prior to backfilling.

4.15.7 If shoring was used, remove from the bottom up.

4.15.8 If a trench box has been used it should be placed no more than 24” above the base of the excavation or a sub-trench bed containing the pipe.

4.15.9 Appropriate measures shall be taken to confirm proper backfilling and compaction of the soil below the trench box. Removing and reinserting the trench box multiple times may be necessary to accomplish this.

4.15.10 Dragging of a trench box shall only be permitted if it will not damage facility or disturb the backfill, otherwise it shall be lifted vertically. No worker shall occupy a trench box while it is being moved.

4.15.11 If compaction is required confirm the appropriate method is employed and compaction testing is conducted in a manner that does not damage any facilities or pipelines in the excavation.

4.15.12 Final grading and cover of the ground disturbance should confirm corrosion control. Original state of the area and access shall be considered in completion of backfilling.

4.15.13 Any excess excavation material shall be properly disposed of.

5.0 Records

5.1 Completed Daily Excavation Checklist, Permits and applicable notifications shall be retained in the project files for +1 year.

6.0 Attachments

6.1 S3AM-303-FM1 Daily Excavation Checklist

6.2 S3AM-303-FM2 Excavation & Trenching Permit

Americas

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.

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

Americas

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.

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

Americas

Ladders

S3AM-312-PR1

1.0 Purpose and Scope

1.1 To establish the minimum requirements for AECOM to use, handle, and store ladders.

1.2 This procedure applies to all AECOM Americas-based employees and operations.

2.0 Terms and Definitions

2.1 **Stepladder** – A self-supporting portable ladder that is non-adjustable in length, with flat steps and hinged spreader design to connect the front and rear rails. It may be collapsed for ease of storage. It is intended for use by one person.

2.2 **Single Ladder** – A non-self-supporting portable ladder that is non-adjustable in length, consisting of one section. It is intended for use by one person.

2.3 **Articulated Ladder** – A portable ladder with one or more pairs of locking hinges which allow the ladder to be set up in several configurations such as a single or extension ladder, with or without a stand-off, a stepladder, a trestle ladder, scaffold or work table.

2.4 **Extension Ladder** – A non-self-supporting portable ladder that is adjustable in length. It consists of two or more sections that travel in guides or brackets arranged so as to permit length adjustment. It is intended for use by one person.

2.5 **Fixed Ladder** – A non-self-supporting ladder that is non-adjustable in length and permanently attached to a structure at a pitch ranging from 60 degrees to 90 degrees from the horizontal. The preferred pitch of a fixed ladder is between 75 degrees and 90 degrees from the horizontal. A fixed ladder is considered to be of "Substandard Pitch" if it is installed at an angle between 60 degrees and 75 degrees from the horizontal. Fixed ladders having a pitch greater than 90 degrees are not allowed.

2.6 **Job-Made Ladder** – A custom, made-to-fit specific job situations during construction or demolition operations. Their primary purpose is to provide access to or egress from a work area. They are not intended to serve as a workstation. They are temporary in nature and serve only until a particular phase of work is completed or until permanent stairways or fixed ladders are ready for use. Job-made ladders must be in full compliance with local regulations.

3.0 References

3.1 S3AM-003-PR1 SH&E Training

3.2 S3AM-216-PR1 Compliance Assurance

3.3 S3AM-208-PR1 Personal Protective Equipment

3.4 S3AM-209-PR1 Risk Assessment & Management

3.5 S3AM-304-PR1 Fall Protection

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Managers**

- Responsible for the implementation of this procedure and compliance with local regulations for supervised employees.

4.1.2 **SH&E Managers**

- Provide guidance as to application of the procedure.

4.1.3 **Employees**

- Adhere to this procedure, apply appropriate precautions and work practices in their use of ladders.

4.2 Training

4.2.1 All Employees who will climb above 6 feet (2 meters) shall take Fall Prevention / Protection Training. Refer to the *S3AM-304-PR1 Fall Protection* procedure.

4.2.2 All Employees will be oriented to the hazards and controls of any ladders present on the site and be aware of the safety planning and Task Hazard Assessment (THA) in accordance with *S3AM-209-PR1 Risk Assessment & Management*.

4.2.3 All Employees involved in the use of ladders on the project / location will be instructed in the requirements of this procedure.

4.3 Personal Protective Equipment (PPE)

- Personal fall protection equipment must be worn when working above the regulated height in your location. Refer to the *S3AM-208-PR1 Personal Protective Equipment* and *S3AM-304-PR1 Fall Protection* procedures for more specifics.
- PPE must be appropriate for the work location being constructed or industrial work site and/or client requirements.

4.4 Ladders

4.4.1 The following are minimum requirements for the use and care of ladders by AECOM personnel. Compliance with American National Standards Institute (ANSI) standards ANSI A14.1, ANSI A14.3, or Canadian Standard Association (CSA) standard CAN/CSA-Z11-M81 - Portable Ladders and applicable State, Provincial or Territorial regulations is also required. Additionally consider the following:

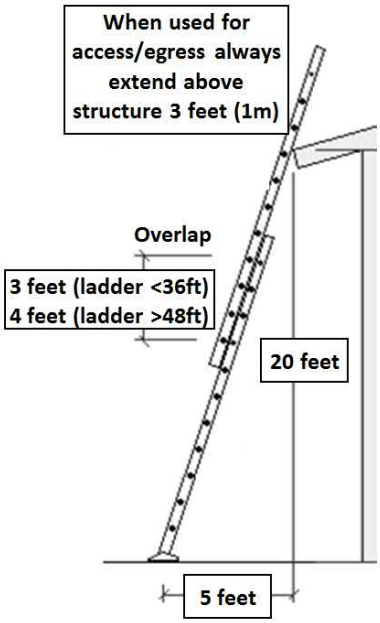
- Ladders shall be visually inspected before use. If a ladder is broken, damaged, or defective, it shall be removed from service and tagged with an “unsafe equipment” tag until made safe for use or destroyed.
    - Ladders will be maintained in good condition at all times. All ladder rungs shall be evenly spaced and securely affixed to the side rails. Ladders shall not have loose, broken or missing rungs, split side rails, or other defects.
    - During the inspection the type, size, length, and load rating (as well as labels and certification stickers) must be verified to ensure the ladder is correct for the work to be done.
    - Refer to the *S3AM-216-PR1 Compliance Assurance* procedure
- Ladders having metal parts (other than hardware) will not be used where potential electrical hazards exist unless they bear a manufacturer's label that indicates:
    - The ladder complies with ANSI 14.5 and CSA Z11-M81.
    - It is approved for electrical use.
    - Site-constructed ladders (vertical construction ladders, straight or job-built ladders) shall be built in accordance with State, Provincial or Territorial regulations.

4.4.2 Use of Ladders

- Use the appropriate type of ladder for the work to be done according to manufacturer’s specifications.
    - Ladders are not to be used as a brace, skid, guy or gin pole, gangway or other uses not specified by the manufacturer.

- Single and extension ladders shall be equipped with non-slip safety feet and secured from "kicking out" or slipping (e.g. tied off at the top and bottom, held and stabilized by another worker, or otherwise secured).
- Set up barricades or warnings around ladder if it must be set close to thoroughfares, passageway doors or high traffic locations.
    - A ladder will not be placed in front of a door opening toward the ladder unless the door is blocked open, locked, or guarded.
    - Ladders projecting into passageways or doorways where they can be struck by personnel, moving equipment, or materials must be protected by barricades or guards.
- Areas around the tops and bottoms of ladders shall be kept clear.

- Single rail ladders shall not be used.
- Set the ladder at the proper angle of one horizontal to every four vertical.
- Ladders shall rest on a surface of ample strength to support the load of the ladder and other applied loads. Ladders used for access shall extend 3 feet (1 meter) above the access level.
- Ladders should be set up on a firm level surface.
    - As applicable, use CSA/ANSI approved spike foot ladders for soft surfaces and non-slip foot ladders for hard, smooth surfaces
    - As applicable, if the base is to rest on soft, uncompacted or rough soil, a mud-sill must be used to stabilize the ladder.
- Ladders will not be placed on boxes, barrels, or other unstable bases to form longer sections.
- Do not paint or use painted wooden ladders as paint may hide unsafe wear and tear.



- Only one person shall be on a ladder at any time unless the ladder is designed for use of additional people.
- Always face the ladder when ascending or descending.
- Always maintain three points of contact with the ladder (i.e., two hands and one foot or two feet and one hand).
- Workers must ensure that their bodies are kept between the side rails of the ladder. Extending beyond the side rails or straddling a space between a ladder and another object will reduce the stability of the ladder.
- The Task Hazard Assessment shall consider potential fall hazards, any applicable regulatory requirement by jurisdiction and client requirements when determining whether fall protection must be in place or worn when working from portable ladders.
- Prior to using any ladder, ensure footwear is free of mud, snow, grease or other slippery materials.
- Check for overhead electrical conductors prior to setting up a ladder. Ensure that ladders do not come into contact with or encroach upon the minimum safe distances from energized electrical conductors.
- Do not use metal ladders or wire-reinforced wooden ladders in proximity to energized power lines or electrical equipment. When working near electrical equipment use only wood or fiberglass ladders approved for that use.
- Ladders shall be used for their intended purpose and must not be used horizontally as substitutes for scaffold planks, runways or other service for which they were not designed.

- Never carry materials, tools or other objects when ascending or descending from a ladder. Hoist lines or other appropriate methods should be used to transport materials from one work surface to another.
- Ladders will not be spliced together to form longer sections.
- At no time will a worker stand or sit on the top two rungs of any ladder.

4.5 Fixed Ladders

4.5.1 Cage protection is required on fixed ladders of more than 20 feet (6.1 meters) or as specified by local jurisdiction.

4.5.2 Landing platforms on fixed ladders shall be provided at heights specified by the given jurisdiction and be equipped with standard railings and toeboards, so arranged as to give safe access to the ladder.

4.5.3 As permitted by the applicable jurisdiction, ladder safety climbing devices may be used in lieu of cage protection on fixed ladders or more in height.

- Landing platforms are not required in these cases except at regular step-off points. All ladder safety devices will be compatible with the ladders with which they are used.

4.5.4 Ladder safety climbing devices may be required in addition to cages as specified by jurisdictional legislation.

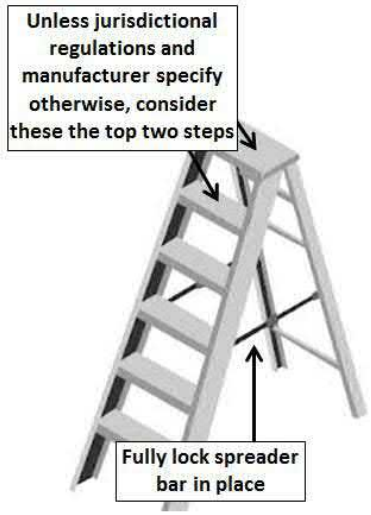
4.6 Portable Ladders

4.6.1 Ladder Types / Grades

- The Occupational Safety and Health Administration, ANSI and CSA all have established “duty ratings” for portable ladders which identifies the conditions under which the ladder can be safely used. The following table generally describes these ratings:

TYPE / GRADE	MAX WORK LOAD	RATED USE
Type IAA	375 lbs (170 kg)	Super Heavy Duty
Type IA	300 lbs (136 kg)	Extra Heavy Duty
Type I	250 lbs (113 kg)	Heavy Duty Industrial
Type II	225 lbs (102 kg)	Medium Duty Commercial
Type III	200 lbs (91 kg)	Light Duty Household
Notes: lbs = pounds kg = kilograms		

- Ladders purchased for use on AECOM sites will be appropriate for industrial applications (Type IAA, IA, I, II). Light-duty household ladders (Type III) are not permitted.
- Ladder type / grade shall be selected according to the proposed task, the ladder’s load capacity, the expected load, and the task’s anticipated hazards to ensure suitability.



4.6.2 Step Ladders

- The stepladder must be in good condition and the right ladder type/grade for the job to be performed.
- Only use stepladders on clean, even surfaces.
- The platform and top step of ordinary types of stepladders will not be used as steps.
- Do not work from the top two steps of a stepladder. The pail shelf is not a step.
- Only use a stepladder in the fully opened position with the spreader bars locked.

- Do not use stepladders as supports for scaffolds or as a straight ladder.
- Stepladders may be used as a work platform; however, do not over reach while on a stepladder. Climb down and move the ladder to a new position.

4.6.3 Extension Ladders

- Extension ladders are to be used for access to a higher level only, not as a work platform.
- When extended, upper and lower sections of extension ladders must overlap a minimum of:
  - 3ft (1m) if combined sections total less than or equal to 36ft (11m).
  - 4ft (1.25m) if combined sections total 37ft to 48ft (11m-15m).
  - 5ft (1.5m) if combined sections total 49ft to 60ft (15m-18m).
- An extension ladder must be equipped with locks that hold the extension in place.
- Ladders must be tied off.
- Use polypropylene ropes on extension ladders that may be exposed to corrosive chemical.
- Keep both metal and wooden ladders away from electrical sources.
- Where a ladder is used for regular access and egress between levels, platforms should be provided at each landing area.
- The landing areas at both ends of the ladder must be clear of debris and other materials.
- The ladder should be set at the proper angle of one horizontal to every four vertical lengths.

4.6.4 Single ladders shall not exceed the following limits (client or jurisdictional legislation may impose further restrictions):

- Type IAA – 16 feet (5 meters).
- Type IA – 30 feet (9 meters).
- Type I – 30 feet (9 meters).
- Type II – 24 feet (7.5 meters)

4.6.5 Extension ladders shall not exceed the following limits(client or jurisdictional legislation may impose further restrictions):

- Type IAA
  - 3 section length – 36 feet (11 meters)
  - 2 section length – 32 feet (9.5 meters)
- Type IA
  - 3 section length – 72 feet (22 meters)
  - 2 section length – 60 feet (18 meters)
- Type I
  - 3 section length – 72 feet (22 meters)
  - 2 section length – 60 feet (18 meters)
- Type II
  - 3 section length – 60 feet (18 meters)
  - 2 section length – 48 feet (15 meters)

4.6.6 Step ladders shall not exceed the following limits (client or jurisdictional legislation may impose further restrictions):

- Type IAA – 12 feet (3.6 meters).
- Type IA – 20 feet (6 meters).
- Type I – 20 feet (6 meters).
- Type II – 12 feet (3.6 meters)

4.6.7 Care of Ladders

- Ladders will be handled with care and not be subjected to abuse or misuse.
- Immediate inspection and appropriate maintenance is required of any ladder exposed to fire, subjected to damaging chemicals, involved in a fall or collision, or which has become coated with oil or grease. Refer to the *S3AM-216-PR1 Compliance Assurance*.
- When not in use, ladders will be stored where they are protected from potential damage caused by collision, temperature, moisture, etc.
- Users will return ladders to the proper storage location when the job is completed.

5.0 Records

5.1 None

6.0 Attachments

6.1 None

Americas

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.

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-pens[1] 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.
    - 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.

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[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.*

- 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 recommendations 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 hogweed[2] (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.
- 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

[2] Phytodermatisi producer: keep skin covered and wash well after exposure

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

Americas

Working On & Near Water

S3AM-315-PR1

1.0 Purpose and Scope

1.1 Establishes the minimum requirements and guidance for AECOM personnel assigned to projects that place them at risk of falling into water where a drowning hazard exists (e.g., more than 3 feet / 1 meter deep, fast-moving stream, water body with soft bottom creating entrapment hazard), including working ashore, near to, or over water or ice.

1.2 Employees performing tasks involving work on or under bridges, or on larger vessels, barges, or boats, who are constantly protected by guardrail systems, nets, or body harness systems are deemed to be adequately protected from the danger of drowning, and are not required to wear life jackets or buoyant work vests.

1.3 Projects conducted on a ship at sea or in port may not be required to comply with parts of this procedure provided:

- AECOM can demonstrate the hazard and related controls as identified in this procedure are adequately addressed through controls established by another controlling entity (e.g. ship owner/operator, port authority, etc.) and these are available to AECOM personnel.
- If AECOM cannot demonstrate adequate controls are in place, the related requirements of this procedure shall be met.

1.4 This procedure applies to all AECOM Americas-based employees and operations.

2.0 Terms and Definitions

2.1 **PFD** – Personal Flotation Device

2.2 **Life Jacket** – A personal flotation device that will turn over an unconscious worker in the water so their face and nose are not submerged.

2.3 **USCG** – United States Coast Guard

2.4 **Lifebuoy** – A throwable buoyant rescue ring with 90 feet (28 meters) buoyant line attached.

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-333-PR1 Marine Safety & Vessel Operations

3.5 S3AM-334-PR1 Diving

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Manager**

Responsible for the overall success of a project and the performance of employees engaged in project activities (with the support of Supervisors), and as follows:

- Confirm that all appropriate Safety, Health and Environment (SH&E) procedures are identified and implemented and their applicability during the planning stage of field investigation projects.
- Allocate appropriate resources to implement the required measures.

- Designate a field staff person to implement and maintain these measures, maintain related documentation, and to communicate with appropriate parties as necessary.
- Consult with the purchasing department on the appropriate vendors for rentals/leases.
- Confirm that boat/watercraft rental/leasing vendors have appropriate paperwork (licenses, insurance, maintenance records, orientations, etc.).
- Confirm that the project is properly staffed with trained employees.
- Require that at least one employee trained in cardiopulmonary resuscitation (CPR) and first aid is on site during work activities.
- Designate at least one employee on site to respond to water emergencies and, as applicable, operate the rescue boat at times when there are employees above, in, or near water.
- Develop and submit a SH&E Plan and other relevant SH&E planning documents for review and approval by the SH&E Manager.
- Develop a written section in the SH&E Plan (or equivalent document) to address worker safety, water rescue, and personnel transfer procedures as required in this standard.
- Confirm Task Hazard Assessments (THA) are completed prior to tasks commencing.

4.1.2 **SH&E Manager**

Responsible for providing support to the Manager and his/her designee in the evaluation of safety and health risks and the identification of applicable policies, procedures, and appropriate precautions, and as follows:

- Review all project related SH&E Plans and THAs as required.
- Provide access to safety records, including training records, for field staff.
- Provide support to Manager.

4.1.3 **Supervisors**

Responsible for verifying current status of applicable staff's training and equipping them for the work at hand, and as follows:

- Conduct daily safety meetings to include a review of the hazards and control measures associated with working over/near water. Refer to *S3AM-209-PR1 Risk Assessment & Management.*
- Train employees on their responsibilities, the hazards and the control measures associated with working over/near water.
- Perform SH&E inspections.
- Confirm that all safety issues and equipment deficiencies are properly corrected, and that the proper equipment is available to the field staff to safely meet the goals and quality objectives of the project.

4.1.4 **Employees**

Responsible for complying with the safe work practices specified in this policy and all other applicable SH&E policies or procedures and reporting all unsafe working conditions, and as follows:

- Review, contribute to, and sign the SH&E Plan prior to beginning the project and whenever new tasks or environmental changes occur.
- Review, contribute to, and sign the THA prior to initiating the associated task.
- Confirming that their SH&E training is up to date.
- Confirming daily that equipment is properly maintained and functioning.
- Confirm they wear all required Personal Protective Equipment (PPE).

4.2 General Safety Considerations

4.2.1 During project preparation, consideration shall include, but not be limited to**:**

- The location and nature of the site.
- Type of water hazard.
- Underwater hazards and structures.
- Access to the worksite and/or water body.
- Scope of work.
- Equipment to be used
- Local climate.

4.2.2 The information shall be considered when determining the appropriate controls, PPE, and level of emergency preparedness that is required. All projects working near water hazards shall have an appropriate SH&E Plan and THA prepared. Refer to *S3AM-209-PR1 Risk Assessment & Management*.

4.2.3 PPE specified in the SH&E Plan and THA is to be worn as required, to meet the specific regulations of the work area, including as applicable, local and Federal legislation.

4.2.4 Whenever there exists the possibility of falling into water, personnel shall be attired in a USCG approved Type III or Type V PFD or Life jacket. Refer to *S3AM315-ATT1 Personal Floatation Devices*. The vest shall be properly sized for the individual and shall be secured at all times. For cold water conditions (water temperature less than 55 degrees Fahrenheit [13 degrees Celsius]), a USCG-approved Shallang/Mustang suit shall be worn to protect personnel from risks of cold water immersion.

4.2.5 For work at night, Type II, III, or V PFD should have a chemical light, or other appropriate survival light attached to facilitate rescue. All PFDs shall have reflective tape on them to facilitate visibility at night. For work in non-US areas, the PFD shall be approved by the appropriate local authority, or be approved as an International Maritime Organization (IMO)/Safety of Life at Sea (SOLAS) lifesaving device. This shall include either a Type II buoyant vest or a Type III flotation aid.

4.2.6 Swimming is prohibited, unless it is being conducted by certified divers in the completion of their assigned task, or to prevent a serious injury or loss of life in a person in a water/person overboard emergency.

4.2.7 The buddy system shall be utilized whenever there is the possibility of falling into water, in which two persons operate as a single unit in order to monitor and assist each other in performing tasks.

4.2.8 When work is performed in water where a drowning hazard exists, or on ice, at least one attendant and/or rescue boat operator will be utilized and be available to immediately respond to an emergency and/or launch the rescue boat. The attendant and/or boat operator are not to be assigned other duties beyond safety and rescue.

4.2.9 Conducting shoreline work alone should be avoided, unless constant communications is maintained between Staff and Supervisors, and prior approval by the Manager is granted.

4.2.10 Confirm a throwable lifebuoy with required rescue line attached (Type IV PFD) is available.

4.2.11 Confirm any additional equipment (e.g.,, sounding alarms, lifting gear, or rescue boat) as required by legislation is immediately available to recover an individual from the water.

- If the shortest dimension of the water body is greater than the length of line attached to the throw buoy, a skiff or boat shall be available to facilitate a rescue.
- The rescue boat shall be capable of being launched by one person, and shall be properly equipped, and the operator shall be properly qualified per *S3AM-333-PR1 Marine Safety & Vessel Operation*.
- If a rescue boat is not feasible due to site conditions (e.g., water depth), alternate rescue planning shall be provided in the safety plan.

4.3 Personal Protective Equipment (PPE)

4.3.1 PPE shall be selected based on the SH&E Plan and THA, and in accordance with the *S3AM-208-PR1 Personal Protective Equipment*.

4.3.2 The minimum PPE required for wading in water above the knees includes:

- Personal Flotation Devices or lifejackets shall be worn by all workers who are exposed to the danger of drowning in water deep enough for the lifejacket to be effective.
- All inflatable PFD or life jackets shall be approved and have documented regular inspections.
- Shallang/Mustang suits – In water temperatures below 55 degrees Fahrenheit (13 degrees Celsius) (regardless of air temperature) personnel are required to wear a USCG-approved Shallang/Mustang jacket or full-flotation suit, depending on field conditions. This requirement will replace the need for a wearable PFD as these suits (if properly maintained) will provide adequate flotation.
- Waders shall have a slip resistant sole suitable for the substrate.
- Eye protection shall be worn to reduce glare.
- Wading pole shall be used for supporting and testing the substrate before wading.

