APPENDIX I

HEALTH AND SAFETY PLAN

Health and Safety Plan

Excavation and Capping of the Filled First Street Turning Basin, Gowanus Canal

Borough of Brooklyn, New York

Project ID: PW77GOWAN
Contract No. HWDRCW02

Prepared for:

NYC DDC Department of Design and Construction

Submitted by:

AKRF | KSE
The AKRF-KSE JV

MAY 2019

HEALTH AND SAFETY PLAN

Excavation of the Filled First Street Turing Basin, Gowanus Canal

Prepared for:

AKRF Engineering, P.C./KS Engineers, P.C. Joint Venture

And

New York City Department of Design and Construction

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Date:

May 2019

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Arcadis Project Manager

VERSION CONTROL

This Health and Safety Plan (HASP) must be reviewed annually and revised when conditions on the Site change and the change is not addressed by this HASP or if a new task is conducted that is not addressed by this HASP.

Issue	Revision No	Date Issued	Page No	Description	Reviewed by

SIGNATURES

I have read, understand and agree to abide by the requirements presented in this Health and Safety Plan (HASP). I understand that I have the absolute right to stop work if I recognize an unsafe condition affecting my work until corrected.

Name Printed	Signature	Date

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APPENDICES

LIST OF ACRONYMS

Acronym	Definition
AKRF-KSE JV	AKRF Engineering, P.C./KS Engineers, P.C. Joint Venture
APR	air purifying respirator
BBP	bloodborne pathogens
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIH	Certified Industrial Hygienists
CMV	commercial motor vehicles
COCs	constituents of concern
CPR	cardiopulmonary resuscitation
CSP	Certified Safety Professional
EAP	Emergency Action Plan
FHSHB	Field H&S Handbook
GVWR	gross vehicle weight rating
H&S	health and safety
HARC	Hazard Assessment and Risk Control
HASP	Health and Safety Plan
HAZCOM/GHS	Hazard Communication/ Globally Harmonized System
HAZWOPER	Hazardous Waste Operations and Emergency Response
JSA	job safety analysis
kg/L	kilograms per liter
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
ND	Non-detect
NPL	National Priorities List
OSHA	Occupational Safety and Health Administration
PCBs	polychlorinated biphenyls
PPE	personal protective equipment
ppm	parts per million
ROW TSP	Right-of-Way Traffic Safety Plan
SDS	safety data sheet
SOE	support of excavation
SVOCs	semivolatile organic compounds
TBD	to be determined
TCLP	toxicity characteristic leaching procedure
THA	Task Hazard Analysis
TIP	Task Improvement Process
VOCs	volatile organic compounds
µg/L	micrograms per liter

1.0 EMERGENCY ACTION PLAN

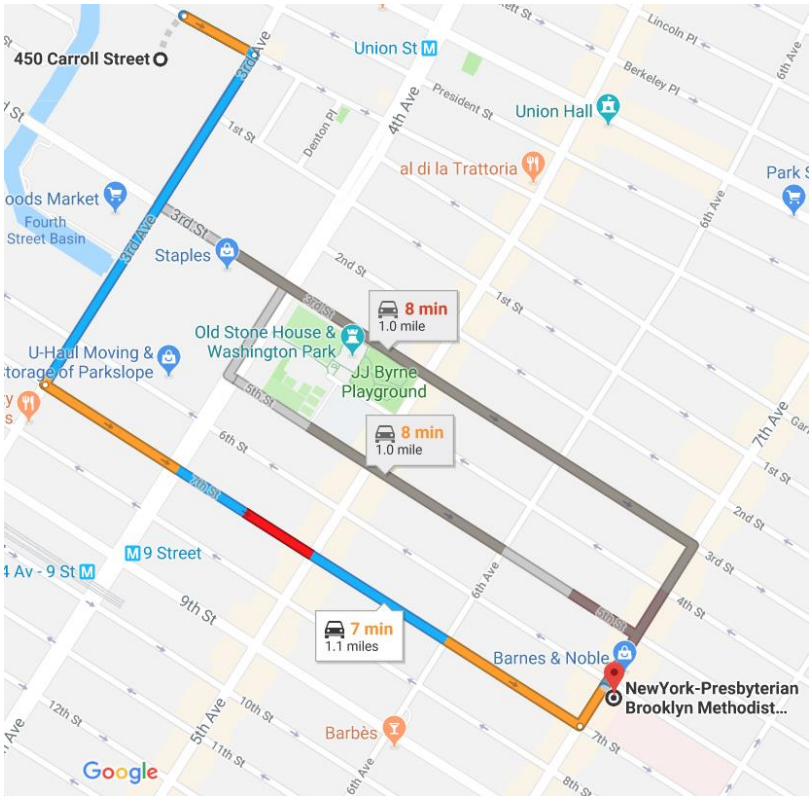
1.1 Route to the Hospital

450 Carroll St
Brooklyn, NY 11215

1. Head southeast on Carroll St toward 3rd Ave — 394 ft
2. Turn right at the 1st cross street onto 3rd Ave — 0.4 mi
3. Turn left onto 7th St — 0.6 mi
4. Turn left onto 7th Ave — 220 ft
   Destination will be on the right

NewYork-Presbyterian Brooklyn Methodist Hospital: Emergency Room
506 6th St, Brooklyn, NY 11215

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.



1.2 Hospital Information

Hospital name: New York Presbyterian Brooklyn Methodist Hospital

Hospital address: 506 6th St. Brooklyn, NY

Hospital phone: 718.780.3000

1.3 Emergency Contact Information and Procedures

Local Police	911 and 718.834.3211
Local Ambulance	911
Local Fire Department	911 and 718.999.2770
Local Hospital: New York Methodist	718.780.3000
Local Weather Data	Weather.com
Utility Contact (gas): National Grid Gas Control Center	516.545.4502
Utility Contact (electric): Con Edison	1800.752.6633
Poison Control	800.222.1222
National Response Center (all spills in reportable quantities)	800.424.8802
U.S. Coast Guard (spills to water)	800.424.8802
Engineer	To be Determined (TBD)
Environmental Monitor	TBD
Responsible Parties	TBD

Use the following notification procedure in the event of an emergency:

- Step 1: Dial 911 (if necessary)
- Step 2: Contact the Engineer
- Step 3: Contact the Environmental Monitor
- Step 4: Contact Responsible Parties

1.4 Emergency Supplies and Equipment List

Emergency supplies and equipment for specific tasks are presented on job safety analyses (JSAs) for the task. The following supplies and equipment are applicable to all tasks performed on the project:

Emergency Supplies and Equipment (check all that apply)		**Location on Site**
X	First-Aid Kit - American National Standards Institute Z308, (Class A or B)	TBD
X	Fire Extinguisher (Class A, B, and C)	TBD
X	Mobile Phone	TBD
	Satellite Phone	TBD
	Traffic Cones	TBD
	2-Way Radios	TBD
X	Water or Other Fluid Replenishment	TBD
	Eye Wash/Quick Drench Station	TBD
X	Eye Wash Bottle	TBD
	Wash and Dry Towelettes	TBD
X	Sunscreen (SPF 15 or higher)	TBD
X	Insect Repellent	TBD
	Chemical Spill Kit	TBD
	Other (specify):	

2.0 INTRODUCTION

2.1 General

All work on this project will be carried out in compliance with applicable Federal, State, and local regulatory standards, including the Occupational Safety and Health Administration's (OSHA's) Hazardous Waste Operations and Emergency Response (HAZWOPER) regulation. This Health and Safety Plan (HASP) generally addresses the health and safety considerations related to the remedy construction activities. However, the Contractor, Engineer, and other Site personnel will be responsible for the preparation of their own HASPs and the health and safety of their personnel. All other personnel or visitors not working under another HASP shall read and be familiar with this HASP before doing any work. These project personnel shall sign the Certification page acknowledging that they have read and understand this HASP. Changes in the scope of the project or introduction of new hazards to the project shall require revision of the HASP by the HASP writer and reviewer, and approval by the Engineer.

This HASP is presented as an appendix and supporting plan to the 100% Design Report.

2.2 HASP Structure

This HASP contains important information related to this project in appendices. Review of relevant appendix information is important to ensure work is conducted safely on the Site. The following appendices are included in this HASP with a summary of their contents:

- Appendix A – Task Hazard Analysis (THA): This appendix contains an analysis of the hazards and controls to be used for tasks performed on this project.
- Appendix B – Job Safety Analyses and Permits: This appendix contains all the project JSAs and any applicable permits required to perform work on this project. If a Health and Safety (H&S) Standard is required to be attached to this HASP, the standard will also be located in this appendix.
- Appendix C – Hazard Communication/Globally Harmonized System (HAZCOM/GHS): This appendix contains a list of chemicals used on the project and safety data sheets (SDSs) applicable to the chemicals used on-site.
- Appendix D – Field Forms: This appendix contains all the field forms and checklists staff are expected to use on the project.
- Appendix E – Supplemental Plans: This appendix contains all applicable supplemental plans [e.g., Right-of-Way Traffic Safety Plan (ROW TSP), Lone or Remote Worker Plan, Journey Management Plan, Silica Exposure Control Plan, etc.]. Shipping Determinations should also be in this appendix.
- Appendix F – Air Monitoring Requirements: This appendix contains action levels for constituents of concern (COCs), required monitoring instruments to be used, and monitoring frequency for specific tasks or for the project.
- Appendix G – Enhanced Levels of Personal Protective Equipment (PPE) Protection: This appendix contains PPE requirements for Level C or higher protection.

2.3 Hierarchy of Administrative Controls

This HASP references several documents that might be used in the field which contain requirements specific to the task and/or project. Staff utilizing these documents must implement the requirements

(PPE, safety equipment, monitoring equipment, etc.) based on the hierarchy specified below (in order of decreasing priority):

1. Permits or supplemental plan templates (if applicable to the task or project)
2. JSAs
3. HASP
4. H&S Standards
5. Field H&S Handbook (FHSHB)

During the tailgate safety briefing, the applicable administrative controls to be utilized for the task/project will be identified, communicated to the field staff, and documented. Requirement changes to a lesser control in a lower hierarchy document requires approval of the Environmental Monitor.

3.0 PROJECT SITE HISTORY AND REQUIREMENTS

3.1 Site Background

Based on historical aerial photographs, the former First Street Turning Basin, located between 312 and 338 Third Avenue in Brooklyn, NY, was approximately a 475- to 560-foot long by 50 to 60-foot wide side channel from the Gowanus Canal surface waterway system, which is a brackish, tidal arm of the New York-New Jersey Harbor Estuary, extending approximately 1.8 miles through Brooklyn, New York. The First Street Turning Basin was presumably constructed in a manner similar to the main canal, including installation of bulkheads along the sides of the channel and excavating the area between the bulkheads to form the Turning Basin. In the early 1900s, a power station building, referred to as the Powerhouse, was constructed adjacent to the southern side of the Site. The area between the western-end of the building and the Gowanus Canal was used for coal storage. The First Street Turning Basin was filled between the years 1953 and 1965. The Gowanus Canal, including the former First Street Turning Basin, was placed on the National Priorities List (NPL) pursuant to Section 105 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) on March 2, 2010.

3.2 Site Description

X	Active		Inactive Industrial		Remote Area		Parking Lot/ Private Roadway
	Bridge		Active Industrial		Residential	X	Public Roadway or Right of Way
	Buildings		Landfill		Retail	X	Security Risk Site/Location
	Commercial	X	Marine		Service Station	X	Non-Military Government Installation
	Construction		Mining		Utility		
	Military Installation		Railroad	X	Other		
Other Specify:		New York State Canal System					

Based on aerial photographs from as recent as 2018, the current Site conditions appear to be a combined vegetated and gravel lot, some of which is being utilized for parking. The area is bordered by parking lots to the north and south, the Gowanus Canal to the west, and 3rd Avenue to the east. The surrounding area appears to be primarily commercial and industrial. Subsurface investigations encountered soils consisting of historic fill, clays and silts. Several obstructions were encountered including timber cribbing bulkheads at the southern perimeter of the Site. COCs include volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), metals and polychlorinated biphenyls (PCBs), which are further evaluated in the next section.

The following COCs were specifically called out in the Environmental Sampling and Analysis Summary Report documenting the results of the 2017 subsurface investigation and supporting materials for exceeding one or more regulatory standard:

Known Compounds	Source (soil/water/drum, etc.)	Known Concentration Range (mg/kg)	
		Lowest	Highest
Aroclor 1242	Soil	ND	4.1 mg/kg
Aroclor 1242	Groundwater	ND	0.28 µg/L
Aroclor 1248	Soil	ND	4.2 mg/kg
Aroclor 1254	Groundwater	ND	1.1 µg/L
Aroclor 1254	Soil	ND	40 mg/kg
Aroclor 1260	Soil	ND	2.6 mg/kg
Total PCBs	Soil	ND	40 mg/kg
Total PCBs	Groundwater	ND	1.4 µg/L
Naphthalene	Soil	0.052 mg/kg	590 mg/kg
Naphthalene	Groundwater	45 µg/L	1900 µg/L
2-butanone	Soil	0.028 mg/kg	0.6 mg/kg
2-butanone (TCLP)	Soil	0.0049 mg/L	0.035 mg/L
Benzene	Soil	0.009 mg/kg	4.9 mg/kg
Benzene (TCLP)	Soil	0.002 mg/L	0.063 mg/L
Ethylbenzene	Groundwater	2.2 µg/L	210 µg/L
Tetrachloroethene (TCLP)	Soil	0.013 mg/L	0.0013 mg/L
2-methylphenol (TCLP)	Soil	ND	0.0026 mg/L
3&4-methylpheol (TCLP)	Soil	ND	0.0023 mg/L
Benzo(a)anthracene	Soil	0.46 mg/kg	160 mg/kg
Benzo(a)pyrene	Soil	0.43 mg/kg	110 mg/kg
Benzo(b)fluoranthene	Soil	0.54 mg/kg	88 mg/kg
Chrysene	Soil	0.5 mg/kg	150 mg/kg
Dibenzo(a,h)anthracene	Soil	0.27 mg/kg	1.9 mg/kg
Indeno(1,2,3-cd)pyrene	Soil	0.61 mg/kg	35 mg/kg
Phenanthrene	Soil	0.49 mg/kg	880 mg/kg
Toluene	Groundwater	1.5 µg/L	45 µg/L

Known Compounds	Source (soil/water/drum, etc.)	Known Concentration Range (mg/kg)	
		Lowest	Highest
Total Xylene	Groundwater	1.3 µg/L	240 µg/L
Arsenic	Soil	5.1 mg/kg	29 mg/kg
Barium	Soil	110 mg/kg	1,400 mg/kg
Barium (TCLP)	Soil	0.27 mg/L	1.4 mg/L
Cadmium	Soil	0.75 mg/kg	17 mg/kg
Cadmium (TCLP)	Soil	ND	0.083 mg/L
Copper	Soil	46 mg/kg	12,000 mg/kg
Lead	Soil	1,100 mg/kg	4,200 mg/kg
Mercury	Soil	0.30 mg/kg	47 mg/kg
Mercury (TCLP)	Soil	ND	0.0062 mg/L
Nickel	Soil	20 mg/kg	2800 mg/kg
Nickel (TCLP)	Soil	0.10 mg/L	7.5 mg/L
Chloride	Groundwater	250 mg/L	12,000 mg/L
Nitrate - N	Groundwater	1.1 mg/L	11 mg/L

Notes:
TCLP = toxicity characteristic leaching procedure
ND = non-detect
µg/L = micrograms per liter
kg/L = kilograms per liter
mg/L = milligrams per liter
mg/kg = milligrams per kilogram

3.3 List of Project Tasks and Scope of Work

This HASP addresses the following project work tasks:

- Task 1 - Excavation: This task includes mobilization, installation of erosion and sediment controls, placement of support of excavation (SOE) structures, permanent bulkhead structures and excavation of the Former First Street Turing Basin utilizing mechanical means, and may require dewatering. It is possible that impacted soil and groundwater containing the constituents listed above will be encountered during excavation and soil staging.
- Task 2 - Backfill/Cap Placement: The entire extent of the excavated area will be backfilled as part of the cap placement utilizing conventional heavy equipment both from the shore and possibly from the water via barges.
- Task 3 – Intertidal Vegetation Installation: As with the cap placement, intertidal vegetation installation will be completed through mechanical and manual methods both from the shore and water. It is assumed that various Site restoration and demobilization activities will take place during Task 2 and Task 3.

3.4 Required Health and Safety Training

Personnel working under this HASP are required to have the following training:

All Staff	Select Staff	Training
X		H&S Program Orientation
X		HAZCOM/GHS/Emergency Action Plan (EAP)
X		Defensive Driving (Smith On-Line)
	X	Aerial Work Platforms and Scissor Lifts
	X	Bloodborne Pathogens (BBP)
	X	Boating Safety
	X	Confined Space Awareness
	X	Confined Space Entrant, Attendant, Supervisor
	X	Hazwoper 40 Hour
	X	Hazwoper 8-Hour Annual Refresher
	X	Hazwoper 8-Hour Supervisor
	X	Excavation Competent Person
	X	Fall Protection Competent Person
	X	Heavy Equipment
	X	Respirator
	X	First Aid / Cardiopulmonary resuscitation (CPR)
	X	Fire Extinguisher
	X	Lock-out / Tag-out

4.0 ORGANIZATION AND RESPONSIBILITIES

4.1 All Personnel

Every person is responsible for completing tasks safely and reporting any unsafe acts or conditions to their supervisor. No person may work in a manner that conflicts with these procedures. Prior to initiating Site activities, all personnel will receive training in accordance with applicable regulations and be familiar with the requirements and standards referenced in this HASP. In addition, all personnel will attend daily safety meetings (tailgate meetings) to discuss Site-specific hazards prior to beginning each day's work. Project personnel and representatives of the Responsible Parties at the Site have the responsibility to stop the work of a coworker or subcontractor if the working conditions or behaviors are considered unsafe.

4.2 Engineer

The Engineer is responsible for verifying that project activities are completed in accordance with the requirements of this HASP. The Engineer is responsible for confirming that the project has the equipment, materials, and qualified personnel to fully implement the safety requirements of this HASP, and/or that subcontractors assigned to this project, meet the requirements established by this HASP. It is also the responsibility of the Engineer to:

- Review with project staff the information required in the Culture of Caring Certification included in this HASP or designate an associate project manager or task manager to perform this function.
- Review all applicable H&S standards and confirm that project activities conform to all requirements.
- Obtain Responsible Parties-specific H&S information and communicate with the Responsible Parties on H&S issues.
- Communicate with the Environmental Monitor on H&S issues.
- Allocate resources for correction of identified unsafe work conditions.
- Confirm that Site workers have all training necessary for the project.
- Report all injuries, illnesses, and near-misses to the Responsible Parties' representative and lead incident investigations, and confirm that any recommendations made are implemented.

4.3 Environmental Monitor

The Environmental Monitor has overall responsibility for the technical H&S aspects of the project. Inquiries regarding H&S standards, project procedures, and other technical or regulatory issues should be addressed to this individual. It is also the responsibility of the Environmental Monitor to:

- Review and work in accordance with the components of this HASP.
- Make sure that this HASP is available to and reviewed by all Site personnel including subcontractors.
- Validate that necessary Site-specific training is performed (both initial and "tailgate" safety briefings).
- Confirm Site visitors have been informed of the hazards related to the work.
- Confirm that work is performed in a safe manner and has authority to stop work when necessary to protect workers and/or the public.
- Coordinate activities during emergency situations.
- Disseminate to other Site personnel all necessary permits and safety information provided by the Responsible Parties and confirm that the material is maintained in an organized manner.
- Communicate with the Engineer, and/or any designated associate project manager/task manager, on H&S issues.
- Report all injuries, illnesses, and near-misses to the Engineer, and/or any designated associate project manager/task manager.
- Make sure that necessary safety equipment is maintained and used at the Site.

The Environmental Monitor will contact an H&S professional for assistance in establishing the respiratory cartridge change schedule as required.

5.0 PROJECT HAZARDS AND CONTROL MEASURES

5.1 Task Hazard Analysis

The scope of work for this project has been subdivided into tasks and each task has been evaluated for hazards using the Hazard Ranking Chart illustrated in Table 1 in accordance with the Arcadis Hazard Assessment and Risk Control (HARC) Health and Safety Standard (AUS HSMS002). Refer to Appendix A for a detailed Task Hazard Analysis (THA) for this project.

Table 1
Hazard Ranking Chart

Risk Assessment Matrix		Likelihood Ratings			
Consequences Ratings		A	B	C	D
People	Property	0 Almost Impossible	1 Possible but Unlikely	2 Likely to Happen	4 Almost Certain to Happen
1-Slight or No Health Effect	Slight or No Damage	0-Low	1-Low	2-Low	3-Low
2-Minor Health Effect	Minor Damage	0-Low	2-Low	4-Medium	6-Medium
3-Major Health Effect	Local Damage	0-Low	3-Low	6-Medium	9-High
4-Fatalities	Major Damage	0-Low	4-Medium	8-High	12-High

5.2 Job Safety Analyses, Permits, and Health and Safety Standards

5.2.1 Job Safety Analyses

A Job Safety Analysis (JSA) has been completed for each safety-critical task and is included in Appendix B. Hazards identified in the table above are addressed specifically in the JSAs, as well as control methods to protect employees and property from hazards. The JSA also lists the type of PPE required for the completion of the task or activity. PPE listed in the task-specific JSA will take precedence over PPE requirements listed in Section 5.3.1 of this HASP.

- Aerial Lifts
- Brush Clearing
- Construction Inspection
- Cranes and Rigging
- Driving Passenger Vehicles
- Excavation Oversight
- Excavation
- Fence Installation (Includes Silt Fence)
- Field Air Monitoring
- Heavy Equipment Operation
- Water Work with Boats

5.2.2 Permits

Selected work activities, listed below, require a permit in accordance with Responsible Parties or specific H&S Standards. The applicable permit is presented in Appendix B with

the JSAs and Safety Standards. PPE and equipment prescribed by the permit take precedence over JSA and HASP requirements.

- Aerial Elevated Work
- Lifting Operations Permit
- Permit Required Entry Confined Space
- Lock-out Tag-out Permit to Work

5.2.3 H&S Standards

H&S Standards addressing safety-critical work activities are listed below and located in Appendix B. These standards should be reviewed by the Engineer, and/or any designated associate project manager/task manager, and Site personnel prior to start of the project or applicable task to confirm that all requirements are met.

- ARC HSFS019 – Utility Location
- ARC HSFS017 – Aerial Work Platform
- ARC HSGE005 – Bloodborne Pathogens
- ARC HSIH014 – Cold Stress Prevention
- ARC HSFS003 – Confined Space Entry
- ARC HSFS004 – Control of Hazardous Energy Lock-out Tag-out
- ARC HSCS005 – Excavation and Trenching
- ARC HSFS006 – Electrical Safety
- ARC HSFS005 – Elevated Work and Fall Protection
- HSF007 – Fall Protection
- ARC HSGE004 – First Aid/CPR/Automated External Defibrillators
- ARC HSGE007 – Hazard Communication
- ARC HSIH008 – Hearing Conservation
- ARC HSMS002 – Hazard Identification Risk Assessment and Risk Control
- ARC HSIH013 – Heat Stress Prevention
- ARC HSCS006 – Heavy and Mechanized Equipment
- ARC HSCS003 – Hoisting and Rigging
- ARC HSCS013 – Hot Work
- ARC HSGE – Motor Vehicle Safety Program
- ARC HSGE15 – Personal Protective Equipment
- ARC HSIH012 – Respirable Crystalline Silica
- ARC HSGE019 – Short Service Employee
- ARC HSGE009 – Stop Work Authority
- ARC HSGE001 – Tailgate Meeting
- ARC HSFS019 – Utility Location Procedures
- ARC HSFS002 – Water Operations

5.3 Personal Protective Equipment

5.3.1 General Requirements

PPE requirements are specified in task-specific JSAs and/or permits listed in Appendix B. If the work activity is not performed under a permit or JSA, then all project workers working on-site outside of an office or cabbed vehicle must wear, at a minimum:

- Hard hat;
- Safety glasses;
- Safety-toed boot; and
- Class II traffic vest.

Regardless of the requirements above, the following PPE marked "R" is required to be available on-site for this project:

Description (Put Specific Material or Type in Box)	R=Required O=Optional
Coveralls	O
Chemical Protective Suit (include type in cell, e.g., Tyvek, Saranex, PVC, etc.)	
Splash Apron	
Rain Suit	O
Traffic Safety Vest (Class II minimum)	R
Hard Hat (if it does not create another hazard)	R
Head Warmer (depends on temperature and weather conditions)	O
Safety Glasses (incorporate sun protection, as necessary)	R
Goggles (based on hazard)	
Splash Guard (based on hazard)	
Ear Plugs	R
Ear Muffs	O
Outer Chemical Resistant Gloves (specify the type of glove based on chemical hazard)	
Inner Chemical Resistant Gloves (specify the type of glove based on chemical hazard)	R
Insulated Gloves	O
Work Gloves	R
Safety Boots (steel toe and shank)	R
Rubber, Chemical-Resistant Boots	
Rubber Boots	O
Disposable Boot Covers	
Snake Chaps or Guards	
Briar Chaps	
Other: Personal Floatation Device	R
Note: Subcontractors are required to have the same PPE available on-site as the PPE listed above.	

5.3.2 Levels of PPE Protection

The following is a summary of the different levels of PPE protection which may be referred to in this HASP, project-related JSAs/permits, or in H&S Standards:

- Level D – Standard work clothing consisting of long pants, shirt with at least a quarter sleeve, hard hat, safety glasses, safety-toed boots, protective gloves, and Class II retroreflective vest (traffic vest).
- Level D Modified – All of the PPE listed above plus coveralls (standard or flame-resistant coveralls or Tyvek).
- Level C – All of the PPE listed above including enhanced skin protection including use of coated Tyvek, Saranex, or equivalent, and use of inner and outer protective gloves and possible use of boot covers. Also includes respiratory protection including mandatory use of dust masks or use of half or full-face piece air purifying respirators (APRs).
- Level B – All of the PPE listed above except enhanced respiratory protection, which includes use of supplied air (self-contained breathing apparatus or airline supplied air).
- Level A – All of the PPE listed above except enhanced skin protection through use of completely encapsulating protective outer suit.

For detailed application of PPE for Level C and higher protection, see Appendix G.

6.0 HAZARD COMMUNICATION / GLOBAL HARMONIZATION SYSTEM

HAZCOM/GHS compliance is the responsibility of the Contractor on this project. SDSs for this project will be available in the Contractor's trailer. Staff on this project are not reasonably expected to encounter or use chemicals subject to OSHA's HAZCOM Standard.

7.0 TAILGATE MEETINGS

Tailgate safety briefings must be conducted at least once daily. The tailgate safety briefing must be documented on the form included in Appendix D or documented on an equivalent form and maintained with the project files. Alternatively, the tailgate safety briefing may be documented and stored/archived digitally using approved software. The tailgate safety briefing will serve as a final review for hazard identification and controls to be utilized. JSAs (including any applicable permit or supplemental plans) should be reviewed as part of the briefing to ensure hazard controls are adequate for planned work. A tailgate safety briefing should be conducted again and documented during the same work shift if Site conditions change from anticipated conditions.

8.0 PERSONAL EXPOSURE MONITORING AND RESPIRATORY PROTECTION

8.1 General Requirements

Personal and area exposure monitoring will be documented on the Air Monitoring Log provided in Appendix D or recorded digitally using approved software. All monitoring equipment will be maintained and calibrated in accordance with manufacturer's recommendations. All pertinent monitoring data will be logged on the form or digitally and maintained on-site for the duration of

project activities. Calibration of all monitoring equipment will be conducted daily and logged on the same form or documented using approved software.

Appendix F lists exposure monitoring requirements and associated action levels for Site exposure hazards (e.g., chemical, noise, radiation). Action levels have been developed for exposure monitoring with real-time air monitoring instruments as specified in the table. Air monitoring data will determine the required respiratory protection levels at the Site during scheduled intrusive activities. The action levels are based on sustained readings indicated by the instrument(s). Air monitoring will be performed and recorded at intervals specified in Appendix F.

If elevated concentrations are indicated, the monitoring frequency will be increased, as appropriate. If sustained measurements are observed during this time, the following actions will be instituted, and the Engineer and Environmental Monitor will be notified. For purposes of this HASP, sustained readings are defined as the average airborne concentration maintained for a period of one (1) minute. For situations where sustained air monitoring measurements are above the time weighted average for the constituent of interest, the Environmental Monitor will contact a Certified Industrial Hygienists (CIH) or Certified Safety Professional (CSP) for assistance.

9.0 MEDICAL SURVEILLANCE

Medical surveillance requirements prescribed by OSHA's HAZWOPER regulations apply to all tasks on this project.. All medical surveillance requirements, as indicated, must be completed and Site personnel must be medically cleared before being permitted on the Site.

10.0 SANITATION

10.1 Potable Water

An adequate supply of potable water must be provided on the Site. Portable containers used to dispense drinking water shall be capable of being tightly closed and equipped with a tap. Water shall not be dipped from containers. Any container used to distribute drinking water shall be clearly marked as to the nature of its contents and not used for any other purpose. Where single service cups (to be used but once) are supplied, both a sanitary container for the unused cups and a receptacle for disposing of the used cups shall be provided.

10.2 Toilet Facilities

Under temporary field conditions, the Environmental Monitor will make provisions so that no less than one toilet facility is available. Use of a nearby toilet facility is an acceptable arrangement for mobile crews having transportation readily available. For the purpose of this project, sanitary facilities will be provided at the Site.

11.0 DECONTAMINATION AND SITE CONTROL PROCEDURES

11.1 Decontamination

Site workers should exercise good hygiene practices by washing hands and face with soap and water prior to consumption of food, drink, or use of tobacco products. Ready access to an adequate supply of potable water, soap, and disposable towels is expected to be maintained on-site. Exposed skin in contact with potentially impacted environmental media, Site chemicals, decontamination

materials (i.e., isopropyl alcohol), or calibration solutions should promptly wash the affected area with soap and water to reduce potential for contamination or skin irritation.

Work conducted under Level C or higher protection must utilize decontamination controls specified in Appendix G.

11.2 Site Control

Site control is required for all field work. The primary purpose of Site control is to minimize worker exposure to known or potentially harmful COCs in environmental media, remediation, or process chemicals or waste materials. Site control also serves to protect Site workers not involved with the environmental investigation or remediation and members of the public from potential contamination. Finally, Site control can be used to prevent theft and vandalism of equipment.

All visitors to the project work area/Site are required to sign in and out on the Visitor's Log (located in Appendix D) for the project and must receive a safety briefing described in Section 7 of this HASP.

For Level D projects, formal establishment of Site control zones is not ordinarily required unless specified by the THA or task-specific JSA. Simple controls such as cones and caution tape should be utilized in areas with high pedestrian traffic. Site control zones are highly variable, based on Site conditions; but, at a minimum, the zone established should be at least 10 feet in all directions from the work activity to the extent practical. Site control may be integrated with other supplemental plans such as Non-ROW TSP, as applicable. See Appendix E for more details.

Site control for Level C or higher protection is addressed in Appendix G.

12.0 SUPPLEMENTAL PLANS AND REQUIREMENTS

12.1 Supplemental Plans

The following checked supplemental plans are applicable to this project and are presented in Appendix E:

	Right-of-Way Traffic Safety Plan
X	Non-Right-of-Way Traffic Safety Plan
	Lone or Remote Worker Plan
	Journey Management Plan
X	Site Security Plan
	International Travel Safety and Security Plan
X	Silica Exposure Control Plan
	State Specific Injury and Illness Prevention Plan – State:
	State Specific Heat Prevention Plan – State:
X	Other: Community Air Monitoring Plan
X	Blood Borne Pathogen Plan
X	Respiratory Protection Level C Plan
	Supplemental plans are not required for this project

12.2 Hazardous Materials Shipping Determinations

A shipping determination is required for all equipment, chemical, battery, and sample shipments. For this project, one or more shipping determinations are:

	Required for this project and are presented in Appendix E.
X	Not required for this project.

12.3 Commercial Motor Vehicles

Vehicles with a gross vehicle weight rating (GVWR) ≥10,001 pounds (alone or when attached to a trailer) are commercial motor vehicles (CMVs) and require drivers to be enrolled in a CMV training program. For this project, one or more vehicles operated by the Contractor will:

X	Meet criteria of a CMV and require use of a CMV trained driver.
	CMV operation is not applicable for this project.

12.4 Tick Hazard Control

☒ Tick exposure is a potential hazard associated with tasks completed on this project.

Arcadis has established a supplemental hazard ranking system for the evaluation of tick hazards. The chart below defines tick hazards as "high," "medium," or "low" based on anticipated Site conditions.

Tick Hazard Ranking Guide

Low	Paved areas; parking lots; well-manicured lawns and fields; no work taking place within 15 feet of vegetated areas; work in regions with no tick populations; sub-freezing temperatures, snow, or ice cover on ground. *
Medium	Brush-hogged fields, wetlands, grasslands; forested areas with little undergrowth; weeds less than knee height; moderately dense foliage; sporadic or moderately vegetated shaded areas; average leaf accumulation and decaying material on the ground; work taking place in fields after application of insecticide; work in regions with a recognized moderate tick population; outdoor work during spring, summer, and fall months. *
High	Uncut fields, wetlands, forested areas, grasslands; weeds taller than knee height; heavy dense foliage; heavily vegetated shaded areas; excessive accumulations of leaves and decaying material on the ground; work in regions with recognized heavy tick populations; areas with posted tick hazard warnings; outdoor work during spring, summer, and fall months. *
* Cold weather does not eliminate risk of exposure to ticks as they may be active all year in areas that experience subfreezing temperatures.	

Work on this project has a low tick exposure hazard. Wear light-colored clothing to help identify presence of ticks on staff. Keep shirt tails inside pants. Plan access that does not encounter Medium and High-risk areas. Use of insect repellent (permethrin and/or DEET) is recommended. Complete personal self-tick checks each day after work is completed.

12.5 Poisonous Plant Hazard Control

☒ Poisonous plant exposure is a potential hazard associated with tasks completed on this project.

Arcadis has established a supplemental hazard ranking system for the evaluation of poisonous plant hazards. The supplemental ranking of "high," "medium," or "low" based on anticipated Site conditions. As part of the ranking process, staff should consider poisonous plants hazardous throughout the year, including winter months.

Work on this project has a low poisonous plant exposure hazard. First aid kits should be equipped with post-exposure soap as a precaution. Inspect work area for presence of hazard prior to initiating work at the location. Plan work to avoid areas of identified poisonous plants. Wear disposable gloves during work and while removing outer footwear.

13.0 BEHAVIOR BASED SAFETY PROGRAM

As part of any project, no matter how simple or complex, Task Improvement Processes (TIPs) should be conducted when practical and when able to integrate into normal business activities. TIPs should be scheduled based on the risk of the tasks being performed, and should be conducted for different tasks and at different times.

The following tasks are suitable for TIP activity for the project:

- Driving
- Site Mobilization
- Boat Operation
- Equipment Operation
- Excavation
- Cap Installation
- Site Restoration
- Site Demobilization

All field staff are encouraged to identify and report near misses that could affect the H&S of employees, our subcontractors, or the public.

14.0 SUBCONTRACTORS

Subcontractors are responsible for the H&S of their employees at all times and have the authority to halt work if unsafe conditions arise.

A copy of this HASP is to be provided to all subcontractors prior to the start of work so that the subcontractor is informed of the hazards at the Site. While this HASP will be the minimum H&S requirements for the work completed on the Site, the Contractor, subcontractor(s), and other Site personnel are expected to perform their operations in accordance with their own HASP, policies, and procedures unique to their respective work to ensure that hazards associated with the performance of the work activities are properly controlled. Copies of any required safety documentation for a subcontractor's work activities will be provided to the Contractor for review prior to the start of on-site activities.

In the event that the subcontractor's procedures/requirements conflict with requirements specified in this HASP, the more stringent guidance will be adopted after discussion and agreement between the subcontractor and the Contractor's H&S personnel. Hazards not listed in this HASP but known to the subcontractor or known to be associated with the subcontractor's services, must be identified and addressed to the Engineer, and/or any designated associate project manager/task manager, and the Environmental Monitor prior to beginning work operations.

When the subcontractor is under contract to or if directed by the Responsible Parties to act on the Responsible Parties' behalf, the Engineer, and/or any designated associate project manager/task manager, along with the Environmental Monitor, has the authority to halt the subcontractor's operations and to remove the subcontractor or subcontractor's employee(s) from the Site for failure to comply with established H&S procedures or for operating in an unsafe manner.

15.0 PROJECT PERSONNEL HASP CERTIFICATION

All Site personnel will sign the certification signature page provided in this HASP.

APPENDIX A
TASK HAZARD ANALYSIS

General Task Hazard Assessment and Risk Control (HARC)

General:	Hazards Applicable to All Project Tasks

The 12 hazard category HARC ratings are not available in this General THA. The mitigated and unmitigated ratings for the hazards presented are based on the Risk Assessment Matrix below. Modify hazards and ratings as necessary to meet project needs.

Risk Assessment Matrix		Likelihood Ratings			
Consequences Ratings		A	B	C	D
People	Property	0 Almost Impossible	1 Possible but Unlikely	2 Likely to Happen	3 Almost Certain to Happen
1-Slight or No Health Effect	Slight or No Damage	0-Low	1-Low	2-Low	3-Low
2-Minor Health Effect	Minor Damage	0-Low	2-Low	4-Medium	6-Medium
3-Major Health Effect	Local Damage	0-Low	3-Low	6-Medium	9-High
4-Fatalities	Major Damage	0-Low	4-Medium	8-High	12-High

Hazard #1

Driving - Driver - Injury, death or property damage due to driver distraction, fatigue, etc.

Overall Unmitigated Risk: HIGH
Mitigated Risk: LOW
Comments: Use Smith System "5-Keys" when driving. See Driving JSA for details.

To mitigate this hazard, use TRACK and the following:
Smith System (on line)
JSAs

Hazard #2

Gravity - Falls - Injury due to slips and trips

Overall Unmitigated Risk: MEDIUM
Mitigated Risk: LOW
Comments: Ensure footwear is appropriate for surface conditions. See HASP PPE section.

To mitigate this hazard, use TRACK and the following:
Job Briefing/Site Awareness
Housekeeping

Hazard #3

Biological - skin/eye irritation or damage from poisonous plants

Suggested FHSHB Ref: III N, AE
Overall Unmitigated Risk: MEDIUM
Mitigated Risk: LOW
Comments: Use skin pre-treatment lotions when available.

To mitigate this hazard, use TRACK and the following:
Job Briefing/Site Awareness
PPE (see HASP "PPE" section)

Hazard #4

Biological - bites or stings from exposure to insects or arachnids

Overall Unmitigated Risk: MEDIUM
Mitigated Risk: LOW
Comments: Do body check daily.

To mitigate this hazard, use TRACK and the following:
Job Briefing/Site Awareness
PPE (see HASP "PPE" section)

Hazard #5

Biological - cuts, scrapes, skin/eye puncture from exposure to physically damaging plants

Overall Unmitigated Risk: MEDIUM
Mitigated Risk: LOW
Comments:

To mitigate this hazard, use TRACK and the following:
Job Briefing/Site Awareness
PPE (see HASP "PPE" section)

General Task HARC (continued)

Hazard #6		
Environmental - Thermal stress - Injury or illness from heat or cold		
		To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	JSAs
Comments:	Use job rotation or rest breaks. Stay hydrated and eat regularly.	
Hazard #7		
Environmental - Inclement weather -Injury or equipment damage from inclement weather		
		To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Weather Monitoring
Mitigated Risk:	LOW	Cont./Emerg. Planning
Comments:	Use 30/30 rule for lightning. See FHSHB for details.	
Hazard #8		
Motion - Musculoskeletal - Injury from lifting, twisting , stooping, or awkward body positions		
		To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Engineering Controls (specify in comments)
Mitigated Risk:	LOW	Admin. Controls (specify in comments)
Comments:	Use proper lifting techniques. Use job rotation when applicable. See FHSHB for details.	
Hazard #9		
Motion - Musculoskeletal - Injury from repeated work activity or body motion		
		To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Engineering Controls (specify in comments)
Mitigated Risk:	LOW	Admin. Controls (specify in comments)
Comments:	Use proper lifting techniques. Use job rotation when applicable. See FHSHB for details.	
Hazard #10		
Sound - Noise - Injury or illness due to noise exposure		
		To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Engineering Controls (specify in comments)
Mitigated Risk:	LOW	PPE (see HASP "PPE" section)
Comments:	Increase distance from source if possible. Maintain equipment.	

Task Specific HARC

Task 1:	Excavation

HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low): FHSHB Ref: D, E

Biological	L	Chemical	M	Driving	M	Electrical	M
Environmental	H	Gravity	M	Mechanical	H	Motion	H
Personal Safety	M	Pressure	L	Radiation	L	Sound	M

Hazard #1

Environmental - Utilities - Injury or property damage from utility strike/damage

Overall Unmitigated Risk: HIGH
Mitigated Risk: MEDIUM

To mitigate this hazard, use TRACK and the following:
Job Briefing/Site Awareness
Specialized Checklist/Forms

Comments: Confirm completion of utility locate prior to ground penetrating activities.

Hazard #2

Environmental - Engulfment - Injury or illness from engulfment in solids, liquids or gases

Overall Unmitigated Risk: HIGH
Mitigated Risk: MEDIUM

To mitigate this hazard, use TRACK and the following:
Specialized Training per Standard
Engineering Controls (specify in comments)

Comments: Utilize compenant person to inspect excavation and support of excavation structures prior to personnel or equipment entering the excavation.

Hazard #3

Driving - Off road - Injury or vehicle damage from object impact/vehicle rollover/improper load securement

Overall Unmitigated Risk: HIGH
Mitigated Risk: LOW

To mitigate this hazard, use TRACK and the following:
JSAs
Specialized Training per Standard

Comments: See JSA and Health and Safety Standard for Heavy Equipment Operations. Inspect loads prior to moving. Make sure slopes/grades are approved by competant person prior to driving equipment across them.

Hazard #4

Mechanical - Pinch point - Injury by pinching of body part in mechanical process

Overall Unmitigated Risk: MEDIUM
Mitigated Risk: LOW

To mitigate this hazard, use TRACK and the following:
Operator Competency per Standard
Site Awareness

Comments: Personnel must exercise caution when working with mechanized equipment to prevent clothing or body parts from being caught in moving parts.

Hazard #5

Pressure - Hydraulic - Injury from hydraulic process or device failure

Overall Unmitigated Risk: MEDIUM
Mitigated Risk: LOW

To mitigate this hazard, use TRACK and the following:
Specialized Training per Standard
H&S Standards

Comments: Inspect equipment per FHSHB including hydraulic lines for wear and damage and replace as needed

Hazard #6

Motion - Struck by - Bodily injury from impact with moving object

Overall Unmitigated Risk: MEDIUM
Mitigated Risk: LOW

To mitigate this hazard, use TRACK and the following:
JSAs
Job Briefing/Site Awareness

Comments: Personnel not involved in excavation activiaties should stand clear of work area and equipment when in operation.

Task Specific HARC (continued)

Task 2:	Soil Capping

HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low): FHSHB Ref: D, E, F

Biological	L	Chemical	L	Driving	M	Electrical	M
Environmental	H	Gravity	H	Mechanical	H	Motion	H
Personal Safety	M	Pressure	M	Radiation	L	Sound	L

Hazard #1

Gravity - Struck by - Injury from falling object

Overall Unmitigated Risk: MEDIUM
Mitigated Risk: LOW

To mitigate this hazard, use TRACK and the following:
Job Briefing/Site Awareness
Competent Person Required (designated person)

Comments: Designated persons shall visually inspect each crane or lifting device on each day of use for defects or damage in order to flag and remove from service any of those devices from service or maintenacne or repair as needed.

Hazard #2

Environmental - Engulfment - Injury or illness from engulfment in solids, liquids or gases

Suggested FHSHB Ref: III Z
Overall Unmitigated Risk: HIGH
Mitigated Risk: MEDIUM

To mitigate this hazard, use TRACK and the following:
Specialized Training per Standard
Engineering Controls (specify in comments)

Comments: Utilize compenant person to inspect excavation and support of excavation structures prior to personnel or equipment entering the excavation during capping phase.

Hazard #3

Gravity - Falls - Injury due to falls from height

Overall Unmitigated Risk: HIGH
Mitigated Risk: LOW

To mitigate this hazard, use TRACK and the following:
Fall Protection Awareness Training
Job Briefing/Site Awareness

Comments: Review requirements for excavation protection and fall protection when working near leading edge of excavation where height is greater then 4' from base of excavation.

Hazard #4

Motion - Process failure - Injury or equipment damage due to improper lockout/tagout

Suggested FHSHB Ref: III AA
Overall Unmitigated Risk: MEDIUM
Mitigated Risk: LOW

To mitigate this hazard, use TRACK and the following:
H&S Standards
Lockout/Tagout

Comments: Confirm limit switches, locking and safety devices are in place and functional as part of routine equipment checklist. See H&S Standard for Equipment Checklist.

Hazard #5

Chemical - solids/particulates, skin or eye irritation/damage/allergy

Overall Unmitigated Risk: MEDIUM
Mitigated Risk: LOW

To mitigate this hazard, use TRACK and the following:
PPE (see HASP "PPE" section)
Job Briefing/Site Awareness

Comments: Utilize wetting when placing stone or soils if dust generation is an issue. If dust generation cannot be mitigated utilize additional PPE such as goggles, dust masks or respirators as needed.

Hazard #6

Chemical - solids/particulates, injury or illness from inhalation

Overall Unmitigated Risk: MEDIUM
Mitigated Risk: LOW

To mitigate this hazard, use TRACK and the following:
PPE (see HASP "PPE" section)
Job Briefing/Site Awareness

Comments: Utilize wetting when placing stone or soils if dust generation is an issue. If dust generation cannot be mitigated utilize additional PPE such as goggles, dust masks or respirators as needed.

Task Specific HARC (continued)

Task 3:	Wetland Installation/Restoration

HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low): FHSHB Ref: NA

Biological	M	Chemical	L	Driving	H	Electrical	L
Environmental	H	Gravity	L	Mechanical	H	Motion	M
Personal Safety	L	Pressure	L	Radiation	L	Sound	L

Hazard #1

Driving - Watercraft - Injury or equipment damage due to improper operation of a watercraft

Overall Unmitigated Risk: HIGH

Mitigated Risk: MEDIUM

To mitigate this hazard, use TRACK and the following:
PPE (see HASP "PPE" section)
Specialized Training per Standard

Comments: Review Boat Operation JSA and Health and Safety Standard and confirm boat operator has required training. Wear PDF in additional to other specalized PPE.

Hazard #2

Environmental - Drowning - Injury from submersion in water

Overall Unmitigated Risk: HIGH

Mitigated Risk: LOW

To mitigate this hazard, use TRACK and the following:
PPE (see HASP "PPE" section)
Site Awareness

Comments: Wear appropriate PPE including a PFD or fall protection when working on shore near or over water. When working from a boat wear PFD at all times and confirm boat operator has appropriate training.