4.3.3 Confirm rescue equipment is on site that is appropriate to the situation (e.g., life buoys with 90 feet [28 meters]) of retrieval line, rescue boat, sounding device). Extra buoys shall be 200 feet (60 meters) or less from each other. During night operations, ring buoys shall have a USCG or SOLAS equivalent water light attached.

4.3.4 Confirm appropriate emergency supplies are available at the location (e.g. blankets, first aid kit).

4.3.5 Immersion suits, or survival suits as they are often called, can significantly improve survival time in cold water.

- Recognizing that hypothermia is a major factor in lives lost at sea, the USCG requires that vessels operating in offshore waters north of 32 degrees North latitude carry an immersion suit for each person aboard.
- These suits are to be used in place of a Type I PFD in an abandon ship situation.
- It is recommended that personnel familiarize themselves with their use and practice donning the suit before leaving the dock. It is recommended that personnel be able to get into an immersion suit in under a minute.
- If necessary to abandon ship, personnel, attired in an immersion suit with head covered in a hat, should enter the water slowly. If possible, keep the head out of the water.

4.3.6 Suits should be stored in a clean and dry location. Avoid stacking or compressing the suits in storage as it may result in a loss of buoyancy. Federal regulations require that immersion suits be stowed so that they are readily accessible to the individual for whom they are intended, from both the individual's normal work area and berthing area. If there is no location readily accessible to both areas, then a suit shall be stowed at each location.

4.4 Land-based water work (shoreline/bridge/pier – includes wading)

4.4.1 All shore work shall be performed in accordance with a "Buddy System".

4.4.2 If sampling near or in flowing water environments, be aware of slippery or steep banks and fast currents. If the current is fast or the water looks deeper than knee height, do not enter the water. If you must enter the water, a PFD and restraining system shall be worn and secured to the bank for your retrieval in the event of an emergency.

4.4.3 Whenever possible, positive controls in the form of fencing or barricades should be considered for long-term waterfront projects to form a security perimeter 10 feet in from the water's edge to prevent field staff from being exposed to water hazards.

4.4.4 Field staff involved in sampling contaminated sediments or surface waters or conducting shoreline surveys may require a Hepatitis A and/or tetanus vaccination depending on site conditions and are advised to consult with their Safety, Health and Environment Manager. An Occupational Safety

and Health Administration 40-hour HAZWOPER may be required for field staff working on site if warranted by the Project.

4.4.5 Take special care on slippery rocks along shorelines, lakeshores, riverbanks, and creeks. Always look ahead at the ground when walking around the water's edge and avoid stepping on stones that have algal growth, especially those in intertidal areas, as these are extremely slippery. It is suggested that workers not be permitted to access areas where these slip/fall hazards exist, especially in locations containing tidal water flow.

4.4.6 Personal Protective Equipment:

- AECOM requires that whenever there exists the possibility of falling into water, field staff shall be attired in a USCG-approved Type III or Type V work vest. This includes when working near fluid-filled tanks, ponds, lagoons, or natural waterways.
- The PFD vest shall be properly sized for the individual and shall be secured at all times. Prior to and after each use, the PFD/suit shall be inspected for defects, which may alter their strength or buoyancy. Defective units shall be discarded and replaced.
- Staff protective gear shall include long pants with adequate puncture resistance, and gloves appropriate to the hazard(s) (e.g., puncture resistant gloves such as Kevlar when sampling, picking up, or manipulating ground cover). It is recommended that field staff use a rake to move ground cover and debris and not touch these items directly by hand whenever possible.

4.5 Wading in a shallow stream or water body:

4.5.1 Chest waders may not be worn when working along, over, or in moving waters; or in waters influenced by tides or acted upon by waves when water depths exceed knee height unless specifically approved by the Manager.

- Chest waders may be worn in still waters in water depths up to the waist if bottom conditions are firm and well understood.
- Chest waders shall never be worn aboard a watercraft of any kind unless specifically approved by the SH&E Manager and required by the task (e.g., rubber or neoprene waders for electrofishing to protect from electric shock).

4.5.2 Always proceed upstream so that the wading team is walking into clear water (no turbidity caused by walking), there is good visibility for any debris floating downstream, and there is a reduced risk that the wading team will be pushed against debris or pushed into a deep hole by the current.

4.5.3 Wading in water deeper than knee height shall be undertaken as a two-person crew unless alternative suitable measures to control the hazard are employed. If conditions or legislation warrant a "rescue team," then an appropriately sized crew should be used, with the rescue team stationed on the shore with the appropriate rescue equipment, as per the site-specific safety plan.

4.5.4 Wading will not occur in the following circumstances:

- If the water is too turbid or too deep to see tripping hazards or deep holes.
- If it appears the bottom is composed of soft sediments where stepping in may result in sinking, or if the bottom consists of clay where slipping is likely.
- If large woody debris is abundant and will be difficult to step over or move around.
- If the water is over the waist of the shortest person on the wading teaming. This does not preclude wading in water bodies that have shallow shorelines that grade into deeper waters. By not wading over waist level there will be approximately 12 Inches (30 centimeters) of "safety distance" on the chest waders (if worn), should a member of the wading team step or slip into a deeper area.
- If there is a risk of the current pushing a member of the team downstream.
- If there is a risk of exposure to dangerous wildlife, or other hazardous conditions, unless appropriate mitigation procedures are in place.

4.6 Cold Water Operations

4.6.1 Cold water operations are defined as any situation that exposes an individual to falling into water that has a temperature of 55 degrees Fahrenheit (13 degrees Celsius) or less.

4.6.2 Sudden immersion in cold water can induce a gasping reaction and uncontrolled breathing which may cause the victim to ingest water and begin choking, experience cardiac arrest, and other physical body conditions all of which can result in a quick drowning.

4.6.3 Cold water incapacitation precedes hypothermia, making swimming and grasping for safety extremely difficult. So while death by hypothermia may occur in roughly one hour in a water temperature of 55 degrees Fahrenheit (13 degrees Celsius), incapacitation due to failing muscle function will occur in as little as 10 minutes, so regardless of your age, physical conditioning, or ability to swim – your odds of survival are greatly enhanced if you wear a life jacket.

4.6.4 AECOM requires personnel to wear a USCG-approved Shallang / Mustang suit at all times whenever there is the risk of falling into cold water. Employees working in these conditions view a training video on the physiological effects of cold water immersion found at: http://www.coldwaterbootcamp.com.

4.6.5 Consideration should be given to the use of immersion of survival suits when project work involves cold water operations.

4.6.6 Water and ambient air temperatures shall be directly measured at the start of each work shift, and no less than once daily. Shift/daily temperature records will be maintained in the site or field notes.

4.7 Working on Ice

4.7.1 Working in situations where ice exists shall be strictly limited due to the extreme hazards associated with falling through the ice cap, cold water immersion, and the logistical difficulties associated with executing a rescue.

4.7.2 Specific information and procedures for working on ice can be found in *S3AM-315-ATT2 Ice Safe Work Practices*.

4.7.3 Ice conditions (e.g., thickness, color, cracking) shall be recorded at the start of each work shift, and no less than once daily. Ice condition records will be maintained in the site or field notes. If ice conditions do not meet the criteria specified in *S3AM-315-ATT2 Ice Safe Work Practices*, then work shall not proceed until the required conditions are met.

4.7.4 Personnel working in or on ice shall be attired in a USCG-approved Shallang / Mustang survival suit and be supported by shore side personnel to assist in recovery in the event of a break through. Depending on the nature of the project, on-ice personnel should either wear a harness tethered back to shore, or push a flat bottom boat along on the ice and have the boat tethered back to shore.

4.7.5 Personnel working on ice covered waters should dramatically reduce vessel speed to avoid damaging propellers, shafts, and rudders. Personnel should be cognizant of shoreline ice which can prevent access to alternative ramps and docks that were considered as egress points in emergency planning.

4.7.6 Personnel should be wary that boat ramps on tidally influenced waters can flash freeze at low tide, precluding or compromising safe access and egress.

4.7.7 Extra safety equipment:

- Extra blankets should be kept on site (in a vehicle) when working on or near frozen water bodies.
- An ice pick, ice chisel, and/or ice auger should be used by a member of the crew with experience or training in identifying thin or weak ice.
- A braided rope, preferably 98 feet (30 meters) in length.

4.8 Emergency Response

4.8.1 Emergency preparedness applies to any work where there exists the risk of falling into water, especially moving waters, along piers, bulkheads, and river banks with a sharp drop off in bathymetry.

4.8.2 Field staff working in or alongside waters, especially moving waters, where there exists the possibility of falling in shall have an Emergency Response Plan to recover someone in the event they have fallen in.

4.8.3 A throwable rescue device (Class IV PFD) shall be immediately available in the event of an emergency situation. In these situations the position and accessibility of throw rings and other rescue devices (e.g., ladders) and the mechanism to recover a person from the water shall be considered.

4.8.4 The number and placement of ladders and throw rings shall be sufficient so that the maximum swimming distance to them is no more than 25 feet.

4.8.5 If workers have the potential to get stuck in mud or fluidized sediment, air injection equipment designed to free worker's feet/legs may need to be available on site. At a minimum, a safety line should be available to be deployed from safe ground. If a worker does get stuck, they should not struggle as this causes further sinking. Use a pole to conduct sediment probing to assess water depths, the stability of shoreline terrain, and the bearing capacity of bottom sediments ahead of the chosen path.

4.9 Training

- All Staff and Managers working on projects with exposure to open water shall receive training in their applicable tasks, the hazards, precautions, and rescue procedures associated with working in or over water, refer to the *S3AM-003-PR1 SH&E Training* program.
- All staff working on or near frozen water bodies shall complete Ice Safety Awareness training.
- Staff who will be working on frozen water bodies regularly or for extended periods of time should take an Ice Rescue Training course, or obtain management approval based on their level of experience/competence working on ice.
- Staff working near cold water shall complete awareness level training on Cold Water Immersion.

5.0 Records

5.1 None

6.0 Attachments

6.1 S3AM-315-ATT1 Personal Floatation Devices

6.2 S3AM-315-ATT2 Ice Safe Work Practices

Americas

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.

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

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 insulted) parts, communication wires, or any other overhead wire or cable.

1.2 This procedure applies to all AECOM Americas**-**based employees and operations.

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

Lockout Tagout

S3AM-325-PR1

1.0 Purpose and Scope

1.1 Establishes the requirements to perform hazardous energy control through lockout and tagout (LOTO) operations.

1.2 This procedure applies to all AECOM Americas-based employees and operations.

1.3 All AECOM work is regulated by this procedure when:

1.3.1 An unexpected energization or start-up of machines and/or equipment would result in the release of stored energy which could cause injury to an employee.

1.3.2 Any employee (or contractor) is required to remove or bypass a guard or other safety device.

1.3.3 Any employee (or contractor) is required to place any part of his body into the mechanism of a piece of equipment or path of hazardous energy.

2.0 Terms and Definitions

2.1 **Affected Employee** – A trained person whose job requires him/her to operate or use a machine or piece of equipment on which servicing or maintenance is being performed under LOTO, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed. The Affected Employee is not performing work under LOTO, but rather is potentially affected by the work being performed by the Authorized Employee(s).

2.2 **Authorized Employee** – A person who is appropriately trained and handles LOTO of a machine, piece of equipment or system in order to perform servicing, construction or maintenance on that machine, system or equipment.

2.3 **Cord and Plug-connected Equipment** – Equipment where the only energy source is electrical power provided by a plug-in connection.

2.4 **Energy Source** – Include, but are not limited to, any electrical, mechanical, hydraulic, pneumatic, chemical, radiation, thermal, or compressed gas energy source; fluid systems; flammable systems; energy stored in springs; and potential energy from suspended objects (gravity) that may injure personnel, cause property damage, and/or cause a release of hazardous substance to the environment.

2.5 **Energized** – Connected to an energy source or containing residual or stored energy.

2.6 **Energy-isolating Device** – A mechanical device that physically prevents the transmission or release of energy. This includes locks, hairpins, tongs, lockable valves, clamshell devices for valves, blank flanges for piping systems, and restraining devices to prevent movement of parts.

2.7 **Isolation** – A physical activity using a device that prevents the transmission or release of energy. Examples of devices used to isolate equipment/systems include, but are not limited to restraint blocks, electrical circuit breakers, disconnect switches, fuses, slip gates, slip blinds, or double valves. Control circuit devices, motor controllers, etc., are NOT acceptable isolation devices.

2.8 **Locking Device** – A device that utilizes a lock, key to hold an energy-isolation device in the safe position for the purpose of protecting personnel.

2.9 **Lockout** – The use of a locking device to confirm that an energy-isolating device and the equipment it controls cannot be operated until the lockout device is removed.

2.10 **Lockout / Tagout- (LOTO) Specific Procedure** – A written procedure developed specifically for each piece of machinery or equipment capable of unexpectedly releasing energy. This procedure outlines in detail of how LOTO will be performed.

2.11 **Normal Production Operations** – The utilization of a machine or piece of equipment to perform its intended production function.

2.12 **Qualified Person** – A person, familiar with the construction and operation of the equipment and the hazards involved, trained and competent in the applicable LOTO procedures and assigned authority for the coordination and overseeing of Authorized Employee(s) implementation of LOTO protection. A Qualified Person may be referred to by a different term depending upon jurisdiction (e.g. Requesting Authority, Lockout Authority, Person in Charge, etc.).

2.13 **Servicing and/or Maintenance** – Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or unjamming of machines or equipment, and making adjustments or tool changes where employees could be exposed to the unexpected energization or start-up of the equipment or a release of hazardous energy.

2.14 **Tagout** – Use of a warning device, such as a tag and its means of attachment, to establish that an energy-isolating device and the equipment it controls may not be operated until the tagout device is removed.

3.0 References

3.1 S3AM-003-PR1 SH&E Training

3.2 S3AM-004-PR1 Incident Reporting, Notifications & Investigation

3.3 S3AM-209-PR1 Risk Assessment & Management

3.4 S3AM-218-PR1 Permit to Work

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Managers**

- Provide LOTO training to Employees engaged in tasks covered by this procedure.
- Prepare and implement LOTO procedures on their locations / projects.
- Confirm appropriate and adequate lockout equipment is available for their location / project.
- Determine LOTO responsibilities (AECOM, contractor or client).
- Consult with the Safety, Health and Environment (SH&E) Department regarding project / location -specific requirements for LOTO.
- Inform the authorized and affected employees about the client or facility's LOTO requirements.
- Confirm only trained employees perform LOTO procedures while working in areas requiring hazardous energy control.
- Confirm the ‘Removal of Unattended LOTO Devices’ procedure is followed when necessary.
- Confirm that the site-specific written LOTO procedure is audited at least annually including the observation of workers performing the procedure.

4.1.2 **Qualified Person**

- Only employees who have completed LOTO Performance training and Competent Person (LOTO) training may be designated as a Qualified Person. Refer to *S3AM-003-PR1 SH&E Training*.
- Verify with the Manager who is responsible for LOTO at client facilities or sites.
- Shut-down equipment or request de-energizing of an energy source.

- Inspect de-energizing with the Authorized Employee(s).
- Confirm that the Authorized Employee(s) has locked and tagged the source.
- Require that all applicable Authorized Employees affix lock/tags at the same locations(s).
- Operate the equipment controls or otherwise verify that the equipment cannot be restarted after being locked out.
- Coordinate the continuation of LOTO protection through shift or personnel changes.
- Control accountability of locks and tags.
- Make appropriate entries on the *S3AM-325-FM1 Lock & Tag Log* or equivalent. Where the number of energy control activities is extensive or the scope of energy controls is complex, the qualified person may choose to use the *S3AM-325-FM4 Lockout Tagout Permit* as an aid.
- Conduct tests and visual inspections prior to reenergizing to check that circuits and equipment can be safely energized.
- May be referred to by different terms depending upon jurisdiction (e.g., Requesting Authority, Person in Charge, Lockout Authority, etc.).

4.1.3 **Supervisor (or competent designate)**

- Confirm that all Affected Employees and Authorized Employees under their direction are fully aware of, trained in, understand, and adhere to the LOTO procedures applicable to the task at hand.
- Identify when and where potential energy sources require lockout tag out to control unexpected energy release (consult client representatives, operators, equipment manuals, manufacturers, Qualified Person, etc.)
- Approve developed and written LOTO procedures.
- As applicable, confirm client requirements or programs are incorporated into the LOTO procedures.
- Document and investigate any identified LOTO procedural deficiencies.
- Confirm all on-site affected employees are informed of the procedure(s) used to control potential energy sources in order to prevent unexpected release.
- As applicable, act as the Qualified Person.
- Confirm the ‘Removal of Unattended LOTO Devices’ procedure is followed when necessary.

4.1.4 **Authorized Employees**

- Only **Authorized** Employees who have completed LOTO Performance training will be permitted to perform LOTO procedures and to work under LOTO procedures. Refer to *S3AM-003-PR1 SH&E Training.*
- Verify with the Manager who is responsible for LOTO at client facilities or sites.
- Obtain lock(s), key(s) and tag(s).
- Meet with facility representatives, Qualified Person and Affected Employees to review the LOTO activities.
- Implement project / site-specific LOTO procedures.
- Review any equipment-specific LOTO procedures prior to initiating work on the equipment.
- Any procedural deficiencies shall be immediately reported to the Supervisor and logged as an incident in IndustrySafe, refer to the *S3AM-004-PR1 Incident Reporting, Notifications & Investigation*. No further work will be permitted on the equipment until procedures are amended.

4.1.5 **Affected Employees**

- Complete LOTO Awareness training. Refer to *S3AM-003-PR1 SH&E Training*.
- Support Authorized Employees with the safe shutdown and restart of equipment.
- Assure that no attempt is made to restart equipment without the knowledge of all Affected Employees and Authorized Employees performing work on the equipment.

4.1.6 **Employees**

- Refrain from making any attempt to restart equipment that is LOTO.
- Avoid areas where Authorized Employees are working on equipment.

4.2 Training

4.2.1 The Manager shall orientate all Employees to the location or project specific SH&E plan and Task Hazard Assessment (THA) requirements, in accordance with *S3AM-209-PR1 Risk Assessment & Management*, and confirm training requirements are met prior to work starting. Proof of training and orientation shall be documented and retained in the location / project or SH&E Department files. Qualified Person(s), Authorized Employees, Affected Employees, and their Supervisors and Managers will be trained in the following areas before being involved in de-energizing or shut-down of equipment, LOTO, affected by LOTO or to work on equipment requiring LOTO:

- Recognition of hazardous energy sources;
- Types and magnitudes of energy sources located in the workplace;
- Procedures for energy isolation and control, including specific procedures developed for specific equipment and systems (e.g. valve lockout, electrical lockout, etc.);
- Recognition of when to use LOTO procedures;
- Purpose and use of the energy control (LOTO) procedure, equipment, and devices; and
- Prohibitions and penalties for attempting to restart or re-energize equipment which has been locked out/tagged out, or to work on equipment without following the LOTO procedures.

4.2.2 A Qualified Person is limited to those supervisors and managers, and selected employees who have successfully completed all of the required training per the *S3AM- NA-003-PR1 SH&E Training* requirements (LOTO Performance and Competent Person (LOTO)) and is familiar with the construction and operation of the proposed equipment and the hazards involved.

4.2.3 Authorized Employees will be trained in the purpose and use of the LOTO procedure training per the *S3AM- NA-003-PR1 SH&E Training* requirements (LOTO Performance). Authorized Employees shall also be adequately training and competent in relation to the skills required to perform the LOTO procedure (e.g. all electrical work shall be performed by a qualified electrician)

4.2.4 Affected Employees will be trained in the purpose and use of the LOTO procedure training per the *S3AM- NA-003-PR1 SH&E Training* requirements (LOTO Awareness).

4.2.5 All Employees whose work operations may be in an area where LOTO procedures may be utilized will be trained about the procedure and about the prohibition relating to attempts to restart or reenergize machines or equipment that are locked out/tagged out. These personnel are not required to be familiar with specific procedures for equipment and systems.

4.2.6 Retraining or refresher training for a Qualified Person, Authorized Employees and/or Affected Employees will be conducted annually or whenever one of the following exists:

- The Employee has a change in job assignment;
- There has been a change in the equipment or process;
- There has been a change in the energy-control procedure or new hazards arise;
- When evaluation of applied LOTO procedures reveals a need for additional training; and/or

- An incident occurs as a result of unexpected energy release.

4.2.7 Training Documentation

All employee training, including refresher training, will be documented in accordance with *S3AM-003-PR1 SH&E Training*. Employee training records will include type of training, date, and employee name. These records will be maintained for each Employee for the duration of their employment. Each office and project site shall maintain a current list of personnel trained in accordance with the designations; Qualified Person, Authorized Employees and Affected Employees.

4.3 Lockout Tagout Equipment

4.3.1 Locks

- Locking devices shall meet the following criteria:
  - Be traceable to an individual person using a tag, picture, number or other unique identifier.
  - Be marked in such a way so as to distinguish the LOTO locks from locks used for any other purpose.
  - Be made of durable non-conducting material.
  - Be substantial and secured in such a way as to prevent inadvertent removal without excessive force.
  - Be standardized within the facility (color, shape or size) and placed in a conspicuous location.
  - Shall NOT be a combination style lock. Shall be a keyed lock.
- Keyed requirements may vary per jurisdiction and client requirements. Examples:
  - Each lock to be keyed differently and have only one key in existence held by the Authorized Employee.
  - Each lock to be keyed differently with two keys available:
    - One key in the possession of the Authorized Employee responsible for applying and removing the lock .
    - The second key shall be strictly controlled by a person authorized and trained to use the duplicate key in accordance with Emergency Lock Removal or Unattended LOTO Device procedures (e.g. Qualified Person, Supervisor, etc.).
  - Multiple locks keyed to one key:
    - The locks are applied to lockout all aspects of the system by the Qualified Person and the key placed inside a group lockbox.
    - After all Authorized Employees have verified the system as completely locked out, each Authorized Employee applies his/her individual lock to the lockbox.

4.3.2 Tags

- Tags shall accompany locks and are to be placed at the same point as the lock.
- The tag's means of attachment shall be substantial and secured in such a way as to prevent inadvertent removal. The attachment means shall be of a non-reusable type, attachable by hand, self-locking, and non-releasable.
- Tags shall be constructed to withstand environmental conditions (i.e. weather, chemicals, etc.) and printed to confirm the message remains legible. Tags shall contain the following information:
  - Warning(s) (e.g. DO NOT OPERATE, DO NOT OPEN, etc.).

- Name of the person responsible for the device.

- Tags are to be consistent within the facility / site in color, shape, or size, and with print and format standardized. In addition to containing warnings and the responsible person's name, the tag format may contain further information such as, but not limited to:
  - Company name.
  - Reason for LOTO.
  - Work being completed.
  - Date and time of initial lockout.
  - Supervisor's name.
  - Emergency phone numbers.
- Where lockout with a keyed lock is not possible, a tag(s) containing the above mentioned information shall be in place (e.g. steering wheel lockout) at the point of isolation or as close as safely possible.
  - The tag shall be highly visible and adequately identify the point of isolation and the associated hazards.

4.3.3 Other Lockout Equipment

- Multiple lockout device
  - Utilized where various Authorized Employees will be working on a machine, equipment or system.
  - The multiple lockout device is applied to the point of isolation or to a lockbox, with each Authorized Employee applying his/her individual lock to the multiple lockout device.
- Lockbox
  - Use of the lockbox is coordinated by the Qualified Person.
  - Utilized where various Authorized Employees will be working on a machine, equipment or system.
- *S3AM-325-FM1 Lock & Tag Log* or equivalent.
- Additional equipment to adequately secure the point of isolation. Examples:
  - Chains
  - Lockout pins
  - Plug lockouts
  - Pneumatic lockout devices
  - Lockout bags
  - Valve lockouts
  - Toggle locks
  - Electrical socket lockouts
  - Blanks and blinds

4.4 General LOTO Procedures

4.4.1 Only Authorized Employees trained in lockout/energy control procedures will be involved with the locking out, de-energizing and control of all potential sources of energy on energized systems.

4.4.2 Written procedures for lockout and energy control shall be developed and approved by the Supervisor and shall be implemented prior to performing work. Where client requirements and programs exist, AECOM procedures shall incorporate them and shall be compatible with them.

4.4.3 The site, project or client-specific procedures shall be understood and followed for the health and safety of all staff affected by or involved with the locking out, de-energizing and control of all potential sources of energy prior to the performance of work on energized systems.

4.4.4 No work shall be initiated (including LOTO procedures) prior to obtaining any required permits. Refer also to *S3AM-218-PR1 Permit to Work* for additional guidance related to Safe Work Permits.

4.4.5 The site specific emergency response plan shall be in place and reviewed with all affected personnel potentially affected.

4.4.6 Be aware of the type and magnitude of all potential energy sources, such as:

- Chemical,
- Hydraulic,
- Radiological,
- Electrical,
- Mechanical,
- Residual,
- Gravitational,
- Pneumatic,
- Thermal, and
- X-ray testing of pipes.

4.4.7 It is the responsibility of Managers and/or Supervisors to identify through meetings with Client representatives when and where their work requires the isolation and control of an energy source.

4.4.8 The Manager and/or Supervisor shall:

- Determine whether more than one Authorized Employee or crew will be working on the machine or equipment. As applicable, establish the Qualified Person(s).
- Evaluate the potential for Authorized Employees on multiple shifts to be working on the equipment. If multiple shifts will be working on the same equipment consult the section ‘Shift Change Procedures.’
- Identify and communicate to all Affected Employees and to all Employees whose work operations may be in an area where LOTO procedures may be utilized:
    - The associated energy source(s) of the machine(s), equipment or system that will be de-energized and isolated. Note that more than one source of energy may be involved with each machine, piece of equipment or system.
    - The hazards of the identified energy sources.
    - How the energy will be isolated and brought to a zero energy state.
    - How the energy will be locked out of service, tagged and tested to verify the effectiveness of the controls.

4.4.9 Where the procedures are affected by the facilities or workers of the client, procedures will follow the requirements of and be approved by the client.

4.4.10 Where there is a danger of energy being released or equipment or systems being energized:

- Shut down machine/equipment by normal stopping procedure and confirm that the controls are in a neutral position (off).

- Disconnect the main sources of power by breaking the primary circuit, valve, pipe, etc.
- Each separate energy source shall be disconnected, or in the closed, locked or controlled position.
- The motor switch on all individual motor drives shall be locked in the off position.
- Locking out a low voltage control circuit is not considered breaking a main power source.

4.4.11 Release all residual energy remaining behind the power source (e.g. hydraulic, or air pressure). If there is a possibility of re-accumulation of stored energy level, verify isolation until the task is complete or the possibility no longer exists. Use the following methods to guard against energy left in equipment after it has been isolated: .

- Inspect the system to confirm that all parts have stopped moving.
- Install grounding wires.
- Relieve trapped pressure.
- Release the tension of springs or block the movement of spring-driven parts.
- Block or brace parts that could fall because of gravity.
- Bleed pneumatic and hydraulic systems and leave vent valves open. Block parts in hydraulic and pneumatic systems that could move from loss of pressure.
- Drain process piping systems and close valves to prevent the flow of hazardous materials.
- Use blank flanges on lines without valves that shall be blocked.
- Purge reactor tanks and process lines.
- Dissipate extreme heat or cold when possible.
- Remove fuses from electrical circuits.
- Monitor situations where there is a potential for stored energy to re-accumulate.

4.4.12 Each Authorized Employee shall affix their own individual lock and tag in a manner that will hold the energy-isolating device in a safe or off position.

4.4.13 NOTE: Locks and tags by themselves do not de-energize machinery, equipment or systems. Attach them only after isolation from the energy source(s).

4.4.14 If more than one employee is involved in the LOTO procedure (group lockout) for the given machinery, equipment or system:

- The locks, tags and isolation points are documented by the Supervisor or the Qualified Person using *S3AM-325-FM1 Lock & Tag Log* or equivalent.
- Each Authorized Employee shall apply his/her own individually identifiable lock to a LOTO device capable of accepting multiple locks at the isolation point(s), OR
- Energy isolation and LOTO may be performed by the Qualified Person.
    - The Qualified Person applies the locks and tags at the various isolation points. Depending upon the jurisdiction or client requirements, two Qualified People may be required to apply the locks and tags.
    - After each involved Authorized Employee has verified the system as completely lockout out by the Qualified Person(s), the key(s) to the isolation point lock(s) is placed in a lockbox.
    - Each Authorized Employee applies his/her own individually identifiable lock to the lockbox.
    - Attach the *S3AM-325-FM1 Lock & Tag Log* or equivalent, to the outside of the lockbox.

4.4.15 NOTE: In cases of complex group lockout scenarios; (multiple group lockouts, use of additional locks/lockout devices beyond the available keyed alike locks etc.), an equipment/site specific procedure(s) shall be developed by a competent/qualified worker and reviewed and implemented by all involved Authorized Employees to achieve a zero energy state.

4.4.16 Test the machine(s), equipment or system(s) prior to working on it to verify all sources of energy have been isolated. Examples include, but are not limited to:

- Verifying that the main disconnect switch or circuit breaker can't be moved to the "on" position.
- Depressing all start buttons and activating controls.
- Using a voltmeter to check for potential energization sources.

4.4.17 Under no circumstances is an Authorized Employee allowed to work on machinery, equipment or systems that do not contain their own lock (even if the energy is isolated and locked and tagged by another employee). Authorized Employees shall work *only* on protected source(s) to which they have applied their individual lock (at the isolation point(s) or on the associated lockbox).

4.4.18 Locks and tags will remain in place until the work has been completed.

4.4.19 The locks, tags, and equipment shall not be tampered with by any Employee.

4.4.20 Only the Authorized Employee placing the lock and tag may remove the lock and tag.

4.4.21 If the Employee who placed the LOTO device/sign subsequently no longer works for the company, cannot be located or a LOTO device/sign shall be removed due to an emergency, the Supervisor and/or Qualified Person (and as applicable, the Client Contact) shall be notified and the removal shall follow the procedures in accordance with appropriate section 'Removal of Unattended LOTO Devices' or 'Emergency Lock Removing Procedures'.

4.4.22 Preparing to Re-energize

4.4.23 The following steps shall be taken for temporary operation of a locked out energy source or when restarting a machine, piece or equipment or system in order to place back in service:

- Confirm the task (maintenance, construction, repair) is complete. If more than one Authorized Employee performed the LOTO, inform the Supervisor (or if applicable, the Qualified Person) that the task is complete.
- Confirm that tools are picked up, non-essential items removed, equipment components are intact and safety chains, guards, guard rails, warning signs, etc. are replaced. If a guard, guardrails, etc. shall remain off during temporary operation (e.g. maintenance process requires access during operation, to observe or evaluate operation during maintenance or repair, etc.), appropriate control measures shall be established and in place to confirm the safety of all personnel.
- The Authorized Employee shall notify Affected Employees that the lockout device(s) will be removed. If more than one Authorized Employee performed the LOTO, the Supervisor (or if applicable, the Qualified Person) will confirm the notification of all Affected Employees and Authorized Employees.
- Remove all locks and tags. This can be done only by the Authorized Employee who applied the lock and/or tag, unless 'Removal of Unattended LOTO Devices' or 'Emergency Lock Removing Procedures' are followed.
- The Authorized Employee (or, if a group lockout, the Supervisor or Qualified Person) shall complete a thorough inspection of the machinery, equipment, or system and worksite, to confirm the equipment is ready for start-up.
- Advise all Affected Employees and Authorized Employees that the equipment or process will be restarted.
- Confirm all personnel are clear of all line of fire zones. Position controls correctly for start-up; machinery, equipment or system may be restarted.

- If the restart was initiated as temporary operation of a locked out energy source, the machinery, equipment or system shall be immediately de-energized, isolated and LOTO procedures completed again immediately following the required temporary operation.

4.5 Shift Change Procedures

4.5.1 If ongoing work requires carryover from shift to shift, or transfer of responsibility between Authorized Employees, the following procedure will be implemented:

- The Authorized Employee(s) who originally performed the lockout will walk through the lockout/isolation steps with the new Authorized Employee(s).
- At each isolation point, the original Authorized Employee shall remove his/her LOTO device(s), to be immediately replaced by the new Authorized Employee's device(s).
- Upon transfer of the LOTO equipment, the new Authorized Employee(s) shall verify that the equipment is still isolated prior to continuation of work.

4.5.2 Under no circumstances shall the original LOTO devices remain in place and just the keys transferred.

4.5.3 For a Supervisor and Qualified Person conducting group lockouts, the same procedure shall be used with the oncoming Supervisor or Qualified Person.

4.6 Removal of Unattended LOTO Devices

4.6.1 Only the person(s) who placed the LOTO devices on the system can remove the devices, unless:

- The Manager has verified that the Authorized Employee is not on site and is not available to return to the site to remove the lock.
- All reasonable efforts have been made to contact the Authorized Employee to verify that the work is complete and the devices are about to be removed.
- The Manager inspects the LOTO device and confirms that the appropriate steps in preparation of safely re-energizing the machinery, equipment or system have been completed.

4.6.2 If all of the above apply, the locks and tags will be removed only at the direction of the Manager. The Manager shall complete an *S3AM-325-FM3 Unattended & Emergency Lock Removal Form* or equivalent, to document the event prior to removing the lock and file the form with the project / location files. A copy of the form shall be sent to the SH&E Department member with oversight responsibility for the project / location.

4.6.3 The Manager shall confirm the affected machinery, equipment or system is monitored to confirm no one returns while re-energizing.

4.6.4 UNAUTHORIZED REMOVAL OF A LOTO DEVICE WILL RESULT IN IMMEDIATE DISMISSAL FROM THE PROJECT SITE AND POTENTIAL TERMINATION!

4.6.5 The Authorized Employee whose LOTO device was removed shall be informed of the removal prior to resuming work.

4.7 Emergency Lock Removing Procedures

4.7.1 This procedure will ONLY be used in an emergency situation defined as an event that may cause injury, fire, explosion, over exposure or other hazards to the general public, the environment or personnel.

4.7.2 In an emergency event that requires a lock or tag to be removed by a person other than the Authorized Employee who placed the lock or tag, the following lock-removing procedure will be implemented by the Supervisor or Qualified Person, or by another Authorized Employee under the direction or observation of the Supervisor or Qualified Person:

- As the situation permits, attempt to contact the Authorized Employee whose LOTO device shall be removed.

- Investigate and verify that all equipment and material in relation to the work has been completed and/or put into a safe configuration.
- Confirm all Authorized Employees have been removed from the hazardous location and all Affected Employees on site are notified.
- Remove the LOTO device.

4.7.3 If not notified prior to lock removal, attempt to contact the Authorized Employee whose lock was removed to advise that the LOTO device has been removed.

4.7.4 The Manager shall complete an *S3AM-325-FM3 Unattended & Emergency Lock Removal Form*, or equivalent, to document the event and file the form with the project /location files. A copy of the form shall be sent to the SH&E Department member with oversight responsibility for the project / location.

4.7.5 Whenever a LOTO is removed for emergency purposes by anyone other than the Authorized Employee who placed the LOTO, that person and all other Authorized Employees and Affected Employees shall be contacted (immediately if on shift, and prior to the start of their next shift if off shift) to inform them that the equipment/system is no longer locked out/tagged out.

4.8 Specific LOTO Procedures

4.8.1 Written procedures will be developed for the LOTO of each piece of equipment that has potentially hazardous energy sources. Refer to *S3AM-325-ATT1 Equipment-Specific LOTO Procedure Template* or equivalent.

4.8.2 Each procedure shall be reviewed and approved by the SH&E Department prior to implementation.

4.8.3 Equipment-specific written LOTO procedures are not required, if ALL of the following conditions are met:

- The equipment's only energy source is electrical;
- The unexpected start-up of the equipment is controlled by unplugging the equipment from the electrical source; and
- The plug or switch is under the exclusive control of the person performing the work.

4.8.4 Additionally, written equipment-specific LOTO procedures are not required if ALL of the following apply:

- The machine has no potential for stored or residual energy, or re-accumulation of stored energy after shutdown (i.e. contains a capacitor to store electrical energy or pressurized tank to store air/gas);
- The machine has a single energy source that can be readily identified and isolated;
- The lockout and isolation of the energy source completely de-energizes and deactivates the equipment;
- Servicing of the machine requires that its energy source shall previously have been locked out and tagged out in accordance with General LOTO Procedures as provided in this Standard Operating Procedure; and
- A single lockout device achieves a locked-out condition.

4.8.5 All equipment-specific LOTO procedures will be prepared to meet the following:

- Equipment-specific LOTO procedures shall be developed in accordance with the requirements of this procedure.
- Procedures are to involve completion of Form *S3AM-325-FM2 LOTO Verification Checklist* or equivalent;
- Authorized Employee(s) perform work according to manufacturer's specifications;

- Equipment-specific preparation for re-energizing procedures shall be developed in accordance with General LOTO Procedures as provided in this Standard Operating Procedure;
- Reenergize the machine, equipment or system according to manufacturer's specifications.

4.9 LOTO Procedures (no Equipment-Specific Written Procedure)

4.9.1 In the absence of an equipment-specific LOTO procedure, the following procedures, in combination with a completed Safe Work Plan and/or Task Hazard Analysis can be used as an acceptable substitute.

4.9.2 Process Equipment

- Determine what energy sources are present, such as electrical, gas, pressurized systems (e.g. steam, water, and hydraulics), heated fluids or gas (e.g. steam, hot water), and gravity (e.g. suspended piping).
- Determine which of these sources requires isolation to perform the work.
- Determine the locations where each energy source for the system / piece of equipment can be turned off/isolated AND be locked out. For example, if a machine has an on/off button, pushing the button to the off position is not sufficient isolation, since the button cannot be locked out. The equipment shall either be unplugged and the plug lockout out or the circuit breaker or electrical switch supplying the machine or equipment located, closed and locked out.
- Make sure Employees in the area are aware the equipment is about to be shut-down and locked out, and then close the isolation devices. Once closed, the Authorized Employee(s) lock out the isolation devices so they cannot be inadvertently opened.
- Place an appropriate tag on each lock out device based on the tag requirements.
- Once locked out, verify that the isolation was successful by following manufacturers' directions or standard trade practice. Means of determining whether isolation was successful include, but are not limited to:
  - Attempting to start up equipment,
  - Opening pressure relief valves, and
  - Attempting to ignite the pilot light.
- Complete the *S3AM-325-FM2 LOTO Verification Checklist*, or equivalent.
- Authorized Employee(s) perform the necessary work.
- Confirm all tools and non-essential items are removed from the work area. Confirm removed guards are replaced and equipment/system components are intact.
- Inform Employees in the area that the LOTO systems will be removed
- Authorized Employee(s) remove their individual tag(s) and lock(s) used to isolate the various energy sources.
- Open up each isolation source. For fluid or gas systems, check for leaks at the area the work was performed as necessary.
- Inform Employees in the area that the LOTO systems have been removed.
- If additional work is required (e.g., repair of leak, fine tuning of work), the LOTO procedure shall be re-established. Under no circumstances shall work be performed on the equipment without prior isolation of the energy sources.

4.9.3 Electrical Systems

- In general, AECOM personnel will provide LOTO services in low-voltage situations only (voltage is below 600 volts). Specific procedures for high-voltage situations (above 600 volts), will either be developed by certified AECOM electrical personnel appropriately trained and

competent in high-voltage electrical work or by subcontractor high-voltage operations. Developed high-voltage procedures shall obtain approval from the SH&E Manager. If an electrical subcontractor is utilized, they will be required to provide documentation of their high-voltage certification.

- If the lockout involves a low-voltage (voltage is below 600 volts) electrical system, an Authorized Employee shall be a qualified electrician or , as permitted, an equivalent qualified and competent worker will lockout and de-energize all applicable electrical systems:
    - Identify the disconnect or breaker by matching its name or number for each piece of equipment.
    - Identify any secondary and tertiary systems within the electrical system (i.e. capacitors).
    - Open disconnect or breaker and all other applicable systems; lock them open with multiple-lockout device and tag the lock(s).
    - Where disconnecting devices cannot be locked open, the equipment (electric or mechanical), shall be disabled by removing fuses, breakers or disconnecting wire leads, etc.
    - Appropriate “Danger – Do Not Operate” tag shall be securely placed on the source of electrical or mechanical energy.
    - Removed fuses are not to be left in the general area of the equipment that is to be isolated.
    - All disconnected wires shall have the ends isolated.
    - Verify the power is disconnected by attempting to activate the equipment.
    - All Authorized Employees associated with work requiring the electrical lockout shall be present to witness and verify the test.
    - Confirm all Authorized Employees and Affected Employees are standing clear during this test.
    - If equipment involves a motor:
    - Activate the manual motor control station to confirm the power is disconnected.
    - If equipment is on delay:
    - Wait a predetermined time to confirm the power is disconnected.
- Competent Electrical Worker
    - If it is necessary to test for voltage (e.g. before applying grounds):
    - Prove the integrity of the voltage tester against a known live circuit.
    - Check the voltage between phases and to ground.
    - Re-prove the integrity of the voltage tester against the known live circuit.
- Isolating Electrical Circuits without a Lockout Device
- Note: Only a competent electrical worker may undertake the following steps in accordance with NFPA 70E Standard for Electrical Safety in the Workplace and/or the Canadian Electrical Code.
    - Where reliable lockout mechanisms are not available:
    - Remove the conductors from the breaker.
    - Isolate and protect the bare conductors.
    - Test the disconnected circuit for voltage.

- Identify and tag the circuit.

- When the work is completed:
  - At the completion of the installation, disassembly, repair or maintenance, confirm that all parts and guards are replaced and all tools / equipment are removed.
  - Do not remove locks, replace fuses, etc. until it is verified all personnel are clear of all line of fire zones, the work is finished and a thorough inspection of the equipment and worksite is completed.
  - Removal of personal lock(s) and/or Lock-Out Tag(s) is only to be performed by the Authorized Employee(s) who affixed the tag(s) or lock(s).
  - Remove the “DO NOT OPERATE” sign.

4.9.4 Pressurized Water, Air or Inert Gas(e.g. Nitrogen, Carbon Dioxide, etc.)

- Note that more than one source of energy may be involved with the system. Make sure the equipment to be worked on is turned off / isolated, locked out and tagged out in accordance with the requirements of this procedure.
- Turn off (close) any valve upstream of the work area. Note: if steam or water can enter the pipe from the normal downstream side, either verify that the check valve is operating properly, or confirm that all necessary valves have been closed and are functioning properly. If this procedure is being used in preparation of confined space entry, positive isolation (i.e. line break, blind plate, or double-block and bleed) shall be established on both sides prior to authorizing confined space entry.
- Using the appropriate locking device, Authorized Employee(s) lock and tag the valve(s) in the closed position. Confirm the tag contains all pertinent information.
- Allow the system to be worked to cool down (in the case of steam or hot water).
- Once cooled, open any unsecured pressure relief valves and drain any additional fluids from the system. If the system is not equipped with a pressure relief or drain system, make sure the pipes are cool to the touch and slowly open and drain in accordance with standard trade practice.
- Once the system has been reduced to atmospheric pressure, the pipes or lines shall be disconnected, blinded, or closed by a valve and locked out and/or tagged out accordingly. Observe line entry procedures when first opening the line.
- Complete *S3AM-325-FM2 LOTO Verification Checklist* or equivalent.
- Authorized Employee(s) perform the necessary work.
- Confirm all sections are replaced, secure and closed.
- Remove all tools and non-essential items from the work area.
- Inform Employees in the area that work has been completed and equipment is being energized.
- Removal of personal lock(s) and/or Lock-Out Tag(s) is only to be performed by the Authorized Employee(s) who affixed the tag(s) or lock(s).
- Slowly open the valve, stopping when water or steam flow has started. Observe the work performed to make sure no leaks are evident. If leaks are observed, re-close the valve, isolate the system, and follow the steps of this section to reapply and verify the LOTO of the system.
- If no leaks are detected, gradually open the isolation valves to their normal position.

4.9.5 Pressurized Gas (e.g. Natural Gas, Propane, etc.)

- Note that more than one source of energy may be involved with the system. Make sure the equipment to be worked on is turned off / isolated, locked out and tagged out in accordance with the requirements of this procedure.
- Confirm appropriate atmospheric monitoring is in place and maintained as necessary.
- Turn off the valve upstream from the area to be worked on. Note: if gas can enter the pipe from the normal downstream side, either verify that the check valve is operating properly, or confirm that all necessary valves have been closed and are functioning properly. If this procedure is being used in preparation of confined space entry, positive isolation (i.e. line break, blind plate, or double-block and bleed) shall be established on both sides prior to authorizing confined space entry.
- Using the appropriate locking device, Authorized Employee(s) lock and tag the valve(s) in the closed position. Confirm the tag contains all pertinent information.
- Confirm all spark sources in the area have been isolated or removed.
- Using non-sparking tools, the Authorized Employee(s) shall remove the remaining gas in the line using standard trade practice. If in an enclosed area, make sure appropriate ventilation is present. If the flow of gas does not stop, then shut down the next upstream valve, or the gas main valve. Each additional valve closed shall be locked out and tagged out.
- Complete *S3AM-325-FM2 LOTO Verification Checklist* or equivalent.
- Authorized Employee(s) perform the required work. If hot work is necessary (e.g. soldering, grinding, welding), confirm the requirements of *S3AM-332-PR1 Hot Work* are followed prior to authorizing work.
- Once work has been completed, make sure that all connections are replaced and secured as required.
- Confirm all tools and non-essential items are removed from the work area.
- Inform Employees in the area that work has been completed and equipment is being energized.
- Removal of personal lock(s) and/or Lock-Out Tag(s) is only to be performed by the Authorized Employee(s) who affixed the tag(s) or lock(s).
- Slowly open the valve, stopping when gas flow has started. Observe the work performed to make sure no leaks are evident.
- Test the work area for leaks using an approved testing solution. If leaks are detected, re-close the valve(s), isolate the system, and follow the steps of this section to reapply and verify the LOTO of the system before additional repairs can be made.
- If no leaks are detected, gradually open the isolation valves to their normal position.