Hazard #3

Environmental - Wind -Skin injury from sun or wind exposure

Overall Unmitigated Risk: MEDIUM

Mitigated Risk: LOW

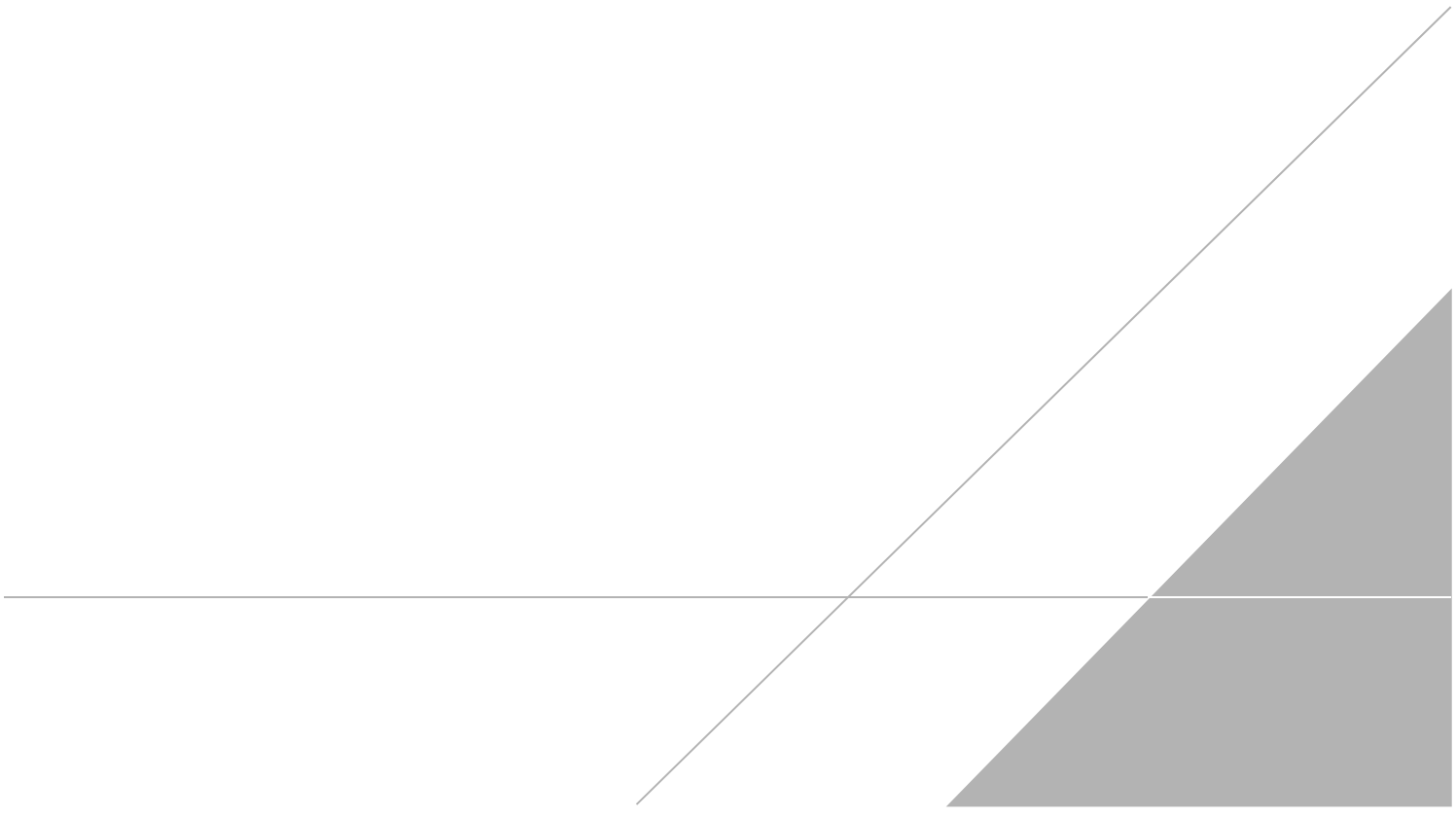
To mitigate this hazard, use TRACK and the following:
PPE (see HASP "PPE" section)
Field H&S Handbook (see ref. above)

Comments: Utilize long sleeves and sunscreen to protect against sunburns and windburn when working on our near water were wind/sun protection from buildings and vegetation is limited.

APPENDIX B

JOB SAFETY ANALYSES, PERMITS, AND HEALTH AND SAFETY STANDARDS

Arcadis Standards



ARCADIS Infrastructure · Water · Environment · Buildings	ARCADIS HS Standard Name Aerial Work Platform HS Standard	Revision Number 03
Implementation Date 15 March 2011	ARCADIS HS Standard No. ARC HSFS017	Revision Date 21 January 2015

EXECUTIVE SUMMARY

This Health and Safety Standard (HSS) sets forth minimum requirements for ARCADIS personnel to conduct work safely with the use of aerial work platforms (AWPs). There are many types and varieties of aerial work platforms that can be used to efficiently and safely conduct work. Examples of these are Extensible Boom Platforms, Aerial Ladders, Articulating (Jointed) Boom Platforms, Vertical Towers, or any combination of these. These types of AWP's are also known as "Aerial Lifts", "Cherry Pickers", "Ladder Trucks", "Telescopic Boom Lifts" and "Personnel Lifts".

This standard includes the practices to adequately protect ARCADIS personnel from accident and injury when using an AWP.

- The TRACK process and Stop Work Authority shall be used to prevent the following most common types of accidents associated with AWPs: Overturning, Uncontrolled Descents and Movements, Crushing, Collisions, and Electrocution.
- A copy of the manufacturer's operations manual must be provided with the work platform and stored in the weather-resistant storage compartment on the aerial platform.
- The aerial platform shall be used in accordance with the manufacturer's instructions and requirements.
- Aerial work platforms shall be inspected and maintained in accordance with the manufacturer's recommendations.
- Only trained and qualified operators who hold a current Equipment Operator Permit will operate an AWP. See section 5.3 of this standard for the Equipment Operator Permit requirements and Exhibit 3 for a copy of this permit.
- Controls on the AWP shall be plainly marked as to their function and tested before use.
- The boom and basket loads, maximum platform height, and maximum travel height for each AWP shall not be exceeded.
- Under all travel conditions the travel speed shall be limited according to the conditions of the ground surface, congestion, slope, location of personnel, and other factors causing a hazard of collision or injury to personnel.
- Guardrails shall be in place around the perimeter of the platform.
- Personnel occupying a boom-supported aerial platform shall wear approved fall restraint systems, including safety harnesses and a lanyard that restrains the worker from exiting the platform.
- The operator shall maintain adequate clearance from overhead obstructions such as building structures or energized electrical lines.
- The equipment shall be inspected daily and before each use by the operator for any defects or hazards that can be seen visually. See Exhibit 4 for the AWP Inspection Checklist.
- Aerial platforms that are not in proper operating condition shall be immediately removed from service until repaired.

ARCADIS Infrastructure · Water · Environment · Buildings	ARCADIS HS Standard Name Aerial Work Platform HS Standard	Revision Number 03
Implementation Date 15 March 2011	ARCADIS HS Standard No. ARC HSFS017	Revision Date 21 January 2015

1. POLICY

It is ARCADIS policy to minimize and control the hazards involved with the use of AWPs. ARCADIS recognizes that our work will at times require the use of these AWPs to complete our work. In those cases, this work will be conducted using the TRACK process. Use of all AWPs will only be by trained and qualified operators who hold a current Equipment Operator Permit to use a specific type of AWP.

2. PURPOSE AND SCOPE

2.1 Purpose

The basic purpose of the ARCADIS Aerial Work Platform HSS is to prevent accidents, injuries and equipment damage. AWPs are useful machines in providing access to locations where scaffolding is not present and, in many cases, are more effective to use than scaffolding. This HSS provides the minimum safety requirements for operation, inspection, maintenance, and training for AWPs. In addition to these safety requirements, the manufacturer's instructions for the specific aerial work platform used shall be followed.

2.2 Scope

This HSS applies to all ARCADIS US work in the use of aerial work platforms. Examples of these are Extensible Boom Platforms, Aerial Ladders, Articulating (Jointed) Boom Platforms, Vertical Towers, or any combination of these. These types of AWP's are also known as "Aerial Lifts", "Cherry Pickers", "Ladder Trucks", "Telescopic Boom Lifts" and "Personnel Lifts". **Exhibit 2** of this Standard contains some Typical Examples of these Aerial Work Platforms.

Note: A scissor-lift or lift cart is considered by OSHA to be a mobile scaffold. Therefore, it must be used in accordance with the OSHA standards for mobile scaffolds used in construction work. Refer to the Scaffold Standard (ARC HSFS015).

3. DEFINITIONS

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

4. RESPONSIBILITIES

4.1 PICs, Project Managers, and Task Managers

Are responsible for implementing this HSS on any project in which ARCADIS employees and/or subcontractors use aerial work platforms. These individuals are responsible for communicating and appropriately managing subcontractors, ensuring that employees and subcontractors, as applicable, have appropriate training and authorization to use an AWP as specified in this standard. These individuals are responsible for involving the appropriate ARCADIS H&S Staff and for ensuring that all subcontractors have been informed of the minimum H&S requirements for activities involving the use of AWPs.

4.2 Division H&S Directors

Are responsible for communicating with all PICs, PMs, APMs, within ARCADIS and ensuring that they are aware of this HSS and for ensuring that it is being implemented effectively.

4.3 Operations Managers and Supervisors

Are responsible for ensuring that all ARCADIS personnel are knowledgeable of the aerial work platform requirements and comply with the procedures, including inspection, maintenance, training, and permitting.

4.4 ARCADIS Employees

ARCADIS employees are responsible for implementing the TRACK (**T**hink through the task, **R**ecognize the hazard, **A**ssess the risk, **C**ontrol the risk, **K**eep H&S first in all things) process before any and all work involving aerial work platforms. Employees are responsible for adhering to the aerial work platform policies and procedures set forth in this HSS. They should communicate H&S concerns, issues and questions to their supervisor or their respective H&S contact prior to initiating work.

5. PROCEDURE

5.1 General Requirements for AWPs

- The TRACK process and Stop Work Authority shall be used to prevent the following most common types of accidents associated with AWPs: Overturning, Uncontrolled Descents and Movements, Crushing, Collisions, and Electrocution.
- A copy of the manufacturer's operations manual must be provided with the work platform and stored in the weather-resistant storage compartment on the aerial platform.
- The aerial platform shall be used in accordance with the manufacturer's instructions and requirements.
- Aerial work platforms shall be inspected and maintained in accordance with manufacturer's recommendations. See Exhibit 4 for the AWP Inspection Checklist.
- Only trained and qualified operators who hold a current Equipment Operator Permit will operate an AWP. See section 5.3 of this standard for the Equipment Operator Permit requirements.
- Before the aerial platform is used and during use, the operator shall use TRACK and check the area in which the aerial platform is to be used for possible workplace hazards.
- Controls shall be plainly marked as to their function.
- The boom and basket loads, maximum platform height, and maximum travel height for each AWP shall not be exceeded.

- Brakes shall be set before use, if the lift comes equipped with them.
- Trash and debris shall not be allowed to accumulate on the work platform.
- All body parts shall be kept inside the confines of the basket while the platform is in motion.
- Do not operate in storms (high winds, thunderstorms) that compromise the safety of personnel. Employees must refer to the operation and safety manual for each AWP to determine the maximum wind speed use. AWP operators must also factor in whether or not additional surface area has been added to the platform when considering maximum wind speed use.
- Except in case of emergency, the lower level controls of a lift shall not be operated unless permission has been given by the person in the lift.
- Before ladder trucks and tower trucks are moved, the aerial ladders shall be secured in the lower traveling position by the locking device above the truck cab, and the manually operated device at the base of the ladder, or by other equally effective means.

5.2 Operation of AWPs

5.2.1 Workplace Inspections

Before the aerial platform is used and during use, the operator shall use TRACK and check the area in which the aerial platform is to be used for possible hazards such as, but not limited to:

- Drop-offs or holes, including those concealed by water, ice, mud, etc.
- Slopes
- Bumps and floor obstructions
- Debris
- Overhead obstructions and electrical conductors
- Hazardous locations and flammable atmospheres
- Inadequate surfaces and supports
- Wind and weather conditions
- Presence of unauthorized persons
- Other possible unsafe conditions

5.2.2 Travel Speeds/ Movement

Under all travel conditions the travel speed shall be limited according to the conditions of the ground surface, congestion, slope, location of personnel, and other factors causing a hazard of collision or injury to personnel.

An aerial work platform shall not be moved when the platform is in the elevated position except for equipment that is specifically designed for that purpose.

The area surrounding the aerial work platform shall be cleared of personnel and equipment before lowering the platform.

5.2.3 Adequate Support Requirements

The support surface shall be adequate for the aerial work platform and the load carried. The AWP shall not be operated from a position on trailers, railway cars, floating vessels, or similar equipment unless the application is an approved use by the AWP manufacturer

For those AWPs that are approved for use on floating vessels, the AWP shall be positioned as close to the center of the platform or barge, as feasible. A controlled access zone or perimeter guarding must be in place and the AWP must be securely anchored/tethered, as required by the manufacturer.

When using an AWP on floating work platforms, the site specific Health & Safety Plan (HASP) and/or Job Safety Analysis (JSA) must be developed to address the following:

- Operator specific training/competency requirements
- AWP load rating capacity
- Design consideration to eliminate risk of capsize
- Motorized equipment capabilities and use limitations
- Fall Protection Requirements and other water safety PPE/rescue equipment requirements
- Controlled Access Zone or permiter guarding requirements
- Method of anchoring or tethering the AWP equipment
- Define lighting requirements
- Access to the barge/platform
- Communication method
- Emergency response/notification procedures

5.2.4 Leveling the Aerial Platform

Aerial work platforms should be used on a firm and level surface. The aerial platform shall not be operated in any manner on grades, side slopes, or ramps exceeding those

for which the aerial platform is rated by the manufacturer. Outriggers, stabilizers, extendible axles, oscillating axles, or other stability enhancing means shall be deployed and locked into place as required by the manufacturer. Outriggers, when used, shall be positioned on pads or a solid surface. Wheel chocks shall be installed before using a lift on an incline.

5.2.5 Fall Protection

Guardrails shall be in place around the perimeter of the platform, and access gates or openings shall be properly closed per the manufacturer' instructions. Personnel shall maintain a firm footing on the platform floor. Climbing by occupants on the mid-rail or top-rail of the AWP is prohibited. The use of planks, ladders, or any other device in or on the AWP for achieving additional height or reach is prohibited.

Personnel occupying a boom-supported aerial platform shall wear approved fall restraint system, including safety harnesses and lanyards that restrains the worker from exiting the platform. The lanyard shall be secured to the manufacturer's specified anchorage point inside the basket. Lanyards shall not be attached to any adjacent structure, pole, or equipment while working from an aerial work platform. Refer to the ARCADIS Elevated Work and Fall Protection Standard (ARC HSFS007) for the requirements associated with using fall protection equipment in aerial work platforms. Personnel using fall protection equipment must comply with those requirements and be trained prior to the use of the equipment.

5.2.6 Platform Access

The platform shall only be accessed through the designated access point. Personnel shall only vacate or enter a raised platform by following guidelines and instructions provided by the manufacturer.

5.2.7 Overhead Clearance

The operator shall maintain adequate clearance from overhead obstructions such as building structures or energized electrical lines. Refer to the ARCADIS Utility Clearance Standard for additional clearance information.

5.2.8 Tools/ Materials on the Work Platform

Only properly secured tools and materials, which are evenly distributed and can be safely handled by a person working from the platform, shall be on the platform while it is being moved. Consider tethering or tying off tools and materials to the platform when they create a hazard of falling to surfaces below. Ropes, electric cords, and hoses should be positioned to prevent them from becoming entangled when it is being elevated, lowered, or moved.

5.2.9 Fueling

The engine shall be shut down while fuel tanks are being filled. Fueling shall be done in a well-ventilated area free of flame, sparks, or other hazards that may cause fire or explosion. A fire extinguisher is to be available during refueling.

5.3 Equipment Operator Permit

ARCADIS or Subcontractor shall provide a trained and qualified operator with an Equipment Operator Permit prior to using the AWP. A copy of this permit shall be kept at the jobsite, and the permit shall be carried by the operator when using the AWP. The permit shall indicate the specific type of AWPs an operator has been trained on and is authorized to operate. See **Exhibit 3** for a copy of this permit.

5.4 Inspections and Maintenance

Aerial work platforms shall be inspected and maintained in accordance with the manufacturer's recommendations.

The equipment shall be inspected daily and before each use by the operator for any defects or hazards. See Exhibit 4 for the AWP Inspection Checklist. Frequent and annual inspections shall also be performed by a qualified person, such as a mechanic experienced on the specific type of aerial platform (or one having similar design characteristics).

Aerial platforms that are not in proper operating condition shall be immediately removed from service until repaired. Any repair must be performed by a qualified person and in accordance with the manufacturer's recommendations. No modifications can be made to this equipment without written permission from the manufacturer.

5.4.1 Pre-Start Inspections

Before use or at the beginning of each shift, the AWP shall be given a visual inspection and functional test including, but not limited to, the following:

- Test lift controls
- Safety devices
- Personal protective devices
- Air, hydraulic and fuel systems
- Cables and wiring
- Loose or missing parts
- Tires and wheels
- Placards, warnings, control markings and operating manuals
- Outriggers, stabilizers, extendable axles and other structures
- Guardrail system
- Items specified by the manufacturer

The aerial platform shall not be placed into service until all missing components, malfunctions and problems have been corrected.

5.4.2 Frequent and Annual Inspections

Frequent and annual inspections of the AWP shall be performed in accordance with the manufacturer's instructions and following these circumstances:

- Upon arrival to a job site
- When the AWP has been in service for three months or every 200 hours
- If the AWP has been out of service for a period of three months

The inspection shall be made by a person qualified on the specific type of aerial platform or one having similar design characteristics. The inspection shall include the items from a pre-start inspection and those specified by the manufacturer. The aerial platform shall not be placed into service until all malfunctions and problems have been corrected.

6. TRAINING

6.1 Aerial Work Platform Operators

Only personnel who have received instructions and training regarding the inspection, application and operation of a specific aerial work platform, shall operate that AWP. Training will be under the direction of a qualified, competent individual capable of determining an employee's proficiency in knowledge and actual operation of the AWP. This training shall include the recognition and avoidance of hazards associated with operation of the specific AWP. Such training shall include, but are not limited to the following:

- The purpose and use of operating manuals
- Pre-start inspections
- Responsibilities associated with problems or malfunctions affecting the operation of the aerial work platform
- Factors affecting stability
- The purpose of placards and decals
- Safety rules and regulations
- Operator warnings and instructions
- The purpose and function of all controls
- Actual operation of the aerial work platform

6.2 Training Documentation

All training shall be documented. The document evidencing operator training shall be provided by the vendor or person who conducts the training. The employee receiving that

training shall ensure that a copy of the training document is submitted to the ARCADIS Training Team.

6.3 Retraining

The operator shall be retrained, when so directed by ARCADIS supervisor and/or management, based on observation and evaluation of the operator.

7. REFERENCES

29 CFR 1910.67 - Vehicle Mounted Elevated and Rotating Work Platforms

29 CFR 1910.68 - Manlifts

29 CFR 1926.453 - Aerial Lifts

29 CFR 1910.333(c)(3) – Electrical, Selection and Use of Work Practices.

ANSI ZA92.2 Vehicle Mounted Elevating and Rotating Work Platforms.

ANSI A92.3-2006 - Manually-Propelled Elevating Aerial Platforms

ANSI A92.5-2006 - Boom-Supported Elevating Work Platforms

ANSI A92.6-2006 - Self-Propelled Elevating Work Platforms

8. RECORDS

All records regarding aerial work platform inspections and maintenance must be maintained in the project files. Employee training records will be maintained by the ARCADIS Training Department.

ARCADIS Infrastructure · Water · Environment · Buildings	ARCADIS HS Standard Name Aerial Work Platform HS Standard	Revision Number 03
Implementation Date 15 March 2011	ARCADIS HS Standard No. ARC HSFS017	Revision Date 21 January 2015

9. APPROVALS AND HISTORY OF CHANGE

Approved by: Tony Tremblay, CSP – Director of H&S, Infrastructure Division

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
15 March 2011	01	Brent Oakeson / Tony Tremblay	Original document
17 Feb 2012	02	Brent Oakeson / Tony Tremblay	Removed references to Scissor Lifts (moved to Scaffolding Standard). Updated examples and definitions of AWP's.
21 January 2015	03	Sharon Lingle / Tony Tremblay	Revised Section 5.2.5 to clarify use of an approved fall restraint system; Header format and History of Change table format updated

ARCADIS Infrastructure · Water · Environment · Buildings	ARCADIS HS Standard Name Aerial Work Platform HS Standard	Revision Number 03
Implementation Date 15 March 2011	ARCADIS HS Standard No. ARC HSFS017	Revision Date 21 January 2015

EXHIBIT 1 – DEFINITIONS

Aerial work platform: A mobile device that has an adjustable position platform, supported from ground level by a structure.

Anchorage(s): A secure point of attachment to be used with personal fall protection equipment.

Articulating boom: A means used to support the personnel platform with two or more hinged boom sections.

Base: The relevant contact points of the aerial platform that form the stability fulcrum (e.g., wheels, casters, outriggers, stabilizers, etc.).

Boom-supported elevating work platform: An aerial work platform supported by a boom that telescopes, articulates, rotates, or extends beyond the base dimensions to position personnel, along with their tools and materials. These devices are power operated with primary functions controlled from the platform.

Elevating assembly: The mechanisms used to position the platform relative to the aerial platform chassis.

Elevating work platforms, (self-propelled or manually propelled): An aerial work platform that has an adjustable platform position, supported from ground level by a structure. The platform cannot be positioned completely beyond its base.

Guardrail system: A vertical barrier primarily intended to protect against personnel falling to lower levels.

Maximum Platform Height: The maximum elevation measured from the floor of the platform to the surface upon which the machine is being supported.

Maximum Travel Height: The maximum platform height or the most adverse configuration(s)

Outriggers: Devices that increase the stability of the aerial platform and that are capable of lifting and leveling the aerial platform.

Platform: The portion of an aerial platform intended for occupation by personnel with their necessary tools and materials.

Platform height: The vertical distance measured from the floor of the platform to the surface upon which the aerial platform is being supported.

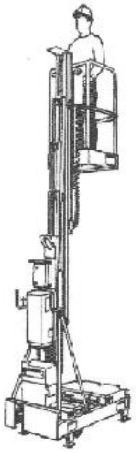
Qualified operator: A person who has received training on the specific elevating work platform device has demonstrated knowledge and skill in operating the equipment, and is authorized to operate the specific AWP.

Rated work load: The designed carrying capacity of the aerial platform, as specified by the manufacturer.

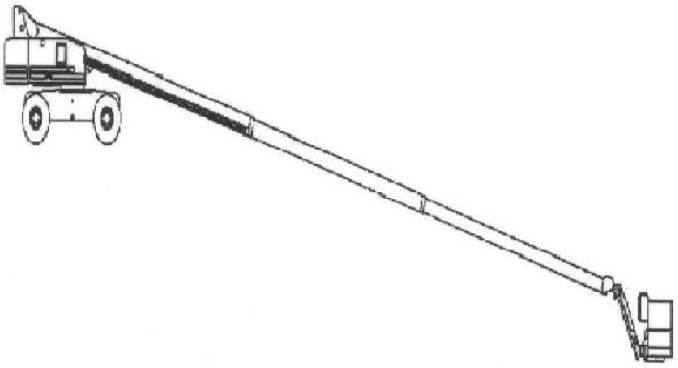
Stability/stable: A condition of an aerial platform in which the sum of the moments which tend to overturn the unit is less than the sum of the moments tending to resist overturning.

ARCADIS Infrastructure · Water · Environment · Buildings	ARCADIS HS Standard Name Aerial Work Platform HS Standard	Revision Number 03
Implementation Date 15 March 2011	ARCADIS HS Standard No. ARC HSFS017	Revision Date 21 January 2015

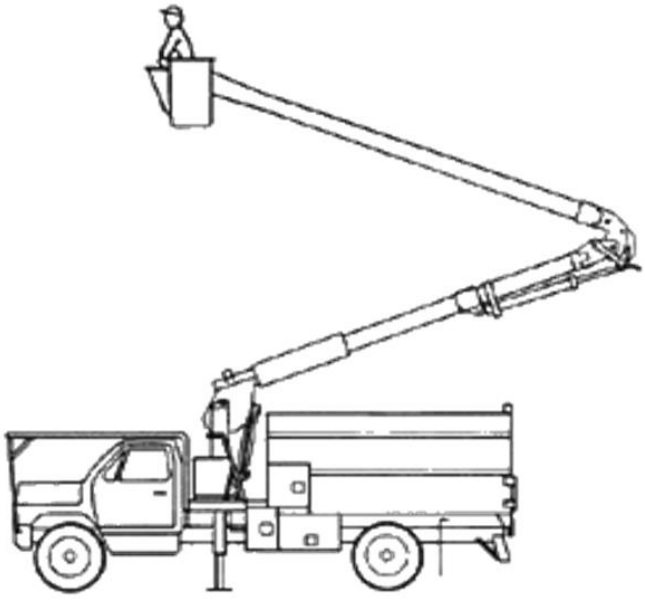
EXHIBIT 2 – TYPICAL EXAMPLES OF AERIAL WORK PLATFORMMS



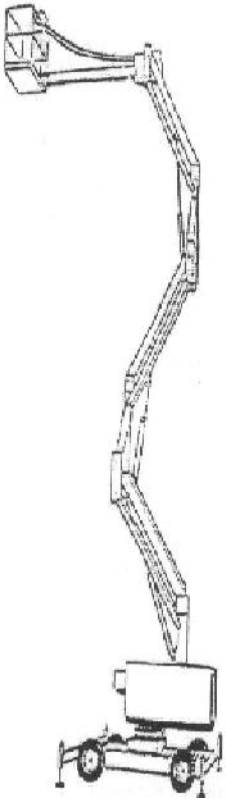
Vertical Tower



Extensible Boom Platforms



Extendable Boom Truck



Articulating Boom Platforms

ARCADIS Infrastructure · Water · Environment · Buildings	ARCADIS HS Standard Name Aerial Work Platform HS Standard	Revision Number 03
Implementation Date 15 March 2011	ARCADIS HS Standard No. ARC HSFS017	Revision Date 21 January 2015

EXHIBIT 3 – EQUIPMENT OPERATOR PERMIT

Operator Name:
Operator Company:

This Operator is authorized to operate the following designated equipment:

Aerial Work Platforms	Manufacturer(s) / Type(s) / Model #'s	Trainer/ Vendor	Date of Training
☐ Personnel Lift			
☐ Telescopic Boom Lift			
☐ Articulated Boom Lift			
☐ Vehicle Mounted Lift			
Mobile Scaffold			
☐ Scissor Lift			
Other			
☐			
☐			
☐			

Notes:

_____

_____

_____

Date Issued:_____ Date Expires:_____

Authorized by:_____ Signature:_____
(Supervisor or PM)

ARCADIS Infrastructure · Water · Environment · Buildings	ARCADIS HS Standard Name Aerial Work Platform HS Standard	Revision Number 03
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EXHIBIT 4 – AERIAL WORK PLATFORM INSPECTION CHECKLIST

ARCADIS
Infrastructure · Water · Environment · Buildings

AERIAL WORK PLATFORM INSPECTION CHECKLIST

Equipment Type:	**Equipment #:**
Manufacturer:	**Model #:**
Project / Location:	
Inspected by:	**Date:**

Indicate if the items below have been checked and are adequate for operational and safe use.

ITEMS TO BE CHECKED			
Equipment Conditions:	**Yes**	**No**	**N/A**
a) Fuel level	☐	☐	☐
b) Engine oil level	☐	☐	☐
c) Air, hydraulic and fuel systems	☐	☐	☐
d) Cables and wiring	☐	☐	☐
e) Battery, water level, condition, state of charge	☐	☐	☐
f) Tires, proper inflation, no damage, wheels	☐	☐	☐
g) Platform structure, cleanliness, physical condition	☐	☐	☐
h) Guardrail system, safety chains, fall protection anchorage points	☐	☐	☐
i) Instruction labels, placards, markings in place and legible	☐	☐	☐
j) No loose or missing parts	☐	☐	☐
k) Locking pins	☐	☐	☐
l) Operating manual	☐	☐	☐
m) Fire extinguisher	☐	☐	☐
Controls:	**Yes**	**No**	**N/A**
a) All controls marked as to their function	☐	☐	☐
b) Test all lift controls, switches, buttons	☐	☐	☐
c) Raise and lower platform/boom	☐	☐	☐
d) Raise platform/boom and lower with auxiliary power	☐	☐	☐
e) Telescope out and in	☐	☐	☐
f) Swing platform right and left	☐	☐	☐
g) Extend and level outriggers / stabilizers	☐	☐	☐
h) Drive machine forward and reverse, right and left	☐	☐	☐
i) Personal protective devices, Horn, backup alarm, warning lights	☐	☐	☐
j) Brakes	☐	☐	☐
Other Items / Specific to Model / Manufacturer:	**Yes**	**No**	**N/A**
a)	☐	☐	☐
b)	☐	☐	☐
c)	☐	☐	☐
d)	☐	☐	☐
e)	☐	☐	☐
f)	☐	☐	☐

Note: Defects found must be repaired prior to equipment use. Retain this form with the equipment until the end of the workday, then keep this form in the project files.

Notes: _____

_____

_____ _____

Signature of Person Completing Repairs **Date/ Time Repaired**

ARCADIS Infrastructure · Water · Environment · Buildings	ARCADIS HS Standard Name Aerial Work Platform HS Standard	Revision Number 03
Implementation Date 15 March 2011	ARCADIS HS Standard No. ARC HSFS017	Revision Date 21 January 2015

EXHIBIT 5 – STATE SPECIFIC AERIAL WORK PLATFORM STANDARDS

The following states have standards that may exceed those of the federal standard for Aerial Work Platforms. If your office or work location is in one of these states, please review the regulations and modify accordingly:

- California –General Industry Safety Orders, Subchapter 7. Group 4, Article 24.
- Hawaii – General Industry Standards, Title 12, Subtitle 8, Part 2.
- Michigan – Health Standards for General Industry, Part 58. Aerial Work Platforms.
- Utah – General Industry Standard Supplement, R614-6-8
- Washington – Chapter 296 - 869, WAC. Elevating Work Platforms.

EXECUTIVE SUMMARY

It is the policy of ARCADIS to prevent and minimize occupational exposure to blood borne pathogens through the use of engineering and administrative controls and personal protective equipment (PPE).

Blood borne Pathogens are pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV) and human immunodeficiency virus (HIV).

Corporate H&S Department has the responsibility to communicate the policy and standard requirements with all ARCADIS-US (AUS) offices.

ARCADIS Managers and Supervisors (including project and task managers) have the responsibility to provide oversight management for the Health & Safety (H&S) of employees in their respective operations, and ensure that the HSS is being implemented.

ARCADIS Employees have the responsibility to adhere to this HSS and to communicate H&S concerns, issues and questions to their supervisor or to the corporate Health and Safety staff.

Each office or jobsite subject to this standard will have a written Exposure Control Plan that is to be reviewed annually. The Plan will outline methods to be utilized and schedules to be kept to maintain compliance with this standard. The Plan is designed to eliminate or minimize employee exposure. A copy of the plan should be accessible to all employees.

The Hepatitis B (HBV) vaccination series and post-exposure evaluation and follow-up will be made available to all employees who fall under this standard at no cost to the employee. Initial and annual training will be provided to all employees who have been designated as first aid responders or are expected to render first aid and/or are expected to clean an area contaminated with blood or other potentially infectious materials.

All exposure and medical records shall be kept for the duration of employment plus 30 years.

All employee training records will be kept from the date on which the training occurred and maintained for the duration of employment plus 10 years.

1. POLICY

It is the policy of ARCADIS to comply with the OSHA's Blood borne Pathogens (BBP) Standard as it relates to the work we do.

2. PURPOSE AND SCOPE

2.1 Purpose

ARCADIS is committed to providing a healthy and safe work environment for its employees, subcontractors, clients and visitors. To this end, ARCADIS embraces this policy to eliminate or minimize exposure to blood borne pathogens.

2.2 Scope

The standard applies to all employees who have been designated as first aid responders or who are expected to render first aid and/or are expected to clean an area contaminated with blood or other potentially infectious materials as part of their job responsibilities. This standard does not cover employees who perform unanticipated "good Samaritan acts" at work.

3. DEFINITIONS

There are a number of definitions associated with this standard. These definitions are presented in **Exhibit 1** of this document.

4. Responsibilities

4.1 Corporate H&S Department – has the responsibility to:

- Communicate the policy and standard requirements with all ARCADIS-US (AUS) offices.
- Establish a written Exposure Control Plan template for offices and projects to utilize that is designed to eliminate or minimize employee exposure.
- Ensure that a copy of this plan is accessible to employees in accordance with 29 CFR 1910.1020(e).
- Ensure that this Health and Safety Standard (HSS) is reviewed annually and revised as necessary.
- Facilitating the implementation of this HSS and providing "hands-on" assistance to ARCADIS staff in its implementation.
- ARCADIS Managers and Supervisors (including project and task managers) – provide oversight management for the Health & Safety (H&S) of employees in their respective operations, and ensure that the HSS is being implemented.

4.2 ARCADIS Employees – have the responsibility to adhere to this HSS and to communicate H&S concerns, issues and questions to their supervisor or to the corporate Health and Safety staff.

5. PROCEDURE

5.1 General Requirements

Each office or jobsite that is subject to this standard will have a written Exposure Control Plan that is to be reviewed annually.

5.2 Written Exposure Control Plan

The Written Exposure Control Plan is designed to eliminate or minimize employee exposure. The plan will be reviewed and updated at least annually, including any changes in technology and any devices that have been considered/purchased that may eliminate or decrease employee exposure. A copy of the plan will be accessible to all employees. A template plan can be found in Exhibit 2. The plan should address the following:

- Exposure Determination to include employees who, without regard to PPE, have potential exposures and what tasks (e.g. providing First Aid) could so expose them.
- Methods of Compliance;
- Hepatitis B Vaccination and Post-Exposure Evaluation and Follow-up;
- Labeling and Signs - Communication of Hazards;
- Recordkeeping; and
- How the route of exposure and circumstances under which it occurred will be documented.

5.3 Methods of Compliance

The written Exposure Control Plan will outline what methods will be utilized and what schedules must be kept to maintain compliance with this standard. The following will be addressed in the plan:

- Universal Precautions will be observed to prevent contact with blood or other potentially infectious materials; examples include gloves, masks or eye protection.
- Engineering and Work Practice Controls will be used to eliminate or minimize employee exposure. These include:
    - Hand washing facilities will be readily available. If this is not feasible, antiseptic hand cleanser, single use towels or antiseptic towelettes will be made available with hand washing to be done as soon as possible thereafter.

  - Requiring that employees wash their hands as soon as possible after removal of PPE, and that they wash any skin or flush mucous membranes with water as soon as possible after contact with potentially infectious materials.

  - Education of employees so that splashing, spraying, or spattering of blood or body fluids will be minimized.

- PPE will be considered appropriate only if it does not permit blood or other infectious material to pass through or reach clothes, undergarments, skin, eyes, mouth or other mucous membranes under normal conditions of use. **Exhibit 3** is a guide to blood borne pathogen PPE.

  - PPE that is appropriate to the potential exposure will be made available and, where necessary, made of hypoallergenic material. If the employee declines to wear PPE, the circumstances will be investigated and documented.

  - PPE will be removed prior to leaving the incident area and placed in an appropriately designated container for decontamination or disposal. Defective, damaged or questionable PPE will be repaired or replaced as needed.

  - Gloves will be worn when it is reasonably anticipated that the employee may have hand contact with blood or other potentially infectious materials, mucous membranes and/or non-intact skin. They will also be worn when handling or touching contaminated items or surfaces. Gloves must be disposable and will be exchanged for a new pair when contaminated, torn or punctured. Disposable (single use) gloves shall not be washed or decontaminated for re-use.

  - Masks, eye protection and face shields are required whenever splashes, spray, spatter, or droplets of blood or other potentially infectious materials may be generated and eye, nose, or mouth contamination can be reasonably anticipated.

  - Gowns, aprons, and other protective body clothing are required when splashing, splattering or spraying of the body with blood or other potentially infections materials is reasonably anticipated.

- Cleaning and Decontamination of all surfaces by an appropriate disinfectant will be done as soon as possible after contact with blood or other potentially infectious materials. Contaminated waste and/or laundry such as bloodied bandages or clothing will be placed in leak-proof containers or bags and labeled or color coded as noted in Section 5.5. Contaminated sharps such as broken glass will be picked up by mechanical means such as a brush/dust pan, and will be discarded immediately in a container that is puncture resistant, leak-proof and labeled or color coded as noted in Section 5.5.

- If contaminated sharps (e.g., needles, metal or glass) or other contaminated material is an expected/potential hazard at a project site, the H&S Plan will include instruction for its removal by a professional company/service. If such items are unexpectedly found at a site, stope work, isolate the area in question, contact the client and

discuss with the client options for contracting with a professional company service for clean up and removal.

5.4 Hepatitis B Vaccination and Post-Exposure Evaluation and Follow-up

The Hepatitis B (HBV) vaccination series and post-exposure evaluation and follow-up will be made available to all employees who fall under this standard at no cost to the employee. The healthcare provider who examines the employee will document if HBV vaccination is indicated and if the employee received the vaccination. If an employee declines the vaccination, a declination form as shown in **Exhibit 4** will be signed by the employee. However, if the employee later decides to have the vaccination **and** is still covered under this standard, the vaccination will be made available at that time.

Post-Exposure Evaluation and Follow-up will be made available immediately following an exposure incident. The ARCADIS office will supply to the physician a description of the employee's duties as they relate to the exposure incident, the route and circumstances of exposure, the results of the source individual's testing if known and the employee's medical records including HBV vaccination status if not already available to the physician.

The medical provider will supply his/her written medical opinion to ARCADIS which will contain only that the employee has been informed of the results of the evaluation and has been told about any medical conditions that require further evaluation or treatment. The employee should receive a more detailed confidential medical evaluation from the medical provider.

- Testing of the employee's blood will be done as soon as possible as recommended by the medical provider. If the employee decides to give consent for the blood to be drawn but not tested, the employee will have 90 days in which to change his/her mind as the sample must be preserved for 90 days.

5.5 Labeling and Signs

All contaminated waste, laundry and sharps will be labeled as required by this standard.

Red bags or containers may be substituted for labels. Labels will be fluorescent **orange or orange-red** with lettering and symbols in a contrasting color and include the following legend:

6. Training

All employees who have been designated as first aid responders or are expected to render first aid and/or are expected to clean an area contaminated with blood or other potentially infectious materials, will receive training upon initial assignment and then annually thereafter by a vendor approved by Corporate H&S.

A copy of the regulatory text of this standard will be made available to all applicable employees. Training will include opportunity for interactive questions and will include at a minimum:

- A general explanation of modes of transmission and symptoms associated with blood borne pathogens;
- An explanation and the location of the written exposure control plan;
- An explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials;
- An explanation of the use and limitations of methods that will prevent or reduce exposure including appropriate engineering controls, work practices, and PPE;
- Information on the types, basis for selection, proper use, location, removal, handling, decontamination and disposal of PPE;
- Information on the Hepatitis B vaccine;
- Information on the appropriate actions to take and persons to contact in an emergency involving blood or other potentially infectious materials including information on post-exposure evaluation and follow-up; and
- An explanation of the signs and labels and/or color coding.

Training records will include the training date, a summary of the training sessions, the name and qualifications of person conducting the training, and names and job titles of all persons attending the training sessions. The trainer will provide their qualifications and a training content summary.

7. REFERENCES (regulation citation, technical links, publications, etc.)

CFR 1910.1030 “Blood borne Pathogens”

OSHA Interpretation Letters:

- 12/4/92: “Applicability of Blood borne Pathogens Standard to Emergency Responders, Decontamination, Housekeeping, and Good Samaritan Acts”

- 12/15/92: “Blood borne Pathogens Impact on Non-Health Care Industries”

- 10/5/92: “Employee Training in First Aid”

8. RECORDS

Complete employee medical records regarding exposure will be established and maintained for each employee with occupational exposure by the approved medical provider in accordance with 29CFR 1910.120.

These records will be kept confidential and will not be disclosed without an employee's written consent except as required by this standard or by law.

Exposure and medical records shall be kept for the duration of employment plus 30 years

All employee training records will be kept from the date on which the training occurred and maintained for the duration of employment plus 10 years.

9. APPROVALS AND HISTORY OF CHANGE

Tony Tremblay, CSP – Infrastructure Division Director of H&S

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
June 2003	01	Sue Byers/Pat Vollertsen	Original document
24 February 2010	02	Sue Byers	Change to new format
5 December 2011	03	Sue Byers/Tony Tremblay	Review and update
13 April 2012	04	Camille Carollo/Tony Tremblay	Added Executive Summary; moved definitions from Section 3 to Exhibit 1
15 February 2013	05	Amanda Tine/Tony Tremblay	Added language about required length of time for keeping medical/exposure records and training records in executive summary and in Section 8.
28 February 2014	06	Pat Vollertsen/Tony Tremblay	Added information to section 5.3 regarding contaminated items found at project sites and added ECP template as exhibit 2

EXHIBIT 1

BLOODBORNE PATHOGENS – DEFINITIONS

Blood means human blood, human blood components, and products made from human blood.

Blood bore Pathogens means pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV) and human immunodeficiency virus (HIV).

Contaminated means the presence or the reasonably anticipated presence of blood or other potentially infectious materials on an item or surface.

Decontamination means the use of physical or chemical means to remove, inactivate, or destroy blood borne pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use, or disposal.

Exposure Incident means a specific eye, mouth, other mucous membrane, non-intact skin, or needle contact with blood or other potentially infectious materials that results from the performance of an employee's duties.

Licensed Healthcare Professional is a person whose legally permitted scope of practice allows him or her to independently perform the activities required by paragraph (f) Hepatitis B Vaccination and Post-exposure Evaluation and Follow-up.

Hand washing Facilities means a facility providing an adequate supply of running potable water, soap and single use towels or hot air drying machines.

HBV means hepatitis B virus.

HIV means human immunodeficiency virus.

Occupational Exposure means reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties.

Other Potentially Infectious Materials means (1) The following human body fluids: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids; (2) Any unfixed tissue or organ (other than intact skin) from a human (living or dead); and (3) HIV-containing cell or tissue cultures, organ cultures, and HIV- or HBV-containing culture medium or other solutions; and blood, organs, or other tissues from experimental animals infected with HIV or HBV.

Parenteral means piercing mucous membranes or the skin barrier through such events as needle sticks, human bites, cuts, and abrasions.

Personal Protective Equipment is specialized clothing or equipment worn by an employee for protection against a hazard. General work clothes (e.g., uniforms, pants, shirts or blouses) not intended to function as protection against a hazard are not considered to be personal protective equipment.

Source Individual means any individual, living or dead, whose blood or other potentially infectious materials may be a source of occupational exposure to the employee. Examples include, but are not limited to, ARCADIS employees, subcontractors, clients or other persons who have sustained an injury.

Sterilize means the use of a physical or chemical procedure to destroy all microbial life including highly resistant bacterial endospores.

Universal Precautions is an approach to infection control. According to the concept of Universal Precautions, all human blood and certain human body fluids are treated as if known to be infectious for HIV, HBV, and other blood borne pathogens.

Work Practice Controls means controls that reduce the likelihood of exposure by altering the manner in which a task is performed (e.g., prohibiting recapping of needles by a two-handed technique).

EXHIBIT 2

EXPOSURE CONTROL PLAN TEMPLATE

EXHIBIT 3

BLOODBORNE PATHOGENS

GENERAL GUIDELINES FOR PPE

(taken from Safetyinfo.com)

TASK	GLOVES	PROTECTIVE CLOTHING	MASK	EYEWEAR
Bleeding with spurting blood	X	X	X	X
Minimal bleeding with no spurting blood	X			
Cleaning up/Decontamination with no splashing/splattering	X			
Cleaning up/Decontamination with Splashing/splattering	X	X	X	X

These examples are based on the application of Universal Precautions.

EXHIBIT 4

BLOODBORNE PATHOGENS

HEPATITIS B VACCINATION DECLINATION FORM

(29 CFR 1910.1030 APP A)

ARCADIS

HEPATITIS B DECLINATION

I understand that due to the potential of my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring Hepatitis B virus (HBV) infection. I have been given the opportunity to receive the Hepatitis B vaccination series, at no charge to myself.

If you are declining the vaccination, please select one of the following:

☐ I decline Hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring Hepatitis B, a serious disease.

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

☐ I decline Hepatitis B vaccination as I have already had the Hepatitis B vaccination series.

_____
Employee's Name – Printed

_____ _____
Employee's Signature Date

_____ _____
Witness' Signature Date

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EXECUTIVE SUMMARY

Projects conducted in cold environments may be necessary in various ARCADIS business operations. It is the policy of ARCADIS to protect employees from environmental stressors related to cold and/or wet conditions through the use of engineering and administrative controls as well as personal protective equipment (PPE). This Health & Safety Standard (HSS) provides direction on the prevention and treatment of cold-related illnesses and injuries.

The most common cold related illnesses and injuries include:

- Cold Burn
- Frostnip
- Frostbite
- Hypothermia
- Trench Foot
- Chilblains

Personnel will be responsible for understanding the signs and symptoms involved in cold stress in both themselves and other personnel on the project site.

Environmental risk factors for cold stress include:

- Low temperatures
- High velocity air movement
- Dampness
- Cold water
- Some pressurized tanks/cylinders can become extremely cold when the contents are released quickly

For those ARCADIS staff working in cold and/or wet conditions, there are a number of preventative and protective measures that staff can implement to minimize potential for cold related illness/injuries including:

- Monitor your physical condition and that of your coworkers;
- Paying special attention to hands, feet, head, neck and face when choosing appropriate PPE to protect against the hazards of the cold:
    - Wear several layers of loose clothing for insulation (tight clothing reduces blood circulation to the extremities)l
    - Boots should be insulated.and in some cases, waterproof
    - Wear a hat to reduce the loss of body heat from your head.
    - Be aware that some clothing may restrict movement resulting in a hazardous situation;
- Acclimation to working in cold environments by implementing a physical fitness training regimen prior to starting work;
- Ensuring proper hydration to maintain electrolytes and body temperature;
- Depending on situation/location, consider including chemical hot packs in your first aid kit;
- Where possible, select the warmest part of the day to perform work outside; and
- Taking rest breaks in warm, dry shelters.

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1. POLICY

It is ARCADIS policy that employees who are required to work in cold environments be protected from related hazards. Cold-related illness and injury may be prevented through the use of engineering, administrative controls and/or personal protective equipment (PPE).

2. PURPOSE AND SCOPE

2.1 Purpose

The purpose of this HSS is to provide direction on the prevention and treatment of cold-related illnesses and injuries.

2.2 Scope

This standard applies to ARCADIS employees and subcontractors who work on projects and operations where cold stress may be encountered.

3. DEFINITIONS

Definitions relating to Cold Stress can be found in Exhibit 1.

4. RESPONSIBILITIES

4.1 Project Managers and Task Managers

Project Managers (PMs) and Task Managers (TM) are responsible for ensuring that cold stress is considered and addressed in project hazard/risk assessments and project planning.

4.2 Employees

ARCADIS employees are responsible for understanding the signs and symptoms that can lead to cold stress and adhere to the prescribed control and mitigation processes and methods. They will report to the PM or TM any signs and symptoms of cold stress exhibited by themselves or by other personnel on the project site. ARCADIS employees are responsible for reviewing and understanding this Cold Stress HSS.

4.3 Corporate Health and Safety

Corporate H&S staff are responsible for keeping this HSS up-to-date with safe work practices and working with the Training Team to develop Cold Stress training content and/or assessing third-party training content.

5. PROCEDURE

5.1 Major Risk Factors for Cold-Related Illnesses and Injuries

5.1.1 Personal Risk Factors

- Wearing inadequate, inappropriate (i.e. cotton) or wet clothing increases the effects of cold on the body.
- Lack of hydration to replace metabolized electrolytes.
- Inadequate acclimatization to cold weather related stresses.

- Consumption of certain drugs or medications such as alcohol, nicotine, caffeine and medication which inhibits the body's response to the cold or impairs judgment.
- Existing illness such as; common virus, diabetes, heart, vascular and thyroid problems - may make a person more susceptible to hazards of the cold.
- Becoming exhausted or immobilized, especially due to injury or entrapment may speed up the adverse effects of cold weather.

5.1.2 Environmental Risk Factors

- Performing work in environmental conditions such as; low temperatures, high velocity air movement, dampness and potential for cold water emersion.
- Wind chill is a critical factor when evaluating work conditions.
- Continuous contact with a cold and/or highly thermo-conductive surface such as; stone, ice, concrete or metal.
- Working in facilities where refrigerated processes are in operation or where no mechanized heat is provided.

5.2 Assessing the Work Environment

Each ARCADIS employee needs to evaluate the work environment to identify and assess potential cold-stress risk factors and appropriate controls (e.g., apply TRACK skills).For example, each employee will need to:

- Understand the weather condition(s) that may exist throughout the work day (air temperature, humidity, water temperature, and wind speed for example);
- Determine how much physical activity is anticipated;
- Determine length of the work shift/potential exposure time to evaluate planned work/rest schedule;
- Evaluate the type of clothing/PPE being worn; and
- Consider personal medical conditions that may be aggravated by working in the cold.

Based on this assessment, ARCADIS employees will need to consider the risk and implement appropriate controls before proceeding with work.

5.3 Preventative Measures and Controls

5.3.1 Safe Work Practices

- Ensure that personnel remain hydrated. Dehydration may increase the susceptibility of cold injury due to a change in blood flow to the extremities.
- Educate personnel on the symptoms of cold-related stresses - heavy shivering, uncomfortable coldness, severe fatigue, drowsiness or euphoria.