4.9.6 Mobile Equipment

- Mobile equipment being repaired / maintained shall be prevented from being inadvertently started and Employees protected from unexpected movement.
- The Authorized Employee(s) conducting the repairs / maintenance shall remove the keys from the ignition.
- Each Authorized Employee is to fix a Tagout device indicating warning e.g. “DO NOT OPERATE” to the steering mechanism.
- The Tagout Device(s) shall include:
    - Name of Authorized Employee applying the tag
    - Date

- Time
- Location of keys

- Conduct any other necessary isolation procedures (i.e. application of emergency brake, blocking of tires, etc.).
- Verify that there is no stored energy on the piece of equipment that is to be worked on.
- Authorized Employee(s) perform the required work
- At the completion of the repair or maintenance, confirm that all parts and guards are replaced and all tools / equipment are removed.
- Do not remove locks, disengage brakes, etc. until it is verified all personnel are clear of all line of fire zones, the work is finished and a thorough inspection of the equipment is completed.
- At the completion of the repair / maintenance, the Tagout device(s) shall only be removed by the Authorized Employee(s) who affixed the tag.

4.9.7 Mechanical Systems

- Mechanical systems (pumps, turbines, etc.) to be installed, disassembled, repaired, tested or maintained shall be prevented from being inadvertently started or energy released. The Qualified Person or Authorized Employee shall confirm:
- The Qualified Person or Authorized Employee shall confirm motors or engines are turned off / isolated, locked out and tagged out in accordance with these procedures.
- Note that more than one source of energy may be involved with the system.
- The Authorized Employee(s) shall apply personal lock(s) and tag(s) to the starting mechanism when possible. If not possible affix Tagout device(s) indicating warning e.g. “DO NOT OPERATE” to the starting mechanism of the motor or engine.
- The Tagout device is to include:
  - Name of individual applying the tag
  - Date
  - Time
- The Authorized Employee(s) shall apply any applicable brakes, pawls or other manufacturer installed isolation devices.
- Authorized Employee(s) lockout and tag all applicable mechanical equipment (e.g. valves) using lockout devices such as, but not limited to:
  - Securing hazardous parts to other fixed and immobile parts.
  - Chain secured through valves or handles at required position.
  - Blanking and blinding.
- Authorized Employee(s) restrict the movement of any other parts that could release stored energy (i.e. sheaves, counterweights, etc.) and provide secondary isolation where necessary through measures such as, but not limited to:
  - Securing hazardous parts to other fixed and immobile parts.
  - Support or isolation of hazardous parts through the use of rigging attached to hoisting equipment, winch lines, etc.
- Verify that there is no stored energy on the piece of equipment that is to be worked on.
- Authorized Employee(s) perform the required work

- At the completion of the installation, disassembly, repair or maintenance, confirm that all parts and guards are replaced and all tools / equipment are removed.
- Do not remove locks, disengage brakes, open valves, etc. until it is verified all personnel are clear of all line of fire zones, the work is finished and a thorough inspection of the equipment and worksite is completed.
- Release of securement or support mechanisms, disengaging of brakes and opening of valves shall be performed only by the Authorized Employee(s).
- Removal of personal lock(s) and/or tag(s) is only to be performed by the Authorized Employee(s) who affixed the lock(s) and/or tag(s).

4.10 Annual Program Review

4.10.1 At least annually (or whenever any incident or serious near miss occurs due to inadequate LOTO) , an independent Qualified Person or Authorized Employee who is not involved in the procedure being assessed shall conduct and document a review and assessment of the energy control program specific to the identified facility. The assessment should include a meeting with Authorized Employees and any other Affected Employees.

4.10.2 The assessment shall include the following elements.

- Where lockout is used, evaluation of the Authorized Employees' understanding of responsibilities under the LOTO program.
- Hold group meetings, attended by the Authorized Employee who is performing the inspection and all Qualified People and Authorized Employees who implement the procedure.
- Where tagout is used, evaluation of the Authorized Employees' understanding of responsibilities under the LOTO program and the limitations of the tagout system.
- Review LOTO verification checklists and other documentation to confirm procedure is being correctly followed and documented.
- Observe active application of the LOTO program.
- If deficiencies are noted during the assessment, corrective actions and retraining of Employees, as necessary, shall be performed immediately.
- The inspector shall provide a copy of all assessment documentation to the applicable Manager for review and filing.

4.10.3 These assessments shall, at least, provide for a demonstration of the procedures and may be implemented through random audits and planned visual observations. These assessments are intended to confirm that the energy control procedures are being properly and consistently implemented.

5.0 Records

5.1 Location or project orientation and training records shall be retained in their respective permanent file repository (project files or SH&E Department files).

6.0 Attachments

6.1 S3AM-325-ATT1 Sample Tags

6.2 S3AM-325-FM1 Lock & Tag Log

6.3 S3AM-325-FM2 LOTO Verification Checklist

6.4 S3AM-325-FM3 Unattended & Emergency Lock Removal

6.5 S3AM-325-FM4 Lockout Tagout Permit

6.6 S3AM-325-FM5 Annual Program & Training Assessment

6.7 S3AM-325-FM6 Equipment-Specific LOTO Procedure Template

Americas

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.

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 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. 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 clearing is required in urban areas.

4.6.4 Hand clearing is also recommended for non-urban areas and may be required by the given 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.

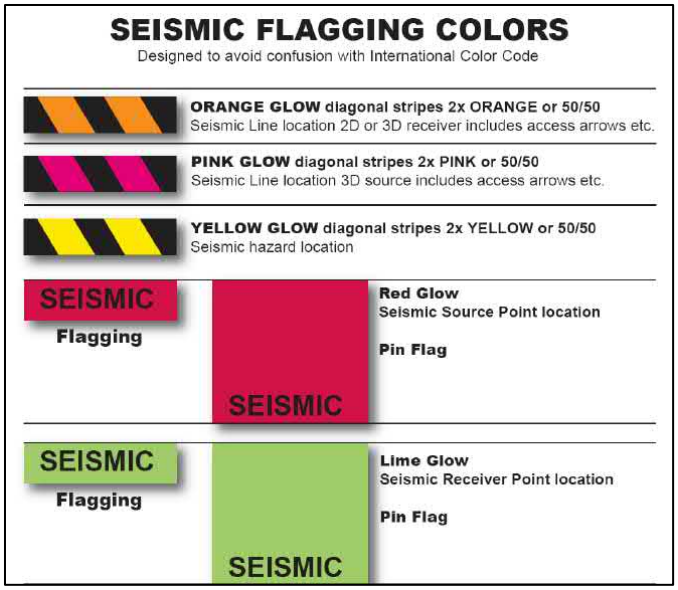
4.8 Uniform Color Coding

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 hand cleared 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, hand clearing should be conducted if possible and shall be conducted as required by the given jurisdiction.
- Hand 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

Hot Work

S3AM-332-PR1

1.0 Purpose and Scope

1.1 Establishes the minimum requirements for welding, cutting, and other hot work activities. Other AECOM activities may also trigger the need for a Hot Work Permit and procedure depending upon the associated hazards (e.g. internal combustion engine or electrical equipment in flammable atmospheres).

1.2 This procedure applies to all AECOM Americas-based employees and operations.

1.3 AECOM's clients may have hot work related procedures. Provided the client's procedures meet or exceed those of AECOM, the client procedures may be used in place of AECOM's procedure. AECOM employees shall be familiar with client requirements for welding, cutting and other hot work activities and coordinate such activities with the client representative.

2.0 Terms and Definitions

2.1 **Authorized Air Monitor** – Worker(s) who have been designated to monitor the presence of flammable gas in the area where hot work is planned using appropriate air-monitoring equipment.

2.2 **Class I Location – Gases or Vapors** – Hazardous area in which flammable gases or vapors may be present in sufficient quantities to be explosive or ignitable. Local regulations should be reviewed to ensure all conditions are met prior to entering work zone.

2.3 **Class II Location – Combustible Dust** – Hazardous area in which combustible dust under normal operating conditions is present at concentrations sufficient to produce explosive or ignitable mixtures. Local regulations should be reviewed to ensure all conditions are met prior to entering work zone.

2.4 **Class III Location – Fibers** – Hazardous area in which fibers or materials capable of producing combustible fibers are present in concentrations sufficient to produce ignitable mixtures. Local regulations should be reviewed to ensure all conditions are met prior to entering work zone.

2.5 **Combustible Material –** Any material that may ignite when introduced to an ignition source (e.g., wood, paper, cardboard and plastic).

2.6 **Designated Area** – A specific area designed or approved for hot work, such as a maintenance shop, a detached outside location that is of non-combustible or fire-resistive construction, or an outdoor location (many greenfield construction sites) essentially free of combustible and flammable contents, and suitably segregated from adjacent areas. A Hot Work Permit is not required in a Designated Area.

2.7 **Fire Watch** – Worker(s) designated to monitoring hot work and the surrounding area for incipient fires and changing conditions.

2.8 **Hot Work –** A work activity that by the nature of the operation (e.g., grinding, burning, thermo cutting/welding, brazing, etc.) creates an open source of ignition (primary source of ignition or secondary source of ignition) or that could produce temperatures high enough to cause the ignition of flammable gases and combustible materials.

2.9 **Hot Work Control Areas** – Fire-hazardous areas such as cable-spreading rooms, cable trays, conveyor galleries, rubber-lined piping equipment and structures, potentially explosive atmospheres, and similar hazardous hot work areas identified by project safety personnel.

2.10 **Hot Work Operator –** Worker(s) who will handle the hot work equipment and conduct the hot work processes.

2.11 **Hot Work Permit** – Document issued prior to the start of hot work, which is used to verify the presence of appropriate fire prevention and protection measures.

2.12 **Intrinsically Safe** – A form of protection based on the restriction of electrical energy within the system, equipment or tool to a level below that which may cause ignition by either sparking or heating effects. Most electronic communication devices, flashlights, cameras and power tools are not rated as intrinsically safe.

2.13 **Lower Explosive Limit (LEL) –** The minimum concentration of a particular flammable or combustible gas or vapor necessary to support its combustion in air. The safety factor for hot work is 10 percent of the LEL as measured using a calibrated combustible gas detector. Note: At 10 percent of the LEL, the atmosphere may be considered immediately dangerous to life and health (IDLH). In some locations, the safety factor for hot work is 5 percent of the LEL.

2.14 **Primary Source Ignition (PSI) Hot Work** – Any work with equipment and tools that use high-energy sources (open flames, electric arcs or incandescent spark) that may ignite flammable or combustible atmospheres, solid materials or liquids when used in a normal manner. PSI hot work is often referred to as 'naked flame' hot work. Examples of PSI hot work include, but are not limited to, the following:

- Welding and burning,
- Grinding, and
- Torch cutting and soldering.

2.15 **Secondary Source Ignition (SSI) Hot Work –** Any work with equipment and tools that may create low-energy sparks and ignite a flammable or combustible atmosphere when used in a normal manner or due to errors or malfunction. SSI hot work is also referred to as 'spark potential' hot work. Examples of SSI hot work include, but are not limited to, the following:

- Sandblasting;
- Using electrical or electronic equipment that is not intrinsically safe or explosion proof (e.g., most electronic communication devices, flashlight, etc.);
- Using spark-ignition engines (including vehicles) in a Class I area (e.g., vehicle entry into a tank dike);
- Using a rotating steel brush;
- Electrical isolation testing; and
- Producing a friction spark, typically from a rusty surface.

2.16 **Sources of ignition** – In locations where flammable vapors may be present, precautions shall be taken to prevent ignition by eliminating or controlling ignition sources. These may include open flames, lightning, smoking, cutting and welding, hot surfaces, frictional heat, sparks (static, electrical, and mechanical), spontaneous ignition, chemical and physical-chemical reactions, and radiant heat.

3.0 References

3.1	Q2-312-PR1	Monitoring and Measuring Equipment Procedure
3.2	S3AM-002-PR1	Stop Work Authority
3.3	S3AM-003-PR1	SH&E Training
3.4	S3AM-011-PR1	Fire Protection
3.5	S3AM-012-PR1	First Aid
3.6	S3AM-202-PR1	Competent Person Designation
3.7	S3AM-208-PR1	Personal Protective Equipment
3.8	S3AM-218-PR1	Permit to Work
3.9	S3AM-301-PR1	Confined Spaces

3.10 S3AM-325-PR1 Lockout Tagout

3.11 S3AM-123-PR1 Respiratory Protection

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Manager/Supervisor**

- Administer this procedure and the development of the project SH&E Plan.
- Confirm AECOM Employees receive the specified level of protection as to project welding, cutting and burning activities.
- Confirm a Hot Work Permit is issued and has been signed by all parties prior to starting hot work and all control measures are maintained during hot work.
- Confirm compliance with this procedure during all hot work operations.
- Confirm all Employees performing hot work and in the vicinity of hot work are appropriately trained to the applicable tasks and associated hazards.

4.1.2 **Hot Work Operator**

- Maintain appropriate training to the task(s) to be undertaken. Know and apply applicable company and regulatory policies and procedures related to hot work operations.
- Participate in the inspection of welding and burning equipment and work areas.
- Participate in the completion of and sign the Hot Work Permit to acknowledge his or her understanding of the conditions documented on the permit.
- Comply with the conditions of the issued Hot Work Permit.
- Safely handle hot work equipment and processes.
- Stop hot work operations immediately if unsafe conditions develop and notify the Manager or Supervisor immediately for evaluation and appropriate action.

4.1.3 **Authorized Air Monitor**

- Responsible for operating air-monitoring equipment to monitor the presence of flammable gas in the area where hot work is planned.
- Participate in the completion of and sign the Hot Work Permit to acknowledge his or her understanding of the conditions documented on the permit. Perform the following duties:
    - Verify that the air monitoring device to be used is calibrated according to the manufacturer's instructions and that calibration information is documented in Section B – Atmospheric Monitoring of *S3AM-332-FM1 Hot Work Permit* or equivalent.
    - Perform initial air monitoring of the hot work area for the presence of flammable gas.
    - Perform continuous air monitoring for the presence of flammable gas between the hot work and potential vapor sources.
    - Verify that a LEL Mitigation Plan is developed and documented in Section C – LEL Mitigation Plan of *S3AM-332-FM1 Hot Work Permit* or equivalent if initial or continuous air monitoring detects the presence of flammable gas (LEL is greater than 0 percent).
    - Verify that the LEL Mitigation Plan is implemented and flammability is controlled to less than 10 percent (or 5% in certain jurisdictions) of the LEL before allowing hot work to proceed.

- Stop all hot work if any air monitoring reading is greater than 10 percent (or 5% in certain jurisdictions) of the LEL.

- The Authorized Air Monitor may also be the Fire Watch, if a Fire Watch is required per Section D – Fire Watch of *S3AM-332-FM1 Hot Work Permit*.
- The Authorized Air Monitor shall not be a Hot Work Operator during PSI hot work but may be a Hot Work Operator during SSI Class 1 hot work.
- NOTE: Refer to Air Monitoring (Class 1 Areas) of this procedure for additional information regarding the Authorized Air Monitor and air monitoring requirements.

4.1.4 **Fire Watch**

- Responsible for monitoring hot work and the surrounding area for incipient fires and changing conditions.
- Participate in the completion of and sign the Hot Work Permit to acknowledge his or her understanding of the conditions documented on the permit.
- The Fire Watch may also be the Authorized Air Monitor. Refer to Section D – Fire Watch of *S3AM-332-FM1 Hot Work Permit*
- Perform no duties other than those required of the Fire Watch, and if applicable, the Authorized Air Monitor.
- Perform no other duties apart from fire watch duties (and Authorized Air Monitor if applicable), including, but not limited to the following duties:
  - Understand the location, nature and hazards of the hot work to be performed.
  - Survey the area to verify that the necessary fire protection equipment is in place and ready for use and be trained in its use.
  - Confirm that safe conditions are maintained during hot work operations.
  - Remain within communication range of the person(s) performing the hot work and maintain a line of sight with the hot work.
  - Do not leave the area for any reason without a replacement or stopping the hot work.
  - Watch for fires in all areas exposed to hot work and communicate to Hot Work Operators to cease all hot work if a fire occurs.
  - Try to extinguish a fire only when the fire is obviously within the capacity of the equipment available.
  - Sound the alarm (e.g., air horn) and implement evacuation procedures immediately if determined a fire is not within the capacity of the available extinguishing equipment.
  - In the absence of fire or evacuation, remain in the hot work area at least 30 minutes after the hot work has ceased to detect and extinguish possible smoldering fires.
- The Fire Watch shall not be a Hot Work Operator and shall have no other duties other than Fire Watch, and if applicable, the Authorized Air Monitor, during the hot work activities and for a period of at least 30 minutes afterwards.

4.2 General Requirements

4.2.1 As applicable, alternative methods to hot work shall be employed when fire-hazardous areas (e.g., cable-spreading rooms, cable trays, conveyor galleries, rubber-lined piping equipment and structures, etc.), potentially explosive atmospheres, and similar hazardous areas may be encountered.

4.2.2 At a minimum, a SH&E Plan and a task hazard assessment (THA) shall be prepared prior to any hot work activities.

- The SH&E Plan will identify the hot work activities and address any required environmental monitoring including gas monitoring, dust, noise, metals, radiation or other monitoring as may be appropriate for site conditions.
- The SH&E Plan will provide the measures required to eliminate or otherwise control the hazards associated with the hot work.
- The Hot Work Permit Applicability decision flow chart contained in the procedure shall be used to identify air monitor, fire watch and hot work permit requirements. Refer also to *S3AM-218-PR1 Permit to Work* for additional guidance related to Safe Work Permits.
- All SH&E Plan requirements will be followed by AECOM personnel.
- 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. Refer to *S3AM-010-PR1 Emergency Response Planning*.

4.2.3 Before any hot work is performed, and as part of developing the SH&E Plan, the area shall be evaluated for flammables or combustibles by the Supervisor responsible for authorizing hot work. Examples may include, but are not limited to:

- Identifying flooring materials.
- Determining if any materials such as paper, straw or wood shavings are within 50 feet (15.24 meters) of the proposed hot work.
- Verifying the contents of any containers or tanks within 50 feet (15.24 meters) of the proposed hot work.
- Testing to determine if flammable atmospheres exist in the proposed hot work area.
- Testing the atmosphere in vessels that may be welded or cut to verify adequate cleaning or purging.
- Assessing the dryness of grass or trees in the hot work area and vicinity.

4.2.4 Where hot work permits are used, all hot work activities shall be controlled and isolated from flammables and combustibles.

4.2.5 Performing hot work in classified and non-classified areas may be considered a hazardous activity, and a Hot Work Permit may be required. Refer to *S3AM-332-FM1 Hot Work Permit*.

4.2.6 The Hot Work Permit has five purposes:

- To serve as written permission to do the work;
- To provide a minimum safety checklist;
- To show the steps necessary to provide a safe job site for conducting hot work;
- To alert operating personnel to the work in progress; and
- To provide a record of safety steps taken for contract work.

4.2.7 The client may also have requirements for whether a hot work permit is required.

4.2.8 Individuals, who have the technical and procedural competencies as defined by AECOM as well as their roles within the Hot Work activity, shall provide input to the permit as necessary to address all hazards and permit conditions related to the hot work.

4.2.9 Engineering controls shall be implemented to control hot work hazards to the extent feasible.

- Non-intrinsically safe equipment is prohibited from all locations that may contain a flammable

or combustible atmosphere.

- Positive air shut-off valves on internal combustion engines may be required to prevent ignition of flammable or combustible atmospheres.
- When possible, objects to be welded, cut, or heated shall be moved to a designated safe location. If this is not possible, all movable combustibles in the workspace shall be taken away to a safe place.
- If the object to be welded, cut, or heated cannot be moved and all combustibles cannot be removed (e.g., equipment, walls, floors, etc.), positive means shall be taken to confine the heat, sparks, and slag to protect the immovable combustibles.
- No welding, cutting, or heating shall be done where application of flammable paint, presence of other flammable compounds, or heavy dust concentrations create a possible hazard.
- Wherever there are openings or cracks in the flooring that cannot be closed, precautions shall be taken so no sparks or slag will drop through the floor. The same precautions shall be taken in the presence of cracks or holes in walls, open doorways, and open or broken windows.
- Provide metal buckets for disposal of electrode stubs.
- When feasible, ventilation shall be in place to control atmospheric hazards.

4.2.10 Identify the type of metal to be worked on and protective coatings that have been applied. Where coatings are flammable or toxic, the coating shall be stripped a minimum of four inches (10 centimeters) from the areas of heat application.

- Before welding, cutting, or heating is commenced on any surface covered by a preservative coating whose flammability is not known, a test shall be made by a competent person to determine its flammability. Refer to *S3AM-202-PR1 Competent Person*.

4.2.11 Position welding screens or shields to protect workers and passers-by from welding arc rays.

4.2.12 All hot work equipment shall be used only for operations for which it is approved and as recommended by the manufacturer and maintained in good repair in accordance with manufacturer's specifications.

4.2.13 All personnel involved in a hot work operation have the authority and responsibility to stop any work that they consider to be unsafe. Refer to *S3AM-002-PR1 Stop Work Authority.*

4.2.14 Employees assigned to operate or maintain oxygen/fuel-gas supply equipment and resistance welding equipment will be thoroughly instructed in the safe use and maintenance of such equipment by a qualified person.

4.2.15 If other Employees are required to work in the vicinity of hot work operations, they shall be protected, given the required PPE, and be notified of the work and all safety procedures prior to starting the hot work (e.g., screens, signs identifying workpieces that are hot, barricades and restricted entry to hot work area, etc.).

4.2.16 Exposure to welding operations can result in eye damage, burns, or respiratory illness. If an incident occurs, seek medical attention and report it to the Manager or Supervisor. Refer to *S3AM-004-PR1 Incident Reporting, Notifications & Investigation*.

4.2.17 Training shall be provided as to the use of Hot Work Permits to all associated Employees in accordance with *S3AM-003-PR1 SH&E Training*.

4.3 Training

4.3.1 Employees shall be trained and, as applicable, certified in accordance with anticipated tasks (e.g. Welding, Air Monitor, Fire Watch, etc.), associated hazards, and jurisdictional requirements (e.g., Mexico - annual training to safety procedures of the welding and cutting program). Refer to *S3AM-003-PR1 SH&E Training*.

4.3.2 Training shall be provided as to the use of Hot Work Permits to all associated Employees in accordance with *S3AM-003-PR1 SH&E Training.*

4.4 Personal Protective Equipment

4.4.1 Selection and use of personal protective equipment shall comply with *S3AM-208-PR1 Personal Protective Equipment.*

- Contact lenses should not be worn if there is a potential exposure to chemicals that can irritate the eye.

4.4.2 Eye and Face Protection

- ANSI/CSA-approved welding helmets and hand shields shall be used during all arc welding/cutting operations, excluding submerged arc welding. ANSI/CSA-approved cutting / welding goggles shall also be worn during arc welding/cutting operations. The goggles or glasses may be either clear or colored glass, depending on the type of exposure in welding operations.
- If required to observe the welding operation, use an ANSI/CSA-approved welder's helmet fitted with a filter shade that is suitable for the type of welding that is being performed.
- If required to observe the chipping and grinding operation, use ANSI/CSA-approved impact rated safety goggles or safety glasses with both UVA and UVB radiation protection along with an ANSI/CSA-approved impact rated face shield or welder's helmet.
- ANSI/CSA-approved safety goggles or other ANSI/CSA-approved eye/face protection shall be used during light work gas welding operations, torch brazing, or inspection.
- Hot Work Operators and attendants on resistance welding or brazing equipment shall use ANSI/CSA-approved face shields or goggles, depending on the particular job.

4.4.3 Protective Clothing

- All welders shall wear flameproof gauntlet gloves.
- Welders shall wear approved fire resistant welding jackets or aprons made of leather, or other suitable material for protection against radiated heat and sparks.
- Fire-resistant clothing (FRC) or, as permitted, clothing made of natural fibers (wool, cotton) is required for welders and others working with the Hot Work Operators. Synthetic materials are prohibited.
- ASTM/CSA-approved steel-toed boots with a minimum of 6 inches (15.24cm) of ankle support.

4.4.4 Respiratory Protective Equipment

- Respiratory protective equipment will be selected, used, and maintained in accordance with *S3AM-123-PR1 Respiratory Protection*.
- Respiratory protective equipment shall be required when feasible engineering controls are insufficient to mitigate the respiratory hazards.
- Respiratory protective equipment may be required when one or more of the following conditions exist:
  - Room size (with special regard to ceiling height) is limited, or welding/cutting work is extensive and ventilation is limited.
  - Several welders are working in the area at the same time.
  - Potentially unsafe atmospheric conditions exist.
  - Hazardous fumes, gases, or dusts of toxic metals, particularly lead, cadmium, chromium, beryllium, and zinc, are present in the base metal or in coatings.

4.5 Non-Permissible Areas

4.5.1 All hot work is prohibited in areas not authorized by facility management and the following areas:

- In sprinkler-equipped buildings where sprinklers are impaired, unless the requirements of NFPA 25 are met (or equivalent local standard);
- In the presence of explosive atmospheres (greater than or equal to 10 percent of the LEL); or
- In the presence of unclean or improperly prepared tanks, vessels or other containers and equipment that have previously contained flammable or combustible materials when their contents may be exposed to an ignition source.

4.6 Hot Work Permit

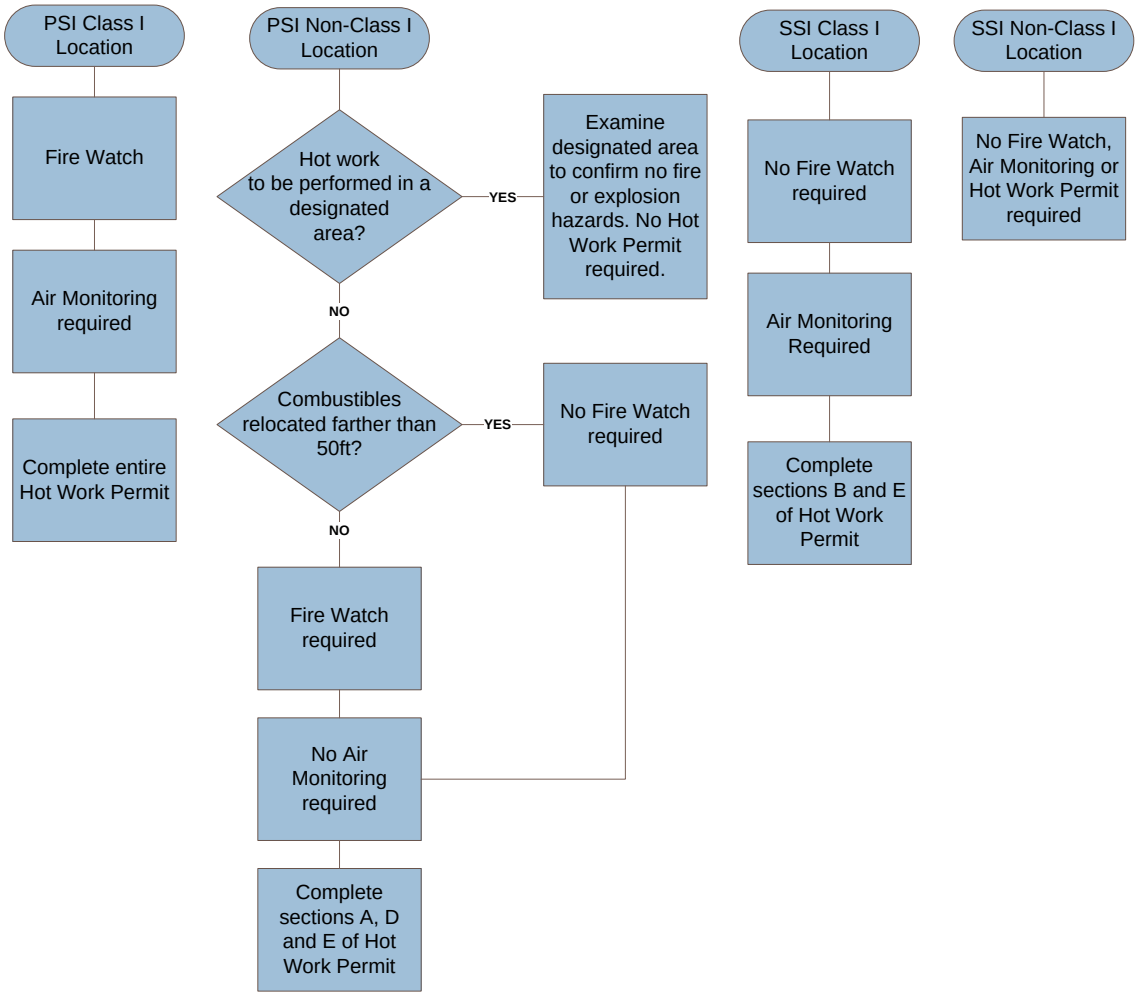
4.6.1 A Hot Work Permit is required and shall be prepared before any PSI hot work (other than in a designated area) or any SSI Class 1 Location hot work is performed. Any volatile contaminants (surface or subsurface) on sites shall be evaluated to determine if the definition of Class 1 is met.

4.6.2 A Hot Work Permit is not required for SSI non-Class 1 Location hot work.

4.6.3 A Hot Work Permit is valid for no more than one work shift.

- If hot work is suspended during a shift, the permit shall be revalidated before further hot work can continue.
- Revalidation involves inspecting the hot work area for any change to previous conditions and conducting air monitoring if the hot work is performed in a Class 1 Location.

4.6.4 Hot Work Permit Applicability



4.6.5 Air Monitoring Program

- An Air Monitoring Program shall be developed before any Class 1 hot work is performed.
- The following information, which is documented in Section B of *S3AM-332-FM1 Hot Work Permit* or equivalent, shall be included in the Air Monitoring Program:
  - The area where the hot work shall be performed, including the specific points where the hot work will be performed.
  - All hot work equipment (ignition sources) and all potential sources of flammable gas within 50 feet (15.24 meters) of the hot work. Examples of potential sources of flammable gas include sumps, drains, flanges, valves, liquid boots, excavations and all confined areas and equipment located within them, such as floating roof pontoons, piping, excavations, vessels and boreholes or wells with potentially flammable gases.
  - The area that shall be monitored by the Authorized Air Monitor. At a minimum, this includes a 50-foot (15.24-meter) radius from the point of the hot work. Hot work in a confined space requires air monitoring for flammable gas throughout the entire space. Refer to *S3AM-301-PR1 Confined Spaces*.
- All air monitoring associated with hot work shall be conducted by an Authorized Air Monitor who is trained and competent in the use of the instrument and hazards of the monitored area.
- The instrument(s) used for air monitoring shall be calibrated by the Authorized Air Monitor prior

to use, refer to *Q2-312-PR1 Monitoring and Measuring Equipment Procedure.* The Authorized Air Monitor shall maintain documentation of the calibrations in Section B –of *S3AM-332-FM Hot Work Permit* or equivalent form.

- Air monitoring equipment is to produce an audible alarm when LEL exceeds the established set point (e.g. 5 percent or 10 percent). The authorized air monitor shall remain in hearing range of the audible alarm and locate the air monitoring equipment between the hot work and potential vapor source. More than one instrument may be needed to monitor the air properly.
- Initial readings shall be recorded in Section B–of *S3AM-332-FM Hot Work Permit* or equivalent form prior to signing the permit. If readings are >0%, Section C – LEL Mitigation Plan or equivalent form shall be completed.

4.7 LEL Mitigation Plan

4.7.1 Section C of *S3AM-332-FM1 Hot Work Permit* documents the location of confirmed sources of flammable gas and the controls needed to eliminate, reduce or maintain the LEL reading to less than 10 percent (or 5% in certain jurisdictions) of the LEL.

4.7.2 An LEL Mitigation Plan shall be developed and implemented if the presence of flammable gas is detected (LEL greater than 0 percent) at any time during the hot work.

4.7.3 The following information shall be documented in Section C of *S3AM-332-FM1 Hot Work Permit* or equivalent form:

- The percent of the LEL that was measured;
- The identified source(s) of the flammable gas within the hot work area;
- The controls, if any, that shall be implemented to effectively eliminate, reduce or maintain the flammability level to less than 10 percent (or 5% in certain jurisdictions) of the LEL within the hot work area; and
- The percent LEL measured after controls, if any, have been implemented.

Note: If at any time the LEL reading is greater than or equal to the safety factor of 10 percent (or 5% in certain jurisdictions) of the LEL, the hot work shall stop immediately and shall not resume until controls are implemented to reduce the LEL level to less than the safety factor (as per jurisdiction, 5% or 10%) of the LEL.

4.8 Fire Watch Requirements

4.8.1 A Fire Watch is required whenever the hot work meets any of the following criteria:

- The hot work consists of PSI Class 1 hot work.
- The PSI hot work will be performed:
  - Within 50 feet (15.24 meters) of shielded combustible material;
  - Within a 50-foot (15.24-meter) radius of wall or floor openings that expose combustible materials;
  - Adjacent to metal partitions, walls, ceilings or roofs that are in contact with combustible materials on the other side and are likely to be ignited by conduction or radiation; or
  - Where fire alarms or suppression systems have to be disabled.

4.8.2 In some cases more than one fire watch may be necessary (e.g. various levels in a building). This shall be identified in the SH&E Plan and the THA.

4.8.3 The Fire Watch shall be in the ready position at all times while hot work is being performed. The ready position consists of the following:

- Being attentive to the hot work being performed.
- Properly positioning the fire extinguisher prior to the start of work.
- Always maintaining a line of sight to the hot work being performed.

4.8.4 The Fire Watch shall stop the work if he or she deems that:

- Unsafe conditions have developed.
- The work is exceeding the scope described in the Hot Work Permit.

4.8.5 A Fire Watch shall be maintained for at least 30 minutes after completion of hot work operations so that possible smoldering fire can be detected and extinguished.

4.8.6 They shall be familiar with facilities and procedures in the event of a fire. The Fire Department shall be immediately notified of all fires.

4.8.7 A second Fire Watch shall be required if one Fire Watch cannot directly observe combustible materials that could be ignited by the hot work operation.

4.9 PSI Hot Work

4.9.1 PSI hot work, such as grinding, has been known to generate sparks with enough force to transport them up to 50 feet (15.24 meters) from the point of the hot work; therefore, it is possible to perform PSI hot work up to 50 feet (15.24 meters) away from a Class 1 location and yet still introduce an ignition source into a Class 1 area.

4.9.2 Prior to performing PSI hot work, the following requirements shall be met and shall be verified by the permit writer:

- All combustible and flammable materials shall be relocated at least 50 feet (15.24 meters) in all directions from the job site.

4.9.3 If relocating these materials is impractical (e.g. equipment, walls, floors, etc.), the following precautions shall be taken:

- The materials shall be shielded with fire-retardant covers or with metal or fire-retardant guards or curtains.
- The edges of covers at the floor shall be tight to prevent the entrance of sparks, including at the point where several covers overlap when a large pile is being protected.
- NOTE: Consideration should be given to spark-containment techniques that lessen the distance sparks are able to travel freely (e.g., fire-retardant screens, guards, spark/slag catcher).
- A fully charged and operable fire extinguisher appropriate for the type of potential fire shall be available for use in the work area (20 pounds [9.07 kilograms] minimum), refer to *S3-NA-106-PR1 Fire Protection* procedure.
- A non-flammable, impervious material shall seal sewer openings, ducts and drains. Where sealing is insecure or impractical, water spray or stream should be directed across openings.
- The location of the hot work relative to combustible and flammable materials and classified areas shall determine the need for a Fire Watch, as outlined in this practice. Personnel within the vicinity of the hot work shall be suitably protected against such dangers as heat, sparks, flash and slag.

4.10 Preparation for PSI Class 1 Location Hot Work

4.10.1 Prior to performing any PSI Class 1 hot work, the requirements set forth for All PSI Hot Work and the relevant requirements of air monitoring of this practice shall be met and verified by the permit writer. Additional requirements include:

- The venting, draining or bleeding of flammable or combustible liquids and gases shall be stopped within 50 feet (15.24 meters) of the hot work.
- Affected excavations, conduits and manholes within 50 feet (15.24 meters) of the hot work shall either be monitored for the presence of flammable gas or sealed to confirm that an ignition source is not introduced.
- NOTE – Non-intrinsically safe tools (including cell phones) are prohibited from use in Class 1 Locations, except as defined in Initial and Continuous Hot Work Air Monitoring, regarding SSI Class 1 Hot Work.

4.11 Preparation for PSI Hot Work within 50 feet (15.24 meters) of Buildings or Other Structures

4.11.1 The conditions in Preparation for all PSI Hot Work shall be met and verified before any PSI hot work is performed inside or within 50 feet (15.24 meters) of buildings or structures with building materials or contents that may be combustible or flammable. Additional requirements include:

- Openings or cracks in walls, floors or ducts within 50 feet (15.24 meters) of the hot work shall be tightly covered with fire-retardant or non-combustible materials to prevent the passage of sparks to adjacent areas.
- Ducts that might carry sparks to distant combustible or flammable materials shall be shielded, shut or both.
- If hot work is performed near walls, partitions, ceilings or roofs of combustible materials, fire-retardant shields or guards shall be provided to prevent ignition.
- If hot work is done on one side of a wall, partition, ceiling or roof, combustibles on the other side shall be relocated if possible. If it is impractical to relocate combustibles, a Fire Watch shall be provided on the side of the combustibles.
- Hot work shall not be attempted on a partition, wall, ceiling or roof with a combustible covering or insulation, or on walls or partitions of combustible sandwich panels or similar construction.
- If the hot work is close enough to cause ignition by conduction, it shall not be performed on pipes or other metal that is in contact with combustible walls, partitions, ceilings roofs or other combustibles.
- The following shall apply to hot work performed in close proximity to a sprinkler head:
    - A wet rag shall be laid over the sprinkler head and then removed at the conclusion of the welding or cutting operation.
    - Special precautions (e.g., ventilation, shielding) shall be taken during the hot work to avoid accidental operation of automatic fire suppression systems. Consultation with the building owner, system manufacturer or other authority may be required.

4.12 SSI Class I Location Hot Work

4.12.1 Periodic up to continuous air monitoring, as determined by the permit writer and documented on the Hot Work Permit Section B –*S3AM-332-FM1 Hot Work Permit* or equivalent form shall be performed and the results documented.

4.12.2 NOTE: Non-intrinsically safe tools (including cell phones) are prohibited from use in Class 1 areas, except as defined in Initial and Continuous Hot Work Air Monitoring, regarding SSI Class 1 hot work.

4.13 Air Monitoring (Class 1 Locations)

4.13.1 Flammable and combustible liquids and gases are present in Class 1 Locations. In order to perform hot work safely in these areas, initial and continuous air monitoring is required to confirm that any flammable gas in the work area is detected and properly controlled.

- Hot work is prohibited if air monitoring readings are greater than or equal to 10 percent of the

LEL (or 5% in certain jurisdictions).

4.13.2 If the hot work will be performed in a tank or vessel, the air monitoring requirements for confined spaces shall apply. Refer to *S3AM-301-PR1 Confined Spaces*.

4.13.3 When the possibility exists for an oxygen-deficient atmosphere, the oxygen level could be below the level (10 percent oxygen) required by the air monitor to give the correct flammability (LEL) reading.

- Alternate testing methods shall be required to accurately assess the flammability hazard.
- This may occur where a tank, vessel or piping contains an inert gas such as nitrogen or carbon dioxide. For this reason, it is important to monitor oxygen levels prior to monitoring for LEL.

4.13.4 Continuous Hot Work Air Monitoring (PSI Class 1 Locations)

- All PSI Class 1 Location hot work requires attended continuous air monitoring while the hot work is being performed.
- An Air Monitor shall survey the perimeter of the permitted area at least once an hour. The survey shall cover at least a 50 feet (15.24 meters) radius from the point of the hot work.
- When not conducting a periodic perimeter survey, the authorized gas tester shall be primarily positioned between the hot work and any potential sources of flammable gas.
- NOTE: The use of several air monitors around the hot work should be considered, depending on the work location. If more than one continuous monitor is in use, only one instrument needs to be actively attended.
- Readings from continuous air monitoring and hourly surveys should be recorded on the Hot Work Permit, even if the monitors do not alarm and the readings do not differ from the initial air monitoring results.
- If initial air monitoring readings are 0 percent LEL, but continuous air monitoring indicates the presence of flammable gas (greater than 0 percent of the LEL), the hot work shall stop and an LEL Mitigation Plan shall be developed, documented, and implemented.
- If the implementation of the LEL Mitigation Plan controls the flammability level to the safety factor of less than 10 percent (or 5% in certain jurisdictions) of the LEL, the authorized gas tester will continue monitoring the area while hot work continues.
- If at any time the LEL reading reaches the safety factor (as per jurisdiction, 5% or 10%), the hot work shall stop until the source of the flammable gas is controlled to less than the jurisdictional safety factor of the LEL.
- During drilling operations, where the potential of flammable gas is known to exist, the borehole may be classified as a Class 1 Location and continuous gas monitor shall be used in the immediate proximity of the top of the hole.

4.13.5 Initial and Continuous Hot Work Air Monitoring (SSI Class 1 Locations)

- Vehicles, mobile plant equipment and other non-intrinsically safe equipment present potential ignition sources. Consequently, SSI hot work in Class 1 Locations (e.g., a tank dike) requires the completion of a Hot Work Permit and air monitoring.
- Air monitoring shall be performed for SSI hot work in Class 1 Locations:
    - Before a vehicle or equipment that is not intrinsically safe is allowed to enter the Class 1 area, an authorized gas tester shall survey the area along its planned path to its destination.
    - The vehicle or equipment can proceed into the classified area only when flammability readings are 0 percent LEL, or less than 10 percent (or 5% in certain jurisdictions) of the

LEL with an implemented LEL Mitigation Plan.

- Continuous air monitoring shall be performed as long as the vehicle's engine or non-intrinsically safe equipment is running and initial monitoring is greater than 0 percent.
- If the vehicle or non-intrinsically safe equipment is shut off, it shall not be restarted until the area around the vehicle or non-intrinsically safe equipment is surveyed for flammable gas.
- The planned egress of the vehicle or equipment from the Class 1 Location shall be surveyed for flammable gas prior to its departure from the area.
- Periodic up to continuous air monitoring, as determined by the risk assessment, shall be performed and documented on the Hot Work Permit.

4.14 Welding and Cutting General Requirements

4.14.1 Avoid looking directly at the welding arc.

4.14.2 Avoid prolonged exposure to welding/paint fumes.

4.14.3 Avoid touching recently welded joints.

4.14.4 Welding/Cutting on Containers

- No welding, cutting, or other hot work shall be performed on empty drums, barrels, tanks, or other containers until they have been thoroughly cleaned and it is absolutely certain that there are no flammable materials present or any substances such as greases, tars, acids, or other materials which, when subjected to heat, might produce flammable or toxic vapors. Any connection to the drum or vessel shall be disconnected or blanked off.
- All hollow spaces, vacancies, or containers shall be ventilated to remove gases before preheating, cutting, or welding. Purging with inert gas is recommended.
- In addition to the requirements presented in *S3AM-301-PR1 Confined Spaces*, welding/cutting in confined spaces such as a tank, boiler, pressure vessel, or small compartment shall require the following precautionary measures:
  - Local exhaust ventilation shall be provided, unless workers wear supplied-air respirators.
  - Gas cylinders and/or welding machines shall be placed outside the confined space.

4.14.5 If irritation or "red eye" occurs as a result of welder's flash, employees shall contact non-emergency medical support immediately through the applicable AECOM-dedicated line. Refer to *S3AM-004-PR1 Incident Reporting, Notifications & Investigation* and *S3AM-012-PR1 First Aid*. Symptoms may include:

- Pain that may be mild to very severe;
- Bloodshot eyes;
- Light sensitivity;
- Watery eyes;
- Blurred vision; and
- The feeling of having something in the eye.

4.14.6 Employees should seek urgent medical help, in accordance with *S3AM-004-PR1 Incident Reporting* and *S3AM-012-PR1 First Aid*, if any of the following symptoms are experienced:

- Blurred vision;
- Vision changes;
- Seeing spots or flashes of light;

- Pain when moving eyes; and
- Worsening pain.

4.15 Gas Welding and Cutting Safety Requirements

4.15.1 Fuel-gas hoses and oxygen hoses shall be easily distinguishable from each other. The contrast shall be made by different colors or by surface characteristics readily distinguishable by touch. Oxygen and fuel-gas hoses shall not be interchangeable. A single hose having more than one gas passage shall not be used.

4.15.2 When parallel sections of oxygen and fuel-gas hose are taped together, not more than 4 inches (10 centimeters) out of 12 inches (30.5 centimeters) shall be covered by tape.

4.15.3 All hoses in use shall be inspected at the beginning of each work shift. Defective hose shall be immediately removed from service.

4.15.4 Hoses, cables, and other equipment shall be kept clear of walkways, ladders, and stairs.

4.15.5 Clogged torch tip openings shall be cleaned with approved cleaning wires, drills, or other devices designed for this purpose.

4.15.6 Torches to be used shall be inspected at the beginning of each work shift for leaking shutoff valves, damaged hose couplings, and clogged tip connection. Defective torches shall not be used.

4.15.7 Torches shall be ignited by friction lighters or other approved devices only. Matches and, flame lighters shall not be used to ignite a torch.

4.15.8 Oxygen and fuel-gas pressure regulators, including related gauges, shall be in proper working order and equipped with “Flashback” arrestors attached to the gauges. NOTE: Flashback arresters are in addition to “Backflow” devices.

4.15.9 All oxygen cylinders and fittings shall be kept away from oil or grease.

- Cylinders, cylinder caps and valves, couplings, regulators, hose, and apparatus shall be kept free from oil or greasy substances and shall not be handled with oily hands or gloves.
- Oxygen shall not be directed at oily surfaces or greasy clothes, or used within a fuel oil or other storage tank or vessel.