- Acclimatization - allowing for a period of adjustment to the cold before beginning a full work schedule. This process may be accelerated and enhanced by implementing a physical fitness training program prior to start of work.
- Whenever possible, select the warmest hours of the day to do work outside.
- Reduce periods of inactivity in cold conditions, and take frequent short breaks in warm, dry shelters.
- Depending on situation/location, consider including chemical hot packs in your first aid kit.

5.3.2 Protective Clothing Guidance

Protective clothing is generally needed for work at or below 39°F (4°C), but keep in mind that warmer temperatures coupled with wind and rain can lead to cold stress, so 39°F is a guideline temperature. Clothing should be selected to suit the temperature, weather conditions (e.g., wind speed, rain), the level and duration of activity, and job design. These factors are important to consider so that employees can regulate the amount of heat and perspiration generated while working. If the work pace is too fast or if the type and amount of clothing are not properly selected, excessive sweating may occur. The clothing next to body will become wet and the insulation value of the clothing will decrease dramatically. This increases the risk for cold injuries, therefore, consider the following guidance:

- Clothing should be worn in multiple layers which provide better protection than a single thick garment. The air between layers of clothing provides better insulation than the clothing itself. Having several layers also gives employees the option to open or remove a layer before you get too warm and start sweating or to add a layer when you take a break. It also allows you to accommodate changing temperatures and weather conditions. Successive outer layers should be larger than the inner layer, otherwise the outermost layer will compress the inner layers and will decrease the insulation properties of the clothing.
- The inner layer should provide insulation and be able to "wick" moisture away from the skin to help keep it dry. Base layers should be made of hydrophobic synthetic weave to enhance moisture transportation away from the skin. (e.g. polypropolene or wool). Thermal underwear made from polyesters or polypropylene is suitable for this purpose.
    - Cotton clothing should be avoided as a base layer touching the skin due to its hydrophilic moisture retention properties. However, for those employees using Arc-Rated (AR) or Flame Resistant (FR) clothing, please keep in mind that only natural fiber undergarments are recommnended.
- Additional layers of clothing should provide adequate insulation for the weather conditions under which the work is being done. These additional layers should also be easy to open or remove before an employee gets too warm to prevent excessive sweating during strenuous activity. Employees should consider a middle layer of hydrophobic synthetic fabric to transfer moisture and retain insulation in a damp environment.

- For work in wet conditions, the outer layer of clothing should be waterproof. Consider an outer layer provided with a waterproof breathable membrane to break the wind (e.g. Gore-Tex® or other proprietary fabric). The outer layer should have the means for closing off and opening the waist, neck and wrists to help control how much heat is retained or given off. Some jackets have netted pockets and vents around the trunk and under the arm pits (with zippers or Velcro fasteners) for added ventilation possibilities

- Clothing should be kept clean since dirt fills air cells in fibers of clothing and destroys its insulating ability.

- Consider keeping a change of clothing available in case work clothing becomes damp or wet.

- Pay special attention to protecting feet, hands, head, neck and face:

  - Excessive heat loss can occur through the head. When appropriate, additional insulation when wearing a hard hat, may include an insulated hard hat liner, skull cap, scarf and/or ear warmers.
  - In extreme temperatures, hands should be covered at all times to reduce potential for cold-burns as well as frostbite. Ill-fitting gloves can impair circulation and increase susceptibility to frostbite/frostnip. Be aware of tight fitting gloves and consider mittens for the added benefit that portable hotpockets can be carried inside mittens. For work below 1.4°F (-17°C), mittens should be used. Cotton is not recommended. It tends to get damp or wet quickly, and loses its insulating properties. Wool and synthetic fibers, on the other hand, do retain heat when wet.
  - Consider using felt-lined, rubber bottomed, leather-topped boots with removable felt insoles for heavy work in cold weather conditions since leather is porous, allowing the boots to "breathe" and let perspiration evaporate. Footwear should be insulated to protect against cold and dampness. A dual layer sock system consisting of a thin liner sock inside an insulating outter sock is highly recommended. Whatever sock is chosen should not cause the insulated boot to fit too snugly. Overly snug footwear allows for body heat loss due to conductive heat transfer. If work involves standing in water or slush, then waterproof boots should be worn. While these waterprooof boots protect the feet from getting wet from cold water in the work environment, they also prevent the perspiration to escape. The insulating materials and socks may become wet more quickly than when wearing leather boots and increase the risk for frostbite.
  - Avoid steel shank and/or steel toe boots where an appropriate composite material substitute (e.g. carbon-fiber, ceramic and/or Kevlar toe/insert) is available.
  - Protective eyewear should be treated with anti-fog spry prior to wearing in cold conditions.

5.3.3 Engineering Controls

Some engineering controls to consider implementing:

- Use of an on-site source of heat, for example, air jets, radiant heaters or contact warm plates.

- Shield work areas from drafty or windy conditions.
- Provide a heated shelter (e.g. vehicle, building, tent) for employees who experience prolonged exposure to equivalent wind-chill temperatures of 30°F /-1°C or less.
- When taking breaks in the shelter ensure that snow and ice are removed from clothing prior to entry to minimize water generation.
- Use thermal insulating material on equipment handles when temperatures drop below 30°F / -1°C.

5.4 Types of Cold Stress - Signs and Symptoms

5.4.1 Frostnip/Frostbite

Skin exposed to temperatures a little below the freezing mark can take hours to freeze, but very cold skin can freeze in minutes or seconds. Air temperature, wind speed, and moisture all affect how cold the skin becomes. A strong wind can lower skin temperature considerably by dispersing the thin protective layer of warm air that surrounds our bodies. Wet clothing readily draws heat away from the skin because water is a potent conductor of heat. The evaporation of moisture on the skin also produces cooling. For these reasons, wet skin or clothing on a windy day can lead to frostbite even if the air temperature is above the freezing mark. The extent of permanent injury, however, is determined not by how cold the skin and the underlying tissues become but by how long they remain frozen.

Frostbite is an injury to the body that is caused by freezing. Frostbite causes a loss of feeling and color in the affected areas. It most often affects the nose, ears, cheeks, chin, fingers, or toes. Frostbite can permanently damage body tissues, and severe cases can lead to amputation. In extremely cold temperatures, the risk of frostbite is increased in workers with reduced blood circulation and among workers who are not dressed properly.

Three nearly simultaneous physiological processes underlie frostbite injury: tissue freezing, tissue hypoxia, and the release of inflammatory mediators.

Symptoms of Frostbite:

- Reduced blood flow to hands and feet (fingers or toes can freeze)
- Sharp pain progressing to numbness with red skin at first, then turning cold and white
- Tingling or stinging
- Aching
- Bluish or pail, waxy skin
- Skin becomes hard and numb. Blisters may form following thawing.
- Usually affects the fingers, hands, toes, feet, ears and nose first.

Frostbite is classified by degree of injury (first, second, third, or fourth), or simply divided into two types, superficial (corresponding to first- or second-degree injury) and deep (corresponding to third- or fourth-degree injury). Most frostbite injuries affect the feet or

hands. The remaining 10% of cases typically involve other exposed body parts (e.g. nose, ears, cheeks, etc.). Once frostbite sets in, the affected part begins to feel cold and, usually, numb; this is followed by a feeling of clumsiness. The skin turns white or yellowish. Many patients experience severe pain in the affected part during rewarming treatment and an intense throbbing pain that arises two or three days later and can last days or weeks. As the skin begins to thaw during treatment, edema (excess tissue fluid) often accumulates, causing swelling. In second- and higher-degree frostbite, blisters appear. Third-degree cases produce deep, bloodfilled blisters and, during the second week, a hard black eschar (scab). Fourth-degree frostbite penetrates below the skin to the muscles, tendons, nerves, and bones.

Like frostbite, frostnip is associated with ice crystal formation in the tissues, but no tissue destruction occurs and the crystals dissolve as soon as the skin is warmed. Frostnip affects areas such as the earlobes, cheeks, nose, fingers, and toes. The skin turns pale and one experiences numbness or tingling in the affected part until warming begins.

5.4.2 Hypothermia

When exposed to cold temperatures, your body begins to lose heat faster than it can be produced. Prolonged exposure to cold will eventually use up your body's stored energy. The result is hypothermia, or abnormally low body temperature. A body temperature that is too low affects the brain, making the victim unable to think clearly or move well. This makes hypothermia particularly dangerous because a person may not know it is happening and will not be able to do anything about it.

Symptoms of hypothermia:

- Body temperature drops below 95°F / 35°C
- Fatigue or drowsiness
- Uncontrolled shivering
- Cool, bluish skin
- Slurred speech
- Clumsy movements
- Irritable, irrational or confused behavior

5.4.3 Cold Water Immersion

Cold water immersion creates a specific condition known as immersion hypothermia. It develops much more quickly than standard hypothermia because water conducts heat away from the body 25 times faster than air. Typically people in temperate climates don’t consider themselves at risk from hypothermia in the water, but hypothermia can occur in any water temperature below 70°F. Survival times can be lengthened by wearing proper clothing (wool and synthetics and not cotton), using a personal flotation device (PFD, life vest, immersion suit, dry suit), and having a means of both signaling rescuers (strobe lights, personal locator beacon, whistles, flares, waterproof radio) and having a means of being retrieved from the water.

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5.4.4 Trench Foot

Trench foot, also known as immersion foot, is an injury of the feet resulting from prolonged exposure to wet and cold conditions. Trench foot can occur at temperatures as high as 60°F if the feet are constantly wet. Injury occurs because wet feet lose heat 25-times faster than dry feet. Therefore, to prevent heat loss, the body constricts blood vessels to shut down circulation in the feet. Skin tissue begins to die because of lack of oxygen and nutrients and due to the buildup of toxic products.

Symptoms of trench foot include:

- Reddening of the skin
- Numbness
- Leg cramps
- Swelling
- Tingling pain
- Blisters or ulcers
- Bleeding under the skin
- Gangrene (the foot may turn dark purple, blue, or gray)

5.4.5 Chilblains

Chilblains are caused by the repeated exposure of skin to temperatures just above freezing to as high as 60°F. The cold exposure causes damage to the capillary beds (groups of small blood vessels) in the skin. This damage is permanent and the redness and itching will return with additional exposure. The redness and itching typically occurs on cheeks, ears, fingers, and toes.

Symptoms of chilblains include:

- Redness
- Itching
- Possible blistering
- Inflammation
- Possible ulceration in severe cases

5.5 First Aid and Emergency Procedures

Contact Emergency Medical Services and WorkCare to discuss first aid/emergency procedures.

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5.5.1 Frostnip/Frostbite

- Emergency medical help should always be summoned whenever frostbite is suspected.
- Move the person to a warm dry area. Do not leave the person alone.
- Remove any wet or tight clothing that may cut off blood flow to the affected area.
- Do not rub the affected area. Rubbing causes damage to the skin and tissue.
- It should be noted that experts advise rewarming in the field only when emergency help will take more than two hours to arrive and refreezing can be prevented.
- First line of rewarming should include bundling the affected area in warm dry clothing and blankets to utilize body heat to treat the affected area.
- Should the affected area not respond to body heat only, gently place the affected area into a luke warm water bath and slowly and gratually increase temperature, but do not exceed 105°F. Monitor the water temperature to slowly warm the tissue. Do not pour warm water directly on the affected area because it will warm the tissue too fast causing tissue damage. Warming takes about 25-40 minutes.
- After the affected area has been warmed, it may become puffy and blister. The affected area may have a burning feeling or numbness. When normal feeling, movement, and skin color have returned, the affected area should be dried and wrapped to keep it warm.
- Discuss with WorkCare whether blisters should be debrided (cleaned by removing foreign material) or simply covered with aloe vera.
- Discuss with WorkCare whether the patient should be given ibuprofen to combat inflammation.
- The key to prehospital treatment is to avoid partial thawing and refreezing, which releases more inflammatory mediators and makes the injury substantially worse. If there is a chance the affected area may get cold again, do not warm the skin. If the skin is warmed and then becomes cold again, it will cause severe tissue damage.
- Seek medical attention as soon as possible.

5.5.2 Hypothermia

- Call for emergency help.
- Move the person to a warm, dry area. Do not leave the person alone.
- Remove any wet clothing and replace with warm, dry clothing or wrap the person in blankets.
- Have the person drink warm, sweet drinks (sugar water or sports-type drinks) if they are alert. Avoid drinks with caffeine (coffee, tea, or hot chocolate) or alcohol. Handle hypothermia victims gently and do not give anything by mouth if they are unconscious.

- Have the person move their arms and legs to create muscle heat. If they are unable to do this, place warm bottles or hot packs in the arm pits, groin, neck and head areas. Do not rub the person's body or place them in warm water bath, as this may stop their heart.

5.5.3 Trench Foot

Workers suffering from trench foot should:

- Remove shoes/boots and wet socks.
- Dry their feet.
- Avoid walking on feet, as this may cause tissue damage.

5.5.4 Chilblains

Workers suffering from chilblains should:

- Avoid scratching.
- Slowly warm the skin.
- Use corticosteroid creams to relieve itching and swelling.
- Keep blisters and ulcers clean and covered.

6. TRAINING

Unless working in the Arctic, there is no specific training requirement for ARCADIS staff, however, each ARCADIS employee is responsible for reviewing and understanding this Cold Stress HSS. Reasonable effort should be made by ARCADIS staff working in cold working environments, and those who supervise them, to be able to recognize and know what steps to take to prevent cold-stress.

Working in the Arctic involves project-specific requirements and specialized training, including but not limited to Working on the North Slope (Alaska) and Learn to Return – Survival Training (Canada and Alaska) or similar. ARCADIS staff must also comply with client-specific requirements when it comes to selecting survival school training.

7. REFERENCES (regulation citation, technical links, publications, etc.)

- Fact Sheet No. OSHA 98-55 ProtectingWorkersinColdEnvironments.pdf
- OSHA – The Cold Stress Equation 1998 OSHA Coldcard.html
- NIOSH – Hazards and Exposures www.cdc.gov/niosh/topics/coldstress
- OSHA – Cold Stress Guide, Workplace Safety & Health Topics – Cold Stress
- Canadian Centre for Occupational Health and Safety Cold Environments - Working in the Cold
- OSHA – Tips to Protect Workers in Cold Environments

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8. RECORDS - DATA RECORDING AND MANAGEMENT

This HSS will be reviewed on a routine basis and revised as appropriate. When revised, the revision date/number will be documented under “History of Change” and the prior plan archived per company policy.

9. APPROVALS AND HISTORY OF CHANGE

Approved By: Tony Tremblay, CSP – Corporate H&S, Director of Technical Programs

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
31 May 2013	01	Keith Antell/Tony Tremblay	Original document
3 February 2015	02	Tony Tremblay	Section 7 links updated

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EXHIBIT 1 – DEFINITIONS

Cold Burn – instant superficial freezing of tissue when touching a very cold object, tool or specific types of liquids or gases.

Cold Stress – Injuries or health effects that come from working under cold conditions. Four factors contribute to cold stress: cold air temperature, high velocity air movement, dampness of the air and contact with cold water or surfaces.

Cold Water, as defined by the US Coast Guard, means water where the monthly mean low water temperature is normally 59 degrees F (15 degrees C) or less.

Fingertip Fissures – Deep, intractable and very painful fissuring that may occur on the fingertips when exposed to prolonged or repeated cold conditions.

Frostbite – Exposed skin is susceptible to frostbite when the air temperature is below 0°F or when there are high winds combined with cold temperatures. Symptoms may include loss of sensation, cold, pale and waxy skin. Frostbite can lead to tissue damage, scarring and possible amputation.

Frost Nip – the freezing of the skin and superficial tissue. The skin turns white after exposure to cold wind. It is similar to frostbite by less severe.

Hydrophilic Material – Materials that exhibit a strong affinity for water, e.g. cotton.

Hydrophobic material – Materials that exhibit a lack of affinity for water. Typically a polyester fabric (polypropolyene, polar fleece or a number of other proprietary names) that does not absorb water/perspiration. Additionally, body heat will cause a capillary effect moving moisture away from the skin to the out surface of the fabric. This capillary action will keep the wearer warmer over a longer period than a hydrophilic fabric.

Hypothermia – the chilling of the body's core temperature below 95°F (35°C). Hypothermia usually happens at very cold temperatures, but can also occur in cooler temperatures, for example, if an individual is submersed in water or becomes chilled from rain. Symptoms may include: shivering (uncontrolled), slurred speech, memory loss, erratic behavior, clumsy movements and bluish/purple colored skin.

Trench Foot – caused by continuous exposure to the cold without freezing, combined with constant dampness or immersion in water. Water temperatures do not have to be below freezing. Symptoms of trench foot include a tingling and/or itching sensation, pain, swelling, cold and blotchy skin, numbness and a prickly or heavy feeling in the foot.

Wind Chill Temperature - is how cold people and animals feel when outside. Windchill is based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature. Therefore, the wind makes it feel much colder. If the temperature is 0 degrees Fahrenheit and the wind is blowing at 15 mph, the wind chill is -19 degrees Fahrenheit. At this wind chill temperature, exposed skin can freeze in 30 minutes.

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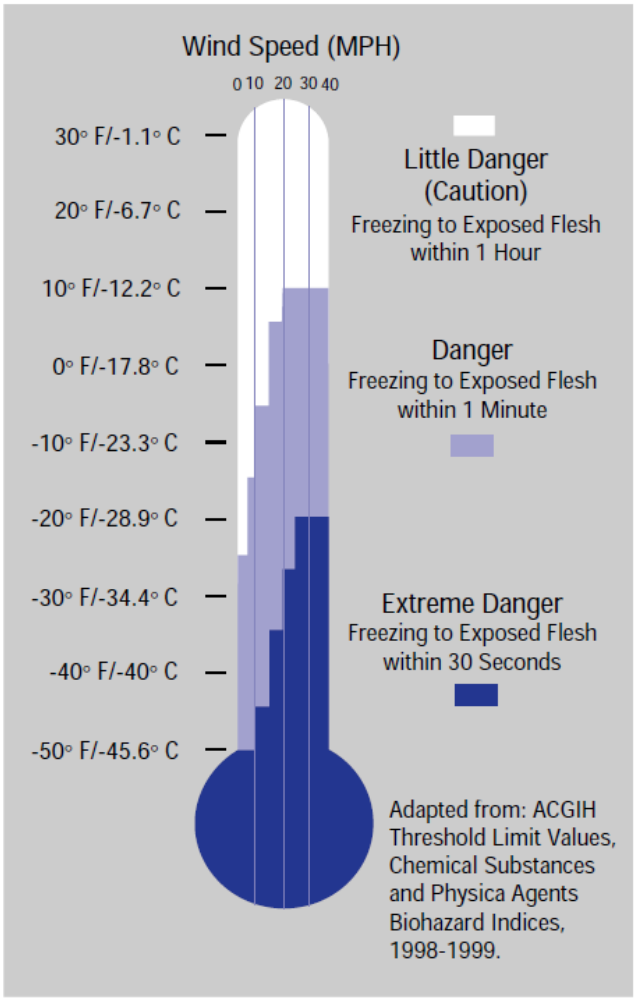
EXHIBIT 2 – OSHA COLD STRESS EQUATION

THE COLD STRESS EQUATION

LOW TEMPERATURE + WIND SPEED + WETNESS = INJURIES & ILLNESS

When the body is unable to warm itself, serious cold-related illnesses and injuries may occur, and permanent tissue damage and death may result. **Hypothermia** can occur when *land temperatures* are **above** freezing or *water temperatures* are below 98.6°F/ 37°C. Cold-related illnesses can slowly overcome a person who has been chilled by low temperatures, brisk winds, or wet clothing.



U.S. Department of Labor
Occupational Safety and Health Administration

OSHA 3156
1998

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EXHIBIT 3 – NATIONAL WEATHER SERVICE Windchill Chart

NWS Windchill Chart

Wind (mph) \ Temperature (°F)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times — 30 minutes — 10 minutes — 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

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EXHIBIT 4 – SASKATCHEWAN DEPARTMENT OF LABOR
Work/Warm-up Schedule for a 4-Hour Shift (Guidance Information)

Work Warm-up Schedule for Outdoor Activities

This information applies to moderate to heavy physical work activity in any four-hour period. At the end of the four-hour period an extended break in a warm location is expected. Warm-up breaks are assumed to provide 10 minutes in a warm environment. These guidelines apply to workers wearing dry clothing.

Sunny sky Air temperature		No noticeable wind		Wind 8 km/h (5 mph)		Wind 16 km/h (10 mph)		Wind 24 km/h (15 mph)		Wind 32 km/h (20 mph)	
°C below zero *	°F below zero *	Max. work period	Number of breaks**	Max. work period	Number of breaks**	Max. work period	Number of breaks**	Max. work period	Number of breaks**	Max. work period	Number of breaks**
26 to 28	15 to 19	120 minutes	1	120 minutes	1	75 minutes	2	55 minutes	3	40 minutes	4
29 to 31	20 to 24	120 minutes	1	75 minutes	2	55 minutes	3	40 minutes	4	30 minutes	5
32 to 34	25 to 29	75 minutes	2	55 minutes	3	40 minutes	4	30 minutes	5	Non-emergency work should stop	
35 to 37	30 to 34	55 minutes	3	40 minutes	4	30 minutes	5	Non-emergency work should stop			
38 to 39	35 to 39	40 minutes	4	30 minutes	5	Non-emergency work should stop					
40 to 42	40 to 44	30 minutes	5	Non-emergency work should stop							
43 and below	45 and below	Non-emergency work should stop									

* All temperatures are approximate
** Number of breaks: This includes a normal break after 2 hours and the number of additional warm-up breaks needed.

Apply the schedule one step lower for work with limited physical activity. For example, at -35°C (-30°F) with no noticeable wind, a worker with a job requiring little physical movement should have a maximum work period of 40 minutes with four breaks in a four-hour period.

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

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

Environment Canada may report a wind chill index. If wind speeds are higher than those identified in the chart, a wind chill index of -51°C should be used to determine the point at which all non-emergency work should stop.

Implementation Date 5 May 2008	ARCADIS HS Standard Name Confined Space Entry	ARCADIS
Revision Date 7 May 2018	ARCADIS HS Standard No. ARC HSFS003	Revision Number 15

EXECUTIVE SUMMARY

This Health & Safety Standard (HSS) applies to all general industry work and construction work. As such, maintenance and repair activities and/or construction work performed in confined spaces are covered by this standard. Confined space hazards in General Industry that are not addressed by an industry-specific OSHA standard will be covered by this standard. ARCADIS employees engaged in construction activities within confined spaces must comply with this HSS, including Construction Industry specific requirements outlined in section 5.11 of this HSS.

This HSS requires ARCADIS to determine what kinds of spaces our workers are in, what hazards could be there, how those hazards should be made safe, what training workers should receive, and how to rescue those workers if anything goes wrong.

A Confined Space is any enclosed space which meets all three of these conditions:

1. Is large enough and so configured that an employee can bodily enter and perform assigned work. In order to meet this criteria, an employee must physically be able to enter and work in the space.
2. Has limited or restricted means for entry or exit.
3. Is not designed for continuous employee occupancy.

It is ARCADIS' policy that our staff will not enter permit-required confined spaces (PRCS) or Non-PRCS unless it is absolutely necessary. If it becomes necessary to enter PRCS or Non-PRCS, this HSS, at a minimum will be strictly followed. A summary of the important requirements for managing the risks of confined spaces are summarized below.

Potential confined spaces in the work area that could be purposely or mistakenly entered by ARCADIS or subcontractor staff must be identified as confined spaces. Entry is forbidden into these spaces until they are classified. If no entry is necessary, classification is not required. A competent person shall evaluate each confined space in accordance with the criteria defined in this HSS using the Confined Space Evaluation Form.

If entry is or may be required, the spaces must be evaluated and classified as to being a PRCS, Non-PRCS or remain classified as a confined space. The host employer may have done this already, but this must be verified prior to entry. A competent person must complete the Confined Space Evaluation Form (Exhibit 3).

A PRCS is a confined space that has one or more of the following characteristics:

- Contains or has a potential to contain a hazardous atmosphere;
- Contains a material with the potential for engulfment of an Entrant;
- Has an internal configuration such that an Entrant could be trapped or asphyxiated by inwardly converging walls or a floor which slopes downward and tapers to a smaller cross-section; or
- Contains any other recognized serious safety or health hazard (refer to Exhibit 1 definitions for details).

A permit package must be completed prior to any entry, including the Confined Space Evaluation Form (Exhibit 3) and the PRCS Entry Permit (Exhibit 6).

Non-Permit Required Confined Spaces is a confined space that meets the definition of a confined space but does not meet the requirements for a permit-required confined space. If classification indicates a Non-PRCS, entry may be completed after the Non-PRCS Entry Checklist (Exhibit 5) is completed.

Implementation Date 5 May 2008	ARCADIS HS Standard Name Confined Space Entry	ARCADIS
Revision Date 7 May 2018	ARCADIS HS Standard No. ARC HSFS003	Revision Number 15

1. POLICY

It is ARCADIS' policy that our staff will not enter a Permit Required Confined Space (PRCS) or a Non-Permit Required Confined Space (Non-PRCS) unless it is absolutely necessary. If it becomes necessary to enter a PRCS or Non-PRCS, this standard, at a minimum will be strictly followed.

2. PURPOSE AND SCOPE

2.1 Purpose

This standard sets forth the accepted practice for evaluation and entry of a PRCS and Non-PRCS. In addition, it establishes the requirement for a PRCS Entry Permit protocol to effectively mitigate or eliminate the hazards presented by entry into PRCS and Non-PRCS.

2.2 Scope

This standard applies to all general industry and construction work. As such, maintenance and repair activities and/or construction work performed in confined spaces are covered by this standard. Confined space hazards in General Industry that are not addressed by an industry-specific OSHA standard will be covered by this standard. ARCADIS employees engaged in construction activities within confined spaces must comply with this HSS, including Construction Industry specific requirements outlined in section 5.11 of this HSS.

Note: This HSS does not apply to Construction work regulated by 1926 subpart P – Excavations, Construction work regulated by 1926 subpart S – Underground Construction, Caissons, Cofferdams and Compressed Air, Construction work regulated by 1926 subpart Y – Diving, Agriculture Part 1928, or Shipyard Employment Part 1915.

This standard applies to all employees of ARCADIS who may work around or in confined spaces. Only trained and authorized personnel are permitted to enter confined spaces, supervise confined space activities, serve as an attendant during PRCS activities and perform non-entry rescues from PRCS.

Due to the diverse nature of ARCADIS field activities, the hazards associated with each PRCS and Non-PRCS entry will be unique to each job site and must documented using the Confined Space Evaluation Form (Exhibit 3). Prior to entry, a permit must be completed for a PRCS (Exhibit 6) or checklist needs to be completed for a Non-PRCS (Exhibit 5) and/or Alternative Procedures confined space entry (Exhibit 4).

3. DEFINITIONS

See Definitions in Exhibit 1.

4. RESPONSIBILITIES

4.1 Attendants

An Attendant will be assigned to monitor each PRCS entry operation. The Attendant must know the physical and atmospheric hazards in the PRCS and must know how these

hazards enter the body (such as skin contact and inhalation), signs and symptoms of exposure, and characteristic effects (such as behavioral effects) of exposure to these hazards. In addition, the Attendant is responsible for the following:

- An Attendant is prohibited from monitoring the activities of more than one PRCS entry site at a time.
- An Attendant must be stationed and remain stationed outside the PRCS at all times during entry operations. An Attendant shall perform no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.
- All Attendants must have training and instruction in their duties and responsibilities regarding PRCS entry. The following are assigned duties:
    - Maintain an accurate count of all entrants in the PRCS
    - Monitor activities both inside and outside the PRCS to verify the continued safety of entrants
    - Maintain visual contact or verbal communication with all entrants in the PRCS at all times
    - Order evacuation of the PRCS if an uncontrolled hazard develops, either within or outside the PRCS, or upon observing a behavioral effect of hazard exposure among entrants
    - Warn unauthorized persons away from the PRCS
    - Participate in non-entry rescue
    - Summon rescue and other emergency services
- Attendants must maintain current certification in basic first aid and cardiopulmonary resuscitation (CPR).
- Under no circumstances should the Attendant attempt rescue of entrants by entering the PRCS.
- If the Attendant does not have a means to summons additional emergency responders, then a second standby employee must be present in the area within sight or call to assist as necessary. This standby person could be the Entry Supervisor, if different than the Attendant.

4.2 Authorized Entrants

Entrants must have training and instruction in their duties and responsibilities regarding confined space entry. All authorized entrants must:

- Recognize the hazards and changing conditions, as well as the signs and symptoms of exposure to the hazard(s).
- Shall confirm that all isolation, Lockout/Tagout have been completed prior to entry into confined space.

- Maintain visual contact and/or verbal communications with the Attendant at all times.
- Use testing and monitoring equipment including ventilation equipment, communication equipment, PPE, lighting equipment, ladders or other means of ingress/egress, and other equipment necessary for entry and rescue from the PRCS.
- Maintain an awareness of all external barriers required to protect from external hazards (e.g., blanking, blocking and lockout) and the proper use of those barriers.
- Obey evacuation orders given by the Attendant, Entry Supervisor, automatic alarm activation, or when self-perceived.
- Employees are prohibited from serving as authorized entrants and attendants simultaneously.
- Authorized entrants may serve simultaneously as entry supervisors only if they meet the Training requirements as both an Entry supervisor and Authorized entrant.
- It is recommended, not required that authorized entrants maintain current certification in basic first aid and cardiopulmonary resuscitation (CPR).

4.3 Entry Supervisors

An Entry Supervisor will be assigned to supervise all PRCS entry operations. The entry supervisor must know the physical and atmospheric hazards in the PRCS and must know how these hazards enter the body (such as skin contact and inhalation), signs and symptoms of exposure, and consequences/characteristic effects (such as behavioral effects) of exposure to these hazards. In addition, the Entry Supervisor is responsible for the following:

- Verifies that the Confined Space Evaluation Form (Exhibit 3) and PRCS Entry Permit (Exhibit 6) is completed prior to PRCS entry
- Verifies that the conditions in the PRCS are within the planned conditions and as specified in the entry permit by checking the appropriate entries in the PRCS Entry Permit.
- Verifying completion of the atmospheric testing specified in the PRCS Entry Permit and verifying that any other procedures and equipment specified in the PRCS Entry Permit are in place prior to endorsing the permit and allowing entry to begin.
- Issue, authorize, and post the PRCS Entry Permit prior to any confined space entry.
- Interface with the host employer to identify hazards associated with the host employer's confined space.
- Review existing confined space data (if any) recorded by the host employer.
- Review the host employer's confined space standard.
- Investigate the host employer's permit entry protocol, ensuring that any identified hazards and previous experience with the confined space is properly communicated.

- Coordinate entry operations with the host employer's employees and/or subcontractors when host employer, subcontractors and ARCADIS employees will be working in or near a PRCS.
- Removes unauthorized individuals who enter or who attempt to enter the PRCS during entry operations
- Coordinate rescue assistance with either the host employer's in-house rescue team and/or the offsite rescue assistance specified by the host employer. The offsite rescue assistance specified by the host employer must have direct rescue experience in the host employer's identified confined space or be provided an opportunity to examine the space and practice a rescue.
- Verify that the means for summoning the rescue service works.
- Verify rescue services are immediately available to rescue employee working within a confined space with an IDLH atmosphere.
- Verify that the host employer takes the necessary precautions in notifying their employees that our employees will be entering the confined space.
- Review the lockout/tagout and isolation measures implemented by the host employer.
- Immediately report any unusual or unforeseen confined space entry hazard to Corporate Health and Safety prior to authorizing entry.
- Complete and maintain the confined space permit form, and have it accessible for review on the job site at all times.
- Offer all entrants an opportunity to review the confined space entry testing results and an opportunity to request a reevaluation of the PRCS in the presence of the entrant if the entrant has reason to believe that the evaluation of the space may not have been adequate.
- Terminates the entry and cancels the permit upon completion of the entry, and after all entrants have exited the PRCS.
- Cancel the PRCS Entry Permit when a condition that is not allowed under the entry permit arises in or near the PRCS.
- With regards to Construction activities, the Entry Supervisor is also responsible to:
    - Suspend or cancel the PRCS Entry Permit and fully reassess the space before allowing reentry when a condition that is not allowed under the entry permit arises in or near the PRCS and that condition is temporary in nature and does not change the configuration of the space or create any new hazards within it.
- Any problems encountered during an entry operation must be noted on the PRCS Entry Permit and forwarded to the Corporate H&S Business Line Director within 8 hours, so that appropriate revisions to the PRCS program can be made.

- Verify that copies of the completed and canceled PRCS Entry Permits are properly maintained in project files and submitted to Corporate H&S (4-Sight-Support@arcadis-us.com), as specified in Section 8.0 – Records.

- Entry Supervisors must maintain current certification in basic first aid and cardiopulmonary resuscitation (CPR).

The Entry Supervisor may also function as the Attendant; therefore, the Entry Supervisor must have the training specified for an Attendant and will assume the duties listed for either the Entry Supervisor or Attendant.

4.4 Corporate H&S with Business Line and Practice Experts

Corporate H&S with Business Line and Practice Experts will review and update this standard on an annual basis or as necessary. In addition, Corporate H&S with Business Line and Practice Experts are responsible to:

- Retain copies of cancelled PRCS Entry Permits for 12-months.

- Review cancelled PRCS Entry Permits periodically to ensure conformance to this standard.

- Provide confined space awareness training, initial confined space Entrant/Supervisor/Attendant training and retraining, or recommend qualified training provider.

- Provide technical assistance regarding confined space entry protocol, atmospheric testing equipment, PPE, hazard assessment and research information on unusual hazards.

4.5 Project Manager (PM) and Task Manager (TM)

Are responsible to:

- Identify host employer requirements and assure they are communicated to the project team.

- Verify that all confined spaces and entry protocols are properly identified and addressed within the project work plan, project Health & Safety Plan, and/or other project-related documents.

- Verify that their business line or project team employees have received the proper confined space training provided by Corporate H&S or qualified training source prior to conducting confined space entry activities.

- Verify that the proper confined space entry equipment, including PPE, atmospheric testing equipment and safety equipment, is available for use by employees.

- Verify that copies of the completed and canceled PRCS Entry Permits are submitted to Corporate H&S and retained with the project files.

4.6 Health and Safety Plan Writers and Reviewers

Use this standard as guidance to ensure the appropriate identification, assessment and control of confined spaces and associated entries for documentation in project HASPs

4.7 Rescue Services

Two types of rescue may be initiated during PRCS work, entry rescue and non-entry rescue. Rescue services in this standard refer to both entry rescue and non-entry rescue. Entry rescue must be provided by an outside service such as a local fire brigade or technical rescue team. ARCADIS employees are prohibited from conducting entry rescues, and will only participate in non-entry rescue if trained to do so and are current with first aid/CPR training.

Whenever ARCADIS or subcontractor personnel enter a PRCS, a written plan must be in place for the rescue of those employees from the space. The rescue service must:

- Be available and always be on alert for all confined space entries as required, or must notify the Entry Supervisor in the event the rescue services become unavailable.
- Be familiar with all equipment used for the task.
- Have proper training and preparation for confined space rescue.
- Use the PPE and rescue equipment necessary for making rescues from confined spaces.
- Know basic first aid and cardiopulmonary resuscitation (CPR); at least one available member of the rescue service must hold a current certification in first aid and CPR.
- Perform assigned rescue duties competently.
- Receive the required authorized entrants' training.
- Practice making PRCS rescues once every 12 months using the following:
    - Dummies, mannequins or actual people
    - Representative of spaces to simulate the types of PRCS from which the rescue is be performed
- Entry Supervisor will review training certificates/documentation.
- Have ready access to the appropriate PPE and equipment necessary to safely retrieve injured or collapsed personnel from the confined space
- Consider ready access to first aid provisions during job planning
- Gather information on every confined space entry task, including exact location, immediately prior to work commencing and before and after breaks

4.8 Competent Person

Competent Person will:

- Evaluate each confined space in accordance with the criteria defined in this HSS using the Confined Space Evaluation Form and Instruction Guide (also included as Exhibit 3 in this HSS);

- Classify the confined spaces as to whether or not they are a PRCS and then evaluate whether or not the PRCS can be reclassified as a Non-PRCS or qualifies for Alternate Procedures;

- Reevaluate a Non-PRCS or an alternate procedures confined space and, if necessary, reclassify it as a PRCS when there are changes in the use or configuration of a Non-PRCS or Alternate Procedures confined space that might increase the hazards to entrants, or some indication that the initial evaluation of the space may not have been adequate; and

- Take prompt corrective measures to eliminate conditions which are unsanitary, hazardous, or dangerous to employees.

4.9 All ARCADIS Employees

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

- Participate in entry operations only if trained and authorized to do so

- Never enter a PRCS without an authorized Attendant, Entry Supervisor, and a completed PRCS Entry Permit

- Never attempt entry rescue

- If unexpected conditions arise during entry, immediately notify other entrants, evacuate the space and inform the Entry Supervisor

4.10 Host Employer

Before entry operations begin, the host employer must provide the following information, if it has it, to the controlling contractor:

- The location of each known PRCS;

- The hazards or potential hazards in each space or the reason it is a PRCS; and

- Any precautions that the host employer or any previous controlling contractor or entry employer implemented for the protection of employees in the PRCS.

If there is no controlling contractor present at the worksite, the requirements for, and role of, controlling contactors must be fulfilled by the host employer or other employer who arranges to have employees of another employer perform work that involves PRCS.

4.11 Controlling Contractor

Before entry operations begin, the controlling contractor must:

- Obtain the host employer's information about confined spaces and previous entry operations; and

- Provide the following information to each entity entering a PRCS and any other entity at the worksite whose activities could foreseeably result in a hazard in the PRCS

a) The information received from the host employer;

b) Any additional information the controlling contractor has about the location of each known PRCS, the hazards or potential hazards in each space or the reason it is a PRCS and any precautions that the host employer or any previous controlling contractor or entry employer implemented for the protection of employees in the PRCS; and

c) The precautions that the host employer, controlling contractor, or other entry employers implemented for the protection of employees in the PRCS.

The controlling contractor and entry employer(s) must coordinate entry operations when:

- More than one entity performs PRCS at the same time; or
- PRCS entry is performed at the same time that any activities that could foreseeably result in a hazard in the PRCS are performed.

The controlling contractor must debrief each entity that entered a PRCS regarding the PRCS program followed and any hazards confronted or created in the PRCS during entry operations.

The controlling contractor must apprise the host employer of the information exchanged with the entry entities. Unless a host employer or controlling contractor has or will have employees in a confined space, it is not required to enter any confined space to collect information listed in bullet 2.

4.12 Entry Employer

Before entry operations begin, each entry employer must:

- Obtain all of the controlling contractor's information regarding confined spaces and entry operations; and
- Inform the controlling contractor of the PRCS program that the entry employer will follow, including any hazards likely to be confronted or created in each PRCS.

The entry employer must inform the controlling contractor in a timely manner of the PRCS program followed and of any hazards confronted or created in the PRCS during entry operations.

5. PROCEDURES AND PRACTICES

Structures or facilities that could be deemed confined spaces may include but not be limited to:

- Enclosed drains or sewers
- Manholes
- Process vessels and exchanges
- Road and rail tankers
- Silos
- Storage tanks

- Sumps
- Well vaults
- Crawl spaces
- Attics
- Pits
- Pipes

A confined space can be permitted or non-permitted, which is determined through the completion of a comprehensive evaluation (Confined Space Evaluation Form – Exhibit 3) of hazards so that appropriate controls are implemented to ensure entry is completed safely.

5.1 What is a Confined Space?

A Confined Space is any enclosed space which meets all three of these conditions:

1. Is large enough and so configured that an employee can bodily enter and perform assigned work. In order to meet this criteria, an employee must physically be able to enter and work in the space.

   Guidance: *As an example, a vault that is 2'x2'x2' is generally not large enough for an employee to "bodily enter". Therefore, a vault of this size would not meet the criteria as being configured such that an employee can bodily enter and perform assigned work, therefore, would not be classified as a confined space;*

2. Has limited or restricted means for entry or exit.

   Note: A space has limited or restricted means of entry or exit if an entrant's ability to escape in an emergency would be hindered. Ladders, and temporary, movable, spiral, or articulated stairs will usually be considered a limited or restricted means of egress. Fixed industrial stairs that meet OSHA standards will be considered a limited or restricted means of egress when the conditions or physical characteristics of the space, in light of the hazards present in it, would interfere with the entrant's ability to exit or be rescued in a hazardous situation.

   Guidance: *With regards to an open topped pit or vault, you will need to consider the depth of the vault or pit and the height of the person entering to perform the assigned work. If the open topped vault or pit is constructed such that a person could stand up and their upper body be "outside of the vault space" and the open topped nature of the vault does not restrict access or exit, then the vault would not meet the criteria as having restricted means for exit. Open topped structures/spaces (e.g., the open top encompasses the entire space) that allow a person to stand up and essentially be out of the "structure/space" atmosphere (typically < 4 feet depth), may not meet the definition of "restricted means for entry or exit". A vault with a small manhole cover, however, does meet the criteria as having limited or restricted means for entry or exit.*

Note: The OSHA Safety and Health Regulations for construction (29 CFR 1926.21) definition of a confined or enclosed space include, but are not limited to, storage tanks, process vessels, bins, boilers, ventilation or exhaust ducts, sewers, underground utility vaults, tunnels, pipelines, and open top spaces more than 4 feet in depth such as pits, tubs, vaults, and vessels; and

3. Is not designed for continuous employee occupancy.

5.2 What is a Permit-Required Confined Space?

A PRCS is a confined space that has one or more of the following characteristics:

- Contains or has a potential to contain a hazardous atmosphere;

  Guidance: Confined spaces in the vicinity of fossil-fuel burning vehicle/equipment exhaust emissions (motor vehicles idling in traffic for example) should be considered to have the potential to contain carbon monoxide from the exhaust emissions if the vehicle and/or equipment is idling nearby.

- Contains a material with the potential for engulfment of an Entrant;

- Has an internal configuration such that an Entrant could be trapped or asphyxiated by inwardly converging walls or a floor which slopes downward and tapers to a smaller cross-section; or

- Contains any other recognized serious safety or health hazard (refer to Exhibit 1 definitions for details).

Use the OSHA PRCS Decision Flow Chart (Exhibit 2) to assist identification of the PRCS and document the findings on the Confined Space Evaluation Form (Exhibit 3).

5.3 What is Permit-Required Confined Space Entry?

Entry constitutes the act by which an employee intentionally passes through an opening into a permit-required confined space. Entry is considered to have occurred as soon as any part of the employee's body breaks the plane of the opening into the PRCS.

5.4 What are the Potential Hazards of a Confined Space?

All parties involved in confined space entry will be competent to recognize hazards that may be associated with a confined space. The parties involved, as part of the evaluation process, will perform a hazard analysis and assessment of the space to identify associated hazards for each space identified, if entry is required. Appropriate controls will then be implemented before entry. The potential hazards of a confined space include but are not limited to:

- Presence of flammable substances and oxygen enrichment which can lead to fire or explosion (Chemical).

- Toxic gases, fumes or vapors which can result in acute local or systemic health effects (Chemical).

- Inert gases which can result in asphyxiation (Chemical).
- Oxygen-deficient atmospheres which can result in asphyxiation (Chemical).
- Liquids or solids that can engulf an Entrant (Mechanical, Motion).
- Extreme temperatures which can result in heat-stress, cold stress, or mental acuity decline (Environment).
- Mechanical or electrical equipment which can result in bodily injury if contacted (Mechanical, Electrical).
- Slippery or uneven walking surfaces (Gravity, Mechanical).
- Low light levels (Radiation, Environment).
- Stressful, confined work areas (Personal safety).
- Poisonous or biting insects or animals, bacteria, biological materials, sanitary wastes (Biological).

5.5 Confined Space Identification and Evaluation

On an ARCADIS project site or work location, information about confined spaces, including their location and characteristics, near the work site must be obtained from the owner or operator of the confined space. In turn, ARCADIS will then inform its subcontractors, as appropriate.

In addition, prior to the initiation of activities, ARCADIS will:

- Verify the location of the identified confined spaces and confirm no others exist in its work area.
- A competent person shall evaluate each confined space in accordance with the criteria defined in this HSS using the Confined Space Evaluation Form (Exhibit 3). This form then becomes part of the PRCS Entry Permit package, if a permit-required entry is necessary.
- Use a meter calibrated to manufacturer specifications and validated using calibration grade gas daily. Calibration and validation must be documented and attached to the air monitoring documentation appropriate checklist or permit.
- Competent person shall classify the confined spaces as to whether or not they are a PRCS and then evaluate whether or not the PRCS can be classified as a Non-PRCS or qualifies for Alternate Procedures. This may include additional consulting with the host employer, outside agencies and other necessary entities, as appropriate. ARCADIS can upgrade the classification beyond the host employer's classification; however ARCADIS will not downgrade the classification unless the specific criteria outlined in section 5.6 or 5.7 of this HSS is met.
- Ensure that exposed employees are informed, by ensuring danger signs (text below) are posted or by any other equally effective means, of the existence and location of and the danger posed by the PRCS.

PRCS signs will be marked as indicated below or similarly:

Danger - - Permit-Required Confined Space, Do Not Enter

As appropriate, the identified PRCS shall be marked accordingly by either the host employer, site owner, or ARCADIS. If a space has locked entry cover or panel, or an access door that can only be opened with special tools, the use of signs may be unnecessary if ARCADIS and/or the controlling employer ensures that all affected employees are informed about such spaces and know that they are not to be opened without taking proper precautions, including temporary signs, to restrict unexpected or unknowing entry.

Non-PRCS may also be marked as appropriate to notify others that it has been evaluated and that it has been classified as a Non-PRCS.

When evaluating another employer's classification of a confined space or reviewing a previous confined space classification generated by an ARCADIS employee, ARCADIS staff must consider that job-related hazards, such as introducing solvent vapors, could turn a Non-PRCS into a PRCS.

5.6 Alternate Procedures - Permit-Spaces (Hazardous Atmosphere Only)

A competent person is authorized to certify the space safe for entry using alternate procedures.

The procedures specified in this section are only applicable if it can be demonstrated that the only hazard posed by the PRCS is an actual or potential hazardous atmosphere and continuous forced air ventilation alone is sufficient to maintain the space safe for entry. In this case, the requirements specified in Section 5.8 of this HSS do not apply, provided that:

- ARCADIS can demonstrate that the only hazard posed by the PRCS is an actual or potential hazardous atmosphere;
- ARCADIS can demonstrate that continuous forced air ventilation alone is sufficient to maintain that the PRCS safe for entry and that, in the event the ventilation system stops working, entrants can exit the space safely; (refer to Exhibit 1 Definitions for details on Safe for Entry atmospheric conditions);
- ARCADIS develops monitoring and inspection data that supports the previous two bullets;
- If an initial entry of the PRCS is necessary to obtain the monitoring and inspection data outlined in the previous bullet, then the entry is performed in compliance with the full PRCS entry procedures detailed in Section 5.8 of this HSS;
- The determinations and supporting data required to document that the only hazard posed by the PRCS is an actual or potential hazardous atmosphere that continuous forced air ventilation alone is sufficient to maintain that permit-space safe for entry will be documented by ARCADIS using the Confined Space Evaluation Form (Exhibit 3) and the Alternate Procedures Confined Space Checklist (Exhibit 4) This document will be made available to each employee who enters the PRCS under the terms of this Alternate Procedure or to that employee's authorized representative; and
- Entry into the PRCS under the Alternate Procedure method must be performed in accordance with the requirements outlined in this section.

5.6.1 Alternate Procedures for Entry into Permit-Spaces Containing Only a Hazardous Atmosphere

Any hazard that would make it unsafe to open an access cover must be eliminated prior to removal. After the entrance covers are removed, the opening will be promptly guarded by a railing, temporary cover, or other temporary barrier in such a manner to prevent an accidental fall through the opening and that will protect each employee working in the space from foreign objects entering the space.

Before workers enter the space, the internal atmosphere will be checked with a calibrated real-time, direct-reading instrument(s) in the following sequence:

1. Oxygen concentration (value must be between 19.5% and 23.5%)

2. LEL (value must be less than 5%)

3. Potential toxic air contaminants (must be less than 50% of either the ACGIH TLV or the OSHA PEL, whichever is more stringent)

   Note: Simple "alarm only" devices which do not provide readings, are not considered acceptable direct reading instruments, for either initial (pre-entry) or periodic (assurance) testing with regards to the Alternate Procedure, since they do not provide enough information relative to the established acceptable entry conditions which is essential to the entrants knowledge. Combination units which have a meter or display which reflect the actual concentrations and a preset alarm feature would be acceptable and possibly desirable because they provide "real time" information on actual concentrations as well as the benefit of automatic (unattended) alarming at a predetermined value.