4.15.10 Torches and hoses shall be completely depressurized (bled) of pressurized gas, prior to storage, or at the end of each shift.

4.15.11 Torches and hoses shall not be stored in enclosed areas (e.g., gang boxes, lockers) while connected to cylinders and gauges shall be removed at the end of shift.

4.15.12 Oxygen connections shall include a means to prevent backflow.

4.15.13 Fuel-gas cylinders shall be provided flashback protection.

4.16 Arc Welding and Cutting Safety Requirements

4.16.1 Electrode holders that are designed for arc welding/cutting and are capable of safely handling the maximum rate current shall be used.

4.16.2 Any current-carrying parts passing through the holder which the arc welder or cutter grips in his/her hand, or the outer surfaces of the jaws of the holder, shall be fully insulated against the maximum voltage encountered and properly grounded.

4.16.3 Grounding is required of the welding machine and the welding circuit.

- Grounding the welding machine is not required if the machine is not double insulated, as indicated by the box-within-box symbol on the rating plate.
- The ground clamp or ground lead (separate from the workpiece connection or workpiece lead) shall connect the workpiece, or the metal table the workpiece rests upon, to a suitable ground,

such as a metal building frame.

4.16.4 All arc welding/cutting cables shall be completely insulated and flexible, capable of handling the maximum current requirements of the work.

4.16.5 Only cables free from repair or splices for a minimum distance of 10 feet (3 meters) from the electrode holder shall be used. Cables with standard insulated connectors or splices with insulating quality that is equal to that of the cable are permitted.

4.16.6 If it is necessary to splice lengths of cable, insulated connectors equivalent to that of the cable shall be used. If connections are made by cable lugs, they shall be securely fastened together and provide good electrical contact. Exposed metal parts of the lugs shall be completely insulated.

4.16.7 If electrode holders are left unattended, the electrodes shall be removed and the holder placed so that they cannot make electrical contact with employees or conducting objects.

4.16.8 To avoid the possibility of electric shock, particularly in humid or damp environments, appropriate and dry PPE shall be worn. Electrode holders shall not be dipped in water.

4.16.9 When the arc welder or cutter leaves work, stops work for any length of time, or when the arc welding cutting machine is to be moved, the power supply to the equipment shall be turned off.

4.16.10 Any faulty or defective equipment shall be reported to the Supervisor and tagged out of service until repaired.

4.16.11 All arc welding/cutting operations shall be shielded by non-combustible or flameproof screens to protect employees and other persons working in the vicinity from the direct ray of the arc.

4.17 Storage and Handling of Compressed Gas Cylinders

4.17.1 Compressed gas cylinders shall be legibly marked with either the chemical or trade name of the gas in accordance with Globally Harmonized System (GHS) or Workplace Hazardous Materials Information System (WHMIS) standardized labelling. Such markings will be stenciled, stamped, or labelled and shall not be easily removable.

4.17.2 The marking shall be located on the shoulder of the cylinder.

4.17.3 Compressed gas cylinders shall be equipped with approved connections.

4.17.4 Acetylene cylinders shall be stored and used valve end up.

4.17.5 Cylinders shall not be stored near highly combustible/flammable materials, especially oil or grease.

4.17.6 All cylinders shall be stored in an upright and secured position (with chains) with caps installed and separated from fuel-gas cylinders or combustible materials (especially oil or grease), by a minimum distance of 20 feet (6 meters), or by a non-combustible barrier at least 5 feet (1.5 meters) high and having a fire-resistance rating of at least one half hour.

4.17.7 Cylinders shall be not dropped, struck by objects, or permitted to strike each other violently.

4.17.8 Cylinder valves shall be closed, gauges removed and caps installed before moving cylinders.

4.17.9 Cylinder valves shall be closed and gauges removed at the end of the shift or when work is finished.

4.17.10 Valves of empty cylinders shall be closed.

4.17.11 Cylinders shall be kept far enough away from the actual welding/cutting operation so that sparks, hot slag, or flames shall not reach them.

4.17.12 Cylinder valves shall always be opened slowly.

4.17.13 An acetylene cylinder valve shall not be opened more than one and one-half turns of the valve stem and preferably no more than three-fourths of a turn.

4.17.14 Do not use acetylene at a pressure in excess of 15 pounds per square inch (psi) gauge pressure, or 30 psi absolute.

4.17.15 Where a special wrench is required to operate a cylinder valve, it shall be left in position on the stem of the valve while the cylinder is in use. In the case of manifolded or coupled cylinders, at least one such wrench shall be available for immediate use.

4.17.16 Regulators shall be removed, valve caps in place, and valves closed when cylinders are transported by vehicles. All vehicles used to transport cylinders shall have a proper support rack installed.

4.17.17 A suitable cylinder truck, chain, or other steadying device shall be used to prevent cylinders from being knocked over while in use.

4.17.18 Cylinders shall not be placed where they may become part of an electric circuit. Tapping of an electrode against a cylinder to strike an arc shall be prohibited.

4.17.19 Only use warm, not boiling, water to thaw cylinders and valves.

4.17.20 Pressure Reducing Regulators:

- Pressure regulators, including the gauges, shall be in proper working order while in use. If not, immediately remove from service.
- Regulators shall be of an approved type for the type of gas to be utilized.
- When a pressure-reducing regulator is attached to a compressed gas cylinder, the cylinder valve shall be opened just slightly at first, so that the regulator can take on pressure slowly. After which, the valve may be turned open to its normal position. If the regulator takes on pressure too quickly, it can damage the regulator and pressure gauges.
- The operator shall stand to the side of glass covered gauges and not in front of them.

4.17.21 Manifolding of Cylinders

- Cylinder manifolds shall be installed under the supervision of a qualified person(s) and shall comply with proper practices in construction and use.
- All manifolds and parts shall be appropriate for the gases for which they are approved.
- When acetylene cylinders are manifold, approved flashback arresters shall be installed between each cylinder and the coupler block. One flash arrestor installed between the coupler block and regulator is acceptable only for outdoor use or if the number of cylinders coupled does not exceed three.
- Each cylinder lead shall be provided with a backflow check valve.

4.18 Mechanical Ventilation

4.18.1 Mechanical ventilation shall consist of either general dilution systems or local exhaust systems. Local exhaust systems are preferred. The applicable SH&E Plan shall identify ventilation requirements suitable to the work environment and anticipated hazards.

4.18.2 Mechanical ventilation shall be of sufficient capacity and so arranged as to produce the number of air changes necessary to maintain welding fume and smoke within safe limits.

4.18.3 General dilution ventilation may not be used as the only means of control when toxic metals are involved in the operation.

4.18.4 Local exhaust ventilation shall consist of freely movable hoods intended to be placed by the welder or burner as close as practicable to the work. This system shall be of sufficient capacity and so arranged as to remove fumes and smoke at the source and keep the concentration of them in the breathing zone within safe limits

4.18.5 Contaminated air exhausted from a working space shall be discharged into the open air or otherwise clear of the source of intake air. Environmental regulations may require filtering or other cleaning of exhausted air.

4.18.6 All makeup air shall be clean and suitable for breathing.

4.18.7 Oxygen shall not be used for ventilation purposes, comfort cooling, blowing dust from clothing, or for cleaning the work area.

4.18.8 The Supervisor shall provide appropriate methods and controls in the case of specific requirements (including welding rods and fluxes, paints and coatings) for materials containing zinc, lead, mercury, beryllium, cadmium, and stainless steel to be cut, heated, and/or welded.

5.0 Records

5.1 Retain completed *S3AM-332-FM1 Hot Work Permit* or equivalent form in the 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-332-FM1 Hot Work Permit

Americas

Concrete

S3AM-338-PR1

1.0 Purpose and Scope

1.1 The purpose of this procedure is to confirm the safety of AECOM Americas personnel during the installation of concrete forms, pouring of new concrete structures, or installation of preformed concrete structures.

1.2 This procedure applies to AECOM Americas employees where concrete is poured or handled. This procedure also applies to Portland cement, mortar, stucco, and other applications of cementitious products.

2.0 Definitions

2.1 None

3.0 References

3.1 S3AM-208-PR Personal Protect Equipment

3.2 S3AM 304 PR1 Fall Protection

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 General

4.2.1 Employees working above any adjacent working surfaces shall review and conform to the applicable fall protection requirements listed in *S3AM 304 PR1 Fall Protection*.

4.2.2 No employees will be permitted to work above an impalement hazard (e.g., rebar) unless it has been protected to eliminate the hazard of impalement.

4.2.3 Prohibit riding of concrete buckets for any purpose. Keep vibrator crews out from under concrete buckets suspended from cranes or cableways.

4.2.4 Provide an employee with a whistle or other sound-producing device to watch for approaching buckets and warn employees to stand clear while the concrete is dumped.

4.2.5 Where practical, use tag lines to control and position suspended concrete buckets.

4.2.6 Provide PumpCrete™ or similar systems using discharge pipes with pipe supports designed for 100 percent overload. Provide compressed-air hoses in such systems with positive fail-safe joint connectors, or otherwise secure them to prevent separation of sections when pressurized.

4.2.7 All nozzle men applying cement, air, sand and water through a pneumatic or high-pressure hose shall wear protective head, hand, and face equipment.

4.2.8 All concrete workers shall wear protective clothing, including safety glasses; rubber boots, and gloves, to reduce the danger of concrete burns. Refer to *S3AM-208-PR Personal Protection Equipment* for additional information.

4.2.9 Wear appropriate personal protective equipment when using tools and equipment associated with concrete masonry work.

4.2.10 Finishers shall wear safety glasses and face shields when chipping, wire brushing, or using power-impact or rotary tools in patching concrete.

4.2.11 In the pour area, or any area where dry Portland cement is being handled or mixed with water or aggregate, provide means to flush eyes (e.g., eyewash station, bottles) for 15 minutes. If the

material contacts skin, wash skin with water and ph-neutral soap or mild detergent.

4.2.12 Provide temporary winter protection enclosures with adequate ventilation, lighting, and fire protection.

4.2.13 Equip pavers with a loud warning bell or horn that sounds when a paver moves ahead or the bucket is run out.

4.2.14 Provide conical or tapered bottoms with mechanical or pneumatic means of starting the flow of materials for bulk storage bins, containers, or silos.

4.2.15 Construct handles on bull floats used where they may contact energized electrical conductors of nonconductive material, or insulate with a nonconductive sheath whose electrical and mechanical characteristics provide the equivalent protection of a handle constructed of nonconductive material.

4.2.16 Do not extend handles of buggies beyond the wheels on either side of the buggy. Installation of knuckle guards on buggy handles is recommended.

4.2.17 Provide concrete buckets equipped with hydraulic or pneumatically operated gates with positive safety latches or similar safety devices installed to prevent premature or accidental dumping. The buckets will be designed to prevent excess aggregate and loose material from accumulating excessively on the top and sides of the bucket.

4.2.18 Block the wheels of ready-mix trucks and set the brakes to prevent movement when discharging on a slope.

4.2.19 Properly guard exposed gears, chains, and rollers of mixers.

4.2.20 Secure sections and ends of tremies, elephant trunks, and similar concrete conveyances with wire rope, chain, or similar safe fastener.

4.2.21 Equip powered and rotating-type concrete troweling machines that are manually guided with a control or dead-man switch that will automatically shut off the power whenever the operator removes his hands from the equipment handles.

4.2.22 The use of ready-mix concrete trucks may create traffic problems, which proper planning and care can lessen and/or eliminate. Control backing operations through the use of a properly trained and attired flag person/spotter who will be positioned so that they have a clear view of the area behind the truck, as well as be clearly visible to the truck driver. Route movement of personnel and project equipment away from this area so that they do not have to cross the truck's means of egress.

4.3 Forms and Shoring

4.3.1 The completed shoring setup should be a homogenous unit or units. For example, do not use tubular steel shoring in combination with adjustable wood or jack-type shoring.

4.3.2 Confirm that formwork and shoring are be designed, erected, supported, braced, and maintained so that they will safely support all vertical and lateral loads that may be imposed upon them during placement of concrete.

4.3.3 Confirm that drawings or plans showing the jack layout, formwork, shoring, working decks, and scaffolding are available at the jobsite.

4.3.4 Remove and stockpile stripped forms and shoring promptly after stripping in all areas in which persons are required to work or pass. Remove and dispose of adhered concrete from forms and planking before stacking when possible to prevent generation of concrete dust. Pull, cut, or remove by other means any protruding nails, wire ties, and other form accessories not necessary to subsequent work to eliminate the hazard.

4.3.5 Do not impose any construction loads on the partially completed structure unless such loading has been considered in the design and approved by the engineer-architect.

4.3.6 When temporary storage of reinforcing rods, material, or equipment on top of formwork becomes necessary, strengthen these areas to meet the intended loads.

4.3.7 Provide sills for shoring that are sound, rigid, and capable of carrying the maximum intended load.

4.3.8 Inspect all shoring equipment prior to erection to determine that it is as specified in the shoring layout. Do not use any equipment for shoring that is found to be damaged.

4.3.9 Inspect erected shoring equipment immediately prior to, during, and immediately after the placement of concrete. Immediately reinforce or re-shore any shoring equipment that is found to be damaged or weakened.

4.3.10 Provide re-shoring when necessary to safely support slabs and beams after stripping, or where such members are subjected to superimposed loads due to construction work done.

4.3.11 Build shoring or form systems in accordance with the AECOM procedure governing excavation when working in excavations.

4.4 Tube and Coupler Shoring

4.4.1 Use tubular steel frames for shoring layouts in accordance with each manufacturer's recommended safe working load based on tests conducted according to the "Recommended Procedure for Compression Testing Scaffolds and Shores" by the Scaffolding and Shoring Institute.

4.4.2 Prior to erection of steel frame shoring, conduct a thorough inspection to confirm material is not heavily rusted, bent, dented, or otherwise damaged or defective.

4.4.3 Provide final adjustment of adjustment screws prior to placement of concrete. Keep screw extensions to a minimum for maximum load carrying capacity.

4.4.4 Plan, design and construct any form, regardless of size, with an adequate factor of safety.

4.4.5 Do not use couplers (clamps) if they are deformed, broken, have defective or missing threads on bolts, or other defects.

4.4.6 Use material for the coupler (clamps) that is of a structural type such as drop forged steel, malleable iron, or structural grade aluminum. Do not use gray cast iron.

4.4.7 When checking the erected shoring towers with the shoring layout, confirm that the spacing between posts does not exceed that shown on the layout; check all interlocking of tubular members and tightness of couplings.

4.4.8 Confirm that all base plates, shore heads, extension devices, or adjustment screws are in firm contact with the footing sill and the form material, and are snug against the posts.

4.5 Vertical Slip Forms

4.5.1 Confirm that the steel rods or pipe on which the jacks climb or by which the forms are lifted are designed specifically for that purpose. Brace any rods not encased in concrete.

4.5.2 Position jacks and vertical supports in such a manner that the vertical loads are distributed equally and do not exceed the capacity of the jacks.

4.5.3 Provide the jacks or other lifting devices with mechanical dogs or other automatic holding devices to provide protection in case of failure of the power supply or the lifting mechanism.

4.5.4 Lift steadily and uniformly, and do not exceed the predetermined safe rate of lift.

4.5.5 Provide lateral and diagonal bracing of the forms to prevent excessive distortion of the structure during the jacking operation.

4.5.6 During jacking operations, the form structure shall be maintained in line and plumb.

4.5.7 Provide all vertical lift forms with scaffolding or work platforms completely encircling the area of placement.

4.6 Pre-Stressed and Post-Stressed Concrete

4.6.1 Keep tools and strand devices clean and in good repair to prevent failure.

4.6.2 Do not permit employees to stand in line or directly over the jacking equipment during tensioning operations. Provide signs and barriers to prevent employees from working behind the jack. Shield all jacking equipment and attachment pieces to protect the workers performing the stressing operations.

4.6.3 Carefully stack stressed members on a level base.

4.6.4 Pre-stressed girders and beams are often unstable when tipped; brace during transportation and handle in such a way to keep the member upright.

4.6.5 Handle stressed members at pick points specifically designated on the manufacturer's drawings, and with the lifting devices recommended by the manufacturer or the engineer in charge.

4.6.6 Do not allow personnel under stressed members during lifting and erection.

4.6.7 Keep anchor(s) turned up close to the anchor plate during jacking operations of any tensioning element(s).

4.6.8 Frequently inspect pulling heads, bolts, and hydraulic rams for indication of fatigue, and the threads on bolts and nuts for diminishing cross section.

4.7 Pre-Cast Concrete and Tilt-Up Operations

4.7.1 Do not permit employees under pre-cast walls, panels, or sections while they are being lifted or tilted into position.

4.7.2 Use properly attached tag lines, especially if the load is to be lifted and moved into place.

4.7.3 Adequately brace pre-cast walls or vertical concrete panels during construction.

4.7.4 Securely attach braces or shores to the concrete member.

4.7.5 Confirm lifting inserts on or in tilt-up pre-cast concrete members are capable of supporting at least two (2) times the maximum intended load applied or transmitted to them.

4.7.6 Confirm lifting hardware can support at least five (5) times the maximum intended load applied or transmitted to the lifting hardware.

4.8 Masonry Work

4.8.1 Handle and store masonry building materials in accordance with AECOM procedures for material handling; scaffolds for masonry construction shall be built in accordance with the AECOM procedures for scaffolding.

4.8.2 Equip power saws for cutting brick or stone with dust collectors or wet cutting methods to control dust. The exhausted dust will be directed away from vehicle or personnel traffic. If brick, stone, or mortar contains more than 1 percent crystalline silica, respirators may be required until air sampling determines that the task does not constitute a potential respiratory hazard.

4.8.3 Employees cutting brick or stone shall wear approved safety goggles or face shields over safety glasses, and hearing protection as appropriate for the task noise levels.

4.8.4 Keep mortar tubs free from ragged edges that may cut the hands, legs, and arms of bricklayers.

4.8.5 Properly brace all walls or vertical surfaces during construction to withstand wind and other pressure.

4.8.6 Dried mortar will not be dropped from planks, crushed by vehicles, or otherwise handled in such a manner as to create a dust hazard.

4.8.7 Masons and other workers with dusty clothes shall remove their outer clothing or otherwise remove masonry-generated dust from their clothes prior to leaving the work area for breaks or end of work. Do not use high-pressure air to remove dust.

5.0 Records

5.1 The following documentation will be maintained.

5.1.1 Training of flagmen/spotters

5.1.2 Inspections of shoring equipment

5.1.3 Air sampling logs for crystalline silica, as needed

6.0 Attachments

6.1 S3AM-338-ATT1 Concrete Products Health Effects

Attachment C

Stretch/Flex Poster

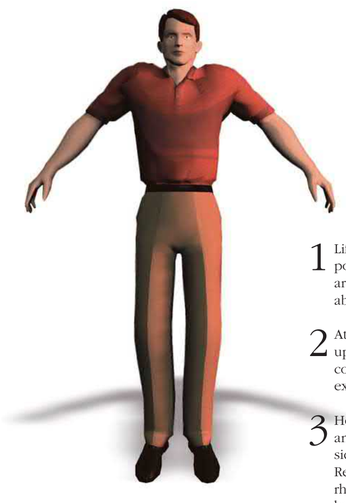
URS

Stretch & Flex Program

WARM-UP BEFORE STRETCHING

Run in place for 30 seconds, 10 jumping jacks, chicken dance, hokie pokie, Macarena, etc. to warm your muscles up.

SHOULDER SHRUG WITH HIGH REACH *Reach High*



1 Lift (shrug) shoulders as high as possible while slowly raising your arms to fully extended position above head.

2 At the same time, lift the body up onto your toes (for as long as comfortable). While reaching high, extend and spread fingers.

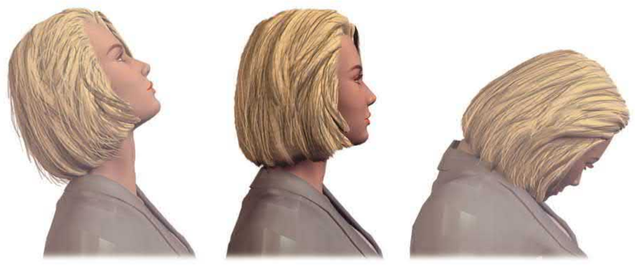
3 Hold this position for 10 seconds and then slowly lower arms to the side into a neutral body position. Relax while breathing slowly and rhythmically. Concentrate on your breathing rate for at least five breath cycles.

TARGET: Biceps, lats, forearms, and muscles that support the spine. Particularly good for using hand tools and light lifting tasks.

NECK STRETCH *Bobblehead*

1 Keep your neck as straight as possible while relaxing your shoulders. Tilt your head to the right. Slowly lower head toward right shoulder.

2 Repeat in four positions: right; left; front, and back each time returning to the upright position.



3 Be sure to do this slowly and do not hold your breath. There should be a complete breath cycle with each position of the head!

TARGET: Neck muscles and stress reducer. Particularly good for equipment operators, office personnel, drafters, CAD operators, and engineers.

TRICEP STRETCH *Backscratch*

1 Bring right hand to upper back between shoulder blades from above shoulder.

2 Place left hand on the tricep (muscle on the underside of the arm) near the elbow.

3 Gently pull right elbow up and back with left hand, moving the right hand down center of upper back as far as comfortable. This should not cause pinching in the neck. Repeat on opposite side.

TARGET: Triceps and shoulders. Particularly good for light lifting, carrying or pushing such as laborers, and mail clerks.

UPPER TRUNK STRETCH *Back Bend*

1 Place hands on back of hips.

2 Slowly arch upper body backward to a comfortable position. Hold while continuing to breath.

3 Return to neutral position and repeat two more times.

TARGET: Lower back, abdominals. Particularly good for truck drivers, equipment operators, laborers.

SHOULDER ROTATION STRETCH *Can Opener*

1 Keeping knees slightly bent, clasp hands behind back.

2 Slowly bend forward from the waist to a comfortable angle while lifting arms upward and behind your back.

3 Hold position for one breath cycle and slowly return to upright position. Repeat two more times.

TARGET: Shoulders and upper back. Particularly good for carpenters, office workers.

TRUNK ROTATION *Sprinkler*

1 Extend left arm out to side and grasp left hip with right hand.

2 Rotate upper body to the left while pulling on hip with right hand.

3 Release tension and change to other side. Repeat on opposite side.

TARGET: Lower back and trunk support muscles. Particularly good for laborers, mechanics, iron workers.

LATERAL ROTATION STRETCH *Take a Bow*

1 Stand upright, feet slightly apart for balance. Extend left arm out to side and grasp left hip with right hand.

2 Rotate upper body to left while pulling on hip with right hand, then bend slowly from waist to left side to a comfortable angle.

3 Return to upright position and change hand locations to other side. Repeat on opposite side.

TARGET: Lats, lower back muscles, abdominals, upper leg muscles. Particularly good for laborers, iron workers.

LATERAL STRETCH *Teapot*

1 Place right hand on waist, extend left arm over head and bend upper body sideways to the right.

2 Hold position for one breath cycle and return to upright position.

3 Repeat two more times and change hand position to other side. Repeat on opposite side.

TARGET: Lats, and triceps plus shoulder mobility. Particularly good for masons, riggers, machinists.

SINGLE LEG STRETCH *Touch Your Toes*

1 Cross legs, keeping both knees slightly flexed.

2 Bend forward slowly from the waist and place both hands on the forward knee. Continue bending forward as far as possible.

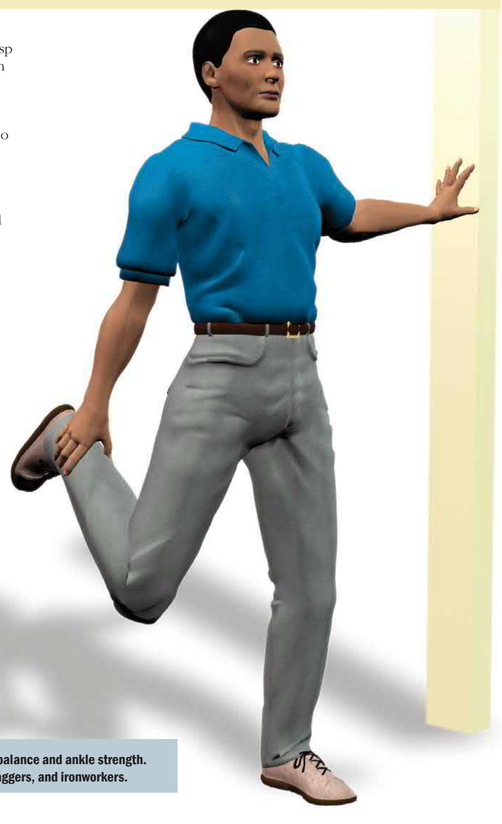
3 Hold position for one breath cycle. WARNING: discontinue this exercise if you become dizzy or lose your balance. Change leg position and repeat.

TARGET: Hamstrings, lower back muscles and stability. Particularly good for laborers, masons, mechanics.

SINGLE QUADRICEPS STRETCH *Ankle Grab*

1 With your left hand hold onto a stationary object for support, grasp your right ankle behind hips with right hand.

2 Pull ankle upward to stretch the quadriceps muscle. WARNING: do not attempt this exercise if you have problems with balance or severe knee injuries. If you have knee injuries, you may elect to lift the lower leg behind you and hold the position for 10 seconds. Repeat on opposite side.



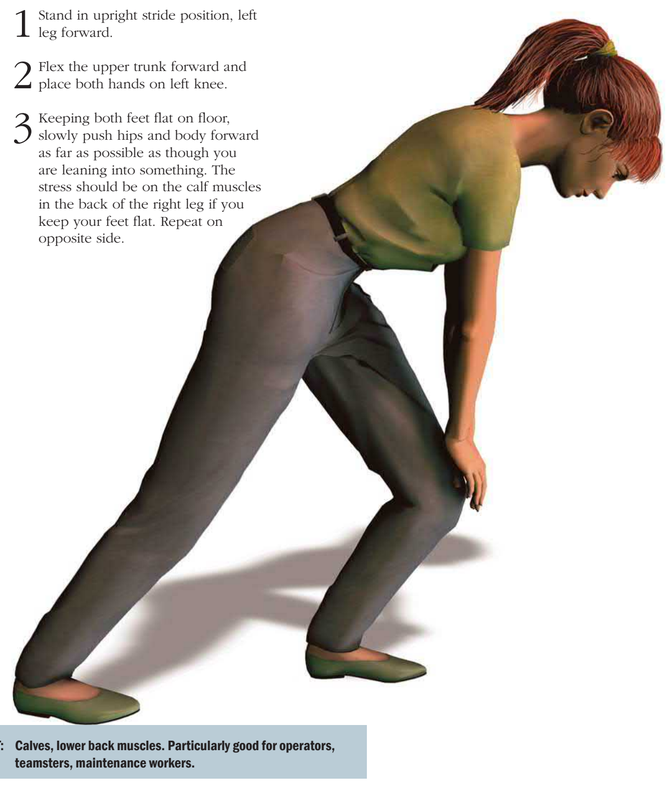
TARGET: Quadriceps and also helps body balance and ankle strength. Particularly good for laborers, flaggers, and ironworkers.

CALF STRETCH *Starting Line*

1 Stand in upright stride position, left leg forward.

2 Flex the upper trunk forward and place both hands on left knee.

3 Keeping both feet flat on floor, slowly push hips and body forward as far as possible as though you are leaning into something. The stress should be on the calf muscles in the back of the right leg if you keep your feet flat. Repeat on opposite side.



TARGET: Calves, lower back muscles. Particularly good for operators, teamsters, maintenance workers.

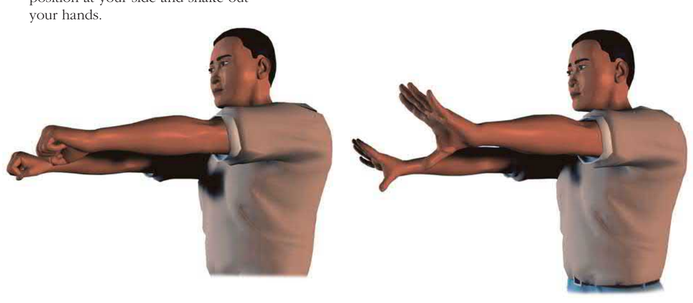
WRIST EXTENSION *Magic Hands*

1 Palms together with fingers apart, press momentarily together and release.

2 Stretch arms out forward and make a fist in each hand. Hold 5 seconds and open hand wide.

3 Force your thumbs down while keeping fingers pointing up towards the sky, wrists are bent back and elbows should be locked. You should feel a slight burn in the upper arm muscles (extensor muscles) of the forearm. These muscles are frequently less used and developed than the flexor muscles in the forearm which leads to unbalance and potential wrist injuries.

4 Hold 10 seconds and release. Return your arms to the neutral arm position at your side and shake out your hands.



TARGET: Extensor muscles. Particularly good for carpenters, administrative professionals, CAD operators, machinists, and maintenance workers.

Attachment D

Safety Data Sheets (SDSs)

MATERIAL SAFETY DATA SHEET

MATERIAL IDENTITY: Super Tech RV & Marine Anti-Freeze

SECTION 1 - MANUFACTURER'S INFORMATION

Manufacturer: Fox Packaging Company
51 East Maryland Avenue
St. Paul, MN 55117-4615

Telephone: (651) 489-8211

Facsimile: (651) 489-8247

Trade Name: Propylene Glycol - Inhibited

Chemical Family: Polyalcohol

Formula: $CH_3CHOHCH_2OH$

CAS NO: 57-55-6

Chemical Transportation Emergency Center (for immediate information about a chemical or to seek assistance from a manufacturer): 1-800-424-9300

SECTION 2 - NORMAL HANDLING PROCEDURES

Precautions To Be Taken In Handling And Storage: Avoid contact with eyes, skin, or clothing. Do not take internally. Upon contact with skin or eyes, wash off with water. Avoid breathing mist or vapor. Store in a cool, dry well-ventilated place.

Protective Equipment:
Eyes: Goggles
Gloves: Impervious
Other: Not required

Ventilation Requirements:
None beyond good room ventilation normally required.

SECTION 3 - HAZARDOUS INGREDIENTS

Basic Material	%	OSHA PEL	LD50	LC50	Significant Effects
Propylene Glycol	30	None Established	>10 g/kg	No Data	Practically non-toxic mild skin and eye irritant.
Dipotassium Phosphate	.2	None Established	**THIS PRODUCT IS NOT SUBJECT TO SECTION 313 OF TITLE III OF S. A. R. A.**		

SECTION 4 - FIRE AND EXPLOSION HAZARD DATA

Flash Point Method: 225°F COC

OSHA Classification: Not Regulated (Ignitable)

Flammable Explosive Limit: **Lower:** 2.6 **Upper:** 12.5

Extinguishing Media: Water spray, dry chemical, alcohol, foam or carbon dioxide.

Special Fire Hazard & Fire Fighting Procedures: Water spray should be used to cool fire exposed containers and/or to disperse unignited vapors. Use NIOSH/MSHA approved positive pressure self-contained breathing apparatus when any material is involved in a fire.

MATERIAL SAFETY DATA SHEET

MATERIAL IDENTITY: Super Tech RV & Marine Anti-Freeze

SECTION 5 - HEALTH HAZARD DATA

Threshold Limit Value: None established.

Symptoms of Over Exposure: Practically non-toxic. Mild skin and eye irritant. May cause diarrhea by oral ingestion.

Emergency First Aid Procedures:
Skin: Flush with water. If an irritation develops, call a physician.
Eyes: Flush with water for 15 minutes, call a physician.
Ingestion: Drink water to dilute.
Inhalation: Remove victim to fresh air.

SECTION 6 - TOXICOLOGY (PRODUCT)

Acute Oral LD 50
>10 g/kg
Acute Dermal LD 50
>2 g/kg
Acute Inhalation LC 50
No Data

Carcinogenicity: Not known to be a carcinogenic.
Mutagenicity: Not known to be a mutagenic.
Eye Irritation: Slight irritant.
Primary Skin Irritation: Slight irritant.

Principal Routes of Absorption: Inhalation.

Effects of Acute Exposure: May cause diarrhea by oral ingestion. May be a slight irritant.

Effects of Chronic Exposure: May be a skin sensitizer in some individuals.

SECTION 7 - SPILL AND LEAKAGE PROCEDURES (CONTROL PROCEDURES)

Action for Material Release or Spill: Wear goggles, coveralls, impervious gloves and boots. Add dry absorbent, shovel or sweep up. Place in an appropriate container and seal. Wash all contaminated clothing before reuse. In the event of a large spill, call the emergency telephone number shown on the front of this sheet.

Waste Disposal Method: Dispose of contaminated product, empty containers and materials used in cleaning up spills or leaks in a manner approved for this material. Consult appropriate federal, state and local regulatory agencies to ascertain proper disposal procedures.

SECTION 8 - SHIPPING DATA

D. O. T. - Not regulated.

MATERIAL SAFETY DATA SHEET

MATERIAL IDENTITY: Super Tech RV & Marine Anti-Freeze

SECTION 9 - REACTIVITY DATA

Stable: Yes **Unstable at:** _____C _____F **Hazardous Polymerization:** May occur - Will not occur - XXX

Conditions to Avoid: Extreme heat

Incompatibility (Material to Avoid): Strong oxidizers

Hazardous Decomposition Products: Carbon Monoxide. Carbon Dioxide.

SECTION 10 - PHYSICAL DATA

Melting Point: No data **Vapor Pressure:** 0.5mmHg/20 °C **Volatiles:** No data

Boiling Point: 370 °F **Solubility in Water:** Soluble **Evaporation Rate:** No data

Specific Gravity: 1.038 (H20=1) **Ph:** No data **Vapor Density:** No data (AIR=1)

Date Prepared: Sep 10, 2003

SAFETY DATA SHEET

DOW AGROSCIENCES LLC

Product name: RODEO Herbicide

Issue Date: 05/14/2015
Print Date: 05/17/2015

DOW AGROSCIENCES LLC encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. IDENTIFICATION

Product name: RODEO Herbicide

Recommended use of the chemical and restrictions on use
Identified uses: End use herbicide product

COMPANY IDENTIFICATION
DOW AGROSCIENCES LLC
9330 ZIONSVILLE RD
INDIANAPOLIS IN 46268-1053
UNITED STATES

Customer Information Number: 800-992-5994
info@dow.com

EMERGENCY TELEPHONE NUMBER
24-Hour Emergency Contact: 800-992-5994
Local Emergency Contact: 352-323-3500

2. HAZARDS IDENTIFICATION

Hazard classification
This material is not hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29CFR 1910.1200.

Other hazards
no data available

3. COMPOSITION/INFORMATION ON INGREDIENTS

This product is a mixture.

Component	CASRN	Concentration
Glyphosate IPA salt	38641-94-0	53.8%

Isopropylamine	75-31-0	1.0%
Balance	Not available	45.2%

4. FIRST AID MEASURES

Description of first aid measures
Inhalation: Move person to fresh air. If person is not breathing, call an emergency responder or ambulance, then give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask etc). Call a poison control center or doctor for treatment advice.

Skin contact: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.

Eye contact: Hold eyes open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eyes. Call a poison control center or doctor for treatment advice.

Ingestion: No emergency medical treatment necessary.

Most important symptoms and effects, both acute and delayed: Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), any additional important symptoms and effects are described in Section 11: Toxicology Information.

Indication of any immediate medical attention and special treatment needed
Notes to physician: No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient. Have the Safety Data Sheet, and if available, the product container or label with you when calling a poison control center or doctor, or going for treatment.

5. FIREFIGHTING MEASURES

Suitable extinguishing media: To extinguish combustible residues of this product use water fog, carbon dioxide, dry chemical or foam. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. Straight or direct water streams may not be effective to extinguish fire. General purpose synthetic foams (including AFFF type) or protein foams are preferred if available. Alcohol resistant foams (ATC type) may function.

Unsuitable extinguishing media: no data available

Special hazards arising from the substance or mixture
Hazardous combustion products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating.

Unusual Fire and Explosion Hazards: This material will not burn until the water has evaporated. Residue can burn. Container may vent and/or rupture due to fire. Electrically ground and bond all equipment. Flammable mixtures of this product are readily ignited even by static discharge. May produce flash fire. Vapors are heavier than air and may travel a long distance and accumulate in low lying areas. Ignition and/or flash back may occur. Flammable mixtures may exist within the vapor space of containers at room temperature.

Advice for firefighters
Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Stay upwind. Keep out of low areas where gases (fumes) can accumulate. Water may not be effective in extinguishing fire. Eliminate ignition sources. Move container from fire area if this is possible without hazard. To extinguish combustible residues of this product use water fog, carbon dioxide, dry chemical or foam. Contain fire water run-off if possible. Fire water run-off, if not contained, may cause environmental damage. Review the "Accidental Release Measures" and the "Ecological Information" sections of this (M)SDS.

Special protective equipment for firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). Avoid contact with this material during fire fighting operations. If contact is likely, change to full chemical resistant fire fighting clothing with self-contained breathing apparatus. If this is not available, wear full chemical resistant clothing with self-contained breathing apparatus and fight fire from a remote location. For protective equipment in post-fire or non-fire clean-up situations, refer to the relevant sections.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures: Isolate area. Refer to section 7, Handling, for additional precautionary measures. Keep unnecessary and unprotected personnel from entering the area. Keep personnel out of low areas. No smoking in area. Eliminate all sources of ignition in vicinity of spill or released vapor to avoid fire or explosion. Vapor explosion hazard. Keep out of sewers. For large spills, warn public of downwind explosion hazard. Check area with combustible gas detector before reentering area. Ground and bond all containers and handling equipment. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.

Environmental precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

Methods and materials for containment and cleaning up: Contain spilled material if possible. Pump with explosion-proof equipment. If available, use foam to smother or supress. Absorb with materials such as: Clay. Dirt. Sand. Sweep up. Collect in suitable and properly labeled containers. Large spills: Contact Dow AgroSciences for clean-up assistance. See Section 13, Disposal Considerations, for additional information.

7. HANDLING AND STORAGE

Precautions for safe handling: Keep away from heat, sparks and flame. No smoking, open flames or sources of ignition in handling and storage area. Electrically bond and ground all containers and equipment before transfer or use of material. Use of non-sparking or explosion-proof equipment may be necessary, depending upon the type of operation. Containers, even those that have been emptied, can contain vapors. Do not cut, drill, grind, weld, or perform similar operations on or near empty containers. Vapors are heavier than air and may travel a long distance and accumulate in low lying areas. Ignition and/or flash back may occur. Never use air pressure for transferring product. Keep out of reach of children. Do not swallow. Avoid breathing vapor or mist. Avoid contact with eyes, skin, and clothing. Use with adequate ventilation. Wash thoroughly after handling. Keep container closed.

Conditions for safe storage: Minimize sources of ignition, such as static build-up, heat, spark or flame. Keep container closed. Do not store in: Carbon steel. Galvanized containers. Steel. Flammable mixtures may exist within the vapor space of containers at room temperature. Store in a dry place. Store in original container. Do not store near food, foodstuffs, drugs or potable water supplies.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure limits are listed below, if they exist.

Component	Regulation	Type of listing	Value/Notation
Isopropylamine	ACGIH	TWA	5 ppm
	ACGIH	STEL	10 ppm
	OSHA Z-1	TWA	12 mg/m3 5 ppm

RECOMMENDATIONS IN THIS SECTION ARE FOR MANUFACTURING, COMMERCIAL BLENDING AND PACKAGING WORKERS. APPLICATORS AND HANDLERS SHOULD SEE THE PRODUCT LABEL FOR PROPER PERSONAL PROTECTIVE EQUIPMENT AND CLOTHING.

Exposure controls

Engineering controls: Good general ventilation should be sufficient for most conditions. Local exhaust ventilation may be necessary for some operations.

Individual protection measures

Eye/face protection: Use safety glasses (with side shields).

Skin protection

Hand protection: Chemical protective gloves should not be needed when handling this material. Consistent with general hygienic practice for any material, skin contact should be minimized.

Other protection: No precautions other than clean body-covering clothing should be needed.

Respiratory protection: Atmospheric levels should be maintained below the exposure guideline. When respiratory protection is required for certain operations, use an approved air-purifying respirator.

The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Physical state	Liquid.
Color	Yellow
Odor	Odorless
Odor Threshold	No test data available
pH	4.6 1% ***NAPM 11A.00*** 1% aqueous solution.
Melting point/range	Not applicable
Freezing point	No test data available
Boiling point (760 mmHg)	110 ℃ (230 ℉)

Flash point	**closed cup** > 93 °C (> 199 °F) ***Setaflash Closed Cup ASTM D3828*** none below boiling point
Evaporation Rate (Butyl Acetate = 1)	No test data available
Flammability (solid, gas)	Not Applicable
Lower explosion limit	No test data available
Upper explosion limit	No test data available
Vapor Pressure	No test data available
Relative Vapor Density (air = 1)	No test data available
Relative Density (water = 1)	1.211 at 22 °C (72 °F) / 4 °C ***Pyknometer***
Water solubility	Soluble
Partition coefficient: n-octanol/water	no data available
Auto-ignition temperature	none below 400 degC
Decomposition temperature	No test data available
Dynamic Viscosity	64.6 mPa.s at 20 °C (68 °F)
Kinematic Viscosity	53.4 mm2/s at 20 °C (68 °F)
Explosive properties	No ***Koenen Apparatus***
Oxidizing properties	no data available
Liquid Density	1.20 g/cm3 at 20 °C (68 °F) ***Digital density meter***
Molecular weight	no data available

NOTE: The physical data presented above are typical values and should not be construed as a specification.

10. STABILITY AND REACTIVITY

Reactivity: no data available

Chemical stability: Thermally stable at recommended temperatures and pressures.

Possibility of hazardous reactions: Polymerization will not occur.

Conditions to avoid: Active ingredient decomposes at elevated temperatures. Avoid static discharge.

Incompatible materials: Heat produced by the reaction with water will cause vaporization. Flammable hydrogen may be generated from contact with metals such as:

Hazardous decomposition products: Decomposition products depend upon temperature, air supply and the presence of other materials.

11. TOXICOLOGICAL INFORMATION

Toxicological information appears in this section when such data is available.

Acute toxicity

Acute oral toxicity
Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts.

LD50, Rat, > 5,000 mg/kg

Acute dermal toxicity
Prolonged skin contact is unlikely to result in absorption of harmful amounts.

LD50, Rabbit, > 5,000 mg/kg

Acute inhalation toxicity
Brief exposure (minutes) is not likely to cause adverse effects.

LC50, Rat, 4 Hour, Aerosol, > 6.37 mg/l

Skin corrosion/irritation
Essentially nonirritating to skin.

Serious eye damage/eye irritation
May cause slight temporary eye irritation.
Corneal injury is unlikely.

Sensitization
Did not cause allergic skin reactions when tested in guinea pigs.

For respiratory sensitization:
No relevant data found.

Specific Target Organ Systemic Toxicity (Single Exposure)
Evaluation of available data suggests that this material is not an STOT-SE toxicant.

Specific Target Organ Systemic Toxicity (Repeated Exposure)
For similar material(s):
Glyphosate.
In animals, effects have been reported on the following organs:
Liver.

Carcinogenicity
For similar material(s): Glyphosate. Did not cause cancer in laboratory animals.

Teratogenicity
For the active ingredient(s): Available data are inadequate for evaluation of potential to cause birth defects.

Reproductive toxicity
For the active ingredient(s): Available data are inadequate to determine effects on reproduction.

Mutagenicity
For the active ingredient(s): In vitro genetic toxicity studies were negative in some cases and positive in other cases.

For similar material(s): Glyphosate. In vitro genetic toxicity studies were negative. Animal genetic toxicity studies were negative.

Aspiration Hazard
Based on physical properties, not likely to be an aspiration hazard.

12. ECOLOGICAL INFORMATION

Ecotoxicological information appears in this section when such data is available.

Toxicity

Acute toxicity to fish
Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50/EL50/LL50 >100 mg/L in the most sensitive species tested).

LC50, Oncorhynchus mykiss (rainbow trout), 96 Hour, > 2,500 mg/l, OECD Test Guideline 203 or Equivalent

Acute toxicity to aquatic invertebrates
EC50, Daphnia magna (Water flea), 48 Hour, 918 mg/l, OECD Test Guideline 202 or Equivalent

Acute toxicity to algae/aquatic plants
EC50, Pseudokirchneriella subcapitata (green algae), 72 Hour, Biomass, 10 - 127 mg/l, OECD Test Guideline 201 or Equivalent

Toxicity to Above Ground Organisms
Material is practically non-toxic to birds on an acute basis (LD50 > 2000 mg/kg).

oral LD50, Colinus virginianus (Bobwhite quail), > 2,000 mg/kg

contact LD50, Apis mellifera (bees), > 100µg/bee

oral LD50, Apis mellifera (bees), > 100µg/bee

Persistence and degradability
Biodegradability: Based on stringent OECD test guidelines, this material cannot be considered as readily biodegradable; however, these results do not necessarily mean that the material is not biodegradable under environmental conditions. For similar active ingredient(s). Biodegradation may occur under aerobic conditions (in the presence of oxygen).

Bioaccumulative potential
Bioaccumulation: For similar active ingredient(s). Bioconcentration potential is low (BCF < 100 or Log Pow < 3).

Mobility in soil
For similar active ingredient(s).
Expected to be relatively immobile in soil (Koc > 5000).

13. DISPOSAL CONSIDERATIONS

Disposal methods: If wastes and/or containers cannot be disposed of according to the product label directions, disposal of this material must be in accordance with your local or area regulatory authorities. This information presented below only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations. If the material as supplied becomes a waste, follow all applicable regional, national and local laws.

14. TRANSPORT INFORMATION

DOT

Not regulated for transport

Classification for SEA transport (IMO-IMDG):

Not regulated for transport

Transport in bulk according to Annex I or II of MARPOL 73/78 and the IBC or IGC Code	Consult IMO regulations before transporting ocean bulk

Classification for AIR transport (IATA/ICAO):

Not regulated for transport

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Transportation classifications may vary by container volume and may be influenced by regional or country variations in regulations. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. REGULATORY INFORMATION

OSHA Hazard Communication Standard
This product is not a “Hazardous Chemical” as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312
Chronic Health Hazard

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313
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.