Where feasible, extended probes will be used for the air monitoring devices so that entry will not be necessary to conduct the initial evaluation.

There may be no hazardous atmosphere within the space whenever any employee is inside the confined space.

A continuous forced air ventilation system or other means to eliminate the hazardous atmosphere will be established prior to entry into the space. The air supply will be from a clean source and may not increase the hazards within the space. Workers may not enter the space until forced air ventilation has eliminated the hazardous atmosphere and it will be continuously operated until all workers have left the space. If forced air ventilation does not eliminate the atmospheric hazard, entry may not commence, and the full PRCS procedures specified in Section 5.8 must be followed.

The atmosphere within the space must be continuously monitored unless ARCADIS can demonstrate that equipment for continuous monitoring is not commercially available or periodic monitoring is sufficient. If continuous monitoring is used, ARCADIS must ensure that the monitoring equipment has an alarm that will notify all entrants if a specified atmospheric threshold is achieved, or that an employee will check the monitor with sufficient frequency to ensure that entrants have adequate time to escape. If continuous monitoring is not used, periodic monitoring is required. All monitoring must ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere. Any employee who enters the space, or that employee's authorized representative, must be provided with an opportunity to observe the testing required by this HSS.

If a hazardous condition is discovered during entry operations, all personnel will immediately evacuate the space, the space shall be evaluated to determine how the hazardous atmosphere developed and measures shall be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place.

Arcadis must provide a safe method of entering and exiting the space. If a hoisting system is used, it must be designed and manufactured for personnel hoisting; however, a job-made hoisting system is permissible if it is approved for personnel hoisting by a registered professional engineer, in writing, prior to use.

Arcadis shall verify that the space is safe for entry and that the pre-entry measures required by Section 5.6.1 of this HSS have been taken, through a written Alternate Procedures Confined Space Entry Checklist (Exhibit 4) that contains the date, the location of the space, and the signature of the person providing the certification. The checklist must be completed before entry and must be made available to each employee entering the space or to that employee's authorized representative.

5.7 Non-Permit Required Confined Space

If the PRCS poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated or isolated without entry into the space, the PRCS may be reclassified as a Non-PRCS for as long as the non-atmospheric hazards remain eliminated.

The competent person shall use the Evaluation Form to certify the space safe for entry.

When there are changes in the use or configuration of a Non-PRCS that might increase the hazards to entrants, or some indication that the initial evaluation of the space may not have been adequate, each entry employer must have a competent person reevaluate that space and, if necessary, reclassify it as a PRCS.

5.7.1 Reclassifying a Permit-Required to a Non-Permit-Required Confined Space

A space classified by an employer as a permit-required confined space may only be reclassified as a Non-PRCS when a competent person determines that all of the following applicable requirements have been met:

- The PRCS poses no actual or potential atmospheric hazards and all hazards within the space are eliminated or isolated without entry into the space, unless it can demonstrate that this is infeasible.

- If it is necessary to enter the PRCS to eliminate or isolate hazards, such entry shall be performed as a PRCS entry. If testing and inspection during that PRCS entry demonstrate that the hazard(s) within the PRCS have been eliminated, the PRCS may be reclassified as a Non-PRCS for as long as the hazards remain eliminated.

  Note: Control of atmospheric hazards through forced air ventilation does not constitute elimination or isolation of the hazards. The Alternate Procedures detailed in section 5.6 of this HSS covers PRCS entry where ARCADIS can demonstrate that continuous forced air ventilation alone will control all hazards in the space.

- Prior to reclassifying a PRCS to a Non-PRCS, all relevant data that demonstrates the basis for the reclassification must be documented and referenced on the Confined Space Evaluation Form (Exhibit 3).

5.7.2 Non-Permit-Required Confined Space Requirements

If the site, as a result of the evaluation process, is revealed to contain any Non-PRCS, ARCADIS will inform affected employees (e.g., detail in HASP or JSA, review during daily tailgate meeting). Entry into these Non-PRCS by ARCADIS employees can be made as follows:

- ARCADIS employees must review the Confined Space Evaluation Form (Exhibit 3) to determine what potential hazards may exist;
- Entry into the Non-PRCS will occur only after all hazards, if any, have been eliminated, without entering the confined space;
- ARCADIS employees must complete and review the Non-Permit Required Confined Space Entry Checklist (Exhibit 5); and
- Best management practice is to have a second person on site in order to provide monitoring of the ARCADIS staff entering into a Non-PRCS.

Non-Permit Entry is permitted as long as the non-atmospheric hazards remain eliminated or isolated. If this is a sustainable situation, the confined space can be entered as a non-permit required entry.

5.8 Permit-Required Confined Space Entry

If a confined space is determined to be a PRCS and entry is necessary to complete the activities, ARCADIS staff will review this HSS and:

- Implement the measure necessary to prevent unauthorized entry;
- Complete the entry permit package which includes the completed Confined Space Evaluation Form (Exhibit 3), and the PRCS Entry Permit (Exhibit 6);
- Evaluate the hazards external to the confined space that may impact the confined space operations including but not limited to pedestrians and vehicles;
- Determine the appropriate hazard controls appropriate for the space using the hazard control hierarchy of eliminate, substitute, isolate, engineer out, administratively manage, and provide personal protective equipment;
- Develop an appropriate air monitoring program based on the characteristics of the space; and
- Identify competent Entry Supervisor, Attendant, Entrants and Rescue personnel and establish procedures for the coordination of these staff.

ARCADIS shall provide testing and monitoring equipment, ventilation equipment, communications equipment, PPE, lighting equipment, barriers and shields, equipment, such as ladders, needed for safe entry and egress by authorized entrants, rescue and emergency equipment and any other equipment necessary for safe entry/exit and rescue from PRCS at no cost to each employee, maintain this equipment properly and ensure that each employee uses this equipment properly.

5.8.1 Entry Permit Package and Process

The PRCS Entry Permit Package is made up of the completed Confined Space Evaluation Form, and the PRCS Entry Permit. The PRCS Entry Permit will be:

- Completed, signed and issued by the Entry Supervisor who will verify that the confined space has been properly evaluated, isolated, drained, washed, purged, flushed ventilated, and tested as appropriate, and that the Confined Space Evaluation Form is completed and attached as part of the permit package.

- Posted at the entrance to the space and remain for the duration of the entry

- Weather-protected to maintain integrity.

In addition, prior to authorizing the PRCS Entry Permit, the Entry Supervisor, along with the attendant and Entrants must ensure the following, as applicable.

- All mechanical apparatus (such as agitators) within or connected to the confined space are de-energized, locked-out, and tagged as per the ARCADIS Lockout/Tagout standard.

- All lines connected to the confined space where the nature of the service could present a hazard immediately dangerous to life or health, such as nitrogen, steam, solvent, acid, or hot water, are isolated from the confined space. Acceptable isolation methods include removing a valve, spool piece, or expansion joint, and blanking or capping the opened end; inserting a suitable full-pressure blank in the piping between connecting flanges; and/or closing and locking at least two valves in the pipeline and locking open to atmosphere a chain valve between the two closed and locked valves.

  Note: Crawl spaces generally contain utility service lines (i.e., water, natural gas, fuel oil, sewage, steam and electric power) which pass through them. If these utility services do not terminate at end use equipment in the crawl space, the inherent hazards of the material flowing through the service lines do not have to be considered in the PRCS determination unless there is reason to believe there is a reasonable probability of a rupture or leak where the contents of the piping would cause a serious safety or health hazard. Therefore, just because there are utility service lines that pass through a confined space doesn't necessarily make that space a PRCS. ARCADIS must evaluate the "likelihood" of a release. Please consider that if the utility service line(s) contains dispensing valves or other termination points, the evaluation must consider that these valves could leak/fail and whether this constitutes a serious safety or health hazard.

- When feasible, all electrical equipment in and around the confined space is de-energized and locked out.

  Note: The presence of energized equipment will not trigger permit entry requirements if it is insulated or enclosed and does not pose a serious safety or health hazard.

- Confined spaces which have contained a known hazardous chemical (e.g., vessels, storage tanks) have been thoroughly cleaned by appropriate means (e.g., overflowing with water, steaming, etc).

- For confined spaces containing known atmospheric hazards, mechanical ventilation is operating to maintain atmospheric hazards within permit parameters.

- The atmosphere of the confined space is initially checked to verify that it contains acceptable levels of oxygen (19.5 to 23.5%) and is free of hazardous levels of explosive/combustible (<10% of the LEL) or toxic gases or vapors (below PEL or

TLV, whichever is more stringent). The Atmospheric Testing Section, of this standard details the air quality specifications which must be met. These specifications are also detailed in the Confined Space Evaluation Form.

- Continuous air monitoring is required to be conducted within the confined space.
- All necessary entry equipment (e.g., retrieval lines, PPE, respiratory protective equipment) is available, in good condition, and functional.
- All Entrants and Attendants have received the appropriate confined space entry training.
- All rescue arrangements are in-place as per the section on Outside Rescue Assistance, and that an adequate means of communicating with outside assistance is immediately available to the attendant.

The Entry Permit must be canceled and all Entrants ordered to evacuate the PRCS when any one of the following conditions arises:

- A change in initial atmospheric conditions which may jeopardize the continued health and safety of Entrants is detected.
- The attendant must leave the work station.
- The attendant is called on to perform duties which do not allow him/her to fulfill his/her duties as an attendant.
- Whenever ordered by the attendant due to factors external to the confined space which may jeopardize the continued safety and health of Entrants.
- At the end of the work shift and/or whenever a different group of Entrants and Attendants will take charge of the confined space.
- Whenever Entrants self-perceive danger and self-initiate evacuation.
- At the termination of confined space entry.
- At the end of the work shift in which the entry occurs.

5.8.2 Other Confined Space Entry Permit Requirements

Additional PRCS Entry Permit package requirements are:

- A separate Entry Permit must be generated for each confined space. However, a single Entry Permit may be generated for entry into multiple sewer system manholes in a continuous sewer system.
- The completed permit package is valid for one shift only. A new permit and checklist must be completed with each new entry. However, if the activities are the same as those evaluated on the Confined Space Evaluation Form, a new evaluation form is not required.
- A new completed and signed Entry Permit Package must be issued for each new crew of Entrants and Attendants.

5.8.3 Evaluation of External Hazards

Prior to any confined space entry, hazards external to the space will be evaluated to ensure protection of Entrants and others. This evaluation is done as part of the ARCADIS TRACK process, the development of JSAs for the job, and the daily tailgate meeting on site. These external hazards may also be evaluated through the development of the site specific health and safety plan.

5.8.4 Atmospheric Testing

ARCADIS shall test or monitor the PRCS as necessary to determine if acceptable entry conditions are being maintained during the course of entry operations. The type of testing that needs to be performed within a PRCS is dependent on the hazards that are present within the space (e.g., ARCADIS isn't required to test substances which will not potentially be present). Measurement of values for each atmospheric parameter should be made for at least the minimum response time of the test instrument specified by the manufacturer. Results of this testing will be documented on the Entry permit.

As necessary, each confined space will be initially tested prior to the Entry Supervisor authorizing entry.

The atmosphere within each confined space must be continuously monitored, even when mechanical ventilation is used, unless it can be demonstrated that equipment for continuous monitoring is not commercially available. (Justification and monitoring interval will be specified in the Confined Space Entry Permit). Monitoring equipment must have an alarm that will notify all entrants if a specified atmospheric threshold is achieved, or the attendant checks the monitor with sufficient frequency to ensure that entrants have adequate time to escape.

The following are the testing sequence and acceptable air quality criteria for a PRCS:

- Oxygen content for PRCS space entry must be 19.5 to 23.5% (Oxygen must be measured first);

- Combustible gas or vapor must not exceed 10% of its Lower Explosive Limit (LEL). Combustible gases are tested for next because the threat of fire or explosion is both more immediate and more life threatening, in most cases, than exposure to toxic gases and vapors. If tests for toxic gases and vapors are necessary, they are performed last.

  Note: Under no circumstances is entry into a PRCS having explosivity monitoring results greater than 10% of the LEL permitted by any employees of ARCADIS without first consulting Corporate Health & Safety or its designated representative. Entry will only be granted if appropriate ventilation, continuous air monitoring, other atmospheric controls and appropriate respiratory protection is in place to allow for safe access/egress. No ARCADIS employee is ever permitted to enter into any PRCS when explosivity monitoring results exceed 50% of the LEL.

  Note: If ARCADIS is unable to reduce the atmosphere below 10 percent LEL within the confined space, employees may only enter if the confined space is inerted so as to render the entire atmosphere in the space noncombustible, and the employees use PPE to address any other atmospheric hazards (such as oxygen deficiency), and ARCADIS eliminates or isolates all physical hazards in the space; and

- Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in OSHA Subpart G or Z, or the ACGIH Threshold Limit Value, whichever is more stringent, and which could result in employee exposure in excess of its dose or permissible exposure limit;

  Note: An atmospheric concentration of any substance that is not capable of causing death, incapacitation, and impairment of ability to self-rescue, injury, or acute illness due to its health effects is not covered by this provision. Where employees are exposed to atmospheric or other toxic hazards which do not present an immediate danger of death or disability that would render the employee unable to escape from the confined space (e.g., air contaminants such as arsenic or asbestos), OSHA's health standards for those hazards and respiratory protection standard applies rather than this PRCS Standard, and employees must be appropriately protected in accordance with those health standards. The PRCS standard is intended to protect employees against specific short-term, acute hazards (not exposures at or below the permissible exposure limits); other standards address a broader range of health and safety concerns. Respiratory protection requirements are detailed in the OSHA respiratory protection standard (29 CFR 1910.134) or the ARCADIS Respiratory Protection Standard.

If it is necessary to enter a confined space where any of the following atmospheric conditions exist, all Entrants must wear either a NIOSH approved self-contained breathing apparatus (SCBA) of at least 60-minute duration or an airline respirator with emergency SCBA, as delineated below (refer to the Respiratory Protection standard for further details):

- Initial atmospheric testing indicates IDLH conditions.

  - Under no circumstances is entry into a PRCS having an IDLH condition permitted by any employee of ARCADIS without first consulting with Corporate Health & Safety or its designated representative. If entry into an IDLH atmosphere is approved by Corporate Health & Safety, entry into a PRCS with an IDLH atmosphere, or into a space that can quickly develop an IDLH atmosphere (if ventilation fails or for other reasons), is only permitted if proper respiratory protection/emergency escape respiratory protection is used, employees are specifically trained for this type of IDLH entry and there is a properly equipped rescue team on site and standing by at the PRCS (at least 1 rescue person for each authorized entrant).

- Initial atmospheric testing indicates conditions within permit parameters, but where the quality of the atmosphere remains questionable.

- Despite initial atmospheric testing results, activities to be performed while in the confined space would endanger Entrants by creating a sudden change in atmospheric conditions within the space. These activities may include but are not limited to welding, painting, coating, cutting, using solvents, or agitating bottom sediments.

Under no circumstances is entry into a PRCS having oxygen levels greater than 23.5%permitted by any employee of ARCADIS.

When monitoring for entries involving a descent into atmospheres that may be stratified, the atmospheric envelope should be tested a distance of approximately 4 feet (1.22 m) in

the direction of travel and to each side. If a sampling probe is used, the entrant's rate of progress should be slowed to accommodate the sampling speed and detector response.

Results of all atmospheric testing must be recorded on the Confined Space Entry Permit and/or an attached air monitoring log.

Entrants and their representatives have the opportunity to participate in all air monitoring and air monitoring instrument calibration, and to review all air monitoring data prior to entry to the space.

5.8.5 Mechanical Ventilation

Mechanical ventilation may be:

- Utilized to maintain the atmospheric conditions required to satisfy the entry permit parameters.
- Used to force clean air into a space or remove contaminated air from the space.

Ventilation systems must be set up to adequately ventilate all areas of the space and be locked in the “on” position. The space must be evacuated if the system fails.

Air intake must be positioned to prevent the introduction of air contamination into the confined space (e.g., away from vehicle exhaust, tank vents).

In the event the ventilation system stops working, the established atmospheric monitoring procedures will be set-up to detect an increase in atmospheric hazard levels in sufficient time for the entrants to safely exit the PRCS.

5.8.6 Work Practices

The following Work Practices must be followed for Permit-Required Confined Space Entry:

- All Entrants must wear a retrieval line secured on one end to the Entrant by a full-body harness, or parachute harness, and the end secured outside the space unless this creates more of a hazard.
- If there is not a fixed retrieval line, a suitable means for rescue appropriate for the configuration of space, must be provided.
- For vertical-entry spaces, the lifeline must be secured to a lifting or other mechanical retrieval device affixed to a suitable anchor point. Reliance on manually lifting an Entrant from a vertical confined space is prohibited. If more than one Entrant is entering the space, each line shall be clearly marked to identify the Entrant and the mechanical retrieval system must be rated for multiple Entrant use.
- Whenever a ladder is required for entry, it must be secured and not withdrawn while anyone remains within the confined space, except as necessary to permit extraction during rescue.
- Adequate, explosion proof illumination must be provided for entry, as necessary.
- Electrical equipment used within a confined space must be explosion-proof and be inspected prior to use to verify good working condition. The equipment must utilize a ground fault interrupt and/or be properly grounded.

- Methods of communication between Attendant and Entrant(s) include voice, voice powered radio, tapping or rapping codes on tank walls, signaling tugs on a rope, and the attendant's direct observation of Entrant(s).
- All confined spaces must be isolated prior to entry.
- Prior to opening or removing lids, covers, access doors, or hatches of a confined space, precautions must be taken to determine if it is safe to do so.
- Whenever entering spaces with permanent ladders, all rungs must be inspected to verify they are in safe and useable condition.
- When working in a vertical confined space, precautions must be taken to prevent equipment and personnel from falling into the confined space opening. Tools should be lowered and removed from the space using a basket or sling to prevent falls and falling objects.
- A re-evaluation of the hazards associated with the space will be conducted if it is believed or known that conditions in the space have changed, or if an Entrant requests re-evaluation or air monitoring.
- If ARCADIS staff must enter a space with staff from one or more other employers, no entry will take place until the entry supervisors from each employer coordinate activities and determine and communicate the entry, operations, and exit and rescue procedures for the multi-employer space. Responsibilities and designation of each authorized position will be reviewed and authorized positions will be appropriately staffed with qualified personnel.

5.8.7 Communications

Prior to any PRCS entry, a communication system will be established between:

- the Attendant and the Entrant
- the Attendant and the Entry Supervisor
- The Attendant and the assigned Rescuers. The Attendant will be in constant and direct communication with the Entrants.

Acceptable forms of communication between the Entrant and the Attendant are:

- Voice;
- Intrinsically safe voice powered radios;
- Hand signals, as long as the Entrants are in constant view of the Attendant;
- Tapping or rapping codes on tank walls;
- Signaling tugs on a rope;
- The Attendant's direct observation of Entrants; and
- Closed-Circuit Television (CCTV) Monitoring.

The appointed rescue team(s) shall be informed of every PRCS entry task, including the exact location, both immediately prior to work commencing and before and after work breaks. Intrinsically safe portable radios or cellular telephones of summoning help from a rescue service shall be available.

5.8.8 Confined Space Entry Equipment

Confined space entry, whether it be permit or non-permit required entry may require a variety of equipment. This will be evaluated as part of the hazard analysis and evaluation process. This equipment may include, but not limited to the following:

- Signs, barricades or other devices to control access to the confined space and to control the area around the confined space where people will be working.
- Energy control devices as specified by the ARCADIS Lockout / Tagout (LOTO) Control of Hazardous Energy standard.
- Entry devices – ladder, tripod and winch, harness or other mechanism to allow safe entry and non-entry rescue – rescue equipment is required for all permit-required spaces.
- Safety equipment – fire extinguishers, lights, cooling vests.
- Ventilation equipment – fans, blowers or other methods to maintain safe atmospheric conditions within the space.
- Air monitoring – meters to measure the air quality, at a minimum confined space entry meters will be able to measure oxygen, lower explosive limit (LEL), hydrogen sulfide (H_2S) and Carbon monoxide (CO) – these may not be necessary for Non-PRCS.
- Personal Protective Equipment – selected based on the hazards.

Other equipment may be required based on the nature of the entry and the activities. For example, self-contained breathing apparatus may be necessary for external rescuers that must enter into a PRCS for rescue purposes. All equipment must be appropriate for the activities of the entry and be approved or certified as specified by regulatory requirements.

5.9 Sewer System Entry

Sewer entry differs in three vital respects from other PRCS entries; first, there rarely exists any way to completely isolate the space (a section of a continuous system) to be entered; second, because isolation is not complete, the atmosphere may suddenly and unpredictably become lethally hazardous (toxic, flammable or explosive) from causes beyond the control of the entrant, ARCADIS or the Owner of the Sewer Line, and third, experienced sewer workers are especially knowledgeable in entry and work in their PRCS because of their frequent entries. Unlike other employments where permit space entry is a rare and exceptional event, sewer workers' usual work environment is a PRCS.

5.9.1 Adherence to Procedure

ARCADIS shall designate as entrants only employees who are thoroughly trained in our sewer entry procedures and who demonstrate that they follow these entry procedures exactly as prescribed when performing sewer entries.

5.9.2 Atmospheric monitoring

Entrants should be trained in the use of, and be equipped with, atmospheric monitoring equipment which sounds an audible alarm, in addition to its visual readout, whenever one of the following conditions are encountered:

- Oxygen concentration less than 19.5 percent or greater than 23.5%;
- Flammable gas or vapor at 10% LEL or more;
- Carbon monoxide at or above 25 ppm; or
- Hydrogen sulfide at or above 1 ppm

Atmospheric monitoring equipment needs to be calibrated according to the manufacturer's instructions. The measurements obtained with substance-specific devices are of vital importance when decisions are made concerning the measures necessary to protect entrants (such as ventilation or personal protective equipment) and the setting and attainment of appropriate entry conditions. However, the sewer environment may suddenly and unpredictably change and the substance-specific devices may not detect the potentially lethal atmospheric hazards which may enter the sewer environment.

In preparing for entry, ARCADIS staff must consider the unique circumstances, including the predictability of the atmosphere, of the sewer PRCS in the workplace.

The selected direct-reading testing instrument should be carried and used by the entrant in sewer line work to monitor the atmosphere in the entrant's environment, and in advance of the entrant's direction of movement, to warn the entrant of any deterioration in atmospheric conditions. Where several entrants are working together in the same immediate location, one instrument, used by the lead entrant, is acceptable.

5.9.3 Surge Flow and Flooding

Entrants and Attendants should develop and maintain liaison, to the extent possible, with the local weather bureau and fire and emergency services in their area so that sewer work may be delayed or interrupted and entrants withdrawn whenever sewer lines might be suddenly flooded by rain or fire suppression activities, or whenever flammable or other hazardous materials are released into sewers during emergencies by industrial or transportation accidents.

Example: When workers are performing work in a storm sewer, a storm upstream from the workers could cause flash flooding. An electronic sensor or observer posted upstream from the work site could alert workers in the space at the first sign of the hazard, giving the workers time to evacuate the space safely.

5.9.4 Special Equipment

Entry into large bore sewers may require the use of special equipment. Such equipment might include such items as atmosphere monitoring devices with automatic audible alarms, escape self-contained breathing apparatus (ESCBA) with at least 10 minute air supply (or other NIOSH approved self-rescuer), and waterproof flashlights, and may also include boats and rafts, radios and rope stand-offs for pulling around bends and corners as needed.

5.10 Permit-Required Confined Space Rescue

Rescue services will be provided and be prepared for permit-required confined space entries. Non-entry rescues can be performed by qualified and trained ARCADIS staff. Entry rescues will be performed by external sources that are qualified and competent to perform entry rescues.

ARCADIS shall ensure that each affected employee is trained in basic first aid and cardiopulmonary resuscitation (CPR). ARCADIS shall ensure that at least one member of the rescue team or local emergency rescue service holds a current certification in basic first aid and CPR is available.

If an injured entrant is exposed to a substance for which a Safety Data Sheet (SDS) or other similar written information is required to be kept at the worksite, that SDS or written information must be made available to the medical facility treating the exposed entrant.

5.10.1 Non-Entry Rescue

ARCADIS staff or an external rescue team can provide non-entry rescue if they are property trained and qualified. Affected employees shall practice making PRCS rescues before attempting an actual rescue, and at least once every 12 months, by means of simulated rescue operations in which they remove dummies, manikins, or actual persons from the actual PRCS or from representative PRCS, except practice rescue is not required where the affected employees properly performed a rescue operation during the last 12 months in the same PRCS the authorized entrant will enter, or in a similar PRCS. In addition, at least one person on the rescue team must be currently certified in first aid and CPR.

Non-entry rescue will involve the use of retrieval systems or methods to assist in the rescue unless the retrieval equipment increases the overall risk of the entry or does not contribute to the rescue of the Entrants.

Whenever non-entry rescue is selected, the entry employer must ensure that retrieval systems or methods are used whenever an authorized entrant enters a PRCS, and must confirm, prior to entry, that emergency assistance would be available in the event that non-entry rescue fails.

For non-entry retrieval, non-entry rescuers shall:

- Ensure the use of a full body harness with a retrieval line attached at the center of the Entrant’s back near shoulder level or above the Entrant’s head by each authorized Entrant.

- Attach the other end of the retrieval line to a mechanical device or fixed point outside the confined space in such a manner that rescue can begin as soon as the rescuer becomes aware that rescue is necessary.

- Set up a mechanical device and make it ready to retrieve personnel from vertical type confined spaces more than 4 feet deep for general industry work and 5 feet deep for Construction work.

- Use the material safety data sheets or written information if an injured Entrant is exposed to a hazardous substance.

- Provide medical personnel treating the exposed Entrant with the material safety data sheet or written information.

5.10.2 Entry Rescue Assistance

If the Entry Supervisor determines entry rescue may be necessary, an assessment will be completed to verify that the designated rescue service:

- Has adequate resources, training and equipment to provide services for the scope of the planned entry.

- Is within a reasonable response distance/time.

Such rescue assistance must be coordinated with either the host employer's designated confined space rescue team and/or with a local emergency response team. The selected rescue services must be offered an opportunity to inspect the confined space prior to initiating the entry. Documentation of this offer and the status of the site visit, if conducted, must be maintained by the entry supervisor.

As appropriate, entry shall progress only after proper notification and verification of adequacy of outside rescue assistance prior to the actual entry activity.

ARCADIS shall inform each rescue team or service of the hazards they may confront when called on to perform rescue at the site.

ARCADIS shall provide the rescue team or service selected with access to all PRCS from which rescue may be necessary so that the rescue team or service can develop appropriate rescue plans and practice rescue operations.

An adequate means of communication (e.g., cellular telephone for contacting offsite emergency assistance, air horn, or two-way radio for summoning the rescue team) must be immediately available to the attendant.

5.11 Construction - Confined Space Entry Requirements

In addition to complying with the rest of this HSS, this section sets forth additional requirements for practices and procedures to protect employees engaged in construction activities at a worksite with one or more confined spaces. This section does not apply to: (1) Construction work regulated by §1926 subpart P—Excavations. (2) Construction work regulated by §1926 subpart S—Underground Construction, Caissons, Cofferdams and Compressed Air. (3) Construction work regulated by §1926 subpart Y—Diving.

Where this section applies and there is a provision that addresses a confined space hazard in another applicable OSHA standard, ARCADIS must comply with both that requirement and the applicable provisions of the OSHA Confined Space in Construction standard.

Examples of locations where confined spaces may occur include, but are not limited to, the following: Bins; boilers; pits (such as elevator, escalator, pump, valve or other equipment); manholes (such as sewer, storm drain, electrical, communication, or other utility); tanks (such as fuel, chemical, water, or other liquid, solid or gas); incinerators; scrubbers; concrete pier columns; sewers; transformer vaults; heating, ventilation, and air-conditioning (HVAC) ducts; storm drains; water mains; precast concrete and other pre-formed manhole units; drilled shafts; enclosed beams; vessels; digesters; lift stations; cesspools; silos; air receivers; sludge gates; air preheaters; step up transformers; turbines; chillers; bag houses; and/or mixers/reactors.

If ARCADIS identifies, or receives notice of, a PRCS and has not authorized employees it directs to work in that space, ARCADIS must take effective measures to prevent those employees from entering that PRCS, in addition to complying with all other applicable requirements of this HSS.

Inform, in a timely manner and in a manner other than posting, its employees' authorized representatives and the controlling contractor of the existence and location of, and the danger posed by each PRCS.

There are 5 key differences between the general industry and construction rule, and several areas where OSHA has clarified existing requirements. The five new requirements include:

1. More detailed provisions requiring coordinated activities when there are multiple employers at the worksite. This will ensure hazards are not introduced into a confined space by workers performing tasks outside the space. An example would be a generator operating near the entrance of a confined space causing a buildup of carbon monoxide within the space.

2. Requiring a competent person to evaluate the work site and identify confined spaces, including PRCS.

3. Requiring continuous atmospheric monitoring whenever possible.

4. Requiring continuous monitoring of engulfment hazards. For example, when workers are performing work in a storm sewer, a storm upstream from the workers could cause flash flooding. An electronic sensor or observer posted upstream from the work site could alert workers in the space at the first sign of the hazard, giving the workers time to evacuate the space safely.

5. Allowing for the suspension of a permit, instead of cancellation, in the event of changes from the entry conditions list on the permit or an unexpected event requiring evacuation of the space. The space must be returned to the entry conditions listed on the permit before re-entry.

In addition, OSHA has added provisions to the new rule that clarifies existing requirements in the General Industry standard that ARCADIS will comply with. These include:

1. Requiring that employers who direct workers to enter a space without using a complete permit system prevent workers' exposure to physical hazards through elimination of the hazard or isolation methods such as lockout/tagout.

2. Requiring that employers who are relying on local emergency services for emergency services arrange for responders to give the employer advance notice if they will be unable to respond for a period of time (because they are responding to another emergency, attending department-wide training, etc.).

3. Requiring employers to provide training in a language and vocabulary that the worker understands.

Finally, several terms have been added to the definitions for the construction rule, such as "entry employer" to describe the employer who directs workers to enter a space, and "entry rescue", added to clarify the differences in the types of rescue employers can use.

5.11.1 Multiple Employers at the Worksite

Each employer that identifies a PRCS, or receives notice of a PRCS, has a duty to inform exposed employees about a PRCS.

ARCADIS and each employer has a responsibility to identify PRCS in which one or more employees it directs may work. However, if there already is a warning sign posted at the PRCS, then ARCADIS does not need to post an additional sign. Rather, ARCADIS shall rely on a preexisting sign to identify a space and must ensure that the sign remains posted for the duration of the potential exposure to the PRCS of employees it directs.

When multiple employers will be working in the same permit-required confined space, each employer has a separate duty to post the warning sign. If an employer decides to enter the space, then this subject must be resolved between the controlling contractor and the entry employers as part of the coordination discussion.

5.11.2 Continuous Atmospheric Monitoring

When employees will be entering a permit-required confined space or activity that qualifies for Alternate Procedures, continuously monitor atmospheric hazards unless ARCADIS can demonstrate that the equipment for continuously monitoring a hazard is not commercially available or that periodic monitoring is of sufficient frequency to ensure that the atmospheric hazard is being controlled at safe levels. If continuous monitoring is not used, periodic monitoring is required with sufficient frequency to ensure that acceptable entry conditions are being maintained during the course of entry operations.

5.11.3 Continuous Monitoring of Engulfment Hazards

If ARCADIS demonstrates that isolation of the space is infeasible because the space is large or is part of a continuous system (such as a sewer), ARCADIS must:

- Perform pre-entry testing to the extent feasible before entry is authorized; and

- If entry is authorized, continuously monitor entry conditions in the areas where authorized entrants are working, except that ARCADIS may use periodic monitoring for monitoring an atmospheric hazard if we can demonstrate that equipment for continuously monitoring that hazard is not commercially available and provide an

early-warning system that continuously monitors for non-isolated engulfment hazards. The system must alert authorized entrants and attendants in sufficient time for the authorized entrants to safely exit the space.

Note: For example, when workers are performing work in a storm sewer, a storm upstream from the workers could cause flash flooding. An electronic sensor or observer posted upstream from the work site could alert workers in the space at the first sign of the hazard, giving the workers time to evacuate the space safely

5.11.4 Suspension of a Permit

The Construction PRCS procedure allows for the suspension of a permit, instead of cancellation, by the Entry Supervisor in the event of changes from the entry conditions listed on the permit or an unexpected event requiring evacuation of the space. The space must be returned to the entry conditions listed on the permit before re-entry.

5.12 Review and Annual Review of the Confined Space Entry Program

Review entry operations when the measures taken under the PRCS program may not protect employees and revise the program to correct deficiencies found to exist before subsequent entries are authorized. Examples of circumstances requiring the review of the PRCS program include, but are not limited to:

- any unauthorized entry of a PRCS
- the detection of a PRCS hazard not covered by the permit
- the detection of a condition prohibited by the permit
- the occurrence of an injury or near-miss during entry
- a change in the use or configuration of a PRCS, and
- employee complaints about the effectiveness of the program.

Any problems encountered during an entry operation must be noted on the PRCS Entry Permit and forwarded to the Corporate H&S Business Line Director within 8 hours, so that appropriate revisions to the PRCS program can be made.

Verify that copies of the completed and canceled Entry Permits are properly maintained in project files and submitted to Corporate H&S (4-Sight-Support@arcadis-us.com), as specified in Section 8.0 – Records.

When problems are encountered during Alternate Procedures or Non-PRCS entry, the problem and resolution will be documented in the Entry Checklist and then a copy of the final Entry Checklist will be forwarded to 4-sight-support@arcadis-us.com.

At least annually, ARCADIS will review the PRCS program to determine if revisions are required to ensure that this HSS adequately addresses confined space evaluation, monitoring, permitting and entry requirements. This review will be accomplished using cancelled entry permits from within the last year, reviewing feedback/comments provided by staff, reading and updating this written standard, and via on-site assessments of entry activities. Based on this review, the program and procedures will be revised as appropriate, and then communicated to appropriate staff.

6. TRAINING

All employees who work in the area of confined spaces or who enter Non-PRCS or who use Alternate Procedures to enter a confined space will be trained in awareness level training in order to

recognize the difference between confined spaces and permit-required confined spaces and how to recognize/control hazards when associated with Non-PRCS entry or Alternate Procedures entry. This training is provided during initial and refresher Hazardous Waste Operations and Emergency Response (HAZWOPER) training and/or through specific confined space awareness training.

For entry into permit-required confined spaces, all parties involved including the Entry Supervisor, Attendants, Entrants and Rescuers will take classroom and hands-on training pursuant to their activities. Additional training is provided to these employees if their duties change, or if new hazards are encountered, or if special procedures or activities occur. Site specific training is also provided to address those site-specific hazards and confined spaces encountered on each project confined space training shall be provided to employees in both a language and vocabulary that the employee can understand.

Rescuers will receive hands-on training pertinent to the type of rescue services they will provide as described in the Rescue section of this document.

Confined Space and PRCS Training required by this HSS must be provided to each affected employee:

1. In both a language and vocabulary that the employee can understand;

2. Before the employee is first assigned duties under this HSS;

3. Before there is a change in assigned duties;

4. Whenever there is a change in PRCS entry operations that presents a hazard about which an employee has not previously been trained (this can be accomplished on site during review of Job Safety Analysis during daily tailgate meeting; and

5. Whenever there is any evidence of a deviation from the PRCS entry procedures required by this HSS or there are inadequacies in the employee's knowledge or use of these procedures.

   Note: If the ARCADIS Task Improvement Process (TIP) is used to document this deviation, the assigned action item will address necessary corrective/retraining actions to address employee knowledge gap or implementation of this HSS.

All training provided to ARCADIS employees must be reviewed and approved by Corporate H&S and will be managed through the ARCADIS training center.

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

7. REFERENCES

- ARCADIS Health and Safety Standard ARC HSFS004 – Control of Hazardous Energy (Lockout/Tagout)
- OSHA Permit-Required Confined Spaces Standard 29 CFR 1910.146
- OSHA Confined Spaces in Construction 29 CFR 1926, Subpart AA

- OSHA Letter of Interpretation (10/24/98) – restricted means of entry or exit
- OSHA Letter of Interpretation (10/27/95) – restricted means of entry or exit

8. RECORDS

Training records will be kept by the individual employee with copies of such certificates kept by the ARCADIS training system. Training dates and times will be kept by the ARCADIS training system.

Those direct-read air monitoring results which show the composition of an atmosphere to which an employee is actually exposed (even if the employee is using a respirator) are exposure records under 29 CFR 1910.20(c)(5) and must be maintained on file for 30 years. Conversely, if ARCADIS determines as the result of initial air sampling not to allow entry into a confined space until additional ventilation and purging of the atmosphere has occurred, the sample would not be considered an exposure record because no employee would ever have been exposed to the atmosphere sampled. Once ARCADIS takes corrective action so that an employee can enter, however, the results of subsequent air sampling that show the atmosphere the employee actually entered would be considered exposure records.

Copies of the completed and canceled PRCS Entry Permits are to be maintained in project files and copies will be submitted to Corporate H&S (4-Sight-Support@arcadis-us.com). All completed and cancelled permits will be maintained for a period of one year.

Problems encountered during Alternate Procedures or Non-PRCS entry will be documented in the Entry Checklist and then a copy of the final Entry Checklist forwarded to 4-sight-support@arcadis-us.com Copies of all HASPs, Confined Space Evaluation Forms (not part of a PRCS permit package), Non-PRCS Checklist and Alternate Procedures Confined Space Entry Checklist that document confined space procedures will be kept in the project files.

9. APPROVALS AND HISTORY OF CHANGE

Approved By: Tony Tremblay, CSP – Corporate H&S, Director of Technical Programs

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
5 May 2008	01	Greg Ertel/Mike Thomas	Original document
21 Jan 2009	02	Mija Coppola/Mike Thomas	Removed reference to Sewer System Manhole Checklist
27 Jan 2009	03	Sue Byers/Mike Thomas	Corrected discrepancy in acceptable CO levels between Section 5.3.3 and checklist in Exhibit1
29 April 2009	04	Sue Byers/Mike Thomas	Modified and added to several sections to provide more detail per the request of several client via ISN

Implementation Date 5 May 2008	ARCADIS HS Standard Name Confined Space Entry	ARCADIS
Revision Date 7 May 2018	ARCADIS HS Standard No. ARC HSFS003	Revision Number 15

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
1 November 2009	05	Sue Byers/Mike Thomas	Modified to include enhancements to the procedures and to meet BP Control of Work Defined Practice for Confined Spaces
1 November 2010	06	Camille Carollo/Tony Tremblay	Modified format to include an Executive Summary. Also, reviewed and edited text to simplify the text.
13 April 2012	07	Camille Carollo/Tony Tremblay	Change Approver to Tony Tremblay Changed terminology JLA to JSA
15 February 2013	08	Tony Tremblay	Clarified application of standard to General Industry and detailed Construction Industry specific requirements; Definition of Permit-Required Confined Space revised; Serious safety and health hazard definition/guidance added; Section 5.6 Alternate Procedures - Permit-Spaces (Hazardous Atmosphere Only) and Section 5.7 Non-Permit Required Confined Space sections added; Permit-Required Confined Space entry requirements consolidated into Section 5.8; Entry; Section 5.11 Construction Industry Confined Space Entry Requirements added; Clarified direct-read air monitoring results recordkeeping requirements; Exhibit 2-5 added to Standard; Added definition of mechanical ventilation to Exhibit 1
11 July 2014	09	Tony Tremblay	Section 5.8.5 first bullet text revised; Mechanical Ventilation definition updated to match global H&S definition; Hyperlinks to OSHA Standard and Proposed Construction Standard added; Typos corrected; Hyperlinks revised

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Revision Date 7 May 2018	ARCADIS HS Standard No. ARC HSFS003	Revision Number 15

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
30 September 2014	10	Tony Tremblay	Section 4.1 Attendant responsibilities and Exhibit 1 Attendant definition revised by eliminating language that did not permit attendant from doing other duties to language that an attendant shall perform no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants; Exhibit format update and page numbering update Section 5.1 and Exhibit 3 add OSHA clarification for depth designation of 4 feet.
3 November 2014	11	Alec MacAdam/Denis Balcer/Tony Tremblay	Confined space definition in section 5.1 and in Exhibit 1 clarified with notes and some guidance information regarding “large enough and so configured that an employee can bodily enter and perform assigned work” and “limited or restricted means of entry or exit”

Implementation Date 5 May 2008	ARCADIS HS Standard Name Confined Space Entry	ARCADIS
Revision Date 7 May 2018	ARCADIS HS Standard No. ARC HSFS003	Revision Number 15

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
31 July 2015	12	Andrew McDonald and Julie Santaniello/Tony Tremblay	Section 2.2Scope of Work adjusted to include reference to Construction work along with work that is excluded; clarified Authorized Entrant and Entry Supervisor responsibilities in Section 4; Section 4.8 Competent Person, 4.10 Host Employer and 4.11 Controlling Contractor and 4.12 Entry Employer responsibilities added; Section 5.6.1 Alternate Procedures air monitoring requirements clarified; Clarified that a Competent Person must evaluate and classify confined spaces before employees enter; Section 5.8.4 clarifies LEL monitoring; Section 5.9.3 Surge Flow and Flooding monitoring example provided; Section 5.11 was a complete revision detailing the additional requirements for construction confined space (multi-employer communication, competent person evaluation of confined space, atmospheric monitoring, monitoring of engulfment hazards and allowing for suspension of a permit); Definitions from Construction Confined Space Standard added to Exhibit 1; Exhibit 3 Confined Space Evaluation form was updated; Exhibit 4 revised to now include Non-PRCS Entry Checklist and an Alternate Procedures checklist; Exhibit 5 Confined Space Entry Permit now includes the Entry checklist and document is now in excel format
20 September 2015	13	Julie Santaniello	Template update
15 December 2015	14	Andrew McDonald / Tony Tremblay	Clarification in section 6 for Alternate Procedures training. Updated Alternate Procedures Checklist to reflect training clarification.
7 May 2018	15	Julie Santaniello	Updated Section 5.6.1 to reference the Alternate Procedures Confined Space Entry Checklist.

Exhibit 1 – Definitions

Acceptable entry conditions - the conditions that must exist in a PRCS, before an employee may enter that space, to ensure that employees can safely enter into, and safely work within, the space.

Attendant - an individual stationed outside one or more PRCS who monitors the authorized entrants and who performs all attendant's duties assigned in the ARCADIS PRCS program. An Attendant shall performs no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.

Authorized entrant - an employee who is authorized by the entry supervisor to enter a PRCS.

Barrier - a physical obstruction that blocks or limits access.

Blanking or Blinding - is the absolute closure of a pipe, line or duct by the fastening of a solid plate that completely covers the bore and that is designed to withstand the pressure of the pipe, line or duct with no leakage beyond the plate.

Competent person - one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them.

Confined Space - is any enclosed space which meets all three of these conditions:

1. Is large enough and so configured that an employee can bodily enter and perform assigned work. In order to meet this criteria, an employee must physically be able to enter and work in the space.

   Guidance: As an example, a vault that is 2'x2'x2' is generally not large enough for an employee to "bodily enter". Therefore a vault of this size would not meet the criteria as being configured such that an employee can bodily enter and perform assigned work, therefore, would not be classified as a confined space;

2. Has limited or restricted means for entry or exit.

   Note: A space has limited or restricted means of entry or exit if an entrant's ability to escape in an emergency would be hindered. Ladders, and temporary, movable, spiral, or articulated stairs will usually be considered a limited or restricted means of egress. Fixed industrial stairs that meet OSHA standards will be considered a limited or restricted means of egress when the conditions or physical characteristics of the space, in light of the hazards present in it, would interfere with the entrant's ability to exit or be rescued in a hazardous situation.

   Guidance: With regards to an open topped pit or vault, you will need to consider the depth of the vault or pit and the height of the person entering to perform the assigned work. If the open topped vault or pit is constructed such that a person could stand up and their upper body be "outside of the vault space" and the open topped nature of the vault does not restrict access or exit, then the vault would not meet the criteria as having restricted means for exit. Open topped structures/spaces (e.g., the open top encompasses the entire space) that allow a person to stand up and essentially be out of the "structure/space" atmosphere (typically < 4 feet depth), may not meet the definition of "restricted means for entry or exit". A vault with a small manhole cover,

however, does meet the criteria as having limited or restricted means for entry or exit.

Note: The OSHA Safety and Health Regulations for construction (29 CFR 1926.21) definition of a confined or enclosed space include, but are not limited to, storage tanks, process vessels, bins, boilers, ventilation or exhaust ducts, sewers, underground utility vaults, tunnels, pipelines, and open top spaces more than 4 feet in depth such as pits, tubs, vaults, and vessels; and

3. Is not designed for continuous employee occupancy.

Confined Space Entry Permit - is the document which defines the conditions of confined space entry, the reasons for entering the confined space, the anticipated hazards of the entry, a listing of atmospheric monitoring equipment, and acceptable atmospheric conditions. The Entry Permit identifies the rescue and other contacts which must be summoned in the case of an emergency, provides a listing of authorized attendants and entrants, the date of entry to the confined space, and the expiration of the Entry Permit. For the purposes of this HSS, the Confined Space Entry Permit package consists of the Confined Space Entry Evaluation Form (Exhibit 3) and the Confined Space Entry Permit (Exhibit 6). The Entry permit package must be re-issued at the beginning of each shift.

Construction Work - work for construction, alteration, and/or repair, including painting and decorating." Generally speaking reconfiguration of a space or installation of substantially new equipment is usually considered construction, whereas refurbishing of existing equipment and space is considered maintenance.

Control - the action taken to reduce the level of any hazard inside a confined space using engineering methods (for example, by ventilation), and then using these methods to maintain the reduced hazard level. Control also refers to the engineering methods used for this purpose. Personal protective equipment is not a control.

Note: If the controlling contractor owns or manages the property, then it is both a controlling employer and a host employer.

Controlling contractor - the employer that has overall responsibility for construction at the worksite.

Double block and bleed – the closure of a line, duct, or pipe by closing and locking or tagging two inline valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

Early-warning system - the method used to alert authorized entrants and attendants that an engulfment hazard may be developing. Examples of early-warning systems include, but are not limited to: alarms activated by remote sensors; and lookouts with equipment for immediately communicating with the authorized entrants and attendants.

Emergency - any occurrence (including any failure of power, hazard control or monitoring equipment) or event, internal or external, to the PRCS that could endanger entrants.

Engulfment - is the surrounding and effective capturing of a person by a liquid or finely divided (flow-able) solid substance that can cause death by filling or plugging the respiratory system or exert force on the body to cause death by strangulation, constriction, crushing or suffocation.

Entrants - employee's who are trained and **authorized** to enter a confined space.

Entry - constitutes the act by which an employee intentionally passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space, whether or not such action is intentional or any work activities are actually performed in the space.

Entry Employer - any employer who decides that an employee it directs will enter a PRCS.

Note: An employer cannot avoid the duties of the confined space standard merely by refusing to decide whether its employees will enter a PRCS, and OSHA will consider the failure to so decide to be an implicit decision to allow employees to enter those spaces if they are working in the proximity of the space.

Entry permit (permit) - the written or printed document that is provided by the employer who designated the space a PRCS to allow and control entry into a PRCS and that contains the information specified in the OSHA standard.

Entry rescue occurs when a rescue service enters a PRCS to rescue one or more employees.

Entry Supervisor - the trained, competent and **authorized** employee responsible for determining if acceptable entry conditions are present at a PRCS where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry.

Note: An entry supervisor also may serve as an attendant or as an authorized entrant, as long as that person is trained and equipped as required by this standard for each role he or she fills. Also, the duties of entry supervisor may be passed from one individual to another during the course of an entry operation.

Hazard - a physical hazard or hazardous atmosphere. Hazard includes both existing hazards and hazards that have a reasonable probability of occurring.

Hazardous Atmosphere is an atmosphere which may expose employees to the risk of death, incapacitation, and impairment of ability to self-rescue (that is, escape unaided from a PRCS, injury, or acute illness from one or more of the following causes:

1. A flammable gas, vapor, or mist in excess of 10% of its lower flammable limit (LFL);
2. An airborne combustible dust at a concentration that meets or exceeds its Lower Flammable Limit (LFL). This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet (1.52 m) or less;
3. An atmospheric oxygen concentration below 19.5% (oxygen-deficient atmosphere) or above 23.5% (oxygen-enriched atmosphere).
4. Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in Subpart G, Occupational Health and Environmental Control, or in Subpart Z, Toxic and Hazardous Substances, or the ACGIH Threshold Limit Value, whichever is more stringent, and which could result in employee exposure in excess of its dose or permissible exposure limit;

   Note: An atmospheric concentration of any substance that is not capable of causing death, incapacitation, and impairment of ability to self-rescue,

injury, or acute illness due to its health effects is not covered by this provision.