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)
This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

Pennsylvania (Worker and Community Right-To-KnowAct): Pennsylvania Hazardous Substances List and/or Pennsylvania Environmental Hazardous Substance List:
The following product components are cited in the Pennsylvania Hazardous Substance List and/or the Pennsylvania Environmental Substance List, and are present at levels which require reporting.

Components	**CASRN**
Isopropylamine	75-31-0

Pennsylvania (Worker and Community Right-To-KnowAct): Pennsylvania Special Hazardous Substances List:
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

United States TSCA Inventory (TSCA)
This product contains chemical substance(s) exempt from U.S. EPA TSCA Inventory requirements. It is regulated as a pesticide subject to Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requirements.

Federal Insecticide, Fungicide and Rodenticide Act
EPA Registration Number: 62719-324
This chemical is a pesticide product registered by the Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets, and for workplace labels of non-pesticide chemicals. Following is the hazard information as required on the pesticide label:

CAUTION

Harmful if inhaled

16. OTHER INFORMATION

Hazard Rating System
NFPA

Health	Fire	Reactivity
1	1	0

Revision
Identification Number: 101188488 / A211 / Issue Date: 05/14/2015 / Version: 3.0
DAS Code: NAF-552
Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

ACGIH	USA. ACGIH Threshold Limit Values (TLV)
OSHA Z-1	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
STEL	Short-term exposure limit
TWA	8-hour, time-weighted average

Information Source and References

This SDS is prepared by Product Regulatory Services and Hazard Communications Groups from information supplied by internal references within our company.

DOW AGROSCIENCES LLC urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.

Attachment E

Site Orientation

Attachment E. Site 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; 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 HASP review) will sign the Personal Acknowledgement located at the end of the HASP. Visitors may receive a shortened version to address the hazards specific to their visit.

The following items, at minimum, will be discussed during the site safety briefing:

- Contents of this HASP;
- The Emergency Response Plan;
- Contractor SH&E Management expectations;
- Injury management, including notification and hospital and occupational clinic locations;
- The AECOM 4-Sight program;
- Stop Work authority;
- The JSAs/ Pre-JHAs (Attachment F) for the tasks that will be performed on a given job;
- Completion of a THA each day (Attachment F);
- 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 meetings must be documented and maintained in the project files.

Attachment F

Project/Task-Specific Job Safety Analysis or Pre-Job Hazard Assessments

Attachment F. Project/Task-Specific Job Safety Analysis or Pre-Job Hazard Assessments

The preparer shall download and prepare one JSA or Pre-JHA for each discrete task being performed **by AECOM** during the project (I.e. Driving, Inspection, Sample Collection, etc.). Subcontractors must prepare their own JSA/ pre-JHAs as the job experts in their tasks.

- Link to Pre-JHA form **S3AM-209-FM4**
- The AECOM electronic job safety analysis (eJSA) toolbox may also be used to find previously approved job safety analyses (JSAs)
- Client required equivalents may be used

Insert list of Pre-Job Hazard Assessments or Job Safety Analysis here. Include after this cover sheet in the final HASP.

Blank Daily THA and Daily Tailgate Forms

The preparer shall download a sufficient number of copies of the daily Task Hazard Analysis and Tailgate Meeting form* (**DCS SH&E ecosystem page**) and insert after this cover sheet in the final HASP. One copy of the THA/ Tailgate MUST be prepared at the start of each shift, and signed by all staff involved in the operation. The THA should be consulted and updated throughout the day if conditions change.

Americas

Pre-Job Hazard Assessment

S3AM-209-FM4

Location: NYSEG Penn Yan Water St. MGP **Date:** 8/14/18

Prepared By: G. Fischer **Approved By:** Click here to enter text.

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
List principal activities involved in the scope of work	Identify each safety or health hazard		Identify elimination, substitution, engineering & administrative controls & any specific required PPE	
ACTIVITY 1 - Travel to/from and on site	Entering/exiting vehicle- slip-trip & fall	6	Maintain three-points of contact Do not try to carry anything when entering/exiting vehicle. Load equipment/bags into vehiclefirst.	3
	Opening and closing vehicle doors, tailgate - crush/pinch	4	Check to make sure fingers and other body parts are not between door/tailgate and frame before closing	2
	Other drivers	15	Use defensive driving. Let aggressive drivers pass, do not respond to hostile drivers/road rage	4
	Distracted Driving	15	No cell phone/portable electronic use. GPS (if needed) must be secured to vehicle in that allows the driver to view the image without having to take their eyes off the road	4
	Accident/Injury	15	Maintain proper seatbelt use and stopping distance. 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. Inspect vehicle prior to use	4
	Fatigued Driving	12	Employees are prohibited from operating a vehicle if they are experiencing signs and symptoms of fatigue. No employee will operate a vehicle if they have worked 14 consecutive hours within a 24 hour period	3
	Getting Lost	6	Review maps and/or directions prior to leaving. If using a navigation system, program before driving. Do not attempt to program while driving.	4

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
	Bad weather	6	Plan for poor driving conditions in advance. Review weather and road conditions. Allow extra time when poor driving conditions are expected	3
	Fueling Vehicle	6	Exercise caution to avoid spillage, do not top off vehicle. Follow all warnings and precautions (turn off vehicle, no smoking, no use of cell phones or other electronic devices, do not re-enter vehicle during fueling), be aware of other drivers to avoid being struck.	2
	Property Damage/Motor Vehicle Accidents	15	Prior to moving a vehicle, do a walk around for obstructions. If backing or navigating in tight circumstances is needed, use a qualified spotter. Operate vehicles at safe speeds. Remain aware of factors that influence traffic related hazards and required controls - sun glare, rain, wind, etc. Work area should be protected by a physical barrier such as cones or caution tape. Review traffic control devices to ensure that they are adequate to protect work area.	4
	Getting Stuck	8	Select correct vehicle for site conditions. Avoid driving off road in wet/muddy conditions. If getting stuck is likely, have a plan in place for extraction.	3
	Pedestrians	12	Delineate designated pedestrian crossings. Have active work areas and construction traffic pathways properly marked and posted	4
ACTIVITY 2 - Construction Oversight	Chemical Exposure	8	Air monitor as indicated by the CAMP and or work zones per the specifications. Verify that air monitoring equipment has been maintained and calibrated as per manufacturer's instructions. Implement dust suppression measures. Minimize exposure by staying out of the work area where possible. Perform equipment and personal decontamination as defined in the HASP.	4
	Construction Traffic	12	Predetermine truck routes and establish appropriate directions and site trucking rules. Operate vehicles at safe speeds. Follow established signage and site speed limits. Look for potential problem areas and establish traffic control as necessary. GOAL – get out and look around the vehicle for any obstructions. When backing up, be aware of pedestrians and other vehicles. Use a qualified spotter when operating in congested areas and	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			when backing. Remain aware of factors that influence traffic related hazards and required controls - sun glare, rain, wind, etc. Work area should be protected by a physical barrier such as cones or caution tape. Review traffic control devices to ensure that they are adequate to protect work area. Verify that all vehicles left unattended are turned off and properly secured against movement (parking brake set, placed in park, wheels chocked if parked on incline)	
	Exertion	7	•Know your physical abilities. Do not overexert yourself, especially In times of high heat. If you experience discomfort, shortness of breath, or unusually fast heart rate, etc., stop immediately and alert another person.	4
	Insects	6	Identify anyone working on site with a bee sting allergy. Know what to do if those persons are stung. Use caution, watch where you put your hands. Inspect material plies for insects such aa spiders and wasp nests before disturbing. Avoid brush when possible; have unnecessary vegetation mowed prior to the start of field work to reduce the possibility of coming Into contact with ticks. When working In areas where ticks may be present (seasonally and n wooded areas), don breathable disposable coveralls with attached booties. If the soles of the booties pose a slip hazard, don overboots and tape coveralls. Place potentially contaminated clothing into plastic garbage bags and seal until clothing can be laundered. Tape seams between the coveralls and gloves/boots. At a minimum, employees are required apply DEET (or similar repellent) to ankles, sleeves and any exposed skin while conducing activities where insects may pose a threat. Use of insect-pesticide (specifically Permethrin) is required when working in heavily wooded areas or areas where licks are expected. Employees must follow manufacturer's instructions when applying Permethrin. Remove coveralls from the inside out, and change coveralls prior to getting inside any vehicles. Check periodically throughout the day for the presence of ticks on skin and clothing, and perform a thorough check for ticks at the end of the day. Have a co-worker check the back of your neck and your upper	5

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			back areas. Be aware of the signs and symptoms of tick-borne diseases.	
	Materials Handling/Loading/Unloading	10	Proper lifting techniques must be used when lifting any object. Plan storage and staging to minimize lifting or carrying distances. Split heavy loads into smaller loads. Employees should be instructed in safe lifting techniques. Back straight, bend at knees, load close to body, lift smoothly, and do not twist. Utilize material handling devices such as hand trucks. Manual lifts of over 50 pounds require two people. Employees are encouraged to get help for any lift that appears excessive.	5
	Noise	6	Hearing protection shall be worn when noise levels exceed 85dBA. Hearing protection will be worn at all times during hammer operation. Personnel will be trained in the proper installation techniques for ear protection that fits in the ear canal. Hearing protective devices will be kept clean and sanitary between uses.	3
	Overhead work	15	Never position yourself under a suspended **load.** Keep all non-essential workers out of the work zone when overhead work is performed. Verify that the Contractor is performing daily inspections of cables, straps, and equipment. Any cables with broken strands, weak spots, kinks, or mashed areas will be replaced prior to use. Verify that crane inspections are performed and that the crane operator has a crane license.	6
	Pedestrian Traffic	8	A reflective safety vest shall be worn at all imes when walking around the site. Always pay attention to moving traffic – never assume drivers are looking out for you.	3
	Poisonous Plants and Brambles	6	Be aware of all poisonous plants found on site. Poison Ivy can grow as a vine or small shrub trailing along the ground or climbing on low plants, trees and poles. Poison Sumac is a woody shrub or small tree growing up to 20 feet tall. *Giant Hogweed* causes blisters, burning and scarring.	4

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			Cow Parsnip sap contains a photo toxin that reacts with ultraviolet light to cause skin irritation ranging from a mild rash to severe blistering. Stinging Nettle hairs on stems and **leaves** produce an intense burning and itching sensation that can last up to thirty minutes. Other plants, like blackberry bushes and smilax have stickers that can scratch and tear skin and clothing.	
	Sheet piling activities	15	Stay clear of overhead loads. Only the Contractor's authorized personnel are permitted in the drop zone of sheet-pile activities. All other non-essential personnel should stay out of the immediate area. Wear hearing protection and verify that Contractors are doing the same. Use maximum safe distances from Overhead Hazards as presented in S3AM-322-PR. If equipment becomes electrically energized, personnel will be instructed not to touch any part of the equipment or attempt to touch any person who may be in contact with the electrical current. The utility company or appropriate party will be contacted to have line de-energized prior approaching the equipment. Rigging equipment is to be inspected dally and taken out of service if not In good condition. Be aware of the risk of pressurized hydraulic hoses. Avoid being In the line of fire.	4
	Slips/Trips/Falls	8	Scan work area for hazard, - Remove trip hazards from work site. Be aware of ground irregularities, concrete footings, and gopher holes. Be attentive to soil piles around open excavations. Be aware of your walking surfaces at all times. Wear suitable footwear with ankle support Avoid slippery, wet, or icy surfaces	3
	Weather (Cold stress/Hypothermia/Trench Foot)	12	During cool weather, wear layers and keep dry. Take warm up breaks in a warm environment. Keep feet dry, do not work In wet shoes or socks for extended periods.	4
	Weather (Heat/Sunburn)	8	Heat stress: to help prevent heat related illness during hot days, drink plenty of fluids. Do not wait until you are	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			thirsty to drink. Wear layers of lightweight, light colored, and loose fitting clothing. Rest often in shady areas. Protect yourself from the sun. Protection from ultraviolet (UV) radiation is important all year. UV rays from the sun can reach you on cloudy or hazy days as well as bright and sunny days. Use a broad-spectrum (against UVA and UVB rays) sunscreen and lip screen with at least SPF15. Seek shade, especially during midday hours when the sun's rays are strongest. Cover up your head and exposed skin.	
	Weather (thunderstorms/Lightning)	6	Discuss inclement weather plan during tailgate meeting and determine rally point. Stop work immediately at first sign of lightning or thunder and do not resume until 30 minutes after last sign of lightning or thunder.	3
	Wildlife	10	Wild animals carry diseases that are dangerous to people. In addition, they may bite when approached or startled. Avoid touching, feeding, and getting near wild animals. Keep foods stored in sealed containers and out of the reach of animals. Be aware of any animals acting in a usual manner and report any animal displaying symptoms of rabies to your site host.	4
	Work around heavy equipment	8	A reflective safety vest shall be worn at all times when walking around the site. Always pay attention to moving vehicles and heavy equipment: never assume drivers are looking out for you. Make eye contact with operator and make sure equipment is in a neutral and lowered position prior to entering a work area. Verify that all equipment is equipped with backup alarms. Keep all non-essential personnel out of the immediate work area	4
	Work near water	15	Maintain a minimum of a 5' distance from bulkhead. If closer approach is required, then apply the provisions of the Working on or Near Water procedure S3AM-315-PR. Float plan is required for all work on water. Contact the SH&E Manager.	6
ACTIVITY 3 – General Site Activities	Cuts/lacerations	9	Proper gloves and cutting techniques using approved	4

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			cutting tools	
	Slips/trips/falls	8	Housekeeping/proper footwear/situational awareness/mark-out of uneven areas	4
	Biological (insects/plants/animals)	6	Site recon/identification of potential site hazards/PPE/bug repellent/poison ivy wipes/etc.	4
	Heat stress/cold stress	8	Proper attire/hydration/breaks/buddy system/gradual acclimation to temperature	4
	Back strain	6	Utilize proper lifting techniques/material handling devices/ramps/get help lifting objects over 49lbs.	3
ACTIVITY 4 – Air Monitoring	Chemical Exposure	8	Air monitor as indicated by the CAMP for particulates and VOCs. Verify that air monitoring equipment has been maintained and calibrated as per manufacturer's instructions. Implement dust suppression measures Minimize exposure by staying back out of the work area. Perform equipment and personal decontamination as defined in the HASP.	4
	Construction Traffic	12	Predetermine truck routes and establish appropriate directions and site trucking rules. Operate vehicles at safe speeds. Follow established signage and site speed limits. Look for potential problem areas and establish traffic control as necessary. When backing up, be aware of pedestrians and other vehicles. Use a qualified spotter when operating in congested areas and when backing. Remain aware of factors that influence traffic related hazards and required controls - sun glare, rain, wind, etc. Work area should be protected by a physical barrier such as cones or caution tape. Review traffic control devices to ensure that they are adequate to protect work area. Verify that all vehicles left unattended are turned off and properly secured against movement (parking brake set, placed in park, wheels chocked if parked on incline)	3
	Exertion	7	Know your physical abilities. Do not overexert yourself, especially In times of high heat. If you experience discomfort, shortness of breath, or unusually fast heart rate, etc., stop immediately and alert another person.	4
	Insects	6	Identify anyone working on site with a bee sting allergy.	4

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			Know what to do if those persons are stung. Use caution, watch where you put your hands. Inspect material plies for insects such aa spiders and wasp nests before disturbing. Avoid brush when possible; have unnecessary vegetation mowed prior to the start of field work to reduce the possibility of coming Into contact with ticks. When working In areas where ticks may be present (seasonally and n wooded areas), don breathable disposable coveralls with attached booties. If the soles of the booties pose a slip hazard, don overboots and tape coveralls. Place potentially contaminated clothing into plastic garbage bags and seal until clothing can be laundered. Tape seams between the coveralls and gloves/boots. At a minimum, employees are required apply DEET (or similar repellent) to ankles, sleeves and any exposed skin while conducing activities where insects may pose a threat. Use of insect-pesticide (specifically Permethrin) is required when working in heavily wooded areas or areas where licks are expected. Employees must follow manufacturer's instructions when applying Permethrin. Remove coveralls from the inside out, and change coveralls prior to getting inside any vehicles. Check periodically throughout the day for the presence of ticks on skin and clothing, and perform a thorough check for ticks at the end of the day. Have a co-worker check the back of your neck and your upper back areas. Be aware of the signs and symptoms of tick-borne diseases.	
	Materials Handling/Loading/Unloading	10	Proper lifting techniques must be used when lifting any object Plan storage and staging to minimize lifting or carrying distances. Split heavy loads into smaller loads. Employees should be instructed in safe lifting techniques. Back straight, bend at knees, load close to body, lift smoothly, and do not twist. Utilize material handling devices such as hand trucks. Manual lifts of over 50 pounds require two people. Employees are encouraged to get help for any lift that appears excessive.	4

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
	Noise	6	Hearing protection shall be worn when noise levels exceed 85dBA. Hearing protection will be worn at all times during hammer operation Personnel will be trained in the proper installation techniques for ear protection that fits in the ear canal. Hearing protective devices will be kept clean and sanitary between uses.	2
	Overhead work	15	Never position yourself under a suspended **load.** Keep all non-essential workers out of the work zone when overhead work is performed. Verify that the Contractor is performing daily inspections of cables, straps, and equipment. Any cables with broken strands, weak spots, kinks, or mashed areas will be replaced prior to use. Verify that crane inspections are performed and that the crane operator has a crane license.	4
	Pedestrian Traffic	8	A reflective safety vest shall be worn at all times when walking around the site. Always pay attention to moving traffic – never assume drivers are looking out for you.	4
	Poisonous Plants and Brambles	6	Be aware of all poisonous plants found on site. Poison Ivy can grow as a vine or small shrub trailing along the ground or climbing on low plants, trees and poles. Poison Sumac is a woody shrub or small tree growing up to 20 feet tall. *Giant Hogweed* causes blisters, burning and scarring. Cow Parsnip sap contains a photo toxin that reacts with ultraviolet light to cause skin irritation ranging from a mild rash to severe blistering. Stinging Nettle hairs on stems and **leaves** produce an intense burning and itching sensation that can last up to thirty minutes. Other plants, like blackberry bushes and smilax have stickers that can scratch and tear skin and clothing.	4
	Sheet piling activities	15	Stay clear of overhead loads. Only the Contractor's authorized personnel are permitted in the drop zone of sheet-pile activities. Wear hearing protection and verify that Contractors are doing the same. Use maximum safe distances from Overhead Hazards as presented in S3AM-322-PR.	4

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			If equipment becomes electrically energized, personnel will be instructed not to touch any part of the equipment or attempt to touch any person who may be in contact with the electrical current. The utility company or appropriate party will be contacted to have line de-energized prior approaching the equipment. Rigging equipment is to be inspected dally and taken out of service if not In good condition. Be aware of the risk of pressurized hydraulic hoses. Avoid being In the line of fire.	
	Slips/Trips/Falls	8	Scan work area for hazard, - Remove trip hazards from work site. Be aware of ground irregularities, concrete footings, and holes. Be attentive to soil piles around open excavations. Be aware of your walking surfaces at all times. Wear suitable footwear with ankle support Avoid slippery, wet, or icy surfaces	4
	Weather (Cold stress/Hypothermia/Trench Foot)	12	During cool weather, wear layers and keep dry. Take warm up breaks in a warm environment. Keep feet dry, do not work In wet shoes or socks for extended periods.	3
	Weather (Heat/Sunburn)	8	Heat stress: to help prevent heat related illness during hot days, drink plenty of fluids. Do not wait until you are thirsty to drink. Wear layers of lightweight, light colored, and loose fitting clothing. Rest often in shady areas. Protect yourself from the sun. Protection from ultraviolet (UV) radiation is important all year. UV rays from the sun can reach you on cloudy or hazy days as well as bright and sunny days. Use a broad-spectrum (against UVA and UVB rays) sunscreen and lip screen with at least SPF15. Seek shade, especially during midday hours when the sun's rays are strongest. Cover up your head and exposed skin.	3
	Weather (thunderstorms/Lightning)	6	Discuss inclement weather plan during tailgate meeting and determine rally point. Stop work immediately at first sign of lightning and do not resume until 30 minutes after last sign of lightning.	3
	Wildlife	10	Wild animals carry diseases that are dangerous to people. In addition, they may bite when approached or startled.	4

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			Avoid touching, feeding, and getting near wild animals. Keep foods stored in sealed containers and out of the reach of animals. Be aware of any animals acting in a usual manner and report any animal displaying symptoms of rabies to your site host.	
	Work around heavy equipment	8	A reflective safety vest shall be worn at all times when walking around the site. Always pay attention to moving vehicles and heavy equipment: never assume drivers are looking out for you. Make eye contact with operator and make sure equipment is in a neutral and lowered position prior to entering a work area. Verify that all equipment is equipped with backup alarms.	4
	Work near water	15	Maintain a minimum of a 5' distance from bulkhead. If closer approach is required, then apply the provisions of the Working on or Near Water procedure S3AM-315-PR. Float plan is required for all work on water. Contact the SH&E Manager.	5
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Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
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SPECIAL REQUIREMENTS

Step #	Equipment to be Used	Inspection requirements	Training Requirements
	List equipment to be used in work activity	List inspection/permit requirements for work activity	List training requirements including hazard communication
1.	Click here to enter text.	Click here to enter text.	Click here to enter text.
2.	Click here to enter text.	Click here to enter text.	Click here to enter text.
3.	Click here to enter text.	Click here to enter text.	Click here to enter text.
4.	Click here to enter text.	Click here to enter text.	Click here to enter text.
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6.	Click here to enter text.	Click here to enter text.	Click here to enter text.
7.	Click here to enter text.	Click here to enter text.	Click here to enter text.
8.	Click here to enter text.	Click here to enter text.	Click here to enter text.
9.	Click here to enter text.	Click here to enter text.	Click here to enter text.

INSTRUCTIONS AND RISK MATRIX

Hazard Evaluation – Identify principal steps of the task. Identify potential safety/health hazards for each step and determine initial risk rating using the matrix provided below. Identify control measures including PPE for each hazard. Re-evaluate hazard potential and assign a final risk rating. If the final risk rating is a 5-9 (medium risk) or 10-25 (high risk), additional hazard controls shall be identified and applied until the final risk rating is reduced to 4 or below. The final risk rating cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin. Add additional rows as required to cover all major steps/aspects of the activity.

Special Requirements – Identify equipment to be used including specific PPE required. Identify inspection requirements such as competent person, permit issue, documented task hazard analysis, etc. Identify training requirements such as hazard communication, scaffold user, fall protection, etc.

High ◄——————————————————————► Low

Probability	Severity				
	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

High ↕ Low

10-25 (red) are high risk, 5-9 (yellow) are medium risk, and 1-4 (green) are low risk

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

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 & SH&E Manager
10 to 25 (High)	Risk requires the approval of the Operations Manager & SH&E Director