5. Any other atmospheric condition that is immediately dangerous to life or health.

Note: For air contaminants for which OSHA has not determined a dose or permissible exposure limit, other sources of information, such as Safety Data Sheets that comply with the Hazard Communication Standard, section 1910.1200 of this Part, published information, and internal documents can provide guidance in establishing acceptable atmospheric conditions.

Note: Some materials—hydrogen fluoride gas and cadmium vapor, for example—may produce immediate transient effects that, even if severe, may pass without medical attention, but are followed by sudden, possibly fatal collapse 12-72 hours after exposure. The victim "feels normal" after recovery from transient effects until collapse. Such materials in hazardous quantities are considered to be “immediately” dangerous to life or health.

Host employer - owns or manages the property on which construction is taking place.

Note: If the owner of the property on which the construction activity occurs has contracted with an entity for the general management of that property, and has transferred to the entity the location of each known PRCS, the hazards or potential hazards in each space or the reason it is a PRCS, and any precautions that the host employer or any previous controlling contractor or entry employer implemented for the protection of employees in the PRCS, OSHA will treat the contracted entity as the hosted employer for as long as the contracted entity manages the property. Otherwise OSHA will treat the owner of the property as the host employer. In no case will there be more than one host employer.

Hot work means operations capable of providing a source of ignition (for example, riveting, welding, cutting, burning, and heating).

Hot Work Permit – the written authorization to perform hot work operations capable of providing a source of ignition.

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

Inerting – the displacement of the atmosphere in a PRCS by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible.

Note: This procedure produces an IDLH oxygen-deficient atmosphere. Isolate or isolation means t

Isolate or Isolation - he process by which employees in a confined space are completely protected against the release of energy and material into the space, and contact with a physical hazard, by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lockout or tagout of all sources of energy; blocking or disconnecting all mechanical linkages; or placement of barriers to eliminate the potential for employee contact with a physical hazard.

Limited or Restricted Means for Entry or Exit - a condition that has a potential to impede an employee's movement into or out of a confined space. Such conditions include, but are not limited to, trip hazards, poor illumination, slippery floors, inclining surfaces and ladders.

Lower Explosive Limit (LEL) or Lower Flammable Limit (LFL) is the minimum concentration (percentage) of a flammable gas that will propagate a flame or explosion in the presence of an ignition source. The more explosive the gas, the lower the LEL/LFL. LEL is usually expressed as a percentage (from zero to 100 percent explosive) and is often used interchangeably with LFL.

Mechanical ventilation is the continuously maintained provision of fresh air into the confined space by mechanical means (energized fans, exhaust units, or other powered equipment) by pulling or forcing clean air into a space and/or exhausting contaminated or hazardous air out of the space to maintain acceptable atmospheric levels. It must be continued while work is being carried out within the space, to maintain acceptable, permitted atmospheric conditions.

Monitor or monitoring - the process used to identify and evaluate the hazards after an authorized entrant enters the space. This is a process of checking for changes that is performed in a periodic or continuous manner after the completion of the initial testing or evaluation of that space.

Non-entry rescue - occurs when a rescue service, usually the attendant, retrieves employees in a PRCS without entering the PRCS.

Non-Permit Confined Space (General Industry) is a confined space that does not contain or have the potential to contain any hazards capable of causing death or serious physical harm.

Non-Permit Required Confined Space (Construction) means a confined space that meets the definition of a confined space but does not meet the requirements for a permit-required confined space

Oxygen-deficient Atmosphere is an atmosphere containing less than 19.5 percent oxygen by volume.

Oxygen-enriched Atmosphere is an atmosphere containing more than 23.5 percent oxygen by volume.

Permit-Required Confined Space (PRCS) is a confined space that has one or more of the following characteristics:

- Contains or has a potential to contain a hazardous atmosphere;
- Contains a material with the potential for engulfment of an entrant;
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or a floor which slopes downward and tapers to a smaller cross-section; or
- Contains any other recognized serious safety or health hazard.

Physical hazard means an existing hazard that can cause death or serious physical harm in or near a confined space, or a hazard that has a reasonable probability of occurring in or near a confined space, and that includes, but is not limited to: Explosives (as defined by paragraph (n) of 29 CFR 1926.914 (definition of "explosive"); mechanical, electrical, hydraulic, and pneumatic

energy; radiation; temperature extremes; engulfment; noise; and inwardly converging surfaces. "Physical hazard" also refers to chemicals that can cause death or serious physical harm through skin or eye contact (rather than through inhalation).

Prohibited Condition is any condition in a PRCS that is not allowed by the permit during the period when entry is authorized. A hazardous atmosphere is a prohibited condition unless ARCADIS can demonstrate that personal protective equipment (PPE) will provide effective protection for each employee in the PRCS and provides the appropriate PPE to each employee.

Qualified person - one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, the work, or the project.

Representative permit space - a mock-up of a confined space that has entrance openings that are similar to, and is of similar size, configuration, and accessibility to, the PRCS that authorized entrants enter.

Rescue Service is the team or entity designated to rescue personnel from confined spaces

Retrieval system – the equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor) used for non-entry rescue of persons from confined spaces.

Safe for Entry is a term used in the Alternate Procedures criteria and is defined as that which is **50%** of the flammable or toxic substance that would constitute a hazardous atmosphere. Entry under Alternate Procedures would not be acceptable if hazards in the space quickly increased if the ventilation were to stop. Sufficient time must be available for an entrant to safely exit the space if the ventilation stops. Safe for Entry limits are detailed as follows:

- With regards to the LEL, 10% of the LEL is used as the Hazardous Atmosphere criteria. Using the 50% of the hazardous atmosphere value, an established Alternate Procedure value for LEL is defined as 5% LEL. Therefore, under the Safe for Entry criteria, ARCADIS uses a 5% LEL value as the Stop Work Level.
- Another example would be carbon monoxide (CO). The OSHA PEL is 50 ppm and the ACGIH TLV is 25 ppm. Since we use the most stringent value and then applying the 50% criteria, the “Safe for Entry” value for CO is 12.5 ppm.

Self-rescue is an entrant’s ability to escape unaided from a confined space

Serious Safety or Health Hazard is described as the substantial probability that death or serious physical harm could result from a condition that exists, or from one or more practices, means, methods, operations or processes that have been adopted or are in use. When a hazard in a confined space is immediately dangerous to life or health, the "PRCS" classification is triggered. The determination of whether the resulting exposure to a hazard in a confined space will impair the employee's ability to perform self-rescue is the aspect that must be addressed by ARCADIS. In order for "serious safety and health hazard" to be recognized as being an impairment to escape, its severity potential for resulting physical harm to an employee must be considered. For example:

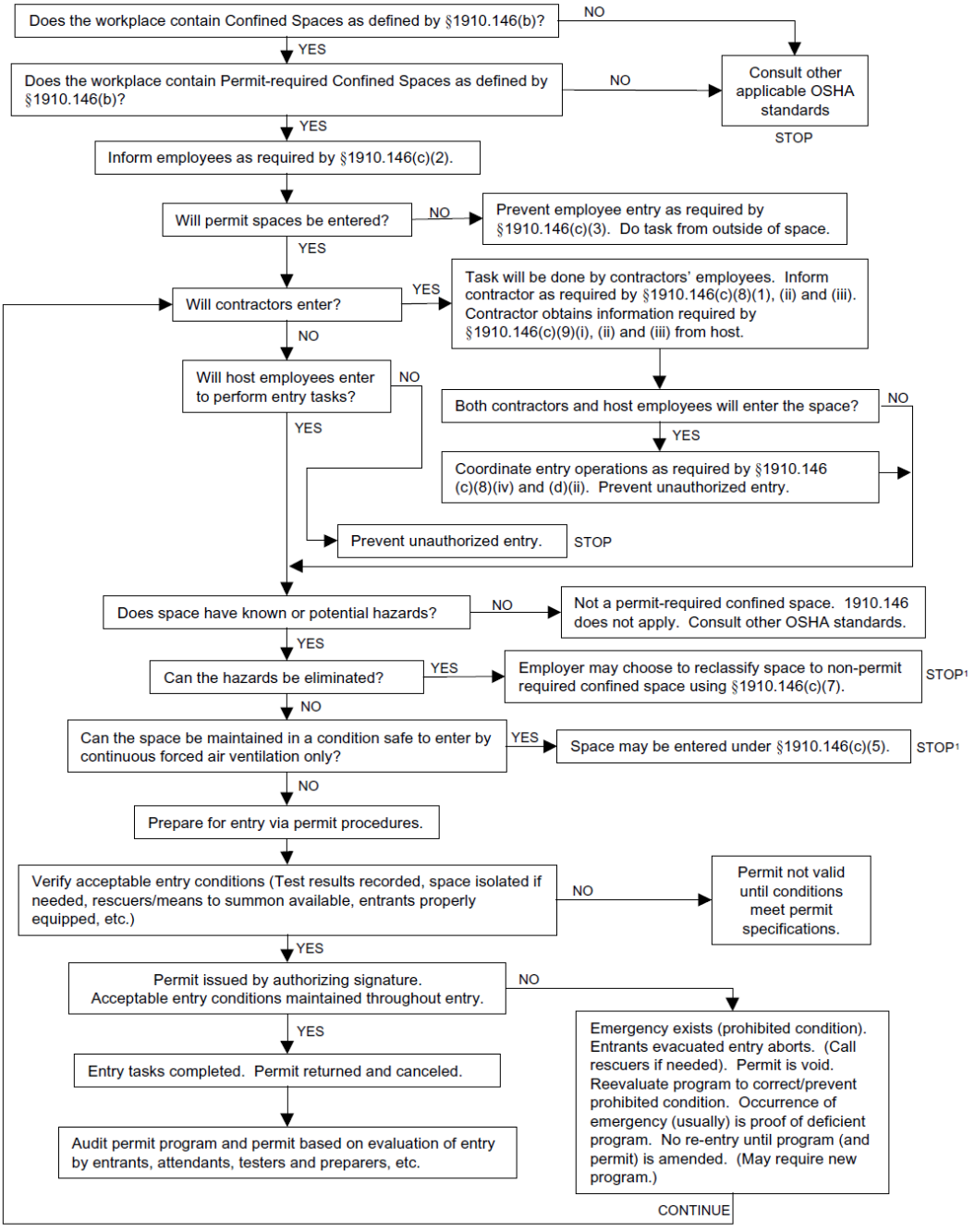
- The mere presence of water alone would not be a basis for applying the PRCS standard. There must be a quantity sufficient either to endanger the life of the entrant or to interfere with escape from the space. Water in combination with other hazardous

conditions could trigger the application of the PRCS provisions of the PRCS standard. For example, a small quantity of water (perhaps as much as 2 to 3 inches deep) in the confined space may not trigger the PRCS classification; however, if the water conceals trip and fall hazards such as abandoned machine pads or floor holes and openings, the combination of these conditions may very well cause the confined space to be classified as a PRCS.

- Crawl spaces generally contain utility service lines (i.e., water, natural gas, fuel oil, sewage, steam and electric power) which pass through them. If these utility services do not terminate at end use equipment in the crawl space, the inherent hazards of the material flowing through the service lines do not have to be considered in the PRCS determination unless there is reason to believe there is a reasonable probability of a rupture or leak where the contents of the piping would cause a serious safety or health hazard. Therefore, just because there are utility service lines pass through a confined space doesn't necessarily make that space a PRCS. ARCADIS must evaluate the "likelihood" of a release. Please consider that if the utility service line(s) contains dispensing valves or other termination points, the evaluation must consider that these valves could leak/fail and whether this constitutes a serious safety or health hazard.

Ventilate or ventilation - controlling a hazardous atmosphere using continuous forced-air mechanical systems that meet the requirements of 29 CFR 1926.57—Ventilation.

Exhibit 2 – OSHA PRCS (29 CFR 1910.146) Decision Flow Chart



[1]Spaces may have to be evacuated and re-evaluated if hazards arise during entry

Exhibit 3 – Confined Space Evaluation Form and Instructions

Confined Space Evaluation Form

Must be attached to Completed Non PRCS & Alternative Procedures Checklist or PRCS Entry Permit

Project Name:	Date / Time:
Project Number:	Project Location:
Evaluation Completed By:	Project Manager:

1. Description of Confined Space

Location of the Space:	
Owner/Host Employer of Space:	Description of the Space:
Dimensions of the Space Entrance:	Dimensions of the Space:
Volume of the Space (Formulas in Instruction Guide):	

2. Definition of the Confined Space

	YES	NO
The space is large enough and so configured that an employee can bodily enter and perform assigned work? **Note:** In order to meet this criteria, an employee must physically be able to enter and work in the space	☐	☐
The space has limited or restricted means of entry or exit?	☐	☐
The space is not designed for continuous occupancy?	☐	☐

1) If any of the above questions are marked YES, this is not a confined space. Stop, there are no hazards to Section 5.
2) If all of the above questions are marked NO, proceed to Section 3.

3. Identification of Confined Space Hazards

Documentation of Pre-Entry Air Monitoring

Monitoring Parameter	Monitoring Equipment	Calibration Info: Date / Time	Calibration Info: By	Pre-Entry Reading	Defined Acceptable Range for Entry[1]
% Oxygen					19.5 – 23.5%
% of LEL					<10% LEL
Hydrogen Sulfide-H_2S					<1 ppm TLV-TWA <5 ppm TLV-STEL
Carbon Monoxide-CO					<25 ppm
Combustible Dust (LFL)					< LFL (Dust that doesn't not obscure vision at a distance of 5ft)
Other:					

[1] Refer to the Confined Space Standard for details on acceptable ranges based on entry classification.
TLV-STEL - Short-term exposure limit: Employee can work in the area up to 15 minutes
TLV-TWA - 8 hr. Time Weighted Avg (PEL/TLV): Employee can work in area 8 hrs (longer with appropriate respiratory protection)

Pre-Entry Atmospheric Testing Conducted By

Print Name:	Date:
Signature:	Time:

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Does the confined space contain, or have the potential to contain, a Hazardous Atmosphere? Note: See Alternate Procedures Confined Space Entry	YES	NO
Oxygen deficient <19.5% or enriched >23	☐	☐
Combustible gases, vapors above 10% of Lower Explosive Limit (LEL)	☐	☐
Hydrogen Sulfide >1 ppm	☐	☐
Carbon Monoxide >25 ppm	☐	☐
An airborne combustible dust at a concentration that meets or exceeds its Lower Flammable Limit (LFL). This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet (1.52 m) or less.	☐	☐
Other toxic gas or vapors exceeding the OSHA PEL or ACGIH TLV, whichever is more stringent.	☐	☐
Any other atmospheric condition that is immediately dangerous to life or health. Describe:	☐	☐
Does the confined space contain a material with the potential for engulfment of an entrant? (e.g., grain, sand or water). Describe:	☐	☐
Does the confined space have an internal shape such that a worker could be trapped or suffocated by inwardly converging walls, floor or ceiling? Describe:	☐	☐
Does the confined space contain any other recognized serious safety or health hazards? Note: A serious safety or health hazard is described as the substantial probability that death or serious physical harm could result from a condition that exists, or from one or more practices, means, methods, operations or processes that have been adopted or are in use.	YES	NO
Mechanical - (agitators, blenders, stirrers, conveyors, unguarded moving parts)		☐
Electrical - (power line contact hazard, exposed energized equipment or terminals)	☐	☐
Chemical - (acids, alkali, coal tar products, paint ingredients, solvents)	☐	☐
Environmental - (heat stress; cold stress; lighting; flooding)	☐	☐
Biological - (sewage, waste water, blood or other bodily fluids, live or dead animals)	☐	☐
Pressure - (compressed gas cylinders, pneumatic or hydraulic lines/equipment, tanks, heated vessels)	☐	☐
Radiation - (Radioactive sources, lasers, infrared or UV sources, microwaves, RF, welding flash)	☐	☐
Hot Work - (welding, cutting, torch work or other (note that a hot work permit is required)	☐	☐
Any other recognized serious safety or health hazards. Describe:	☐	☐

1) If ***ALL*** of the above hazards are marked ***NO***, stop here, classify as a Confined Space Only and go to ***Section 5***.
2) If any of the above hazards are marked ***YES***, complete ***Section 4*** and continue to classify your space. If the nature of the work creates any of the above hazards, this may become a Permit Required Confined Space. Go to ***Section 4***.

4. Definition of Hazards and Description of Controls

(List all of the hazards marked *YES* in Section 3 and complete the information in the table below)

Hazard	Description	Controls

1) If the permit space ***poses no actual or potential atmospheric hazards*** and if all ***non-atmospheric hazards*** within the space are ***eliminated without entry into the space***, the permit space may be reclassified as a ***NON PERMIT REQUIRED CONFINED SPACE*** for as long as the non-atmospheric hazards remain eliminated, stop here and go to ***Section 5***.
2) If all ***non-atmospheric hazards within the space are eliminated*** without entry into the space and actual or potential ***atmospheric hazards are isolated or eliminated through forced air ventilation***, use ***Alternate Procedures Confined Space Entry*** below.
3) If ***Hazards listed are not isolated or eliminated*** the space must be classify this space a ***PERMIT REQUIRED CONFINED SPACE***, stop here and go to ***Section 5***.

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4.a Alternate Procedures Confined Space Entry
For Controlling Atmospheric Hazards

If ARCADIS can demonstrate that physical hazards within the space are eliminated or isolated using engineering controls and ***the only hazard was a potential or actual atmospheric hazard***, without entry into the space to assess, and we can demonstrate that continuous forced air ventilation is sufficient to maintain the permit space safe for entry (e.g. defined as, <5% LEL; toxic substance levels 50% or less of the ACGIH TLV or OSHA PEL, whichever is more stringent), then ***ARCADIS may use the Alternate Procedures*** outlined in (c)(5)(ii) of the OSHA General Industry Permit-Required Confined Space Standard (29 CFR 1910.146) or 29 CFR 1926.1203(e)(2) for Construction Work.

If an initial entry of the permit space necessary to obtain monitoring and inspection data, STOP WORK – This must be performed as a Permit Required Confined Space Entry.

What is the capacity and configuration of the ventilation equipment to be used?
Describe:

Identify atmospheric hazards and potential hazards created by work in the space.
Describe:

In the event the ventilation system stops working, define what atmospheric monitoring procedures will be set-up to detect an increase in atmospheric hazard levels in sufficient time for the entrants to safely exit the [illegible]be:
Describe:

Alternate Procedures Confined Space Entry Readings

Detail below final sampling results from routine testing of the space from the time ventilating began through final determination of acceptable entry conditions (LEL and toxic substance values must be 10% or less of TLV-PEL): (Use table below and the Confined Space Evaluation And Monitoring Documentation Form)

Monitoring For	Monitoring Equipment	Calibration Info: Date / Time	By	Pre-Entry Reading	Defined Acceptable Range for Entry[1]
% Oxygen					19.5 – 23.5%
% of LEL					<5% LEL
Hydrogen Sulfide-H_2S					<0.5 ppm TLV-TWA
					<2.5 ppm TLV-STEL
Carbon Monoxide-CO					<12.5 ppm
Combustible Dust (LFL)					< 50% of LFL
Other:					<50% of TLV or PEL (whichever is more stringent)

[1] Refer to the Confined Space Standard for details on acceptable ranges based on entry classification.
TLV-STEL - Short-term exposure limit: Employee can work in the area up to 15 minutes
TLV-TWA - 8 hr. Time Weighted Avg (PEL/TLV): Employee can work in area 8 hrs (longer with appropriate respiratory protection)

Pre-Entry Atmospheric Testing Conducted By

Print Name:	Date:
Signature:	Time:

1) For ***Permit Required Confined Space Qualifying for Alternate Procedures Confined Space Entry Procedures*** - Go to ***Section 5***.
2) If the permit space has actual or potential atmospheric ***hazards that can not be controlled*** with ventilation OR the Non-Atmospheric hazards listed above have no controls, or if the controls are not achievable for the hazards listed above, this ***area will be considered a: Permit Required Confined Space***. Go to ***Section 5***.

5. Confined Space Classification		
Select how the space was classified and associated Checklist or Permit	**YES**	**NO**
Is the Space classified as a Confined Space? **Note:** If ***NO*** proceed to Section 6. If ***YES*** answer the questions below.	☐	☐
Is the Space classified as Non Permit Required Confined Space? **Note:** If ***YES*** this evaluation must be attached to the ***Completed Non Permit Required Confined Space Entry Checklist***.	☐	☐
Is the space a Permit Required Confined Space Qualifying for Alternate Procedures Confined Space Entry Procedures? **Note:** If ***YES*** this evaluation must be attached to the ***Completed Alternate Procedures Confined Space Entry Checklist.***	☐	☐
Is the space classified as Permit Required Confined Space? **Note:** If ***YES*** this evaluation must be attached to the ***Completed Permit-Required Confined Space Entry Permit.***	☐	☐
1) Evaluation Complete. Go to **Step 6**		

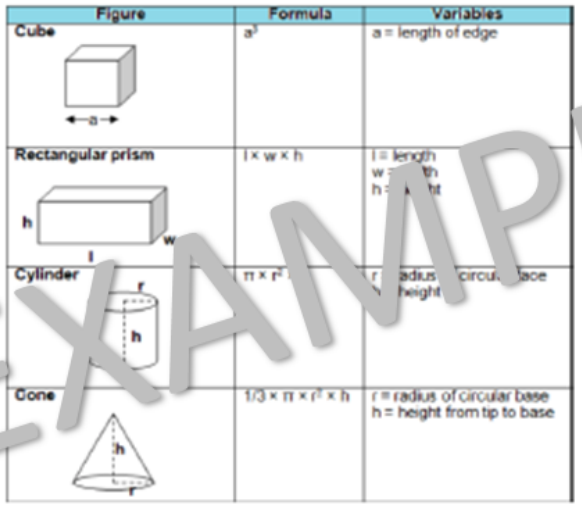
6. Competent Person Completing Confined Space Evaluation Form	
Please note that the minimal credentials for the person authorized to evaluate confined spaces and to certify the space safe for entry, when it relates to Alternate Procedures or Non-Permit Required Confined Space entry, is a competent person, i.e. one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them. A copy of this evaluation form must be attached to the Entry Permit, Alternate Procedures entry checklist and/or Non-Permit Required Confined Space entry checklist.	
Name (Print):	Date:
Signature:	Time:

Confined Space Evaluation Form Instruction Guide

The Confined Space Evaluation From must be completed to properly classify a space as a confined space and must be completed prior to entering a confined space. The evaluation form must be attached to the completed Non Permit Required Confined Space Checklists, Alternative Procedures Checklist or the Permit Required Confined Space Entry Permit.

Section 1. Description of Confined Space

Location: Fill in building pertinent information as indicated on the form. Locations can be uniquely identifiable such as Manhole #, Chemical Building, or Tank C.
Description of the space: Give a short but detailed description of the space to be entered.
Dimension of entrance: Fill in the dimensions of the opening into the space.
Dimension of space: Fill in the approximate depth and width of the space in feet.
Volume of space: Fill in the approximate volume of the space.



Section 2. Definition of the Confined Space

Check ***Yes*** or ***No*** to the three questions, then follow instructions on the form. If Yes is marked for all 3 questions, the space will be classified as a confined space.

3. Identification of Confined Space Hazards

Mark the appropriate ***Yes*** or ***No*** box for each Question. For the Other recognized serious safety or health hazards question, check those categories that apply. For example, if there is an exposed electrical hazard that poses an electrical shock/arc flash hazard located in the confined space, the box labeled Electrical would be checked on the form. The box labeled "Other" may be used for other undefined serious safety or health hazards.
If no hazards can be identified, please indicate "None" in *Section 4* and proceed to *Section 5*.

Note: A serious safety or health hazard is described as the substantial probability that death or serious physical harm could result from a condition that exists, or from one or more practices, means, methods, operations or processes that have been adopted or are in use.

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Section 4. Definition of Hazards and Description of Controls

Describe the hazards present at the time of entry. This rating is irrelevant of what activity is going to occur. (Follow the instructions of the form). Examples of these types of hazards include:

(HA) Hazardous Atmosphere Oxygen level < 19.5 or > 23.5 percent. Flammable range (LFL or LEL) of > than 10%. Toxic air > than TLV or PEL, whichever is more stringent (e.g. CO, H2S).
(M) Mechanical hazards such as sharp objects, augers, paddles, moving gears or parts, rotating, equipment, etc.
(E) Electrical Hazards - electrical sources significant enough to cause personal injury.
(CC) Chemical Contact, typically skin and eye hazard. Corrosive materials that could cause burns, sensitization.
(EN) Environment - heat stress; cold stress; lighting; flooding)
(B) Biological Hazards - sewage, waste water, blood or other bodily fluids, live or dead animals
(P) Pressure - compressed gas cylinders, pneumatic or hydraulic lines/equipment, tanks, well heads, heated vessels
(R) Radiation - Radioactive sources, lasers, Infrared or UV sources, microwaves, RF, welding flash
(W) Welding, cutting, torch work or other hot work (note that a hot work permit is required)
(O) Other recognized serious safety or health hazards
Note: Corrosive chemicals on the wall which pose a skin hazard rather than a respiratory hazard should be listed under "Chemical Contact" hazards.
Section 4 must be extremely well documented, especially the hazard column if you are using this section to confirm whether a space is considered a non permit required confined space. A space classified by the employer as permit required confined space may be reclassified as a non permit confined if the permit space poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated without entry into the space. For example: if an auger is in a confined space, a Lock out/Tag out of the auger may still require the space to be a permit required confined space, but the LO/TO or hazard removal of the auger could reclassify the space as a non permit required confined space.

ARCADIS recommends non-permitted spaces that have contained materials with a NFPA/HMIS rating of 2 or more to be classified as a permit required confined space. Furthermore, site sewers should also be treated as a permit required confined space. Good candidates for non-permit required confined spaces are: tanks which do not/did not contain a hazardous material and storm water sewers.

Hazard	Description	Controls
(HA)	Specific chemical creating a toxic or flammable hazard	State the location of the valve to shut off the chemical. If ventilation is used to control the atmospheric hazard, include flow rates, number of air changes needed, etc.
(M)	Pneumatic press, hydraulic lift, auger, propellers, agitators	State what action needs to be taken to eliminate the hazard. For example: Hydraulic - lockout hydraulic source and place pin in the lift, or block it so it can not fall. For an auger or paddle - remove the auger or lock it/tag it
(E)	State the voltage/amperage and the source. For example: 208v/40amp/vacuum pump	State what needs to be done to lock out the electrical supply and bleed off the vacuum. For example: Lock out and tag out the knife switch located next to the vacuum pump. Open valve on vacuum line to bring to atmospheric pressure.
(CC)	List what chemical hazards might be present. Examples include chemical contact that is a corrosive, or chemical gases, etc.	State the actions to be taken to minimize/eliminate the chemical hazard. For chemical contact, list the PPE or method to decontaminate the tank.
(O)	List all other hazard that might be present. An example may be water that might present a drowning hazard, or dirt that may fall in on you.	State the actions to be taken to minimize/eliminate the hazard. Drain any water that may present a drowning hazard or use a harness device that prevents a person from being submerged.

Note:
Hazard - This space is a listing of the hazards identified in Section 3.
Description and Controls - In these two columns, provide a DESCRIPTION of the hazard associated with the confined space and the CONTROL used to minimize or eliminate the hazard.

5. Confined Space Classification
List the classification of the space. Check ***YES*** or ***NO*** or questions. Follow directions at the bottom of the section. If the space is not classified as a confined space keep evaluation with project records. The evaluation form must be attached to the completed Non Permit Required Confined Space Checklists, Alternative Procedures Checklist or the Permit Required Confined Space Entry Permit.
6. Competent Person Completing Confined Space Evaluation Form
The Competent Person signs this form prior to entry into the confined space. **Note**: the minimal credentials for the person authorized to evaluate confined spaces and to certify the space safe for entry, when it relates to Alternate Procedures or Non-Permit Required Confined Space entry, is a competent person (e.g., one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them). PRCS entries must be reviewed and approved by an Entry Supervisor.

Exhibit 4 –Alternate Procedures Entry Checklist

ARCADIS Design & Consultancy for natural and built assets

Alternate Procedures Confined Space Entry Checklist

Project Name:	Date / Time:
Project Number:	Project Location:
Checklist Completed By:	Project Manager:
Location and Description of Confined Space:	
Entry Objectives:	
Equipment / Materials Required for Entry:	
Time of Entry:	Expiration of Entry:

Pre-Entry Air Monitoring

Enter pre-entry readings below to confirm that space is safe for entry - maintain the permit space safe for entry (e.g. defined as, <5% LEL; toxic substance levels 50% or less of the ACGIH TLV or OSHA PEL, whichever is more stringent)

Monitoring For	Monitoring Equipment	Calibration Info: Date	Calibration Info: Time	Pre-Entry Reading	Defined Acceptable Range for Entry[1]
% Oxygen					19.5 – 23.5%
% of LEL					<5% LEL
Hydrogen Sulfide-H_2S					ppm TLV-TWA <2 ppm TLV-STEL
Carbon Monoxide-CO					<12.5 ppm
Combustible Dust (LFL)					< 50% of LFL
Other:					<50% of TLV or PEL (whichever is more stringent)

[1] Refer to the Co... Space Sta... for deta... on acceptable ranges based on entry classification.
TLV-STEL - Short-... exposure lim... Em... on work in the area up to 15 minutes
TLV-TWA - 8 hr. Tim... ...nted Av... PEL/TLV): Employee can work in area 8 hrs (longer with appropriate respiratory protection)

Pre-Entry Atmospheric Testing Conducted By

Print Name:	Date:
Signature:	Time:

Pre-Entry Checklist

Checklist	YES	NO	N/A	Comment
Competent Person completed confined space evaluation?	☐	☐	☐	Attach copy of signed confined space evaluation to this entry checklist and make available to all entrants
Entry staff completed Confined Space awareness level training?	☐	☐	☐	If ***NO***, ***STOP WORK*** - Staff must possess the understating, knowledge, and skills necessary for safe use of Alternate Procedures entry.
Arcadis can demonstrate that all physical hazards in the space are eliminated or isolated through engineering controls so that the only hazard posed by the permit space is an actual or potential hazardous atmosphere?	☐	☐	☐	

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Pre-Entry Checklist				
Checklist	**YES**	**NO**	**N/A**	**Comment**
Arcadis can demonstrate that continuous forced air ventilation alone is sufficient to maintain that permit space safe for entry, and that, in the event the ventilation system stops working, entrants can exit the space safely.	☐	☐	☐	
Arcadis has developed air monitoring and inspection data that addresses air monitoring to verify that a hazardous atmosphere is not present during Alternate Procedures entry.	☐	☐	☐	
Is an initial entry of the permit space necessary to obtain monitoring and inspection data?	☐	☐	☐	If ***YES***, ***STOP WORK*** - Do not enter the confined space. If entry is required to conduct monitoring/inspection, then this must be performed as a Permit Required Confined Space entry
Have any conditions making it unsafe to remove an entrance cover been eliminated before the cover is removed?	☐	☐	☐	
When entrance covers are removed, has the opening been immediately guarded by a railing, temporary cover, other temporary barrier that will prevent an accidental fall through the opening and that will protect each employee working in the space from foreign objects entering the space?	☐	☐	☐	
Before an employee enters the space, the internal atmosphere has been tested, with a calibrated direct-reading instrument, for oxygen content, for flammable gases and vapors, and for potential toxic air contaminants, in that order?	☐	☐	☐	Any employee who enters the space, or that employee's authorized representative, must be provided an opportunity to observe the pre-entry testing
Is Arcadis actively monitoring and or assessing to confirm that a hazardous atmosphere is not present within the confined space whenever any employee is inside the space?	☐	☐	☐	
Forced air ventilation has eliminated any hazardous atmosphere before employees are allowed to enter the confined space?	☐	☐	☐	

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Pre-Entry Checklist				
Checklist	**YES**	**NO**	**N/A**	**Comment**
Is forced air ventilation directed as to ventilate the immediate areas where an employee is or will be present within the confined space and will continue until all employees have left the space?	☐	☐	☐	
Is the air supply for the forced air ventilation from a clean source and doesn't increase the hazards in the space?	☐	☐	☐	
Is the atmosphere within the space continuously monitored unless Arcadis can demonstrate that equipment for continuous monitoring is not commercially available or periodic monitoring is sufficient?	☐	☐	☐	
If continuous monitoring is used, does the monitoring equipment have an alarm that will notify all entrants if a specified atmospheric threshold is achieved, or an established process that an employee will check the monitor with sufficient frequency to ensure that entrants have adequate time to escape?	☐	☐	☐	
If continuous monitoring is not used, have we established a adequa periodic monitoring frequ	☐	☐	☐	
If a hazard has developed, d Arcadis stop work and evacuate the space until an evaluation determines how the hazard developed?	☐	☐	☐	
If a hazard developed during confined space entry, did Arcadis implement measures to protect employees from this hazard before any subsequent entry takes place?	☐	☐	☐	
Is there a safe method of entering and exiting the confined space?	☐	☐	☐	If a hoisting system is used, it must be designed and manufactured for personnel hoisting
Adequate emergency supplies on hand?	☐	☐	☐	Fire extinguisher, first aid/CPR supplies, etc.

Note:
A permit-required confined space may be entered using Alternate Procedures for as long as the non-atmospheric hazards remain eliminated or isolated; forced air ventilation alone is sufficient to maintain that permit space safe for entry and that, in the event the ventilation system stops working, entrants can exit the space safely; Arcadis develops monitoring and inspection data to confirms the above; and the monitoring and inspection can be completed without initially entering the space. If hazards arise within an Alternate Procedures space: (A) Each employee must leave the space immediately; (B) The space must be evaluated to determine how the hazard developed; and (C) Arcadis must implement measures to protect employees from the hazard before any subsequent entry takes place.

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Arcadis Alternate Procedures Confined Space Entrant(s)	
Total Number of Entrants (Arcadis + Other Authorized Entrants):	
I have been properly instructed with regards to safe entry into this confined space using Alternate Procedures and understand my duties and STOP WORK Authority:	
Names of Entrant(s)	**Signature of Entrants**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Other Authorized Entrants (C[illegible]) Entering Confined Space [illegible] Procedures	
Multi-employer work site activities coo[illegible]ted?	Yes / No / NA
Confirmed that workers workin[illegible]outsid[illegible]ed s[illegible]ce w[illegible]t introduce hazards into the Non- Permit Require[illegible]Confined Sp[illegible]e?	Yes / No / NA
I have bee[illegible]operly i[illegible]cted w[illegible]n regards to safe entry into this confined space using Alternate Procedur[illegible]a[illegible]n[illegible]erstand my duties and my STOP WORK Authority:	
Name of Authorized [illegible]ant:	Company
Signature of Authorized[illegible]	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date

ARCADIS Design & Consultancy for natural and built assets

Individual Authorizing Confined Space Entry using Alternate Procedures	
The following signatory has reviewed this pre-entry checklist, the information contained here-in and has reviewed the confined space evaluation form. Written instructions and safety procedures have been received and are understood. Entry cannot be approved if any questions are answered with a "NO".	
Name (Print):	Date:
Signature:	Time:
Documenting Problems Encountered during Non-PRCS Entry	
If problems are encountered during entry, submit a copy of this checklist to corporate H&S so necessary program/standard revisions can be developed and that a record of documented problems/incidents during Non-PRCS is maintained. A copy of the Non-PRCS Entry Checklist will be forwarded to 4-sight-support@arcadis-us.com	
Describe problem/incident:	
Detail confined space program / standard revisions required:	
Date Copy of Non-PRCS Entry Checklist provided to Corporate H&S:	
Copy of Non-PRCS Entry Checklist provided to Corporate H&S Dept via e-mail: **4-Sight-Support@arcadis-us.com**	

Exhibit 5 – Non-PRCS Entry Checklist

Non Permit-Required Confined Space Entry Checklist

Project Name:	Date / Time:
Project Number:	Project Location:
Checklist Completed By:	Project Manager:
Location and Description of Confined Space:	
Entry Objectives:	
Equipment / Materials Required for Entry:	
Time of Entry:	Expiration of Entry:

Pre-Entry Air Monitoring

(enter pre-entry readings below to confirm that space poses no actual atmospheric hazard)

Monitoring For	Monitoring Equipment	Calibration Info: Date / Time	Calibration Info: By	Pre-Entry Reading	Defined Acceptable Range for Entry[1]
% Oxygen					19.5 – 23.5
% of LEL					<10% LEL
Hydrogen Sulfide-H_2S					<1 ppm TLV-TWA <5 ppm TLV-STEL
Carbon Monoxide-CO					<25 ppm
Combustible Dust (LFL)					< LFL (Dust that doesn't not obscure vision at a distance of 5ft)
Other:					

[1] Refer to the Confined Space Standard for details on acceptable ranges based on entry classification.
TLV-STEL - Short-term exposure limit: Employee can work in the area up to 15 minutes
TLV-TWA - 8 hr. Time Weighted Avg (PEL/TLV): Employee can work in area 8 hrs (longer with appropriate respiratory protection)

Pre-Entry Atmospheric Testing Conducted By

Print Name:	Date:
Signature:	Time:

Pre-Entry Checklist

Checklist	YES	NO	N/A	Comment
Competent Person completed confined space evaluation?	☐	☐	☐	Attach copy of signed confined space evaluation to this entry checklist and make available to all entrants
Confirmed that permit space poses no actual or potential atmospheric hazards?	☐	☐	☐	
All hazards within the space are eliminated or isolated?	☐	☐	☐	Cross-reference against the confined space evaluation form

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Pre-Entry Checklist				
Checklist	**YES**	**NO**	**N/A**	**Comment**
Hazards have been eliminated or isolated without entry into the space (unless we can demonstrate that doing so without entry is infeasible)?	☐	☐	☐	
If it is necessary to enter the permit space to eliminate or isolate hazards, STOP WORK - such entry must be performed as PRCS	☐	☐	☐	If testing and inspection during that entry demonstrate that the non-atmospheric hazards within the permit space have been eliminated or isolated, the permit space may be reclassified as a non-permit confined space for as long as the non-atmospheric hazards remain eliminated or isolated
Has there been changes in the use or configuration of a non-permit confined space that might increase the hazards to entrants, or some indication that the initial evaluation of the space may not have been adequate?	☐	☐	☐	If ***YES***, ***STOP WORK*** and/or e[illegible] confined space immediately. Each e[illegible] employer must have a competent person re[illegible]aluate that space and, if neces[illegible]y, reclassify [illegible] confi[illegible] space.
Adequate emergency supplies on hand?	☐	☐	☐	Fire ex[illegible]guisher, [illegible]st aid/CPR [illegible]
A permit-required confined space may [illegible]reclassifie[illegible]a[illegible] non-[illegible]permi[illegible] confin[illegible] space for as long as the non-atmospheric hazards remain [illegible]minate[illegible]d[illegible]lated. [illegible]haza[illegible]s a[illegible]se w[illegible]n a p[illegible]mit space that has been reclassified as a no[illegible]ermit [illegible]ace, ea[illegible] em[illegible]yee in[illegible]e sp[illegible] must e[illegible] the space				
ARC[illegible] Non[illegible]ermit Required Confined Space Entrant(s)				
Total Numb[illegible] of Entrants (ARCADIS + Other Authorized Entrants):				
I have bee[illegible]perly instructed with regards to safe entry into this Non-Permit Required Confined Space and understand my duties and STOP WORK Authority:				
Names of Entrant(s)		**Signature of Entrants**		
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Other Authorized Entrants (Contractor, Client, Regulator) Entering Non-Permit Required Confined Space	
Multi-employer work site activities coordinated?	Yes / No / NA
Confirmed that workers working outside confined space won't introduce hazards into the Non- Permit Required Confined Space?	Yes / No / NA
I have been properly instructed with regards to safe entry into this Non-Permit Required Confined Space and understand my duties and my STOP WORK Authority	
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date

Individual Authorizing Non-Permit Required Confined Space Entry	
The following signatory has reviewed the pre-entry checklist, the information contained here-in and has reviewed the confined space evaluation form. Written instructions and safety procedures have been received and are understood. Entry cannot be approved if any questions are answered with a "*NO*".	
Name (Print):	Date:
Signature:	Time:

Documenting Problems Encountered during Non-Permit Required Confined Space
If problems are encountered during entry, submit a copy of this checklist to corporate H&S so necessary program/standard revisions can be developed and that a record of documented problems/incidents during Non-PRCS is maintained. A copy of the Non-PRCS Entry Checklist will be forwarded to 4-sight-support@arcadis-us.com
Describe problem/incident:
Detail confined space program / standard revisions required:
Date Copy of Non-Permit Required Confined Space Entry Checklist provided to Corporate H&S:
Copy of Non-Permit Required Confined Space Entry Checklist must be provided to Corporate H&S via **4-Sight-Support@arcadis-us.com.**

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Exhibit 6 – PRCS Entry Permit

Permit-Required Confined Space Entry Permit

Permit No. _____
(e.g., PRCS - Project Number - Date - #(sequential for day))

Project Name:	Date / Time:
Project Number:	Project Location:
Permit Prepared By:	Project Manager:

Location and Description of Confined Space:

Rescue Contact and Phone Number:

Note: If relying on local emergency services for emergency rescue, detail how we have coordinated advance notice if local emergency service will be unable to respond for a period of time (because they are responding to another emergency, attending department-wide training, etc.):

Entry Objectives:

Equipment / Materials Required for Entry:

Time of Entry: | Expirat... ...try:

Respirator Required for Entry: (Explain)

Required Protective Clothing for Entry:

Air Monitoring Interval: (Circle Selection) Continuo... | Eve... 15...n* | ...very ...min* | Every Hour*

* If continuous mon...ing is ...t feasibl... deta...eason... for a... ...onitori...g interval selected:

Pre-Entry Air Monitoring

...enter pre-entr...eadings below, subsequent readings record in attachment or log published in the project HASP)

Monitorin... For	...itoring Equipment	Calibration Info: Date / Time	Calibration Info: By	Pre-Entry Reading	Values outisde defined Aceptable Range = **Hazardous Atmosphere**[1]
% Oxygen					19.5 – 23.5%
% of LEL					<10% LEL
Hydrogen Sulfide-H_2S					<1 ppm TLV-TWA
					<5 ppm TLV-STEL
Carbon Monoxide-CO					<25 ppm
Combustible Dust (LFL)					< LFL (Dust that dosn't not obscure vision at a distance of 5ft)
Other:					

[1] Refer to the Confined Space Standard for details on acceptable ranges based on entry classification.
TLV-STEL - Short-term exposure limit: Employee can work in the area up to 15 minutes
TLV-TWA - 8 hr. Time Weighted Avg (PEL/TLV): Employee can work in area 8 hrs (longer with appropriate respiratory protection)

Pre-Entry Atmospheric Testing Conducted By

Print Name:	Date:
Signature:	Time:

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Pre-Entry Checklist				
Checklist	**YES**	**NO**	**N/A**	**Comment**
Competent Person completed confined space evaluation?	☐	☐	☐	
Are all lines to and from confined space blanked, capped, or isolated?	☐	☐	☐	
Are lines purged, flused and vented?	☐	☐	☐	
Electrical service locked out (entrant with key)?	☐	☐	☐	
Are mechanical devices / systems restrained and locked out?	☐	☐	☐	
If mechanical ventilation is needed, is it in place and functioning?	☐	☐	☐	
If relying upon natural ventilation only, is air monitoring in place?	☐	☐	☐	
Is explosion-proof electrical equipment in use?	☐	☐	☐	
If required, are we using non-sparking tools?	☐	☐	☐	
Are ladders secured at top?	☐	☐	☐	
Are the permanent ladder ru[illegible]s in saf condition?	☐	☐	☐	
Is the g[illegible] fault circ[illegible]rupter checke[illegible]nd functioning?	☐	☐	☐	
Are all ig[illegible]urces id[illegible]and isolated?	☐	☐	☐	
Are warnin[illegible]sted?	☐	☐	☐	
Is required PPE being used?	☐	☐	☐	
Are respirators and air supply equipment in proper condition?	☐	☐	☐	
Are safety harnesses and lifelines in proper condition?	☐	☐	☐	
Is a full-body harness with back "D" ring being used ?	☐	☐	☐	
Is the retrieval system (hoist, etc.) functioning properly?	☐	☐	☐	
Is emergency equipment ready for use?	☐	☐	☐	Fire extinguisher, first aid/CPR supplies, etc.
Are rescue provisions in place?	☐	☐	☐	
Has rescue plan (entry or non-entry) been practiced in last 12 moths?	☐	☐	☐	
Communication device for entrance and attendants?	☐	☐	☐	Explain here:

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Pre-Entry Checklist				
Checklist	**YES**	**NO**	**N/A**	**Comment**
Is air monitoring equipment calibrated and functioning properly?	☐	☐	☐	Calibrated according to manufacturer requirements and daily verification with certified calibration gas
Is pre-entry atmospheric testing completed and within range?	☐	☐	☐	
Is a trained attendant on standby?	☐	☐	☐	
If high hazard work is conducted, are other permits (welding, etc.) in place?	☐	☐	☐	Explain here:
If entry rescue is planned, are SCBAs on site and ready as needed?	☐	☐	☐	
Is the area secured to eliminate unauthorized entry?	☐	☐	☐	
Are entry personnel trained for confined space entry?	☐	☐	☐	
Is this confined space entry permit completed, signed and posted?	☐	☐	☐	

Confined Space Rescue (Non-Entry or Entry Rescue Assistance)		
PRCS Rescue Type: (Circle Selection)	Non-Entry Rescue Entry Rescue	Entry Rescue (selected) identify names, qualifications and verification of rescue capability for type of confined space entry planned by contracted service. ARCADIS staff are not permitted to perform entry rescue
Entry Rescuer Name:		Qualifications:
Has Selected Rescue Type Capabilities been Confirmed and Practied? (<12months)		Yes / No
Provide details on Non-Entry Rescue / Entry Rescue Assistance here:		

Permit Required Confined Space Entrants and Attendants	
Total Number of Entrants: (ARCADIS + Other Authorized Entrants)	Total Number of Attendants: (ARCADIS + Other Authorized Attendants)

ARCADIS Entrant Signature(s)		
I have been properly instructed on safe entry into this Permit Required Confined Space and understand my duties including STOP WORK Authority and the Emergency Evacuation Procedures		
Entrant 1 - Print Name: Entrant 1 Signature:	Date:	Time:
Entrant 2 - Print Name: Entrant 2 Signature:	Date:	Time:
Entrant 3 - Print Name: Entrant 3 Signature:	Date:	Time:

ARCADIS Entrant Signature(s)		
I have been properly instructed on safe entry into this Permit Required Confined Space and understand my duties including STOP WORK Authority and the Emergency Evacuation Procedures		
Entrant 4 - Print Name: Entrant 4 Signature:	Date:	Time:
Entrant 5 - Print Name: Entrant 5 Signature:	Date:	Time:
Entrant 6- Print Name: Entrant 6 Signature:	Date:	Time:

Attendant Signature	
I have reviewed the ARCADIS Confined Space Standard, the completed confined space evaluation form and this entry permit and I understand my responsibilities as an Attendant	
Print Name: Signature:	Date:
Print Name: Signature:	Date:

Other Authorized Entrants (Contractor, Client, Regulator) Entering Permit Required Confined Space	
Multi-employer work site activities coordinated	Yes / No / NA
Confirmed that workers working outside confined space won't introduce hazards into Permit Required Confined Space?	Yes / No / NA
I have been properly instructed on safe entry into this Permit Required Confined Space and understand my duties including STOP WORK Authority and the Emergency Evacuation Procedures	
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date

Entry Supervisor Authorizing Confined Space Entry Permit	
Entry Supervisor has reviewed the work authorized by this permit, the information contained here-in and has reviewed the confined space evaluation form. Written instructions and safety procedures have been received and are understood. Entry cannot be approved if any questions are answered with a "No". This permit is not valid unless all appropriate items are completed	
Entry Supervisor Name (Print):	Date:
Entry Supervisor Signature:	Time:

Construction Work ONLY Entry Supervisor Suspending Permit Required Confined Space Entry Permit	
Detail the situation that warranted the temporary suspension of the Construction Work Permit Required Confined Space Entry Permit:	
OSHA Construction Confined Space standard allows for the suspension of a permit, instead of cancellation, in the event of changes from the entry conditions listed on the permit or an unexpected event requiring evacuation of the space. The space must be returned to the entry conditions listed on the permit before re-entry.	
Entry Supervisor Name (Print):	Date Permit Suspended
Entry Supervisor Signature:	Time Permit Suspended
Detail how the space was returned to entry conditions listed on the permit before re-entry was allowed:	
Entry Supervisor Name (Print):	Date Permit Reinstated
Entry Supervisor Signature:	Time Permit Reinstated

Entry Supervisor Canceling Confined Space Entry Permit	
Entry Supervisor Name (Print):	Date:
Entry Supervisor Signature:	Time:
Submit a copy of the Completed / Cancelled Confined Space Entry Permit to Corporate H&S @ 4-Sight-Support@arcadis-us.com. Additionaly this Completed / Cancelled Confined Space Entry Permit is to be reatined in project files.	

Documenting Problems Encountered During Permit Required Confined Space Entry
Describe problem/incident:
Detail corrective actions implemented:
Detail confined space program / standard revisions required:
Submit a copy of the Completed / Cancelled Confined Space Entry Permit to Corporate H&S @ 4-Sight-Support@arcadis-us.com. Addtionaly this Completed / Cancelled Confined Space Entry Permit is to be reatined in project files.

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Permit Required Confined Space Entry
Air Monitoring Documentation

Permit No. _____
(e.g., PRCS - Project Number - Date - #(sequential for day))

Project Name:	Date:
Project Number:	Location:
Air Monitoring Conducted By:	Project Manager:

Air Monitoring

Time	Monitoring Equipment	% Oxygen	% of LEL	Hydrogen Sulfide-H_2S	Carbon Monoxide-CO	Combustible Dust (LFL)	Other / Comment
Values beyond defined Aoeptable Range = Hazardous Atmosphere		19.5-23.5%	<10% LEL	<1 ppm TWA <5 ppm STEL	<25 ppm	< LFL (Dust that dosn't not obscure vision at a distance of 5ft)	

Competent person shall use a meter calibrated to manufacturer specifications and validated using calibration grade gas daily. Calibration and validation must be documented and attached to this form.

Print Name:	Date:
Signature:	

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EXECUTIVE SUMMARY

This Health and Safety Standard (HSS) establishes procedures, provides compliance guidelines and outlines minimum training and competency requirements for Arcadis employees, who potentially face a risk of electrical shock, arc flash, or related injuries, when they are working on or are in/and around energized electrical equipment. This HSS addresses electrical safety related work practices, safety-related maintenance requirements, and other administrative controls for employee workplaces that are necessary for the practical safeguarding of employees relative to the hazards associated with electrical energy during activities such as the installation, inspection, operation, maintenance, and demolition of electric conductors, electric equipment, signaling and communications conductors and equipment, and raceways.

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

This HSS applies to every project and operations conducted at Arcadis offices, project sites, client facilities, and any other work-related location where Arcadis employees carry-out activities that directly or indirectly expose these employees to the hazards of electricity.

The Electrical HSS identifies requirements for working within the limited approach boundary and for working within the arc flash boundary. Employees must review and understand these requirements before work can begin.

A Job Safety Plan must be established for each project or activity where Arcadis personnel (including subcontractors) perform work on devices with an electrical energy source. An effective way to prevent an electrical injury is to remove the source of electrical energy and eliminate the possibility of inadvertent energization. To do this, employees must identify all possible sources of electricity, locate the disconnecting means for each source and establish an electrically safe work condition. Where feasible, an electrically safe work condition must be established. When working on or near exposed de-energized parts, including the task of testing for the absence of voltage, they are to be treated as energized until proven otherwise, and the trained and Qualified employee must wear PPE suitable for the maximum degree of all associated electrical hazards.

Employees must not work on or near exposed energized electrical conductors unless they are trained and qualified to recognize and avoid contact. Employees must determine where a difference of 50 volts or more exists between exposed parts within arm’s reach of the work task. Safety-related work practices must be employed by Qualified Persons to prevent electric shock or other injuries resulting from either direct or indirect electrical contacts, when work is performed near or on equipment or circuits that are or may be energized (consistent with their training and with specific energy control procedures). These task specific safety-related work practices must be consistent with the nature and extent of the associated electrical hazards.

1. POLICY

Energized electrical conductors and circuit parts operating at voltages equal to or greater than 50 volts shall be put into an Electrically Safe Work Condition (ESWC) in accordance with the Arcadis Lockout/Tagout (LO/TO) Health and Safety Standard (HSS) ARC HSFS004 by a LO/TO Authorized Employee prior to beginning any task.

Energized work on electrical conductors and circuit parts operating at voltages equal to or greater than 50 volts may be permitted by a Qualified Person who demonstrates that creating an electrically safe work condition introduces additional hazards, increased risk, or the task to be performed is infeasible in a de-energized state due to equipment design or operational limitations.

Energized electrical conductors and circuit parts that operate at less than 50 volts shall not be required to be de-energized where the capacity of the source and any overcurrent protection between the energy source and the employee are considered and it is determined that there will be no increased exposure to electrical burns or to explosion due to electric arcs.

No Arcadis employee shall work on energized electrical conductors or circuit parts or installs electrical equipment that requires electrical power source of equal to or greater than 600 volts, unless appropriately qualified for the specified task and approved by Arcadis Corporate H&S.

2. PURPOSE AND SCOPE

2.1 Purpose

The purpose of the Arcadis Electrical Safety HSS is to prevent accidents, injuries and equipment damage relative to the hazards arising from the use of electricity.

2.2 Scope

This Electrical HSS addresses electrical safety-related work practices, safety-related maintenance requirements, and other administrative controls for employee workplaces that are necessary for the practical safeguarding of employees relative to the hazards associated with electrical energy during activities such as the installation, inspection, operation, maintenance, and demolition of electric conductors, electric equipment, signaling and communications conductors and equipment, and raceways.

This standard applies to every project and operations conducted by Arcadis employees and in any work-related location where Arcadis employees carry-out activities that directly or indirectly expose employees to the hazards of electricity.

This HSS addresses electrical work as the hazardous energy source. As applicable, employees covered by this standard must also follow the Arcadis Control of Hazardous Energy LO/TO HSS (ARC HSFS004). Arcadis clearance requirements for working around and under overhead power lines is addressed in the Arcadis Utility Clearance HSS (ARC HSFS019) and the Arcadis Heavy and Mechanized Equipment HSS (ARC HSCS006).

Work practices not covered by this HSS include:

- Design requirements for electrical equipment and/or work on or directly associated with electrical generation, transmission, or distribution installations.

- Arcadis design / build of Programmable Logic Control (PLC) as this work is covered by other standard requirements established by the Arcadis Technical Knowledge and Innovation (TKI) group.

- Installations in ships, watercraft other than floating buildings, railway rolling stock, aircraft, or automotive vehicles other than mobile homes and recreational vehicles.

- Installations of railways for generation, transformation, transmission, or distribution of power used exclusively for operation of rolling stock or installations used exclusively for signaling and communications purposes.

- Installations of communications equipment under the exclusive control of communications utilities located outdoors or in building spaces used exclusively for such installations.

- Installations under the exclusive control of an electric utility.

3. DEFINITIONS

See definitions in Exhibit 1.

4. RESPONSIBILITIES

4.1 Corporate H&S with Business Line and Practice Experts

Corporate H&S with Business Line and Practice Experts will review and update this standard as necessary. In addition, Corporate H&S with Business Line and Practice Experts are responsible to:

- Provide Qualified Person evaluation, training and retraining, or recommend a qualified training provider.

- Provide technical assistance regarding safe work practices of this HSS.

4.2 Project Management

Project Management (PM) is responsible for implementing this HSS on any project that poses electrical hazards to Arcadis employees or employees of its subcontractors, clients, and other organizations present in the vicinity of work controlled by Arcadis. PM is responsible for communicating and appropriately managing subcontractors, ensuring that employees have appropriate training and qualifications, and for reviewing all opportunities of electrical work performed by or supervised by Arcadis as specified in this standard. PM is responsible for involving the appropriate Arcadis H&S Staff as needed.

In those instances where Arcadis subcontracts electrical work, the minimum H&S requirements for the activity involving electricity must be communicated, including:

- Known hazards that are covered by this HSS, that are related to the subcontractor's work, and that might not be recognized by the contract employer or its employees.

- Information about the employer's installation that the contract employer needs to conduct a hazard assessment.

4.3 Qualified Person

An employee who has demonstrated skills and knowledge related to the construction and operation of electrical equipment and installations and has received safety training to identify the hazards and reduce the associated risk. All servicing of electrical equipment equal to or greater than 50 volts shall be performed by Qualified Persons who operates in strict compliance with Arcadis electrical safety requirements, including LOTO, arc-flash, and shock hazard safety requirements.

4.4 Unqualified Person

Any person who has not received the specific training to perform a task or to recognize that an electrical hazard exists and how to avoid that hazard or who has not shown demonstrated ability is an unqualified person. An employee qualified to perform a specific task may be unqualified to perform other tasks. The characteristics of being qualified and unqualified are task-dependent.

Unqualified person(s) shall not cross the Restricted Approach Boundary nor work on energized electrical conductors and circuit parts operating at voltages equal to or greater than 50 volts.

5. PROCEDURE

The Arcadis task-specific electrical safety process includes, but is not limited to, the following:

- Inspect and evaluate the electrical equipment.
- Consider the condition of maintenance of electrical equipment and systems.
    - Without proper maintenance, the equipment cannot be depended on to perform its required safety functions, such as interrupting fault currents within its characteristic time–current curves. Proper maintenance can be achieved by following the manufacturer's instructions or the recommendation included in NFPA 70B Recommended Practice for Electrical Equipment Maintenance.
- Maintain the electrical equipment's insulation and enclosure integrity.
- Use of a project specified Health & Safety Plan (HASP)
- Pre-plan every job and document first-time procedures using the Job Safety Analysis (JSA) process.
- Use of a Job Safety Plan.
- Use the right tools for the job.
- De-energize, LO/TO and ESWC, if possible

  - When working on or near exposed de-energized parts, including the task of testing for the absence of voltage, equipment is to be treated as energized until proven otherwise, and the trained and Qualified Person must wear PPE suitable for the maximum degree of all associated hazards.

- Anticipate unexpected events (use the TRACK process).
- Identifying the electrical hazards and reduce the associated risk.
- Employees will protect themselves from shock, burn, blast and other hazards due to the working environment by minimizing exposure and using proper PPE.
- Assess employee's abilities, PM approach and H&S principles by using the Task Improvement Process (TIP).
- Auditing and evaluation of task-specific electrical safety plan.

5.1 Planning and Risk Assessment

A Job Safety Plan is required to be prepared prior to energized work on conductors and circuit parts in any electrical equipment such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are in other than dwelling units and that are likely to require examination, adjustment, servicing, or maintenance. A Job Safety Plan shall be completed by a Qualified Person and consists of the following:

- Electrical Task Hazard Assessment Worksheet (THA) (Exhibit 2)
- Job Safety Analysis (JSA)
- Written LO/TO procedures, where required
- Energized Electrical Work Permit (Exhibit 3), where required.

The THA template (Exhibit 2) serves as a baseline to document the shock and arc flash risk assessment for various tasks/voltage to which Qualified Persons may be exposed. The THA shall be used to identify the Limited Approach, Restricted Approach, and Arc Flash boundary requirements and the PPE and other protective equipment necessary in order to reduce exposure to shock, arc flash and other electrical hazards. The THA shall also evaluate whether a second person is required and the training and equipment that person should have when a Qualified Electrical employee is working within the most conservative boundary.

Note: In the absence of medical services near the workplace, an employee trained in methods of safe contact release, first aid, cardiopulmonary resuscitation (CPR) and in the use of an automated external defibrillator shall be available to respond to a medical emergency.

A JSA shall include a description of the job steps required to complete the task and critical actions required to eliminate or reduce the risk including special precautions and the energy source controls.

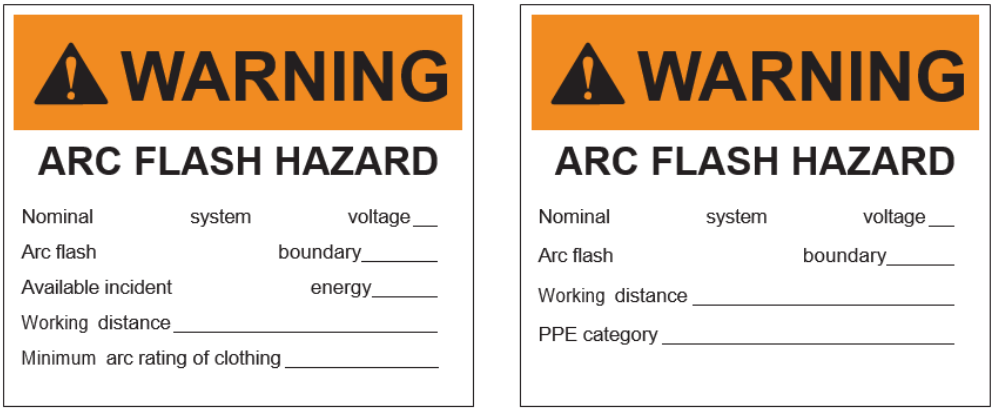
When energized work is performed as permitted an Energized Electrical Work Permit (Exhibit 3) shall be required and documented as described in Section 5.3.1.

5.1.1 Equipment Labeling

Electrical equipment maintained, inspected or accessed by Arcadis employees such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are in other than dwelling units, and are likely to require examination, adjustment, servicing, or maintenance while energized, shall be field marked with a label containing all the following information:

- At least one of the following:
    - Available incident energy and the corresponding working distance or the arc flash PPE category in Table 130.7(C)(15)(a) Arc-Flash PPE Categories for Alternating Current (ac) Systems (Exhibit 4) and Table 130.7(C)(15)(b) Arc-Flash PPE Categories for Direct Current (dc) Systems (Exhibit 5) for the equipment, but not both
    - Minimum arc rating of clothing
    - Site-specific level of PPE
- Nominal system voltage
- Arc flash boundary

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



Note: Representative warning labels

The method of calculating and data to support the information for the label shall be documented. The data shall be reviewed for accuracy at intervals not to exceed 5-years. Where the review of the data identifies a change that renders the label inaccurate, the label shall be updated.

The label must provide sufficient information for an employee to determine the equipment that is necessary for protection. Although owners are responsible for providing the necessary label on equipment containing an arc flash hazard, Arcadis is responsible to ensure that our employees are protected as required by the work task and shall ensure that energized equipment being maintained by Arcadis is labeled accordingly.

Unless changes in the electrical distribution system(s) render the label inaccurate, labels applied prior to the effective date of NFPA 70E Standard for Electrical Safety in the Workplace 2018 shall be acceptable if they complied with the requirements for the equipment labeling in the standard in effect at the time the labels were applied.

5.1.2 Alerting Techniques

Safety signs, safety symbols, or accident prevention tags shall be used where necessary to warn employees about electrical hazards that might endanger them. Such signs and tags shall meet the requirements of ANSI Z535, Series of Standards for Safety Signs and Tags.

Barricades shall be used in conjunction with safety signs where it is necessary to prevent or limit employee access to work areas containing energized conductors or circuit parts. Conductive barricades shall not be used where it might increase the likelihood of exposure to an electrical hazard. Barricades shall be placed no closer than the limited approach boundary given in Table 130.4(D)(a) Shock Protection Approach Boundaries to Exposed Energized Electrical Conductors or Circuit Parts for Alternating-Current Systems (Exhibit 6) and Table 130.4(D)(b) Shock Protection Approach Boundaries to Exposed Energized Electrical Conductors or Circuit Parts for Direct - Current Voltage Systems (Exhibit 7). Where the arc flash boundary is greater than the limited approach boundary, barricades shall not be placed closer than the arc flash boundary. While the barrier is being installed, the Limited Approach Boundary distance shall be maintained, or the energized conductor or circuit parts shall be placed in an electrically safe work condition.

If signs and barricades do not provide sufficient warning and protection from electrical hazards, an attendant shall be stationed to warn and protect employees. The primary duty and responsibility of an attendant providing manual signaling and alerting shall be to keep unqualified employees outside a work area where the unqualified employee might be exposed to electrical hazards. The attendant should have no other duty than to deliver the warning.

5.1.3 Tools and Materials

5.1.3.1 Insulated Tools

Only insulated tools or handling equipment, or both, shall be used when working within the Restricted Approach Boundary of exposed energized electrical conductors or circuit parts where tools or handling equipment might make unintentional contact.

Note: A unqualified person within the limited approach boundary is considered likely to contact an exposed energized electrical conductor and therefore must be using insulated tools and materials.

Insulated tools shall be protected from damage to the insulating material.

Insulated tools shall be rated for the voltages on which they are used.

Insulated tools shall be designed and constructed for the environment to which they are exposed and the manner in which they are used.

Insulated tools and equipment shall be inspected for damage to the insulation or damage that can limit the tool from performing its intended function or could increase the potential for an incident prior to each use.

Fuse, fuse holder handling equipment, or fuse holder handling equipment, insulated for the circuit voltage, shall be used to remove or install a fuse if the fuse terminals are energized.

Ropes and hand-lines used within the Limited Approach Boundary shall be nonconductive.

Fiberglass-reinforced plastic rod and tube used for live-line tools shall meet the requirements of applicable portions of electricals codes and standards dealing with electrical installation requirements.

Portable ladders used for electrical work shall have nonconductive side rails when used within the Limited Approach Boundary or where the Qualified Person or ladder could contact exposed energized electrical conductors or circuit parts.

5.1.3.2 Voltage Testing Equipment

Voltage testing equipment used by employees must be certified as meeting IEC 61010-1 by third party independent testing laboratories. Recognized independent third-party testing laboratories include the Canadian Standards Association (CSA), Technischer Überwachungsverein (TUV), or Underwriters Laboratory (UL). The independent testing laboratory's mark shall appear on the exterior of the instrument.

Note: Instruments for use in the U.S. shall be UL listed to the following standards:

- UL 3111-1 "Standard for Safety for Electrical Measuring and Test Equipment, Part 1" – General Requirements
- UL 3111-2-031 "Handheld Probe Assemblies for Electrical Measurement and Test"
- UL 3111-2-032 "Standard for Safety for Handheld Current Clamps for Electrical Measurement and Test"
- ISA/ANSI 82.01 "Safety Standard for Electrical and Electronic Test Measuring, Controlling, and Related Equipment – General Requirements"

Voltage testing equipment for general use must be a Category III meter rated at 600 Volts for protection against transient voltages (IEC 61010-1). Instruments used outdoors or in outbuildings shall be at least IEC 61010-1 Category IV at 600 Volts. Dependent on the application, it may be necessary to specify instruments capable of measuring higher voltages. All handheld electrical measurement tools used by employees shall be rated for the nominal voltage of the system or component being measured (refer to Table 1 below).

Table 1 International Electrotechnical Commission 61010 Volt Meter Categories

Transient Overvoltage Category (<1,000 Volts)		
Overvoltage Category	Brief Description	Examples
CAT IV	Three phase at utility connection, any outdoor conductors	• Refers to the origin of the installation, i.e., where low-voltage connection is made to utility power. • Electric meters, primary overcurrent protective equipment • Outside and service entrance, service drop from pole to building, run between meter and panel • Overhead line to detached building, underground line to well pump
CAT III	Three phase at distribution including single-phase commercial lighting	• Equipment in fixed installations, such as switchgear and polyphase motors • Bus and feeder in industrial plants • Feeders and short branch circuits, distribution panel devices • Lighting systems in large buildings • Appliance outlets with short connections to service entrance
CAT II	Single phase receptacle connected loads	• Appliance, portable tools, and other household similar loads • Outlet and long branch circuits • Outlets more than 10 meters (30 feet) from Cat III sources • Outlets at more than 20 meters (60 feet) from Cat IV sources
CAT I	Electronics	• Protected electronic equipment • Equipment connected to (source) circuits in which measures are taken to limit transient overvoltages to an appropriate low level • Any high-voltage, low-energy source derived from a high-winding resistance transformer, such as the high-voltage section of a copier

Voltage testing equipment shall be inspected before each use for damaged insulation on leads and other obvious physical damage. Damaged voltage testing equipment shall not be used until authorized repairs have been completed.

All voltage testing equipment shall be tested prior to, and after use, with a known energized electrical source to ensure that the instrument is functioning correctly (Live-Dead-Live approach).

Voltage testing equipment shall not be modified without the written consent of the original equipment manufacturer. The replacement of any defective components must be with identical components to the original or as authorized by the original equipment manufacturer.

5.2 Establishing an Electrically Safe Work Condition

The most effective way to prevent an electrical injury is to remove the source of electrical energy and eliminate the possibility of inadvertent energization. Energized electrical conductors and circuit parts operating at voltages equal to or greater than 50 volts shall be put into an ESWC. To do this, the Qualified Person must identify all possible sources of electricity, locate the disconnecting means for each source and establish an ESWC.

The process of establishing an ESWC can expose employees to electrical hazards. Depending on the integrity of the equipment, circuit, and overcurrent device, an employee could be exposed to arc flash, arc blast, shock, electrocution, and flying parts and pieces. Until the EWSC has been established, including the task of testing for the absence of voltage, equipment is to be treated as energized until proven otherwise. The Qualified Person must wear PPE suitable for the maximum degree of all associated hazards.

Note: Equipment rated as arc resistant by a manufacturer provides assurance to the employee that when the switch operating handle is moved from one position to another, an internal arcing fault within the arc-resistant equipment would not expose the employee to effects from the fault, as long as the equipment doors are closed and latched. Employees must recognize that when the door is less than fully latched or a cover is removed, the arc-resistant nature of the equipment no longer exists.

Note: If an ESWC is achieved and verified, no electrical energy is in the immediate vicinity of the work task(s) and all danger of injury from an electrical hazard has been removed, PPE is not needed, and Unqualified Persons can perform non-electrical work such as cleaning and painting near electrical equipment. Unqualified Persons may perform non-electrical work on equipment after an electrically safe work condition has been established; however, they must understand technical aspects of the work task so as to not create an electrical hazard when the equipment is re-energized and must be capable of executing the task(s) in a manner that will not create unacceptable risk from electrical hazards.

5.2.1 Process of Achieving an Electrically Safe Work Condition

An ESWC is not achieved until the requirements in the Arcadis HSS ARC HSFS004 - Control of Hazardous Energy for LO/TO are met.

5.2.2 Termination of Work

After the required work on an energized system or equipment has been completed, any temporary personnel protective equipment shall be removed from the work area and all permanent barriers or covers shall be reinstalled. Refer to the Arcadis Control of Hazardous Energy (Lockout/Tagout) Procedure ARC HSFS004 for additional information.

5.3 Work Involving Electrical Hazards

Energized work on electrical conductors and circuit parts operating at voltages equal to or greater than 50 volts may be permitted by a Qualified Person who demonstrates that creating an ESWC introduces additional hazards, increased risk, or the task to be performed is infeasible in a de-energized state due to equipment design or operational limitations.

Energized work on electrical conductors and circuit parts operating at voltages equal to or greater than 50 volts by a Qualified Person shall be permitted only:

- Where it can be demonstrated that de-energizing equipment introduces additional hazards or increased risk.

  Note: Examples of additional hazards or increased risk include, but are not limited to, interruption of life-support equipment, deactivation of emergency alarm systems, and shutdown of hazardous location ventilation equipment.

- Where it can be demonstrated that the task to be performed is infeasible in a de-energized state due to equipment design or operational limitations.

  Note: Examples of work that might be performed within the limited approach boundary of exposed energized electrical conductors or circuit parts because of infeasibility due to equipment design or operational limitations include performing diagnostics and testing (for example, start-up or troubleshooting) of electric circuits that can only be performed with the circuit energized and work on circuits that form an integral part of a continuous process that would otherwise need to be completely shut down in order to permit work on one circuit or piece of equipment.

- Where energized electrical conductors and circuit parts operate at less than 50 volts and when any overcurrent protection between the energy source and the worker are considered and it is determined that there will be no increased exposure to electrical burns or to explosion due to electric arc.

  Note: Under normal condition, electrical conductors energized at a voltage level less than 50 volts do not present an electrical shock hazard. However, a thermal hazard can exist in circuits that have a significant capacity to deliver energy, even when the voltage level is less than 50 volts. For instance, battery installations can be connected so that arcing resulting from a short circuit could present a significant thermal hazard.

Note: Control circuits may operate at a voltage less than 50 volts. Creating an open circuit or short circuit in one of these control circuits could result in a different type of hazard – for example, an interruption or other unintended action that could result in exposure to a chemical hazard or creation of an unacceptable environmental condition.

Note: Power limited circuits are not normally considered to be an electrical hazard, and electrical equipment energized at less than 50 volts is not normally considered to be an arc flash hazard. However, the effects of an arcing fault are related to available incident energy. In some instances, an arcing fault hazard might be significant at this lower voltage. If exposure to an electric arc exists, an electrically safe work condition and PPE in accordance with the requirements of this HSS may be necessary.

- Normal operation of electrical equipment shall be permitted where a normal operating condition exists. A normal operating condition exists when all of the following are met:
    1. The equipment is properly installed.
    2. The equipment is properly maintained.
    3. The equipment is used in accordance with instructions included in the listing and labeling and in accordance with manufacturer's instructions.
    4. The equipment doors are closed and secured.
    5. All equipment covers are in place and secure.
    6. There is no evidence of impending failure.

Qualified Persons must have a completed Job Safety Plan including THA, JSA, and Energized Electrical Work Permit before working on or near exposed energized electrical conductors.

As defined within the Job Safety Plan, Qualified Persons are required to wear PPE that was selected to protect employees from hazards associated with the task. The PPE must be inspected before each use to ensure the integrity of the equipment and to ensure it has been maintained in usable condition.

5.3.1 Energized Electrical Work Permit

When energized work is performed as permitted (detailed in Section 5.3), an energized electrical work permit shall be required and documented under the following conditions:

- When work is performed within the Restricted Approach Boundary.
- When the employee interacts with the equipment when conductors or circuit parts are not exposed but an increased likelihood of injury from an exposure to an arc flash hazard exists.

The Arcadis energized electrical work permit (Exhibit 3) will be used, or and equivalent permit that shall minimally include the following items:

- A description of the circuit and equipment to be worked on and their location.
- A description of the work to be performed.

- Justification for why the work must be performed in an energized condition.
- A description of the safe work practices to be employed.
- Results of the shock risk assessment including: Voltage to which personnel will be exposed; Limited Approach Boundary; Restricted Approach Boundary; and personal and other protective equipment required by this HSS to safely perform the assigned task and protect against the shock hazard.
- Results of the arc flash risk assessment including: Available incident energy at the working distance or arc flash PPE category; personal and other protective equipment required by this HSS to protect against the arc flash hazard; and Arc Flash boundary.
- Means employed to restrict the access of Unqualified Persons from the work area.
- Evidence of completion of a job briefing, including a discussion of any job-specific hazards (daily tailgate meeting form or equivalent).
- Energized work approval (authorizing or responsible management, safety officer, or owner, etc.) signature(s).

Refer to Exhibit 3 for an example Energized Electrical Work Permit.

5.3.2 Exemptions to Energized Electrical Work Permit Requirements

Electrical work shall be permitted without an energized electrical work permit if a Qualified Person is provided with and uses appropriate safe work practices and PPE in accordance with this HSS under any of the following conditions:

- Testing, troubleshooting, or voltage measuring;
- Thermography, ultrasound, or visual inspections if the restricted approach boundary is not crossed;
- Access to and egress from an area with energized electrical equipment if no electrical work is performed and the restricted approach boundary is not crossed; or
- General housekeeping and miscellaneous non-electrical tasks if the restricted approach boundary is not crossed.

5.3.3 Shock Protection Boundaries for Energized Electrical Conductors or Circuit Parts

The shock protection boundaries identified as Limited Approach Boundary and Restricted Approach Boundary are applicable where personnel are approaching exposed energized electrical conductors or circuit parts. Reference information from OSHA 1910.333 Table S-5, Table 130.4(D)(a) Shock Protection Approach Boundaries to Exposed Energized Electrical Conductors or Circuit Parts for Alternating-Current Systems (Exhibit 6), and Table 130.4(D)(b) Shock Protection Approach Boundaries to Exposed Energized Electrical Conductors or Circuit Parts for Direct - Current Voltage Systems (Exhibit 7).

Note: The dimensions associated with the shock protection boundaries (Limited and Restricted) depends on the maximum voltage to which an employee might be exposed. The shock protection boundaries (Limited and Restricted) and Arc Flash Boundary are independent of each other.

Note: When Unqualified Person(s) are working at or close to the Limited Approach Boundary, the Qualified Person in charge of the work where the electrical hazard exists shall advise Unqualified Person(s) of the electrical hazard and warn them to stay outside of the Limited Approach Boundary.

Note: No Unqualified Person will be permitted to approach nearer than the Limited approach boundary of energized conductors and circuit parts, unless advised by a Qualified Person and continuously escorted while inside the Limited Approach Boundary. Under no circumstance shall Unqualified Persons(s) be permitted to cross the Restricted Approach Boundary. An Arc Flash Boundary may need to be crossed before entering the Limited Approach Boundary. Arc flash PPE is required to be worn by any employee within the Arc Flash Boundary in accordance with Section 5.3.5.

Only Qualified Person(s) may work in the Restricted Approach Boundary. No Qualified Person shall approach or take any conductive object closer to exposed energized electrical conductors or circuit parts than the Restricted Approach Boundary unless one of the following conditions applies:

1. The Qualified Person is insulated or guarded from the energized electrical conductors or circuit parts operating at 50 volts or more. Insulating gloves or insulating gloves and sleeves are considered insulation only with regard to the energized parts upon which work is performed.

2. The energized electrical conductors or circuit part operating at 50 volts or more are insulated from the qualified person and from any other conductive object at a different potential.

If the conductors are placed into an electrically safe work condition, approach boundaries no longer exist, and Unqualified Persons can then approach the conductor without risk of injury.

5.3.4 Arc Flash Boundary for Energized Electrical Conductors or Circuit Parts

The Arc Flash Boundary for systems 50 volts and greater shall be the distance at which the incident energy equals 5 Joules per centimeter square (J/cm^2) [1.2 calories per square centimeter (cal/cm^2)]. In certain instances, the Arc Flash Protection Boundary might be a greater distance from the exposed energized electrical conductors or circuit parts than the Limited Approach Boundary. The Shock Protection Boundaries and the Arc Flash Hazard Boundary are independent of each other.

If a Qualified and escorted Unqualified Person(s) body or part of the body needs to be within the Arc Flash Boundary in order to perform a task, an arc flash risk assessment must be performed to determine the amount of incident energy that Qualified and Unqualified Person(s) might be exposed to and to determine the PPE required. To determine the Arc Flash Boundary and associated PPE, the incident energy analysis

method (preferred) or the arc flash PPE category method may be used. All parts of the body within the Arc Flash Boundary will be protected.

The preferred method to determine the Arc Flash Boundary is to complete an incident energy analysis, which results in an Arc Flash Boundary at a distance where the incident energy is 1.2 cal/cm^2. The incident energy exposure level shall be based on the working distance of the employee's face and chest area from a prospective arc source for the specific task to be performed. Table 130.5(G) Selection of Arc-Rated Clothing and Other PPE When the Incident Energy Analysis Method Is Used (Exhibit 8) provides PPE requirements. If the arc flash risk assessment is conducted using the incident energy calculation method, the PPE category method is prohibited to determine the required PPE.

The second method is the arc flash PPE category method, which results in an arc flash boundary selected directly from Table 130.7(C)(15)(c) Personal Protective Equipment (PPE) (Exhibit 9). To determine if the arc flash PPE category method is applicable, a Qualified Person needs to determine whether the available fault current and total fault clearing time fall within the maximum available short-circuit current and fault clearing times parameters, using Exhibit 4 and Exhibit 5. If the equipment type is not listed or if the determined values for working distance, available fault current or total fault clearing time are outside of the parameters given in Exhibit 4, then an incident energy analysis is required. The application of the tables is either a "go" or "no go."

5.3.5 Personal Protective Equipment and Other Protective Equipment

When a Qualified Person is working within the Restricted Approach Boundary, they shall wear insulating gloves and sleeves. When a Qualified Person and Unqualified Person is working within the Arc Flash Boundary, they shall wear protective clothing and other PPE in accordance with Exhibit 8, if using the incident energy calculation method, or Exhibit 9, if using the arc flash PPE category method. PPE does not prevent an injury if an incident occurs.

Note: Using arc-rated PPE at its rating provides only a 50% probability of protection from a second-degree burn.

Qualified Person(s) will be provided and must wear arc-rated clothing when within the Arc Flash Boundary to reduce the risk of serious injury or death caused by an arc flash as specified in the Job Safety Plan documents. Although all arc-rated clothing is also flame resistant (FR), the inverse is not always true. FR clothing may not provide adequate protection from an arc flash.

Qualified Persons must:

- Wear arc-rated clothing wherever there is possible exposure to an electric arc flash above the threshold incident energy level for a second degree burn [5 J/cm^2 (1.2 cal/cm^2)].
- Wear arc-rated clothing that covers all ignitable clothing and allows for movement and visibility.
- Wear non-conductive head protection whenever there is a danger of head injury from electric shock or burns due to contact with energized electrical conductors or circuit

parts or from flying objects resulting from electrical explosion. Employees shall wear electrically rated (Type II, Class E or G) hard hats to protect their heads from flying parts and pieces.

- Wear non-conductive protective equipment for the face, neck and chin (arc-rated hood or arc-rated balaclava with arc-rated face shield) whenever there is a danger of injury from exposure to electrical arcs or flashes or from flying objects resulting from electrical explosion. An arc-rated hood shall be used when the anticipated incident energy exposure exceeds 50.2 J/cm^2 (12 cal/cm^2)

- Wear safety glasses or goggles under face shields or hoods whenever there is danger of injury from electric arcs, flashes, or from flying objects resulting from electrical explosion.

- Wear hearing protection whenever working within the Arc Flash Boundary.

- Wear rubber insulating gloves with leather protectors where there is a danger of hand injury from electrical shock due to contact with energized electrical conductors or circuit parts or arc flash burn. Qualified Persons shall wear rubber insulating gloves with leather protectors and rubber insulating sleeves where there is a danger of hand and arm injury from electric shock due to contact with exposed energized electrical conductors or circuit parts. Rubber insulating gloves must be rated for the voltage for which the gloves will be exposed. Insulating gloves, sleeves, and blankets must be marked with the date tested and the date the next test is due. Insulating equipment found to be defective or damaged must be immediately removed from service.

- Wear insulated footwear as protection against step and touch potential. Insulated soles must not be used as primary electric protection. Electrical Hazard (EH) shoes meeting ASTM F2413 can provide a secondary source of electric shock protection under dry conditions. Heavy-duty leather footwear or dielectric overshoes shall be used in all exposures greater than 16.75 J/cm^2 (4 cal/cm^2).

5.3.5.1 Factors in Selection of Protective Clothing

Garments worn as outer layers over arc-related clothing, such as jackets, safety vests or rainwear must also be made from arc-rated material. If personal fall arrest system is used, an arc-rated body harness will be used.

Garments worn as underlayers with meltable fibers such as acetate, nylon, polyester, polypropylene and spandex shall not be permitted in fabric underlayers.

Non-melting, flammable fiber garments shall be permitted to be used as underlayers in conjunction with arc-rated garments in a layered system. If non-melting, flammable fiber garments are used as underlayers, the system arc rating shall be sufficient to prevent breakopen of the innermost arc-rated layer at the expected arc exposure incident energy level to prevent ignition of flammable underlayers.

Arc-rated clothing shall cover potentially exposed areas as completely as possible. Shirts and coverall sleeves shall be fastened at the wrists, shirts shall be tucked into pants and shirts, coveralls and jackets shall be closed at the neck.

Tight fitting clothing must be avoided. Loose-fitting clothing provides additional thermal insulation because of the air spaces. Arc-rated apparel shall fit properly such that it does not interfere with the work task.

5.3.5.2 Maintenance of Personal Protective Equipment

PPE and other protective equipment must be maintained in a safe, clean, and reliable condition and in accordance with manufacturers' instructions. The PPE and other protective equipment shall be visually inspected before each use. PPE and other protective equipment must be stored in a manner to prevent damage from physically damaging conditions from moisture, dust, or other deteriorating agents. In addition, PPE and other protective equipment shall be inspected immediately following any incident that could reasonably be suspected of having caused damage.

Insulating gloves shall be given an air test, along with each inspection. If the new insulating equipment has been electrically tested but not issued for service, it is not permitted to be placed into service unless it has been electrically tested within the previous 12 months. Insulating equipment that has been issued for service is not new and is required to be retested at the following intervals:

- Blankets – before first issue; every 12 months thereafter
- Covers – if insulating value is suspect
- Gloves - before first issue; every 6 months thereafter
- Line hose – if insulating value is suspect
- Sleeves – before first issue; every 12 months thereafter

Arc-rated clothing must be cleaned and maintained in accordance with the clothing manufacturer's instructions.

Work clothing or arc flash suites that are contaminated or damaged to the extent that their protective qualities are impaired shall not be used. Protective items that become contaminated with grease, oil or flammable liquids or combustible materials shall not be used.

5.3.6 Other Precautions While Exposed to Electrical Hazards

Safety-related work practices must be employed by Qualified Persons to prevent electric shock or other injuries resulting from either direct or indirect electrical contacts, when work is performed near or on equipment or circuits that are or may be energized (consistent with their training and with specific energy control procedures). These task specific safety-related work practices must be consistent with the nature and extent of the associated electrical hazards. Refer to the Task Hazard Assessment Sheet template in Exhibit 2.

Before an Arcadis employee works within the Limited Approach Boundary, energized electrical conductors and circuit parts to which an employee might be exposed shall be put into an electrically safe work condition, unless work on energized components is justified (refer to Section 5.3.2 for these instances).

The acts of opening a disconnecting means, measuring for absence of voltage and visually verifying a physical break in the power conductors could pose a risk of injury. These activities are necessary to create an electrically safe work condition, and until they are completed, employees must be wearing PPE based on the degree of hazard. Refer to the Task Hazard Assessment Sheet template in Exhibit 2.

Doors, hinged panels, and the like shall be secured to prevent their swinging into an employee and causing the employee to contact exposed energized electrical conductors or circuit parts operating at voltages equal to or greater than 50 volts or where an electrical hazard exists if movement of the door, hinged panel, and the like is likely to create a hazard.

Project Management must remind employees to be alert at all times when inside the Limited Approach Boundary.

Employees are not permitted to work within the Limited Approach Boundary of energized electrical conductors or circuit parts operating at voltages equal to or greater than 50 volts or where other electrical hazards exist, while their alertness is recognizably impaired due to illness, fatigue or other reasons.

Employees shall use the TRACK process and review the Job Safety Plan documents prior to entering into the Limited Approach Boundary in order to identify situation(s) that could result in person working outside the electrically safe work condition or expose the employee to hazards not addressed in the Job Safety Plan documents. Employees will use Stop Work Authority to address changed conditions and to re-assess hazards not initially addressed or controlled.

Employees must not reach blindly into areas that are not directly visible as it may contain exposed energized electrical conductors or circuit parts.

Employees may not enter spaces containing exposed energized parts, unless illumination is provided that enables the employee(s) to perform the work safely. Where lack of illumination or an obstruction precludes observation of the work to be performed, Qualified Persons shall not perform any task within the Limited Approach Boundary of energized electrical conductors or circuit parts operating at voltages equal to or greater than 50 volts or where an electrical hazard exists.

Conductive articles of jewelry and clothing (such a watch bands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, metal headgear or metal frame glasses) shall not be worn within the Restricted Approach Boundary or where they present an electrical contact hazard with exposed energized electrical conductors or circuit parts.

For conductive materials and equipment that are in contact with any part of an employee's body, employees are instructed (through daily tailgate meetings, job briefings, review of the health and safety plan, etc.) to handle these materials/equipment in a manner that will prevent unintentional contact with energized conductors or circuit parts. If an employee must handle long dimensional conductive objects (such as ducts, pipes, tubes, conductive hose, metal scaffold parts, chains, etc.) in areas with exposed energized electrical conductors or circuit parts, specific work practices will be evaluated (use of the TRACK

process) and instituted (such as the use of insulation, guarding, and material handling techniques) to minimize the hazard.

When working within a confined or enclosed space that contains exposed energized electrical conductors or circuit parts operating equal to or greater than 50 volts or where an electrical hazard exists, employees will use protective shields, barriers or insulating materials as necessary to avoid inadvertent contact with these parts and the effects of the electrical hazards.

Arcadis clearance requirements for working around and under overhead power lines is addressed in the Arcadis Utility Clearance HSS (ARC HSFS019) and the Heavy & Mechanized Equipment HSS (ARC HSCS006). Signage requirements are also included in the Heavy & Mechanized Equipment HSS.

Sufficient access in the vicinity of and working space is provided and maintained about all electric equipment to permit ready and safe operation and maintenance of such equipment. See the most current National Electric Code (NEC) for working clearance requirements.

The dimension of the working space in the direction of access to energized electrical conductors or circuit parts operating at 600 volts or less and likely to require examination, adjustment, servicing, or maintenance while energized may not be less than indicated in Table 2 below. In addition to the distances shown in Table 2 Working Clearances, the workspace may not be less than 30-inches wide in front of the electric equipment. Working space is not required in back of assemblies such as dead-front switchboards or motor control centers where there are no renewable or adjustable parts such as fuses or switches on the back and where all connections are accessible from locations other than the back.

Table 2 Working Clearances

	Minimum Clear Distance for Condition (ft)		
Nominal voltage to ground	a	b	c
0-150	3	3	3
151-600	3	3.5	4

Conditions a, b, and c are as follows:

a Exposed energized electrical conductors or circuit parts on one side and no live or grounded parts on the other side of the working space, or exposed energized electrical conductors or circuit parts on both sides of the work space that are effectively guarded by insulating material. According to the OSHA Electrical Standard (29 CFR 1910.303), insulated wire or insulated bus-bars operating at not over 300 volts are not considered energized electrical conductors or circuit parts.

b Exposed energized electrical conductors or circuit parts on one side of the working space and grounded parts on the other side of the working space. Concrete, brick, or

tile walls shall be considered as grounded.

c Exposed energized electrical conductors or circuit parts on both sides of the workspace [not guarded as provided in Condition a] with the operator between.

5.4 Inspection, Evaluation and Maintenance

5.4.1 Safety Related Maintenance

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

Note: Installations that comply with the NEC, that meet the installation instructions of the equipment manufacturer and that are maintained appropriately are considered safe when operating normally. However, when electrical equipment changes state, such as being switched from energized to de-energized or vice versa; an overload relay is reset; a door is opened or closed; a circuit breaker is reset; or other condition where physical movement occurs, the result might be an initiation of an arcing fault. Depending on the state and condition of the equipment and the functional circuit protective devices, an employee could be exposed to this arcing fault.

If there is a defect or evidence of damage that might expose an employee to injury, the defective or damaged item must be removed from service, and no employee may use it until repairs and tests necessary to render the equipment safe have been made. If the equipment is not owned by Arcadis, Project Management shall notify the client/owner of the need to remove equipment from service and that Arcadis employees/subcontractors will not work on/around the equipment until the equipment is made safe.

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

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

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

5.4.2 Disconnecting and Over-current Protection Requirements

All circuits are protected from over-current conditions based upon the current-carrying capacity of the conductors being used.

Note: The only grounded conductor that can be opened without opening all other phase conductors is the control circuit neutral of a starter via an auxiliary contact of the overload but only if the overload relay and motor contactor are in the same enclosure.

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

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

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

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

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

Maintenance, tests and inspection of overcurrent protective devices must be documented.

5.4.3 Grounding Requirements

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

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

NEC 250.52(A)(5) states: “Rods and pipe electrodes shall not be less than 2.44 m (8 ft.) in length.”

NEC 250.52(A) (5)(b) states, “Grounding electrodes of stainless steel and copper or zinc coated steel shall be at least 15.87 mm (5/8 in.) in diameter, unless listed.”

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

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

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

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

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

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

All portable tools, lights, or devices utilize three-conductor, grounded cord-sets unless protected by an approved system of double insulation. All temporary 120-volt, single phase, 15-, 20- and 30-ampere receptacles are installed with Ground Fault Circuit Interrupters (GFCI) for personal protection. GFCI receptacles shall be tested to ensure proper operation. If the test button does not trip the receptacle, a portable in-line GFCI protective device shall be used.

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

5.4.4 Temporary Wiring Requirements

As required by NEC and/or local code requirements, a certified, licensed electrician must install temporary wiring.

Any portable lighting units will have a protective guard surrounding the light bulb.

Spent light bulbs are replaced promptly and disposed of according to federal, state, provincial, local jurisdiction, or client requirements.

No exposed or empty sockets are permitted.

If any receptacles are required for use in wet locations, they are contained in a weatherproof enclosure. The integrity of the weatherproof enclosure is not affected when a plug is inserted.

Extension cords are not fastened with staples, hung from nails, or suspended by wire.

Temporary light strings are not suspended by their cords unless specifically designed for that purpose. Each lamp is equipped with a suitable guard.

All temporary lighting exposed to wet or hazardous conditions in confined spaces are operated at a maximum of 12 volts and protected by an approved switch near the entrance to interrupt the power in the event of an emergency.

Extension cords are placed so as not to be damaged by sharp objects, moving equipment, or excessive heat.

Note: Multiple extension cords should not be used to extend the overall length. An extension cord current rating is based on the cord's length. A short cord will have smaller conductors for a given current rating than a longer cord of the same current rating. This is due to the impedance of the conductor. A shorter cord has less impedance. The manufacturer picks a conductor size at the cord length that when the rated current is applied to the cord, the voltage drop is insignificant. If the cord is extended by plugging in another cord, the impedance goes up and in order to have no appreciable voltage drop, the current, must be less. If the same current were applied to the extended cord, it could overheat. Therefore, a cord should be selected with the length needed for the current rating needed. Longer cords for a given current rating have larger conductors than shorter cords for the same current rating.

Connectors are placed above ground and protected from water, and cords are either suspended above walkways or covered to eliminate tripping hazards and protect the cord from damage.

Cords are not suspended by conductive material.

All cord sets used in wet locations will have approved plugs molded to the cord insulation, and all receptacles used in wet locations are contained in a weatherproof enclosure that is not affected when a cord-set is inserted.

5.5 Safety Requirements for Special Equipment

5.5.1 Portable and Vehicle-mounted Generators

The frame of a portable generator need not be grounded and may serve as the grounding electrode for a system supplied by the generator under the following conditions:

- The generator supplies only equipment mounted on the generator and/or cord- and plug-connected equipment through receptacles mounted on the generator; and
- The noncurrent-carrying metal parts of equipment and the equipment grounding conductor terminals of the receptacles are bonded to the generator frame.

The frame of a vehicle may serve as the grounding electrode for a system supplied by a generator located on the vehicle when all of the following conditions are met:

- The frame of the generator is bonded to the vehicle frame;
- The generator supplies only equipment located on the vehicle and/or cord- and plug-connected equipment through receptacles mounted on the vehicle or on the generator;
- The noncurrent-carrying metal parts of equipment and the equipment grounding conductor terminals of the receptacles are bonded to the generator frame; and

- The system complies with all other provisions of the OSHA wiring, design and protection.

Only the receptacles (plug sockets) mounted on the generator or vehicle are used to provide power to cord connected tools or equipment.

Generators greater than 5kW single phase shall have a connection to ground (earth).

125V, 15A and 20A receptacles on portable generators must be provided with GFCI protection. Generators manufactured before January 1, 2015 may use a portable GFCI to provide the protection. Under certain instances, OSHA regulations do not require GFCI's on a generator. The generator must meet all three of the following conditions to qualify for the GFCI exemption:

1. The generator must be two-wire, single phase;

2. The generator must not be over 5 kW; and

3. The circuit wires must not be connected to the generator frame, case or other grounded surfaces.

However, this GFCI exemption was removed in the 2002 Edition of the National Electrical Code. As a result, local electrical inspectors, as the "Authorities Having Jurisdiction" will no longer accept the OSHA GFCI exemption and will require the use of GFCI's on portable generators.

5.6 Auditing and Evaluation

The project electrical safety program will be audited using the Task Improvement Process (TIP) Observations or similar to help ensure that the principles and procedures of the electrical safety program are being followed. The frequency of audit shall be determined by Project Managers, based on the complexity of the procedures and the type of work being covered. Where the audit determines that the principles and procedures of the electrical safety program are not being followed, appropriate corrective actions/revisions will be made.

Arcadis shall determine, through regular supervision or through inspections conducted on at least an annual basis (TIP observation), that each employee is complying with the safety-related work practices required and outlined in this HSS and detailed in the Job Safety Plan.

6. TRAINING

The training requirements contained in this section shall apply to employees exposed to an electrical hazard when the risk associated with that hazard is not reduced to a safe level by the applicable electrical installation requirements. Such employees shall be trained to understand the specific hazards associated with electrical energy. They shall be trained in safety-related work practices and procedural requirements, as necessary, to provide protection from the electrical hazards associated with their respective job or task assignments. Employees shall be trained to identify and understand the relationship between electrical hazards and possible injury.

The training required by this section shall be approved by Corporate H&S and includes classroom, online, or on-the-job, or a combination of these. The type and extent of the training provided shall be determined by the risk to the employee. Qualified Person electrical training shall be classroom and/or on-the-job type training. The training may involve some customization to reflect the scope of work performed within project or type of equipment (e.g. PCL cabinets, etc.).

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

6.1 Unqualified Person

Unqualified employees who work around electrical hazards but do not work within the Limited Approach Boundary of energized electrical conductors or circuit parts operating at 50 volts or more, must understand the hazards and shall be trained in, and be familiar with, any electrical safety related practices necessary for their safety, including information about compliance with the Limited Approach Boundaries for shock protection. This will be accomplished by the Unqualified Person receiving electrical awareness training, referencing task specific JSA, being provided site specific instruction, and use of the TRACK process.

6.2 Qualified Person

A Qualified Person shall be trained and knowledgeable of the construction and operation of equipment or a specific work method and be trained to recognize and avoid the electrical hazards that might be present with respect to that equipment or work method.

A Qualified Person shall also be familiar with the proper use of the special precautionary techniques; applicable electrical policies and procedures, PPE, insulating and shielding materials; and insulated tools and test equipment. A person can be considered qualified with respect to certain equipment and methods but still be unqualified for others.

Employees shall be authorized by Corporate H&S to take the Qualified Person training curriculum:

- Completion of the NFPA 70E Qualified Person evaluation with Corporate H&S approval, includes:
    - Review of electrical experience
    - Confirmation of completion of LO/TO Authorized Person
    - Confirmation of Valid First Aid/CPR training;
- Completion of a 2 or 3-day NFPA 70E Classroom course as determined by Corporate H&S;
- Confirm that the following have been completed:
    - Review of the Electrical Safety Standard
    - Job Safety Plan consisting of the following:

        - Electrical Task Hazard Assessment Worksheet (THA) (Exhibit 2)
        - Job Safety Analysis (JSA)
        - Written LO/TO procedures, where required
        - Energized Electrical Work Permit (Exhibit 3), where required and;
    - Participate in an electrically-related TIP as the Observee

Then, based on successfully completing the Qualified Electrical training curriculum, employees will be qualified to work on energized electrical conductors or circuit parts up to 600 volts. No Arcadis employee may work on energized electrical conductors or circuit parts or installs electrical equipment that requires electrical power source of equal to or greater than 600 volts, unless appropriately qualified for the specified task and approved by Arcadis Corporate H&S.

Qualified Persons permitted to work within the Limited Approach Boundary of exposed energized electrical conductors and circuit parts operating at 50 volts or more shall, at a minimum, be additionally trained in all of the following:

- Skills and techniques necessary to distinguish exposed energized electrical conductors and circuit parts from other parts of electrical equipment.
- Skills and techniques necessary to determine the nominal voltage of exposed electrical conductors and circuit parts.
- Approach distances specified in Exhibit 6 and Exhibit 7 and the corresponding voltages to which the Qualified Person will be exposed.
- Decision-making process necessary to be able to do the following:
    - Perform the job safety planning
    - Identify electrical hazards
    - Assess the associated risk
    - Select the appropriate risk control methods from the hierarchy of controls identified in Arcadis Industrial Hygiene Health and Safety Standard (ARC HSIH009) including elimination, substitution, engineering controls, awareness, administrative controls and personal protective equipment

Employees shall be trained to select an appropriate test instrument and shall demonstrate how to use a device to verify the absence of voltage, including interpretation indications provided by the device. The training shall include information that enables the employee to understand all limitations of each specific test instrument that might be used.

Tasks that are performed less often than once per year shall require on-the-job retraining before the performance of the work practices involved and the employee shall participate as an Observee in a documented TIP.

Arcadis shall determine, through regular supervision or through inspections conducted on at least an annual basis (TIP observation), that each employee is complying with the safety-related work practices required and outlined in this HSS and detailed in the Job Safety Plan.

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

Note: In addition, this standard applies to Infrastructure staff that provides oversight of System/Electrical Installs. There will be situations where engineers and/or construction oversight personnel will need to be within the arc flash boundary to perform inspections/oversight of work completed by subcontractors or Qualified Personnel. These staff will need the NFPA 70E training as well and must wear all appropriate PPE as outlined within this HSS and NFPA 70E.

Note: Arcadis Electrical Qualified Persons are qualified to work on energized power systems and controls up to 600 volts providing an Energized Electrical Work Permit is completed (excluding troubleshooting activities) and approved and appropriate PPE and safe work practices are employed. This includes motor controls, switchgear and variable frequency drives of 600 volts or less.

6.3 Emergency Procedures Training

6.3.1 Contact Release

Employees exposed to shock hazards and those employees responsible for taking action in case of emergency shall be trained in methods of the safe release of victims from contact with exposed energized electrical conductors or circuit parts. Refresher training on this topic shall occur annually.

6.3.2 First Aid, Emergency Response and Resuscitation

Employees designated to respond to medical emergencies shall be trained in first aid and emergency procedures. Employees responsible for responding to medical emergencies shall be trained in first aid and emergency procedures, cardiopulmonary resuscitation (CPR) and in the use of automatic external defibrillator (AED), if the Arcadis Emergency Response plan includes the use of an AED. Refresher training for Qualified Electrical staff shall occur on a bi-annual (every two year) basis.

6.4 Retraining

Retraining of Qualified Persons in safety-related work practices and applicable changes in this standard shall be performed at intervals not to exceed three (3) years. Employee(s) shall receive additional training (or retraining) if any of the following conditions exists:

- If the supervisor or during annual assessment inspection (TIP observation) indicate that the employee is not complying with the safety-related work practices.

- If new technology, new types of equipment, or changes in procedures necessitate the use of safety-related work practices that are different from those that the employee would normally use.

- If employee must employ safety-related work practices that are not normally used during his or her regular job duties.

Retraining includes but is not limited to on-the-job training, classroom or online instruction or a combination of both.

6.5 Training Documentation

Arcadis shall document that each employee has received the appropriate level of electrical safety training. Arcadis electrical Qualified Persons will not be added to the Qualified Persons list until an employee has successfully completed the Qualified Electrical training curriculum.

The training documentation shall contain the content of the training, each employee's name, and dates of training along with the evaluation form completed by Corporate H&S or designee.

7. REFERENCES

NFPA 70 National Electric Code

NFPA 70B Recommended Practice for Electrical Equipment Maintenance

NFPA 70E: Standard for Electrical Safety in the Workplace

OSHA 29 CFR 1910 Subpart S – Electrical and 29 CFR 1926 Subpart K – Electrical

ARC HSCS005 Heavy and Mechanized Equipment

ARC HSFS004 Control of Hazardous Energy Procedure

ARC HSFS019 Utility Location Procedures

ARC HSIH009 Industrial Hygiene

Arcadis Legal File Retention Policy

8. RECORDS - DATA RECORDING AND MANAGEMENT

During on-site activities, the Job Safety Plan consisting of the HASP, JSAs, THA(s) and Energized Electrical Work Permit must be present at the site. The Job Safety Plan will be maintained in the applicable project files per the Arcadis Legal File Retention Policy and/or the client contract, which may be more stringent.

Qualified Person training records will be stored in the Learning Center and maintained for the duration of the employee's employment at Arcadis.

Project-specific electrical safety program audits will be completed through the TIP process and entered into the 4-Sight database.

9. APPROVALS AND HISTORY OF CHANGE

Approved by: Julie Santaniello, CSP – Corporate H&S, Manager of Technical Programs

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
26 March 2007	01	Mike Thomas/Pat Vollertsen	Original document
28 June 2007	02	Mike Thomas/Pat Vollertsen	Enhanced for regulatory requirement additions
6 September 2007	03	Mike Thomas/Pat Vollertsen	Changing over to new template format
25 February 2008	04	Sue Byers	Template change
10 March 2009	05	Mike Thomas/Mija Coppola	Modified to address elements of NFPA 70E and based on review of procedure. Process improvements
6 September 2010	06	Tony Tremblay/Mija Coppola	Changed author from Mike Thomas to Tony Tremblay. Electrical Task Hazard Assessment Sheets inserted; NFPA 70E reference tables added; Energized Electrical Work Permit requirement clarified; Grounding Rod information added; LO/TO program reference included; Tagging of defective equipment language added; Reference to hand/power tools HS Standard added; Level III Qualified Electrical person definition modified; Volt Meter Specific Information added.
14 April 2011	07	Tony Tremblay	Section 5.8 Program Auditing added and clarified use of NFPA 70E compliant labels on equipment

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
30 March 2012	08	Tony Tremblay	Update Standard to be compliant with NFPA 70E 2012; Updates to definitions; specifically include inspection activities as included in electrical hazard activities; eliminate use of the term “live electrical” and replace with energized electrical conductors and circuit parts; Insert labeling language; reformat section 5; Insert shock boundary and arc flash boundary information; Revise Task Hazard Analysis sheets
12 February 2013	09	Amanda Tine/Tony Tremblay	Added references to utility clearance standard regarding minimum clearance distances when working around overhead power lines; Section 5.3.numbering corrected; Clarified that when working on or near exposed de-energized parts, including the task of testing for the absence of voltage, they are to be treated as energized until proven otherwise; clarified that safe approach distances for both Qualified and Unqualified staff are detailed in Exhibit 5 Tables 5A and 5B.
5 March 2014	10	Tony Tremblay	Header/Footer format updated; History of change table reformatted to track party responsible for revisions; Corrected Exhibit 8 hyperlink to THA for Panelboards Rated at 240 Volts or Less - Working on Energized Electrical Conductors and Circuit Parts, Including Voltage Testing

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
7 April 2015	11	Andrew McDonald/Tony Tremblay	NFPA 70E_2015 revisions – work shoes replaced by footwear; arc flash risk assessment replaces arc flash hazard analysis; shock risk assessment replaces shock hazard analysis; electrical hazard risk assessment replaces electrical hazard analysis; arc flash PPE category replaces hazard/risk category (HRC); all references to HRC deleted; Added *safety related maintenance requirements and other administrative controls* to the Scope; In the not covered by standard section, deleted outdated reference to Installations underground in mines and self-propelled mobile surface mining machinery and its attendant electrical trailing cable (MSHA has determined that *NFPA 70E* applies to the mining industry workplace); Section 2.2.1 Conditions Providing Acceptable Risk added; Work Related Activities not covered by HSS placed into Section 2.2.2; Section 5.3.11 Alerting Techniques and Section 5.3.12 Portable and Vehicle-Mounted Generators added ; Section 6 training and retraining clarified; definition updates including removal of Prohibited Approach Boundary definition; Exhibit 3, 5, 6 and 8 revised
20 April 2015	12	Pat Vollertsen	Added additional information to section 6.3 in regard to what is required to be a Qualified Individual
14 November 2017	13	Julie Santaniello	Fixed NEC 250.52(A)(5)(b) reference in Section 5.4.2.
2 March 2018	14	David Kobe/Julie Santaniello	Added reference to Heavy & Mechanized Equipment HSS in Section 5.3.2. Clarified markings on PPE and requirement to remove from service if defective or damaged in Section 5.3.6. Added Section 5.3.12 Termination of Work. Updated approver to Julie Santaniello.

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
	15	Andrew McDonald/ Julie Santaniello	Removed LOTO language added references to the Control of Hazardous Energy HSS. Rearranged sections to align more closely with NFPA 70E format. Added Qualified Person and Unqualified Person roles to Section 4. “Job Safety Plan” new term that refers to all plans and permits required for the task. NFPA 70E 2018 revisions: risk assessment requirements (human factors & emphasis on hierarchy of risk controls), updated THA template.

Exhibit 1 – Definitions

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

Accessible –

- **As applied to equipment** – Admitting close approach; not guarded by locked doors, elevation, or other effective means.
- **As applied to wiring methods** – Capable of being removed or exposed without damaging the building structure or finish or not permanently closed in by the structure or finish of the building.
- **Readily (Readily Accessible)** – Capable of being reached quickly for operation, renewal, or inspections without requiring those to whom ready access is requisite to take actions such as to use tools (other than keys), to climb over or under, to remove obstacles, or to resort to portable ladders, and so forth.

Arc Flash Hazard – A source of possible injury or damage to health associated with the release of energy caused by an electric arc.

The likelihood of occurrence of an arc flash incident increases when energized electrical conductors or circuit parts are exposed or when they are within equipment in a guarded or enclosed condition, provided a person is interacting with the equipment in such a manner that could cause an electric arc. An arc flash incident is not likely to occur under normal operating conditions when enclosed energized equipment has been properly installed and maintained. See 2018 NFPA 70E Table 130.5(C) for examples of tasks that increase the likelihood of an arc flash incident occurring.

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

Arc Flash Suit – A complete arc-rated clothing and equipment system that covers the entire body, except for the hands and feet. An arc flash suit may include pants or overalls, a jacket or a coverall, and beekeeper-type hood fitted with a face shield.

Arc Rating - The value attributed to materials that describes their performance to exposure to an electrical arc discharge. The Arc Rating is expressed in cal/cm^2 and is derived from the determined value of the arc thermal performance value (ATPV) or energy of breakopen threshold (E_{BT}) (should a material system exhibit a breakopen response below the ATPV value). Arc Rating is reported as either ATPV or E_{BT}, whichever is the lower value.

Note 1: Arc-rated clothing or equipment indicates that it has been tested for an exposure to an electrical arc. Flame Resistant (FR) clothing without an arc rating has not been tested for exposure to an electrical arc. All arc-rated clothing is also flame-resistant.

Note 2: Breakopen is a material response evidenced by the formation of one or more holes in the innermost layer of arc rated material that would allow for flame to pass through the material.

Note 3: ATPV is defined in ASTM F1959/F1959M, *Standard Test Method for Determining the Arc Rating of Materials for Clothing*, as the incident energy (cal/cm^2) on a material or a multi-layer system of materials that results in 50 percent probability that sufficient heat transfer

through the tested specimen is predicted to cause the onset of second degree skin burn injury based on the Stoll curve, cal/cm^2.

Note 4: E_{BT}, is defined in ASTM F1959/F1959M, *Standard Test Method for Determining the Arc Rating of Materials for Clothing*, as the incident energy (cal/cm^2) on a material or a multi-layer system of materials that results in 50 percent probability of breakopen. Breakopen is defined as a hole with an area of 1.6 cm^2 (0.5 in^2) or an opening of 2.5 cm (1.0 in) in any dimension.

Bonded (Bonding) - Connected to establish electrical continuity and conductivity. Bonding is establishing an electrical connection between conductive elements of an electrical installation. Bonding does not necessarily rely on the presence of a ground connection.

Boundary, Arc Flash – When an arc flash hazard exists, an approach limit from an arc source at which incident energy equals 1.2 cal/cm^2 (5 J/cm^2).

Note: According to the Stoll skin burn injury model, the onset of a second degree burn on unprotected skin is likely to occur at an exposure of 1.2 cal/cm^2 (5 J/cm^2) for one second.

The Arc Flash Boundary is the boundary determined either through calculation or through the use of Exhibit 4 & Exhibit 5, which separates an area in which a person is potentially exposed to a second-degree burn injury from an area in which the potential for injury does not include a second-degree burn. All body parts closer to an arc flash hazard than the arc flash boundary must be protected from the potential thermal effects of the hazard. The Arc Flash Boundary is established at the point where the amount of incident energy that an employee could be exposed to is 1.2 cal/cm^2 or greater. If the incident energy is less than 1.2 cal/cm^2, burns could occur, but they will not be second-degree or worse.

Boundary, Limited Approach – An approach limit at a distance from an exposed energized electrical conductor or circuit part within which a shock hazard exists. The Limited Approach Boundary is not related to arc flash or incident energy. The Limited Approach Boundary is a shock protection boundary intended to define the approach limit for unqualified employees and to eliminate the risk of contact with an exposed energized electrical conductor. The limited approach boundary is the closest approach distance for an *unqualified* employee, unless additional protective measures are used. When an employee, including the longest conductive object being handled by the employee, is closer than this minimum distance, special considerations are necessary for protection.

Boundary, Restricted Approach – An approach limit at a distance from an exposed energized electrical conductor or circuit part within which there is an increased likelihood of electric shock, due to electrical arc-over combined with inadvertent movement, for personnel working in close proximity to the energized electrical conductor or circuit part. Restricted Approach Boundaries may be found in Exhibit 6 & Exhibit 7. This shock protection boundary is the approach limit for qualified employees. The arc flash boundary may be greater than, less than, or equal to the restricted approach boundary. A qualified employee required to cross the restricted approach boundary must be protected from unexpected contact with the conductors or circuit parts that are energized and exposed.

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

Certified - Equipment is "certified" if it (a) has been tested and found by a nationally recognized testing laboratory (e.g. UL certified) to meet nationally recognized standards or to be safe for use

in a specified manner, or (b) is of a kind whose production is periodically inspected by a nationally recognized testing laboratory, and (c) it bears a label, tag, or other record of certification.

Circuit breaker - A device designed to open and close a circuit by non-automatic means and to open the circuit automatically on a predetermined overcurrent without damage to itself when properly applied within its rating. The automatic opening means can be integral, direct acting with the circuit breaker, or remote from the circuit breaker.

Conductor

- **Bare** - A conductor having no covering or electrical insulation whatsoever.
- **Covered** - A conductor encased within material of composition or thickness that is not recognized by NFPA 70E as electrical insulation.
- **Insulated** - A conductor encased within material of composition and thickness that is recognized by NFPA 70E as electrical insulation.

De-energized - Free from any electrical connection to a source of potential difference and from electrical charge; not having a potential different from that of the earth. The term de-energized describes an operating condition of electrical equipment. De-energized does not describe a safe condition.

Device - A unit of an electrical system, other than a conductor, that carries or controls electric energy as its principal function.

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

Electrical Hazard – A dangerous condition such that contact or equipment failure can result in electric shock, arc flash burn, thermal burn, or arc blast injury.

Note: Class 2 power supplies, listed low-voltage lighting systems, and similar sources are examples of circuits or systems that are not considered an electrical hazard.

Electrically Safe Work Condition – A state in which an electrical conductor or circuit part has been disconnected from energized parts, locked/tagged in accordance with AUS Control of Hazardous Energy (Lockout/Tagout) Standard (ARC HSFS004), tested to verify the absence of voltage, and if necessary, temporarily grounded for personal protection.

Note: Establishing an Electrically Safe Work Condition is the only work practice that ensures that an electrical injury cannot occur. However, workers should recognize that operating disconnecting means and verifying absence of voltage might in themselves be hazardous work tasks. Until the electrically safe work condition exists, a risk of injury from electrical energy exists.

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

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

Energized - Electrically connected to, or is, a source of voltage.

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

Exposed –

- **As applied to energized electrical conductors or circuit parts -** Capable of being inadvertently touched or approached nearer than a safe distance by a person. It is applied to electrical conductors or circuit parts that are not suitably guarded, isolated, or insulated.

Note: Conductors that are unguarded and/or uninsulated are considered to be exposed. Some electrical equipment contains conductors that are uncovered and guarded only by the enclosure. If the equipment has ventilation openings, wires and tools, for example, could be inserted through ventilation opening and come into contact with an energized conductor, therefore, the level of exposure is determined based on the situation/task and the associated tools and equipment.

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

Ground – The Earth.

Grounded (Grounding) – Connected (connecting) to ground or to a conductive body that extends the ground connection.

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

Ground-Fault Circuit-Interrupter (GFCI) - A device intended for the protection of personnel that functions to deenergize a circuit or portion thereof within an established period of time when a current to ground exceeds the values established for a Class A device.

Note: Class A ground-fault-circuit-interrupters trip when the current to ground is 6 mA or higher and do not trip when the current to ground is less than 4 mA. For further information, refer to ANSI/UL 943, *Standard for Ground Fault Circuit Interrupters.*

Grounding conductor, **equipment** (**EGC)-** The conductive paths that provide a ground-fault current path and connects normally non-current-carrying metal parts of equipment together and to the system grounded conductor or to the grounding electrode conductor, or both.

Note 1: It is also recognized that the equipment grounding conductor also performs bonding.

Note 2: See NFPA 70, National Electrical Code, for a list of acceptable equipment grounding conductors.

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

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

Hazard – A source of possible injury or damage to health.

Hazardous – Involving exposure to at least one hazard.

Impending Failure - Such as arcing, overheating, loose equipment parts, visible damage, unusual noises or odor, or deterioration of condition.

Incident Energy – The amount of thermal energy impressed on a surface, a certain distance from the source, generated during an electrical arc event. Incident energy is typically expressed in calories per square centimeter (cal/cm^2).

Insulated – Separated from other conducting surfaces by a dielectric (including air space) offering a high resistance to the passage of current.

Note: When an object is said to be insulated, it is understood to be insulated for the conditions to which it is normally subject. Otherwise, it is, within the purpose of these rules, uninsulated.

Isolated (as applied to location) - Not readily accessible to persons unless special means for access are used.

Labeled - Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

Note: Motor control center label showing a third-party identifying mark

Listed - Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or services meets appropriate designated standards or has been tested and found suitable for a specified purpose.

Motor Control Center – An assembly of one or more enclosed sections having a common power bus and principally containing motor control units. A motor control center typically contains starters, disconnect switches, power panels, solid-state drives, and similar components.

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

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

Overload - Operation of equipment in excess of normal, full-load rating, or of a conductor in excess of rated ampacity that, when it persists for a sufficient length of time, would cause damage or dangerous overheating. A fault, such as a short circuit or ground fault, is not an overload.

Panelboard - A single panel or group of panel units designed for assembly in the form of a single panel; including buses, automatic overcurrent devices, and with or without switches for the control of light, heat, or power circuits; designed to be placed in a cabinet or cutout box placed in or against a wall, partition or other support, and accessible only from the front.

Qualified Person - One who has demonstrated skills and knowledge related to the construction and operation of electrical equipment and installations and has received safety training to identify the hazards and reduce the associated risk.

Whether an employee is considered to be a "qualified person" will depend upon various circumstances in the workplace. It is possible and, in fact, likely for an individual to be considered qualified" with regard to certain equipment in the workplace, but "unqualified" as to other equipment.

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

Risk - A combination of the likelihood of occurrence of injury or damage to health and the severity of injury or damage to health that results from a hazard.

Risk Assessment - An overall process that identifies hazards, estimates the likelihood of occurrence of injury or damage to health, estimates the potential severity of injury or damage to health, and determines if protective measures are required.

Note: As used in this HSS, *arc flash risk assessment* and *shock risk assessment* are types of risk assessments.

Service Point - The point of connection between the facilities of the serving utility and the premises wiring.

Note: The service point can be described as the point of demarcation between where the serving utility ends and the premises wiring begins. The serving utility generally specifies the location of the service point based on the conditions of service.

Shock Hazard - A source of possible injury or damage to health associated with current through the body caused by contact or approach to energized electrical conductors or circuit parts.

Note: Injury and damage to health resulting from shock is dependent on the magnitude of the electrical current, the power source frequency (e.g., 60 Hz, 50 Hz, dc), and the path and time duration of current through the body. The physiological reaction ranges from perception, muscular contractions, inability to let go, ventricular fibrillation, tissue burns, and death.

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

Switchgear, Metal-Clad - A switchgear assembly completely enclosed on all sides and top with sheet metal, having drawn out switching and interrupting devices, and all live parts enclosed within grounded metal compartments.

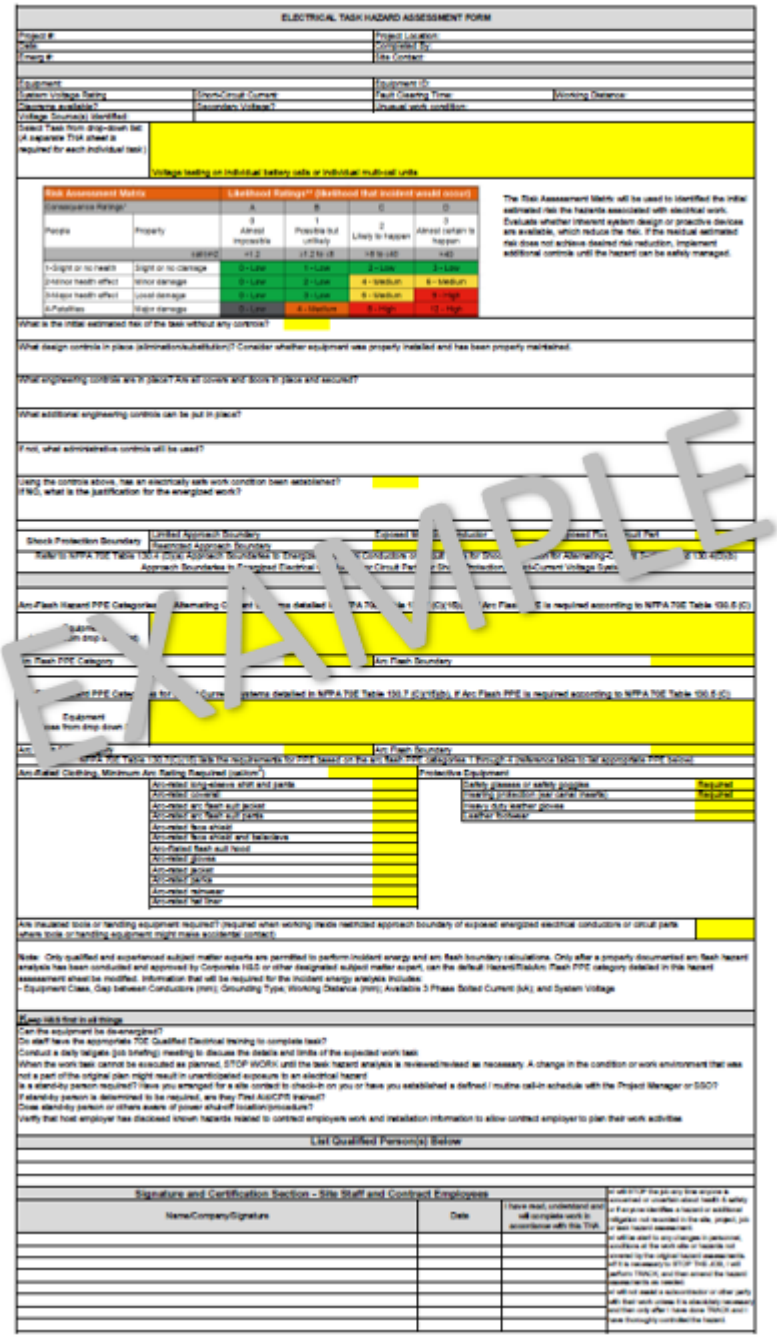
Switchgear, Metal-Enclosed - A switchgear assembly completely enclosed on all sides and top with sheet metal (except for ventilating openings and inspection windows), containing primary power circuit switching, interrupting devices, or both, with buses and connections. This assembly may include control and auxiliary devices. Access to the interior of the enclosure is provided by doors, removable covers, or both. Metal-enclosed switchgear is available in non-arc-resistant or arc-resistant constructions.

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

Working on (energized electrical conductors or circuit parts) -Intentionally coming in contact with energized electrical conductors or circuit parts with the hands, feet, or other body parts, with tools, probes, or with test equipment, regardless of the personal protective equipment a person is wearing. There are two categories of “working on”: *Diagnostic (testing)* is taking readings or measurements of electrical equipment with approved test equipment that does not require making any physical chance to the equipment; *repair* is any physical alteration of electrical equipment (such as making or tightening connections, removing or replacing components, etc.).

Exhibit 2 – Electrical Task Hazard Assessment Form

Link to Electrical Task Hazard Assessment form.



ELECTRICAL TASK HAZARD ASSESSMENT FORM

EXAMPLE

Exhibit 3 - Energized Electrical Work Permit

Link to Energized Electrical Work Permit.

Energized Electrical Work Permit

ARCADIS

Part 1. To be completed by the requester: Project Number:_____

(1) Description of circuit/equipment/job location:_____

(2) Description of work to be done:_____

(3) Justification of why the circuit/equipment cannot be de-energized or the work deferred until the next schedule outage:

_____

_____

_____

Requester Name /Title_____Date_____

Part 2. To be completed by the electrically Qualified Person(s) doing the work:

(1) Detailed Job Description procedure to be used in performing the above detailed work:_____

_____

_____

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

_____

(3) Results of the Shock Risk Assessment:

(a) Voltage to which personnel will be exposed:_____
(b) Limited Approach Boundary:_____
(c) Restricted Approach Boundary:_____
(d) Necessary shock personal and other PPE required to safely perform assigned task:_____

_____

(4) Results of the Arc Flash Risk Assessment:

(a) Available incident energy and working distance or arc flash PPE category:_____
(b) Arc Flash Boundary:_____
(c) Necessary arc flash personal and other PPE required to safely perform assigned task:_____

_____

(5) Means employed to restrict the access of Unqualified Persons from the work area:_____

_____

(6) Evidence of completion of a Job Briefing including discussion of any job-related hazards:_____

_____

(7) Do you agree the above described work can be done safely? ☐ Yes ☐ No (if No, return to the requester)

Electrically Qualified Person(s):_____Date:_____

Electrically Qualified Person(s):_____Date:_____

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

Project Management (Project or Task Manager):_____

Safety Manager:_____Electrically Knowledgeable Person:_____

Date:_____

Note: Once the work is complete, place into the Project Folder (electronic copy is acceptable) for review and retention.

Energized Electrical Work Permit

ARCADIS

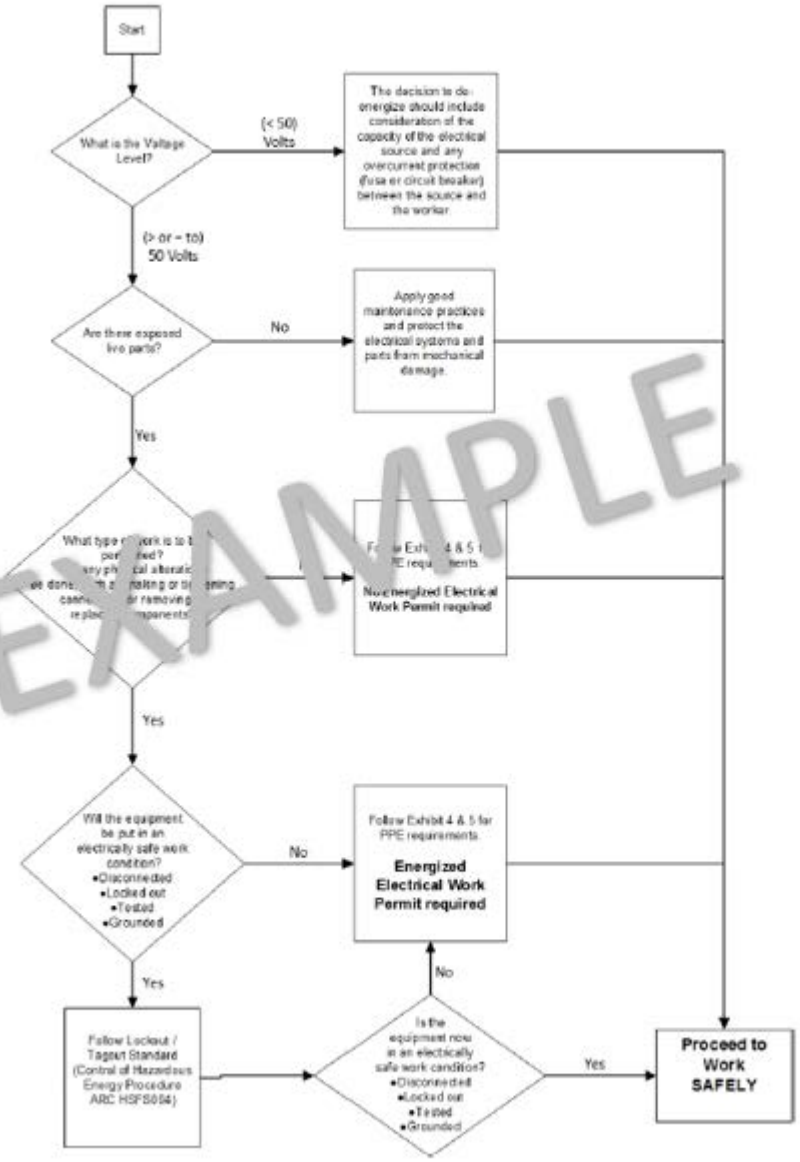


Exhibit 4 - Table 130.7(C)(15)(a) Arc-Flash PPE Categories for Alternating Current (ac) Systems

Table 130.7(C)(15)(a) Arc-Flash PPE Categories for Alternating Current (ac) Systems

Equipment	Arc-Flash PPE Category	Arc-Flash Boundary
Panelboards or other equipment rated 240 volts and below *Parameters: Maximum of 25 kA available fault current; maximum of 0.03 sec (2 cycles) fault clearing time; minimum working distance 455 mm (18 in.)*	1	485 mm (19 in.)
Panelboards or other equipment rated greater than 240 volts and up to 600 volts *Parameters: Maximum of 25 kA available fault current; maximum of 0.03 sec (2 cycles) fault clearing time; minimum working distance 455 mm (18 in.)*	2	900 mm (3 ft)
600-volt class motor control centers (MCCs) *Parameters: Maximum of 65 kA available fault current; maximum of 0.03 sec (2 cycles) fault clearing time; minimum working distance 455 mm (18 in.)*	2	1.5 m (5 ft)
600-volt class motor control centers (MCCs) *Parameters: Maximum of 42 kA available fault current; maximum of 0.33 sec (20 cycles) fault clearing time; minimum working distance 455 mm (18 in.)*	4	4.3 m (14 ft)
600-volt class switchgear (with power circuit breakers or fused switches) and 600-volt class switchboards *Parameters: Maximum of 35 kA available fault current; maximum of up to 0.5 sec (30 cycles) fault clearing time; minimum working distance 455 mm (18 in.)*	4	6 m (20 ft)
Other 600-volt class (277 volts through 600 volts, nominal) equipment *Parameters: Maximum of 65 kA available fault current; maximum of 0.03 sec (2 cycles) fault clearing time; minimum working distance 455 mm (18 in.)*	2	1.5 m (5 ft)
NEMA E2 (fused contactor) motor starters, 2.3 kV through 7.2 kV *Parameters: Maximum of 35 kA available fault current; maximum of up to 0.24 sec (15 cycles) fault clearing time; minimum working distance 910 mm (36 in.)*	4	12 m (40 ft)
Metal-clad switchgear, 1 kV through 15 kV *Parameters: Maximum of 35 kA available fault current; maximum of up to 0.24 sec (15 cycles) fault clearing time; minimum working distance 910 mm (36 in.)*	4	12 m (40 ft)
Arc-resistant switchgear 1 kV through 15 kV [for clearing times of less than 0.5 sec (30 cycles) with an available fault current not to exceed the arc-resistant rating of the equipment], and metal-enclosed interrupter switchgear, fused or unfused of arc- resistant-type construction, 1 kV through 15 kV *Parameters: Maximum of 35 kA available fault current; maximum of up to 0.24 sec (15 cycles) fault clearing time; minimum working distance 910 mm (36 in.)*	N/A (doors closed) 4 (doors open)	N/A (doors closed) 12 m (40 ft) [doors open]
Other equipment 1 kV through 15 kV *Parameters: Maximum of 35 kA available fault current; maximum of up to 0.24 sec (15 cycles) fault clearing time; minimum working distance 910 mm (36 in.)*	4	12 m (40 ft)

Note: For equipment rated 600 volts and below and protected by upstream current-limiting fuses or current-limiting circuit breakers sized at 200 amperes or less, the arc flash PPE category can be reduced by one number but not below arc flash PPE category 1.

Informational Note to Table 130.7(C)(15)(a): The following are typical fault clearing times of overcurrent protective devices:

(1) 0.5 cycle fault clearing time is typical for current limiting fuses when the fault current is within the current limiting range.

(2) 1.5 cycle fault clearing time is typical for molded case circuit breakers rated less than 1000 volts with an instantaneous integral trip.

(3) 3.0 cycle fault clearing time is typical for insulated case circuit breakers rated less than 1000 volts with an instantaneous integral trip or relay operated trip.
(4) 5.0 cycle fault clearing time is typical for relay operated circuit breakers rated 1 kV to 35 kV when the relay operates in the instantaneous range (i.e., "no intentional delay").

(5) 20 cycle fault clearing time is typical for low-voltage power and insulated case circuit breakers with a short time fault clearing delay for motor inrush.

(6) 30 cycle fault clearing time is typical for low-voltage power and insulated case circuit breakers with a short time fault clearing delay without instantaneous trip.

Informational Note No. 1: See Table 1 of IEEE 1584TM, *Guide for Performing Arc Flash Hazard Calculations*, for further information regarding Notes b through d.

Informational Note No. 2: An example of a standard that provides information for arc-resistant switchgear referred to in Table 130.7(C)(15)(a) is IEEE C37.20.7, Guide for Testing Metal-Enclosed Switchgear Rated Up to 38 kV for Internal Arcing Faults.

Exhibit 5 - Table 130.7(C)(15)(b) Arc-Flash PPE Categories for Direct Current (dc) Systems

Table 130.7(C)(15)(b) Arc-Flash PPE Categories for Direct Current (dc) Systems

Equipment	Arc-Flash PPE Category	Arc-Flash Boundary
Storage batteries, dc switchboards, and other dc supply sources *Parameters: Greater than or equal to 100 V and less than or equal to 250 V* *Maximum arc duration and minimum working distance: 2 sec @ 455 mm (18 in.)*	--	--
Available fault current less than 4 kA	2	900 mm (3 ft)
Available fault current greater than or equal to 4 kA and less than 7 kA	2	1.2 m (4 ft)
Available fault current greater than or equal to 7 kA and less than 15 kA	3	1.8 m (6 ft)
Storage batteries, dc switchboards, and other dc supply sources *Parameters: Greater than 250 V and less than or equal to 600 V Maximum arc duration and minimum working distance: 2 sec @ 455 mm (18 in.)*	--	--
Available fault current less than 1.5 kA	2	900 mm (3 ft)
Available fault current greater than or equal to 1.5 kA and less than 3 kA	2	1.2 m (4 ft)
Available fault current greater than or equal to 3 kA and less than 7 kA	3	1.8 m (6 ft)
Available fault current greater than or equal to 7 kA and less than 10 kA	4	2.5 m (8 ft)

Notes

(1) Apparel that can be expected to be exposed to electrolyte must meet both of the following conditions:

(1a) Be evaluated for electrolyte protection

Informational Note: ASTM F1296, *Standard Guide for Evaluating Chemical Protective Clothing*, contains information on evaluating apparel for protection from electrolyte.

(1b) Be arc-rated

Informational Note: ASTM F1891, *Standard Specifications for Arc Rated and Flame Resistant Rainwear*, contains information on evaluating arc-rated apparel.

(2) A two-second arc duration is assumed if there is no overcurrent protective device (OCPD) or if the fault clearing time is not known. If the fault clearing time is known and is less than 2 seconds, an incident energy analysis could provide a more representative result.

Informational Note No. 1: When determining available fault current, the effects of cables and any other impedances in the circuit should be included. Power system modeling is the best method to determine the available short-circuit current at the point of the arc. Battery cell short-circuit current can be obtained from the battery manufacturer. See Informative Annex D.5 for the basis for table values and alternative methods to determine dc incident energy. Methods should be used with good engineering judgment.

Informational Note No. 2: The methods for estimating the dc arc-flash incident energy that were used to determine the categories for this table are based on open-air incident energy calculations. Open-air calculations were used because many battery systems and other dc process systems are in open areas or rooms. If the specific task is within an enclosure, it would be prudent to consider additional PPE protection beyond the value shown in this table. Research with ac arc flash has shown a multiplier of as much as 3× for arc-in-a-box [508 mm (20 in.) cube] versus open air. Engineering judgment is necessary when reviewing the specific conditions of the equipment and task to be performed, including the dimensions of the enclosure and the working distance involved.

Exhibit 6 - Table 130.4(D)(a) Shock Protection Approach Boundaries to Exposed Energized Electrical Conductors or Circuit Parts for Alternating-Current Systems

Table 130.4(D)(a) Shock Protection Approach Boundaries to Exposed Energized Electrical Conductors or Circuit Parts for Alternating-Current Systems

(1)	(2)	(3)	(4)
Nominal System Voltage Range, Phase to Phase[a]	**Limited Approach Boundary[b]**		**Restricted Approach Boundary[b]; Includes Inadvertent Movement Adder**
	Exposed Movable Conductor[c]	Exposed Fixed Circuit Part	
Less than 50 V	Not specified	Not specified	Not specified
50 V–150 V[d]	3.0 m (10 ft 0 in.)	1.0 m (3 ft 6 in.)	Avoid contact
151 V–750 V	3.0 m (10 ft 0 in.)	1.0 m (3 ft 6 in.)	0.3 m (1 ft 0 in.)
751 V–15 kV	3.0 m (10 ft 0 in.)	1.5 m (5 ft 0 in.)	0.7 m (2 ft 2 in.)
15.1 kV–36 kV	3.0 m (10 ft 0 in.)	1.8 m (6 ft 0 in.)	0.8 m (2 ft 9 in.)
36.1 kV–46 kV	3.0 m (10 ft 0 in.)	2.5 m (8 ft 0 in.)	0.8 m (2 ft 9 in.)
46.1 kV–72.5 kV	3.0 m (10 ft 0 in.)	2.5 m (8 ft 0 in.)	1.0 m (3 ft 6 in.)
72.6 kV–121 kV	3.3 m (10 ft 8 in.)	2.5 m (8 ft 0 in.)	1.0 m (3 ft 6 in.)
138 kV–145 kV	3.4 m (11 ft 0 in.)	3.0 m (10 ft 0 in.)	1.2 m (3 ft 10 in.)
161 kV–169 kV	3.6 m (11 ft 8 in.)	3.6 m (11 ft 8 in.)	1.3 m (4 ft 3 in.)
230 kV–242 kV	4.0 m (13 ft 0 in.)	4.0 m (13 ft 0 in.)	1.7 m (5 ft 8 in.)
345 kV–362 kV	4.7 m (15 ft 4 in.)	4.7 m (15 ft 4 in.)	2.8 m (9 ft 2 in.)
500 kV–550 kV	5.8 m (19 ft 0 in.)	5.8 m (19 ft 0 in.)	3.6 m (11 ft 8 in.)
765 kV–800 kV	7.2 m (23 ft 9 in.)	7.2 m (23 ft 9 in.)	4.9 m (15 ft 11 in.)

Notes:

(1) For arc flash boundary, see 130.5(A).

(2) All dimensions are distance from exposed energized electrical conductors or circuit part to employee.

[a]For single-phase systems above 250 volts, select the range that is equal to the system's maximum phase-to-ground voltage multiplied by 1.732.

[b]See definition in Article 100 and text in 130.4(D)(2) and Informative Annex C for elaboration.

[c]*Exposed movable conductors* describes a condition in which the distance between the conductor and a person is not under the control of the person. The term is normally applied to overhead line conductors supported by poles.

[d]This includes circuits where the exposure does not exceed 120 volts nominal.

Exhibit 7 - Table 130.4(D)(b) Shock Protection Approach Boundaries to Exposed Energized Electrical Conductors or Circuit Parts for Direct - Current Voltage Systems

Table 130.4(D)(b) Shock Protection Approach Boundaries to Exposed Energized Electrical Conductors or Circuit Parts for Direct - Current Voltage Systems

(1)	(2)	(3)	(4)
Nominal Potential Difference	**Limited Approach Boundary**		**Restricted Approach Boundary; Includes Inadvertent Movement Adder**
	Exposed Movable Conductor*	Exposed Fixed Circuit Part	
Less than 50 V	Not specified	Not specified	Not specified
50 V–300 V	3.0 m (10 ft 0 in.)	1.0 m (3 ft 6 in.)	Avoid contact
301 V–1 kV	3.0 m (10 ft 0 in.)	1.0 m (3 ft 6 in.)	0.3 m (1 ft 0 in.)
1.1 kV–5 kV	3.0 m (10 ft 0 in.)	1.5 m (5 ft 0 in.)	0.5 m (1 ft 5 in.)
5 kV–15 kV	3.0 m (10 ft 0 in.)	1.5 m (5 ft 0 in.)	0.7 m (2 ft 2 in.)
15.1 kV–45 kV	3.0 m (10 ft 0 in.)	2.5 m (8 ft 0 in.)	0.8 m (2 ft 9 in.)
45.1 kV– 75 kV	3.0 m (10 ft 0 in.)	2.5 m (8 ft 0 in.)	1.0 m (3 ft 6 in.)
75.1 kV–150 kV	3.3 m (10 ft 8 in.)	3.0 m (10 ft 0 in.)	1.2 m (3 ft 10 in.)
150.1 kV–250 kV	3.6 m (11 ft 8 in.)	3.6 m (11 ft 8 in.)	1.6 m (5 ft 3 in.)
250.1 kV–500 kV	6.0 m (20 ft 0 in.)	6.0 m (20 ft 0 in.)	3.5 m (11 ft 6 in.)
500.1 kV–800 kV	8.0 m (26 ft 0 in.)	8.0 m (26 ft 0 in.)	5.0 m (16 ft 5 in.)

Note: All dimensions are distance from exposed energized electrical conductors or circuit parts to worker.

**Exposed movable conductor* describes a condition in which the distance between the conductor and a person is not under the control of the person. The term is normally applied to overhead line conductors supported by poles.

Exhibit 8 - Table 130.5(G) Selection of Arc-Rated Clothing and Other PPE When the Incident Energy Analysis Method Is Used

Table 130.5(G) Selection of Arc-Rated Clothing and Other PPE When the Incident Energy Analysis Method Is Used

Incident energy exposures equal to 1.2 cal/cm^2 up to 12 cal/cm^2
◦Arc-rated clothing with an arc rating equal to or greater than the estimated incident energy[a]
◦Long-sleeve shirt and pants or coverall or arc flash suit (SR)
◦Arc-rated face shield and arc-rated balaclava or arc flash suit hood (SR)[b]
◦Arc-rated outerwear (e.g., jacket, parka, rainwear, hard hat liner) (AN)
◦Heavy-duty leather gloves, arc-rated gloves, or rubber insulating gloves with leather protectors (SR)[c]
◦Hard hat
◦Safety glasses or safety goggles (SR)
◦Hearing protection
◦Leather footwear
Incident energy exposures greater than 12 cal/cm^2
◦Arc-rated clothing with an arc rating equal to or greater than the estimated incident energy[a]
◦Long-sleeve shirt and pants or coverall or arc flash suit (SR)
◦Arc-rated arc flash suit hood
◦Arc-rated outerwear (e.g., jacket, parka, rainwear, hard hat liner) (AN)
◦Arc-rated gloves or rubber insulating gloves with leather protectors (SR)[c]
◦Hard hat
◦Safety glasses or safety goggles (SR)
◦Hearing protection
◦Leather footwear

SR: Selection of one in group is required.

AN: As needed.

[a]Arc ratings can be for a single layer, such as an arc-rated shirt and pants or a coverall, or for an arc flash suit or a multi-layer system if tested as a combination consisting of an arc-rated shirt and pants, coverall, and arc flash suit.

[b]Face shields with a wrap-around guarding to protect the face, chin, forehead, ears, and neck area are required by 130.7(C)(10)(c). Where the back of the head is inside the arc flash boundary, a balaclava or an arc flash hood shall be required for full head and neck protection.

[c]Rubber insulating gloves with leather protectors provide arc flash protection in addition to shock protection. Higher class rubber insulating gloves with leather protectors, due to their increased material thickness, provide increased arc flash protection.

Exhibit 9 - Table 130.7(C)(15)(c) Personal Protective Equipment (PPE)

Table 130.7(C)(15)(c) Personal Protective Equipment (PPE)	
Arc-Flash PPE Category	**PPE**
1	**Arc-Rated Clothing, Minimum Arc Rating of 4 cal/cm2 (16.75 J/cm^2)[a]**
	Arc-rated long-sleeve shirt and pants or arc-rated coverall Arc-rated face shield[b] or arc flash suit hood Arc-rated jacket, parka, rainwear, or hard hat liner (AN) **Protective Equipment** Hard hat Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts)[c] Heavy-duty leather gloves[d] Leather footwear (AN)
2	**2 Arc-Rated Clothing, Minimum Arc Rating of 8 cal/cm^2 (33.5 J/cm^2)[a]**
	Arc-rated long-sleeve shirt and pants or arc-rated coverall Arc-rated flash suit hood or arc-rated face shield[b] and arc-rated balaclava Arc-rated jacket, parka, rainwear, or hard hat liner (AN) **Protective Equipment** Hard hat Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts)[c] Heavy-duty leather gloves[d] Leather footwear
3	**Arc-Rated Clothing Selected so That the System Arc Rating Meets the Required Minimum Arc Rating of 25 cal/cm^2 (104.7 J/cm^2)[a]**
	Arc-rated long-sleeve shirt (AR) Arc-rated pants (AR) Arc-rated coverall (AR) Arc-rated arc flash suit jacket (AR) Arc-rated arc flash suit pants (AR) Arc-rated arc flash suit hood Arc-rated gloves[d] Arc-rated jacket, parka, rainwear, or hard hat liner (AN) **Protective Equipment** Hard hat Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts)[c] Leather footwear

Table 130.7(C)(15)(c) Personal Protective Equipment (PPE) Cont.	
Arc-Flash PPE Category	**PPE**
4	**4 Arc-Rated Clothing Selected so That the System Arc Rating Meets the Required Minimum Arc Rating of 40 cal/cm^2 (167.5 J/cm^2)[a]**
	Arc-rated long-sleeve shirt (AR) Arc-rated pants (AR) Arc-rated coverall (AR) Arc-rated arc flash suit jacket (AR) Arc-rated arc flash suit pants (AR) Arc-rated arc flash suit hood Arc-rated gloves[c] Arc-rated jacket, parka, rainwear, or hard hat liner (AN) **Protective Equipment** Hard hat Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts)[c] Leather footwear

AN: As needed (optional). AR: As required. SR: Selection required.

[a]*Arc rating* is defined in Article 100.

[b]Face shields are to have wrap-around guarding to protect not only the face but also the forehead, ears, and neck, or, alternatively, an arc-rated arc flash suit hood is required to be worn.

[c]Other types of hearing protection are permitted to be used in lieu of or in addition to ear canal inserts provided they are worn under an arc-rated arc flash suit hood.

[d]If rubber insulating gloves with leather protectors are used, additional leather or arc-rated gloves are not required. The combination of rubber insulating gloves with leather protectors satisfies the arc flash protection requirement.

ARCADIS Infrastructure · Water · Environment · Buildings	ARCADIS HS Standard Name Excavation and Trenching	Revision Number 09
Implementation Date 12 May 2008	ARCADIS HS Standard No. ARC HSCS005	Revision Date 23 February 2015

EXECUTIVE SUMMARY

This Standard sets forth the accepted practice for and establishes the requirements for workplace safety near excavations and trenches and employee and subcontractor entry into such.

It is ARCADIS' policy that ARCADIS staff will not enter excavations and trenches unless it is absolutely necessary and that an OSHA-defined Excavation Competent Person is on-site for all excavation work under ARCADIS contractual control. The competent person will be provided by the entity on site responsible for performing the excavation work unless otherwise required by the client. Thus, if an ARCADIS subcontractor is conducting the excavation work, that subcontractor will provide the competent person. If ARCADIS is self-performing the excavation services, then ARCADIS will provide a competent person whether a specialized subcontractor or authorized employee.

An excavation Competent Person must be involved in the excavation/trenching hazard assessment process. This will assist in determining the need for an engineering opinion when excavating near or adjacent to structures and determining the need and timing of inspections.

Prior to excavation, all underground installations (water, electric, telephone, gas, etc.) must be located and documented in accordance with ARCADIS Utility Clearance Policy and Standard ARC HSFS019.

All excavations over four feet in depth (or less than 4 feet in depth if deemed necessary by the Competent Person) shall be provided with a stairway, ladder, ramp, or other safe means of egress so as to require no more than 25 feet of lateral travel.

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

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

Each employee at the edge of an excavation 6 feet (1.8 m) or more in depth shall be protected from falling by guardrail systems, fences, or barricades *when the excavations are not readily seen because of plant growth or other visual barrier*.

Any excavation over 5 feet in depth into which employees will enter that is not entirely in stable rock as defined in this Standard requires use of a protective system.

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

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

ARCADIS Infrastructure · Water · Environment · Buildings	ARCADIS HS Standard Name Excavation and Trenching	Revision Number 09
Implementation Date 12 May 2008	ARCADIS HS Standard No. ARC HSCS005	Revision Date 23 February 2015

1. POLICY

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

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

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

2. PURPOSE AND SCOPE

2.1 Purpose

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

2.2 Scope

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

3. DEFINITIONS

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

4. RESPONSIBILITIES

4.1 Corporate H&S with Division and Practice Experts

- On a routine basis, review and update, as necessary, this standard.
- As requested by Operations Leadership, review cancelled checklists periodically to ensure conformance to this standard.
- Coordinate with the Training Group to ensure that the excavation competent person qualifications and training/retraining requirements are met.

- Conduct excavation competent person evaluations for nominated individuals as necessary, in order to approve and designate them as competent.
- Recommend qualified training provider for excavation awareness training for employees working in or around excavation/trenching operations.
- Provide technical assistance regarding excavation and trench protocol, atmospheric testing equipment, PPE, hazard assessment and research information on unusual hazards.
- Audit project-specific excavation sites for compliance with this standard.

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

- Verify that excavation and trench protocols are properly identified and addressed within the project work plan, project health & safety plan, and/or other project-related documents.
- Verify that their divisional or project team employees have received the proper training provided by Corporate Health & Safety or qualified training source prior to conducting excavation/trenching entry activities.
- Verify that any ARCADIS employee acting as the Excavation Competent person has been designated and authorized to do so per the requirements specified in section 4.4 of this standard.
- Verify that the proper entry equipment, including personal protective equipment (PPE), atmospheric testing equipment and safety equipment, is available for use by their divisional employees.
- Verify that copies of the completed checklists are available for Corporate Health and Safety review and retained with the project files.
- Request that Corporate Health and Safety review cancelled checklists as necessary and appropriate

4.3 Health and Safety Plan Writers and Reviewers

Use this standard as guidance to ensure the appropriate identification, assessment and control of excavation and trenching hazards for documentation in project HASPs and development of task specific Job Safety Analysis (JSA).

4.4 Competent Person

Competent Person responsibilities include:

- Anticipation, identification and control of excavation and trenching hazards, as well as the signs and symptoms of exposure to the hazard(s), and the Authority to implement all corrective actions including Stopping Work.

  Note: An excavation Competent Person must be involved in the excavation/trenching hazard assessment process. This will assist in

determining the need for an engineering opinion when excavating near or adjacent to structures and determining the need and timing of inspections.

- Review existing soil sampling data (if any) or other pertinent hazard characterization information recorded by the client.
- Investigate the client's excavation/trenching protocol, to verify that any identified hazards and previous experience with earthwork at the site is properly communicated.
- Coordinate entry operations with the client's employees when both client and ARCADIS employees will be working in or near an excavation/trench.
- Offer all entrants an opportunity to review the applicable control measures and testing results and an opportunity to request a reevaluation as necessary.
- Design of structural ramps that are used solely by employees as a means of access or egress from excavations.
- Monitoring of water removal equipment and operations, if water is controlled or prevented from accumulating by the use of water removal equipment,
- Inspection of excavations subject to runoff from heavy rains.
- Daily inspections of excavations, the adjacent areas, and protective systems when required.
- If evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions are present, the Competent Person is responsible for ensuring that exposed employees are removed from the hazardous area until the necessary precautions have been taken to ensure their safety.
- Examining material or equipment used for protective systems that is damaged to evaluate its suitability for continued use. If the competent person cannot assure the material or equipment is able to support the intended loads or is otherwise suitable for safe use, then such material or equipment shall be removed from service, and shall be evaluated and approved by a registered professional engineer before being returned to service.
- For excavations less than 5 feet (1.52 m) in depth, in which employees will be entering, a Competent Person must examine the ground to determine if there are indications of a potential cave-in hazard. If there are potential indicators of a cave-in

hazard, the Competent Person will require some form of cave-in protection be implemented before employees can enter.

- Classifying soil and rock deposits based on site and environmental conditions, and on the structure and composition of the earth deposits.
- Soil and rock deposits shall be classified by a Competent Person as Stable Rock, Type A, Type B, or Type C based on the results of at least one visual and at least one manual analysis.
- If, after classifying a deposit, the properties, factors, or conditions affecting its classification change in any way, the changes shall be evaluated by a Competent Person. The deposit shall be reclassified as necessary to reflect the changed circumstances.
- When surcharge loads from stored material or equipment, operating equipment, or traffic are present, a competent person shall determine the degree to which the actual slope must be reduced below the maximum allowable slope, and shall assure that such reduction is achieved.
- Order evacuation of the excavation/trench if an uncontrolled hazard develops, either within or outside the space, or upon observing a behavioral effect of hazard exposure among excavation/trench entrants.
- Verify that all tests and precautionary measures identified on the Daily/Periodic Inspection Checklist located in Exhibit 2 and the ARCADIS Utility Location Policy and Standard ARC HSFS019 has been performed prior to authorizing subsurface work or entry into an excavation or trench.

ARCADIS employees must meet the following requirements to be a designated and approved Competent Person:

- Attend an Excavation Competent Person training course approved by Corporate Health and Safety or have equivalent training; and
- Approval by Corporate Health and Safety through demonstration of practical field experience and/or knowledge of the subject matter.
    - Documentation of the evaluation and approval of each excavation competent person will be completed using the form provided in Exhibit 3.
    - This documentation and a listing of the approved ARCADIS excavation competent person will be maintained by the Training Group; and
- If on an Environmental project where HAZWOPER training is required by ARCADIS, the Competent Person must also have completed the 40 Hour HAZWOPER training, be current on their annual 8 Hour HAZWOPER refresher and it is recommended, but

not required, that the Competent Person completed the HAZWOPER Supervisor training course.

4.5 Site Safety Officer (SSO)

When ARCADIS and/or our subcontractor is in control of an excavation project, the SSO will be responsible for the following:

- Interface with the client representative and Competent Person to identify and understand hazards associated with the client's excavation and trenching and/or work permit programs.
- Implement the ARCADIS Utility Clearance Policy and Procedure and complete the Daily/Periodic Excavation Inspection Checklist, when the excavation project is under the control of ARCADIS.
- Verify adequate training and experience of those ARCADIS employees working in and around excavations.
- Verify that the safety procedures identified in this Standard, the site specific HASP, and applicable regulatory requirements are used when required to protect employees during excavation activities.
- Verify that the client takes the necessary precautions in notifying their employees that our employees will be installing an excavation or trench.
- Review the lockout/tagout and isolation measures implemented by ARCADIS, our subcontractor and/or the client as necessary based on proximity of utilities or other energy sources in the area of the excavation/trench.
- Immediately report any unusual or unplanned excavation or trenching hazards to both the Competent Person and the Project Manager or Task Manager.
- Keep unauthorized persons away from the excavation area.
- Confirm that the ARCADIS Utility Location Policy and Standard ARC HSFS019 has been performed prior to authorizing subsurface work or entry into an excavation or trench.
- Issue, authorize, and have the Utility Clearance and Daily/Periodic Inspection forms readily available for review
- Verify that copies of the completed clearance forms and checklists are properly disseminated to Corporate Health and Safety and retained with the project files, as specified in Section 8.0 – Records.

4.6 Employees

- Notify the PIC, PM, TM or SSO if they have not received appropriate training.
- Review the site specific HASP, task specific JSAs, and other written plans that are associated with their work.

- Use the TRACK process regularly and frequently to recognize the hazards which may be faced during work around or in excavation/trenches, as well as to understand the signs and symptoms of exposure to airborne hazard(s).

- Never enter an excavation/trench without verifying that the required Utility Location Procedure, Daily/Periodic Inspection Checklist and required air monitoring is conducted.

- Use Stop Work Authority if excavation/trenching hazard(s) have not been appropriately addressed. Immediately consult with SSO, Competent Person and ARCADIS Project/Task Manager.

- Use the PPE, air monitoring and testing equipment that has been provided or have access to the information documenting that results are within the defined Action Levels established within the HASP.

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

- If unexpected conditions arise during entry, immediately notify other entrants, evacuate the space and inform the designated Competent Person

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

- At least one person on site must maintain current certification in basic first aid and cardiopulmonary resuscitation (CPR).

5. PROCEDURE

5.1 General Safety Requirements for all Excavations

- If excavation work encounters unanticipated groundwater contamination, soil contamination or other unanticipated contaminants, ARCADIS staff will Stop Work and notify the Project Manager. An appropriate work plan to sample the suspected contaminants shall be developed, samples collected by HAZWOPER trained personnel, the HASP modified and a contaminant management plan developed, as necessary.

- All surface obstructions must be moved or supported so as to protect employees and equipment.

- Prior to excavation, all underground installations (water, electric, telephone, gas, etc.) must be located and documented in accordance with ARCADIS Utility Clearance Policy and Standard ARC HSFS019.

- When excavating in areas near underground installations, proper precautions must be taken to determine the exact location of the installations and to adequately protect and support them. While an excavation is open, underground installations shall be protected, supported or removed as necessary to protect employees.

- Structural ramps that are used solely by employees as a means of access or egress from excavations shall be designed by a competent person.

- Structural ramps used for access or egress of equipment shall be designed by a competent person qualified in structural design, and shall be constructed in accordance with the design.

- Ladders must extend at least 36” (3 feet) above the landing surface.

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

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

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

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

- Employees entering bell-bottom pier holes, or other similar deep and confined footing excavations, shall wear a harness with a lifeline securely attached to it. The lifeline shall be separate from any line used to handle materials, and shall be individually attended at all times while the employee wearing the lifeline is in the excavation.

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

- 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 ensure the stability of such structures for the protection of employees.

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

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

- Each employee at the edge of an excavation 6 feet (1.8 m) or more in depth shall be protected from falling by guardrail systems, fences, or barricades when the excavations are not readily seen because of plant growth or other visual barrier.

- Employees at the edge of a well, pit, shaft, and similar excavation 6 feet (1.8m) or more in depth shall be protected from falling by guardrail systems, fences, barricades, or covers.

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

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

Best Management Practice: *In some instances, an excavation will not have any protective systems in place when employees will not be entering into the excavation. Even if employees are not entering into this type of excavation, a competent person should be consulted to establish a safe zone distance away from the edge of any open excavation to minimize the hazard of falling into this type of excavation. Standing at the edge of an excavation places an employee at risk of falling into the excavation, thereby subjecting themselves to the hazard of excavation/trench collapse, which then triggers the requirement for protective system use as defined in this standard. General guidance would be for employees to remain 6 feet or more away from the edge of any excavation.*

- Dust control measures will be implemented during excavation and soil-moving activities as required by the Health and Safety Plan (HASP). As necessary, dust control measures will also be used to manage soil located in temporary storage areas or stockpile areas. Specific dust control measures will be detailed in the HASP. The Competent Person must be consulted prior to initiating “wet” dust control measures to discuss limits/impact to protective systems.

- Excavations cut through a firewall or containment berm/bund shall provide alternate means of containment while the job is progressing. A specific containment procedure or diversion procedure will be included as a supplement to the HASP or defined in the Remedial Work Plan.

- Excavating in archeological sites requires special consideration and compliance with local legal requirements and shall be avoided wherever possible. Archaeological investigations on federal and state lands have additional requirements. For example, permit provisions are established in federal (specifically the federal Archaeological Resources Protection Act) and some state statutes. If an artifact or archeological feature is unearthed during excavation, ARCADIS shall stop work and consult with client, regulatory agencies and professional archaeologist, as necessary.

5.2 Excavations Requiring Protective Systems

This section defines excavations that require protective systems.

- All excavations into which employees will enter, regardless of depth, where the potential for cave-in exists.
- Any excavation over 5 feet in depth into which employees will enter that is not entirely in stable rock as defined in this Standard.
- Any excavation near a structure, (e.g. foundations, piers, footers, walls, sidewalks, tanks, roadways, etc.), as required by the registered professional engineer reviewing the stability of the excavation and the structure.
- All excavations over 20 feet in depth must be designed by a registered professional engineer regardless of whether personnel will enter it or not.
- All excavations that could potentially impact adjacent structures shall be reviewed by a registered professional engineer to determine if the stability of the structure will be affected by the excavation.
- Support systems for an adjacent structure must be designed by a registered professional engineer.

5.3 Selection and Use of Protective Systems

5.3.1 Shoring or Shielding

If shoring or shielding is selected as the protective system for an excavation, soil classification in accordance with 1926 Subpart P Appendix A is required.

One of the following options must be used for excavations which will be shored or shielded.

- Timber shoring as specified in 1926 Subpart P Appendix C must be utilized
- Hydraulic shoring, trench jacks, air shores, or shields as required in 1926.652 (c)(2) must be utilized following the system manufacturer's data
- A system which follows other tabulated data (approved by a registered professional engineer) must be utilized
- The excavation must be designed by a registered professional engineer

5.3.2 Sloping

If sloping is selected as the protective system for an excavation, the excavation sides must be sloped at a maximum of 34 degrees (1.5 Horizontal: 1 Vertical), unless the procedure listed above is followed.

Soil classification is required for all excavations with sides which will be sloped greater than 34º (1.5 Horizontal: 1 Vertical). If it will be sloped greater than 34º, the one of the following options must be utilized:

- Option 1 - assume Type C and slope 1.5/1 - default sloping classification
- Option 2 - classify soil according to the standard and use Type A/B sloping requirements
- Option 3 – use other tabulated data with PE approval
- Option 4 – PE approval of sloping/benching design

5.4 Atmospheric Testing for Entry

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

Emergency rescue equipment, such as breathing apparatus, a safety harness and line, or a basket stretcher, shall be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. This equipment shall be attended when in use.

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

- Oxygen content must be between 19.5% to 23.5%
- Combustible gas or vapor less than (<) or equal to 5% of its lower explosive limit (LEL): Level D. Continue to monitor atmospheric conditions as detailed in project specific Health and Safety Plan.
- Combustible gas or vapor levels greater than (>) 5%, but < 10% of its LEL: Continuous atmospheric monitoring required; review use/implementation of engineering controls (ventilation, etc.) and PPE; evaluate potential source(s) of ignition and where feasible, remove from the area; fire extinguisher must be available; and use TRACK to assess condition/controls and proceed with caution.
- Combustible gas or vapor levels > or equal to 10% of its LEL: Stop Work; evacuate the excavation/trench; contact the Competent Person and SSO; and re-evaluate source/controls of combustible gas,
- Carbon monoxide levels must not exceed 25 ppm as an 8-hour Time Weighted Average (TWA).

- Hydrogen sulfide must not exceed 5 ppm as a Short-Term Exposure Limit (STEL) value or 1 ppm as an 8-hour TWA.

- Toxic air contaminant levels must not exceed 50% of the PEL or the TLV for the specific contaminant (whichever is lower).

5.5 Location of Underground/Overhead Utilities

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

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

5.6 Daily/Periodic Inspections

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. An inspection shall be conducted by the Competent Person:

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

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

Note: In order to correctly ascertain the soil types, the competent person must identify the locations and the limits of each type of soil, and must conduct visual and all appropriate manual tests to classify the initial (opening) soil types observed.

Note: These inspections are only required when employee exposure can be reasonably anticipated. Not just in-trench exposure, but also ANY hazardous condition in the area that an employee could be exposed to.

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

5.7 Soil Classification for Selection of Protective Systems

5.7.1 Soil Classification

This section describes a method of classifying soil and rock deposits based on site and environmental conditions, and on the structure and composition of the earth deposits. This

section contains definitions, sets forth requirements, and describes acceptable visual and manual tests for use in classifying soils.

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

5.7.2 Soil Classification Definitions

5.7.2.1 Types/Classes of Soil

5.7.2.1.1 Type Class A Soils

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

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

5.7.2.1.2 Type Class B Soils

Type/Class B Soils are:

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

5.7.2.1.3 Type/Class C Soils

Type/Class C Soils are:

- Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less

- Granular soils including gravel, sand, and loamy sand
- Submerged soil or soil from which water is freely seeping
- Submerged rock that is not stable
- Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4 Horizontal:1 Vertical) or steeper

5.7.2.2 Methods for Classifying Soils

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

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

Observe the following:

- Samples of soil that are excavated and soil in the sides of the excavation. Estimate the range of particle sizes and the relative amounts of the particle sizes. Soil that is primarily composed of fine grained material is cohesive material. Soil composed primarily of coarse grained sand or gravel is granular material.

- Soil as it is excavated. Soil that remains in clumps when excavated is cohesive. Soil that breaks up easily and does not stay in clumps is granular.

- The side of the open excavation and the surface area adjacent to the excavation. Crack like openings such as tension cracks could indicate fissured material. If chunks of soil spall off a vertical side, the soil could be fissured. Small spalls are evidence of moving ground and are indications of potentially hazardous situations.

- The area adjacent to the excavation and the excavation itself for evidence of existing utility and other underground structures, and to identify previously disturbed soil.

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

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

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

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

5.7.2.3 Classifications

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

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

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

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

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

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

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

5.7.2.4 Cohesive with Fissures vs Granular

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

5.7.2.5 Layered system

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

5.7.2.6 Reclassifying Soils

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

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

5.7.2.7 Excavation Construction Based on Soil Type

The maximum allowable slope means the steepest incline of an excavation face that is acceptable for the most favorable site conditions as protection against cave-ins, and is expressed as the ratio of horizontal distance to vertical rise (H:V). Short-term exposure means a period of time less than or equal to 24 hours that an excavation is open. Soil and rock deposits must be classified in accordance with Appendix A to Subpart P of Part 1926. The maximum allowable slope for a soil or rock deposit must be determined from the table provided below. The actual slope must not be steeper than the maximum allowable slope. The actual slope must be less steep than the maximum allowable slope, when there are signs of distress. If that situation occurs, the slope must be cut back to an actual slope which is at least horizontal to one vertical (1/2H:1V) less steep than the maximum allowable slope. When surcharge loads from stored material or equipment, operating equipment, or traffic are present, a competent person must determine the degree to which the actual slope must be reduced below the maximum allowable slope, and must assure that such reduction is achieved. Surcharge loads from adjacent structures must be evaluated in accordance with 1926.651(I). Configurations of sloping and benching systems must be in accordance with 29 CFR 1926 Subpart P, Appendix B.

EXCAVATION SLOPE INFORMATION FROM 29 CFR 1926 SUBPART P APPENDIX B MAXIMUM ALLOWABLE SLOPES	
Soil or Rock Type	**Maximum Allowable Slopes (H:V)[1] for Excavations Less Than 20 Feet Deep[2]**
Stable Rock	Vertical (90 degrees)
Type A[3]	¾:1 (53 degrees)
Type B	1:1 (45 degrees)
Type C	1½:1 (34 degrees)

1. Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal (H). Angles have been rounded off.

2. Sloping or benching for excavations greater than 20 feet deep must be designed by a registered professional engineer.
3. A short-term maximum allowable slope of 1/2H:1V (63 degrees) is allowed in excavations in Type A soil that are 12 feet (3.67 m) or less in depth. Short-term maximum allowable slopes for excavations greater than 12 feet (3.67 m) in depth must be 3/4H:1V (53 degrees).

6. TRAINING

6.1 Project - Specific Orientation

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

- Site excavation hazards and procedures;
- Requirements for conducting activities remotely whenever possible;
- Client requirements and procedures for excavation activities;
- Review of applicable federal, state and/or local excavation requirements; and
- This Excavation and Trenching Standard, as appropriate

6.2 Employee Training

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

- All employees who work in the area of potential excavation/trenching sites will receive awareness level training as provided and/or approved by ARCADIS Corporate H&S in order to recognize and to understand the hazards associated with trenching/excavation work.
- On an as needed basis, employees will receive site specific instruction regarding the excavation/trenching operation from the Competent Person and/or the SSO.

6.3 Competent Person Training

Competent Persons will be provided training as follows:

In order for ARCADIS employees to be assigned duties as a competent person, with respect to excavation and trenching, in addition to the criteria noted in section 4.4, personnel must attend an Excavation Competent Person training course approved by Corporate Health and Safety or have equivalent training. The course shall include, but is not limited to the following:

- Introduction to and definition of trenches and excavations.
- General requirements of OSHA 29 CFR 1926 Subpart P.
- Responsibilities and requirements of a competent person.
- Hazards associated with trenches/excavations and Identification and Assessment of these hazards.
- Hazard controls

- Soil analysis and testing (visual and manual;
- Protective systems;
- Personal protective equipment;
- Utility location;
- Atmospheric testing;
- Water drainage and pumping;
- Site housekeeping and management;
- Communications;
- Access and egress

- Emergency Procedures.
- Inspections.

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

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

7. REFERENCES

ARCADIS Health and Safety Standard ARC HSFS010– Health and Safety Planning

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

ARCADIS Utility Clearance Policy and Standard ARC HSF019

OSHA 29 CFR Part 1926 Subpart P - Excavations

8. RECORDS

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

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

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

9. APPROVALS AND HISTORY OF CHANGE

Approved By: Anthony Tremblay, CSP, CIAQP – Corporate H&S, Director of Technical Programs

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
12 May 2008	01	Greg Ertel	Original document
13 June 2008	02		Modified Section 5.1 – 4th bullet related to structural ramps. Modified Section 5.2 to designate a 6x factor for structural integrity of structures near the excavation. Revised Exhibit 1 to modify the definition of a Competent person
9 January 2009	03		Cleaned up definitions, deleted training requirements from Section 5.0 and moved them to Section 6.0, modified purpose statement
31 March 2011	04		Updated Competent Person training and qualification requirements in section 4.6, section 6.2 and definition in Exhibit 1.
27 March 2012	05	Tremblay	Section 4 competent person, SSO and employee responsibilities revised; Confined Space references eliminated; Training requirements clarified; use of ladders detailed; Fall prevention requirements clarified in section 5.1; depth of protective system requirement corrected to 5 feet; spoils pile must be minimum 2 feet from edge of excavation; Atmospheric Monitoring Action Levels revised; Employee Awareness Training and Competent Person Training requirements clarified
4 June 2012	06	Tremblay	Section 4.4 typo corrected; 8-hour HAZWOPER Supervisor course for competent person was made a recommended practice instead of a requirement; Section 4.5 SSO responsibilities revised to eliminate those responsibilities that belong with the Competent Person; Section 5 Best Management Guidance to maintain safe distance from the edge of excavation; checklists hyperlinked

ARCADIS Infrastructure · Water · Environment · Buildings	ARCADIS HS Standard Name Excavation and Trenching	Revision Number 09
Implementation Date 12 May 2008	ARCADIS HS Standard No. ARC HSCS005	Revision Date 23 February 2015

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
18 September 2013	07	Tremblay	Tracking table format updated; Section 5.1 revised to include information about encountering unanticipated contaminants, implementing dust control measures, instituting containment measures when breeching a containment berm and avoiding excavating in archeological sites
26 September 2013	08	Tremblay	Section 5.7.2.7 Maximum Allowable Slope Table had a typo in Type C soil line H:V ratio (corrected the ratio to read 1 ½ : 1). The value of 34 degrees is correct; Header format update and pages renumbered
23 February 2015	09	Tremblay	Page numbering correction; Exhibit 2 checklist and Exhibit 3 Competent Person Checklist inserted to supplement the existing hyperlink to documents

ARCADIS Infrastructure · Water · Environment · Buildings	ARCADIS HS Standard Name Excavation and Trenching	Revision Number 09
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Exhibit 1 – Definitions

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

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

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

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

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

Competent person means one who, through education, training, and/or experience, is capable of identifying existing and predictable hazards or working conditions which are unsanitary, hazardous, or dangerous to employees and who has authorization to take prompt corrective measures to eliminate them.

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

Excavation means any man-made cut, cavity, trench, or depression in an earth surface formed by earth removal into which a person can bodily enter.

Entry constitutes the act by which an employee proceeds into an excavation or trench. Consideration of hazards, especially cave-ins and fall protection must still be considered and accounted for when equipment or personnel are near an excavation or trench, even if personnel will not be entering.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Shield (Shield system) means a structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shield can be

either pre-manufactured or job-built in accordance with 1926.652 (c)(3) or (c)(4). Shields used in trenches are usually referred to as "trench boxes" or "trench shields".

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

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

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

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

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

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

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

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

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

ARCADIS Infrastructure · Water · Environment · Buildings	ARCADIS HS Standard Name Excavation and Trenching	Revision Number 09
Implementation Date 12 May 2008	ARCADIS HS Standard No. ARC HSCS005	Revision Date 23 February 2015

Exhibit 2 – Daily / Periodic Excavation Inspection Checklist

Daily / Periodic Excavation Inspection Checklist

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

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

Soil Classified As:	☐ Stable Rock	☐ Type A	☐ Type B	☐ Type C
Soil Classified On:	By:			
Type of Protective System in Use	☐ Sloping	☐ Shoring	☐ Shielding	☐ Benching	☐ Other
Description:				

Inspection Item	YES	NO	N/A	Comments
Has the ARCADIS Utility Clearance Procedure been completed?	☐	☐	☐	
Are underground installations protected from damage?	☐	☐	☐	
Has a Competent Person been identified?	☐	☐	☐	
Are adequate means of entry / exit available in the excavation – at least every 25 feet?	☐	☐	☐	
If exposed to traffic, are personnel wearing reflective vests and adequate barriers/traffic controls installed?	☐	☐	☐	
Do barriers exist to prevent equipment from rolling into the excavation?	☐	☐	☐	
Was air monitoring conducted prior to and during excavation entry?	☐	☐	☐	
Was the stability of adjacent structures reviewed by a registered P.E.?	☐	☐	☐	
Are spoil piles at least 2 feet from the excavation edge?	☐	☐	☐	
Is the excavation(s) readily visible ? If no, employees must be protected from falling by guardrail systems, fences, or barricades?	☐	☐	☐	
If the well, pit, shaft, or similar excavation is 6 feet (1.8m) or more in depth, are employees protected from falling by guardrail systems, fences, barricades?	☐	☐	☐	
Are work tasks completed remotely if feasible?	☐	☐	☐	
Is a protective system in place and in good repair?	☐	☐	☐	
Is excavation isolated from the effects of vibration?	☐	☐	☐	
Are employees protected from falling / elevated material?	☐	☐	☐	
Is soil classification adequate for current environmental / weather conditions?	☐	☐	☐	
Do portable ladders extend at least 3 feet above the excavation?	☐	☐	☐	
Are portable ladders or ramps secured in place?	☐	☐	☐	
Have all personnel attended safety meeting on excavation hazards?	☐	☐	☐	
Are support systems for adjacent structures in place?	☐	☐	☐	
Is the excavation free from standing water?	☐	☐	☐	
Is water control and diversion of surface run-off adequate?	☐	☐	☐	
Are employees wearing required protective equipment?	☐	☐	☐	
Excavation Competent Person:				Date/Time:

Exhibit 3 – Competent Person Evaluation Form for Excavation / Trenching

Exhibit 3 – Competent Person Evaluation Form for Excavation / Trenching

Name of Employee:_____Job Title:_____

Department: _____Office Location: _____

Experience with Excavations/Trenching:

_____
_____
_____
_____
_____
_____

Relevant Training:

_____
_____
_____
_____
_____
_____
_____

Other Relevant Qualifications:

_____
_____
_____
_____
_____
_____
_____

*Include documentation from employee's Supervisor that acknowledges their capacity to work as a designated competent person.

Based on the information listed above and an evaluation of this employee's knowledge and experience, I consider them to be a Competent Person for Excavation and Trenching.

Evaluation By: _____ Job Title: _____

Signature: _____ Date: _____

Exhibit 3_Competent Person Evaluation Form for Trenching/Excavation_rev6_4June2012 Page 1 of 1

ARCADIS Infrastructure · Water · Environment · Buildings	ARCADIS HS Standard Elevated Work and Fall Protection	Revision Number 04
Implementation Date 24 February 2011	ARCADIS HS Standard No. ARC HSFS007	Revision Date 16 February 2018
Author Brent Oakeson	Page 1 of 27	Approver Julie Santaniello

EXECUTIVE SUMMARY

This Health and Safety Standard (HSS) sets forth minimum requirements for ARCADIS personnel to safely conduct work on elevated surfaces in conjunction with the use of fall protection systems. There are various applications and components of fall protection systems that can be effectively used to eliminate or reduce fall hazards. The information contained in this Standard covers these specific requirements.

The designated Competent Person will refer to this Standard and select the fall protection system that offers the best protection for the specific job, in order to appropriately and adequately protect ARCADIS personnel. To identify these hazards and establish appropriate fall protection measures, the following program and associated ARCADIS ELEVATED WORK PERMIT in Exhibit 2 have been provided.

When an ARCADIS employee has the potential to be exposed to a fall hazard, an Elevated Work Permit must be completed prior to the beginning of a project, task or work action. This permit shall be used to assess the hazards, identify fall protection system/equipment requirements, outline training requirements and identify methods for prompt, safe rescue and removal of a fallen or injured worker.

In General Industry related work, fall protection must be used an provided for each employee who is working at an elevated level in which the potential exists for a free fall of more than 4 feet.

For Construction Industry related work, the fall protection system selected must be used by each employee who is working at an elevated level in which the potential exists for a free fall of more than 6 feet.

The available fall protection measures include:

1. Guardrails
2. Safety Nets
3. Personal Fall Arrest System
4. Positioning Device System
5. Warning Line System
6. Controlled Access Zones
7. Safety Monitoring System
8. Fall Protection Plan
9. Non-conforming Guardrail
10. Designated Area

1. POLICY

It is the policy of ARCADIS to comply with OSHA's Fall Protection Standard **as it relates to the work we do.** In general, we have no control over how our clients select, incorporate, construct and maintain fall protection systems or devices. However, employees, subcontractors and personnel working on a site under ARCADIS control must be aware of and control hazards created during elevated work (working at heights) and what fall protection measures are compatible with the type of work they are doing.

Prior to the start of work where new facilities will be constructed and/or where work will be performed at a client's existing facility, ARCADIS shall make an initial survey of the types of fall hazards that may be encountered and complete the Work at Elevated Heights Permit to identify the kind and number of safeguards that are needed to protect against these fall hazards. The Elevated Work Permit located in Exhibit 2 will be used to assess the hazards, identify fall protection equipment requirements, outline training requirements/documentation, and identify methods for prompt, safe rescue and removal of a fallen or injured worker.

2. PURPOSE AND SCOPE

2.1 Purpose

This standard sets forth practices and policies to be used by employees and subcontractors of ARCADIS when working from elevated work surfaces. The purpose of this standard is to designate the requirements on fall protection systems, to enable employers, employees and supervisors to recognize the fall hazards and establish the practices that will be followed to prevent falls. In addition, this standard identifies the requirements to perform hazard evaluations ahead of the foreseeable fall hazard occurrence; to provide training to employees on the use, inspection, and limitations of fall protection equipment; and to plan/provide for the swift rescue of fallen workers suspended from their equipment.

2.2 Scope

This standard and associated practices apply to those ARCADIS projects in which elevated work hazards exist. As required, fall protection equipment is supplied and/or approved by ARCADIS for use by employees in carrying out their assignments. Employees and subcontractors conducting work from an elevated work surface are required to be protected by approved conventional fall protection methods. (i.e. Guardrails), or use a Personal Fall Arrest System (PFAS), as required by the project Health and Safety Plan (HASP), Job Loss Analysis (JSA), and applicable regulatory standard or client requirements.

Exemption: The provisions of this Fall Protection Standard do not apply when employees are making an inspection, investigation, or assessment of workplace conditions prior to the actual start of construction work or after all construction work has been completed. ARCADIS has established this exception because employees engaged in inspecting, investigating and assessing workplace conditions before the actual work begins or after work has been completed are exposed to fall hazards for very short durations, if at all, since they most likely would be able to accomplish their work without going near the danger zone. In addition, the use of a ladder to gain access to a work

surface over 6 feet will also be applied under this exemption. However, scenarios that keep employees within 6 feet of a fall hazard would not fall under this exemption (e.g. an employee collecting a roof flashing sample at the very edge of a flat roof 20 feet above the ground). If inspections are made while construction operations are underway, all employees who are exposed to fall hazards while performing these inspections must be protected as required by this Standard.

OSHA de minimis policy for non-conforming guardrails 15 or more feet from the edge under certain circumstances

With regards to General Industry compliance, when inspecting for a maintenance activity (e.g., not construction) such as an employee checking an HVAC unit on a roof, the worker is not covered under the Construction Standard exemption and must be protected by a guardrail or some form of acceptable fall protection system if temporary installation of guardrails atop a client's roof is not feasible. Another option for General Industry compliance with regards to roof access might be use of the proposed "designated area".

3. DEFINITIONS

There are a number of definitions associated with this standard and its associated procedures. These definitions are presented in Exhibit 1 of this document.

4. RESPONSIBILITIES

4.1 Employees

Employees are required to work within approved protection systems or use proper fall protection systems during work activities from elevated work surfaces. In addition, employees are required to have their provided fall protection available where the potential for falls exists and to use as required by HASPs, JSAs, or client requirements.

In addition, potentially affected employees have the responsibility to:

- Be capable of recognizing existing or predictable hazards in surroundings and/or working conditions associated with elevated work activities.
- Take prompt corrective measures to eliminate hazardous conditions associated with elevated work and fall protection activities, including, but not limited to stopping work.
- Understand safety requirements to be utilized to protect themselves and others during elevated work activities
- Attend Elevated Work / Fall Protection training as assigned and provide ARCADIS with training documentation prior to beginning work.
- Inspecting fall protection equipment prior to each use.

- Inspect, Clean, and Maintain their fall protection equipment in accordance with training requirements and manufacturer's specifications.

- Properly use fall protection equipment and PPE as specified by this standard, Task Specific Job Loss Analysis and in the site specific HASP.

4.2 ARCADIS Subcontractors

Subcontractors must comply with the following:

- Contractors working on behalf of ARCADIS are responsible for establishing, implementing and managing a fall protection program, which includes identification and elimination or control of fall hazards in compliance with OSHA requirements.

4.3 Task Managers, Project Managers and Principals In Charge

TMs, PMs, and PICs have the responsibility to know and follow applicable ARCADIS HS requirements and for ensuring work on their projects is conducted in accordance with policies/procedures established in this HSP.

Have the responsibility for:

- Reviewing and understanding this Elevated Work and Fall Protection Standard.

- Initiating and ensuring that a hazard analysis is conducted to identify, evaluate and control or eliminate elevated work/fall hazards.

- Communicating with and appropriately managing subcontractors, ensuring that employees have appropriate fall protection training and qualifications.

- Involving the appropriate ARCADIS H&S Staff and project staff, as necessary;

- Providing adequate resources and budget for necessary personal fall arrest system or other fall protection equipment.

- Verifying that employees under their direction adhere to the fall protection requirements of this standard, task specific JSA and procedures specified in the project specific HASP.

4.4 Corporate Health and Safety Staff

Have the responsibility for:

- Ensuring that staff are aware of this Standard.

- Ensuring this Standard is being implemented effectively;

- Providing and/or identifying required training or guidance on approved training options;

- Providing the necessary suppliers and criteria for selection of fall protection equipment.

4.5 Competent Person

The Competent Person will be responsible for determining and setting up the proper fall protection system and for continual observational safety checks so employees can be warned of fall hazards. This Competent Person can be an ARCADIS employee or other person meeting the designated Competent Person Requirements. The Competent Person:

- Must be capable of identifying existing or predictable hazards in surroundings and/or working conditions associated with elevated work and fall protection systems.

- Is authorized to take prompt corrective measures to eliminate hazardous conditions associated with elevated work and fall protection activities, including, but not limited to stopping work.

- Verify that the safety procedures identified in this Standard, the site specific HASP, and applicable regulatory requirements are utilized when required to protect employees during elevated work activities.

- Personal fall arrest systems and components subjected to impact loading shall be immediately removed from service and shall not be used again for employee protection until inspected and determined by a **competent person** to be undamaged and suitable for reuse.

- Develop and employ emergency procedures that include rescue and first aid.

- Verify that safety harness and equipment are regularly inspected and maintained, results of which are recorded in the appropriate documentation. The equipment inspection form can be utilized and kept with equipment for documentation purposes.

- Provide assistance in determining the correct equipment based upon the task and conditions. These staff members should be contacted during planning staging of proposed work to allow ample time to review the proposed work plan and conditions.

- Implement Fall Protection Plans under their Supervision (e.g. Leading edge work, preformed concrete, roofing work).

- Review and approve the Elevated Work Permit before ARCADIS employees proceed with elevated work.

ARCADIS employees must meet the following requirements to be considered a Competent Person:

- Attend a fall protection training course approved by Corporate Health and Safety or have equivalent training to that provided in the fall protection training course; and

- Approval by Corporate Health and Safety through demonstration of practical field experience and/or knowledge of the subject matter.

Non ARCADIS employees who are to be the Competent Person on behalf of ARCADIS employees, must provide their proof of competency to the ARCADIS Project Manager upon request (training records, experience, etc.).

5. STANDARDS AND PRACTICES

5.1 Procedure

ARCADIS projects may periodically require work on an elevated surface that could expose our staff to falling from those elevated surfaces. This can present a significant life-threatening hazard to employees if they are not properly protected from falling. To identify these hazards and establish appropriate fall protection measures, the following program and associated ARCADIS ELEVATED WORK PERMIT in **Exhibit 2** have been provided. The purpose of this section is to accomplish the following:

- Evaluate operations for elevated work hazards and provide direction on activities that require use of a fall protection system;
- Identify appropriate fall protection measures, guards and control measures; and
- Maintain compliance with applicable ARCADIS and government regulations and guidelines.

5.2 General Safety Requirements

ARCADIS will generally not have the authority to control the selection or condition of the fall protection system used at some job sites, but employees will be aware of what fall protection measures are compatible with the type of work they are doing. If an employee judges a fall protection system to be unsafe, inadequate or inappropriate, the employee will use their Stop Work Authority and immediately inform his/her supervisor and/or the client and **not utilize the system** until the problem has been corrected.

The general requirements under this Standard for Elevated Work Activities are as follows:

- To the extent feasible, all elevated work surfaces must be protected with an approved method; guardrail, warning line system or cover to protect employees and equipment. Protection from falling objects on elevated work surfaces (4 inch toe board and hard hats) must also be provided.
- All fall restraint systems must be reviewed and approved for use by a "Competent Person" as part of the elevated work permit process. In addition, fall restraint systems must be constructed of approved materials and used according to the manufacturer's instructions.
- Employees must be trained in fall protection system use and in the specific equipment being used and inspect all equipment prior to use.

- Fall protection must be addressed in the site-specific JSA or HASP.

- If work must be performed on an unprotected elevated work area, an approved fall protection system shall be used.

- Skylights on roofs must be addressed as a potential fall hazard. Added protection such as guardrails, covers, and restraints shall be provided to prevent employees from falling through the skylight.

With regards to Construction activities, ARCADIS employees on a walking/working surface with an unprotected side or edge which is 6 feet or more above a lower level shall be protected from falling by the use of guardrail systems, safety net systems, or personal fall arrest systems. In addition, if there is a possibility of a fall from any height onto dangerous equipment, into hazardous environment (including water), or onto an impalement hazard then ARCADIS staff shall be protected from falling by the use of guardrail systems, safety net systems, or personal fall arrest systems. There are some exceptions to this general 6 feet statement. First, if employees are working in a situation where they could fall into or onto dangerous equipment, like a vat of acid or a crane, then the employee must be protected regardless of the fall height. Also, there are other sections of the construction standards that contain a requirement to have fall-protection when working on specific types of equipment or in specific operations (e.g., scaffolds, ladders, ramps and catwalks).

With regards to General Industry activities, every stairway and floor opening shall be guarded by a standard railing. The railing shall be provided on all exposed sides (except at entrance to stairway). For infrequently used stairways where traffic across the opening prevents the use of fixed standard railing (as when located in aisle spaces, etc.), the guard shall consist of a hinged floor opening cover of standard strength and construction and removable standard railings on all exposed sides (except at entrance to stairway). Every wall opening from which there is a drop of more than 4 feet shall be guarded by one of the following: roller, picket fence, half door, or equivalent barrier. Where there is exposure below to falling materials, a removable toe board or the equivalent shall also be provided. When the opening is not in use for handling materials, the guard shall be kept in position regardless of a door on the opening. In addition, a grab handle shall be provided on each side of the opening with its center approximately 4 feet above floor level and of standard strength and mounting. Every open-sided floor or platform 4 feet or more above adjacent floor or ground level shall be guarded by a standard railing on all open sides except where there is entrance to a ramp, stairway, or fixed ladder. The railing shall be provided with a toeboard wherever, beneath the open sides, persons can pass, there is moving machinery, or there is equipment with which falling materials could create a hazard. Because ARCADIS employees work at many client locations which may or may not be compliant with regards to General Industry Fall Protection requirements, guardrail installation may not be feasible requiring ARCADIS employees and subcontractors to use personal fall arrest systems (PFAS), work positioning systems, travel restricting systems (fall restraint), fixed ladder climbing systems, hole covers, safety nets, etc. to control fall hazards.

Requirements related to fall protection in regards to other OSHA standards such as telecommunications and powered platforms/manlifts are not covered by this standard or discussed in this manual section.

5.3 Fall Prevention Measures - 3 Step Approach

Potential falls shall be controlled by using this three-step systematic approach that is explained in the following subsections:

Step 1: Eliminating Fall Hazards

To eliminate fall hazards, carefully assess the work place and the work itself in the earliest engineering and planning stages of the project. The objective is to eliminate all fall hazards. This assessment of the site and the work not only helps eliminate hazards, but also identifies alternative approaches to the work that can measurably enhance productivity.

Step 2: Minimizing Fall Exposure (Safety by Design Concept)

If fall hazards cannot be completely eliminated during the first step, attempt to prevent falls by improving the work place. Avoid relying on a worker's behavior or fall-arresting equipment to prevent injuries. Early installation of stairs, guardrails, barriers and travel-restriction systems can provide fixed fall protection measures and a safe work environment.

Step 3: Using Proper Fall-Arrest Equipment

Fall-arrest equipment shall be utilized only after determining that potential falls cannot be eliminated by changing work procedures or the work place. Equipment such as harnesses, lanyards, shock absorbers, fall arresters, lifelines and anchorages may reduce the risk of injury if a fall occurs. Carefully assess the work place and work processes to select the most appropriate equipment for the job, and assess how to install and use it correctly.

5.4 Elevated Work Permit

ARCADIS ELEVATED WORK PERMIT

When an ARCADIS employee has the potential to be exposed to a fall hazard, an Elevated Work Permit must be completed prior to the beginning of a project, task or work action. If there are any changes in the job conditions that alter the use of fall protection, the permit must be revised and approved prior to beginning work.

The ARCADIS employee who approves the Permit must be competent in the identification, mitigation, and control of the hazards associated with elevated work.

Upon completion of the permit, it must be reviewed and signed off by an ARCADIS Competent Person prior to beginning work. An onsite Competent Person shall verify that the permit has been reviewed prior to beginning work.

5.5 Guidelines for the Application of Fall Protection Systems

This section is to be used only as a guide for selecting the appropriate fall protection system. It is a brief outline of how fall protection systems can be applied to typical ARCADIS work situations. Ultimately, it is the responsibility of the Competent Person to determine which system is most appropriate for a specific project or task.

Elevated Work Situation	Fall Protection System
Unprotected sides and edges over 6'.	Guardrail, Safety Net, or PFAS.
Leading edge under construction.	Fall Protection System or PFAS
Hoist areas	Guardrail, PFAS, Positioning Device System.
Holes, Wall Openings, Skylights	Guardrail, Covers or PFAS,
Formwork/ Reinforcing Steel	PFAS, Safety Net, Positioning Device System.
Ramps, Runways, Walkways.	Guardrail
Wells, pits, shafts, excavations.	Guardrail, Fences, Barricades, Covers.
Roofs: Steep and Low Slope.	Guardrail, PFAS, Warning Line System.
Precast Concrete Erection	Guardrail, PFAS.
Stack Testing	PFAS, Cage Ladder System, and Rigid Rail or Wire Rail System.

5.6 Fall Protection Measures

Prior to the start of work where new facilities will be constructed and/or where work will be performed at an existing facility, ARCADIS shall make an initial job survey using the TRACK process. The use of TRACK will help identify the types of fall hazards that are expected to be encountered, and develop a plan to identify the kind and number of safeguards that are needed to protect against these fall hazards. The fall protection measures selected shall be compatible with the type of work being performed.

The ARCADIS Elevated Work Permit shall be used to assess the hazards, identify fall protection system/equipment requirements, outline training requirements/documentation and identifying methods for prompt, safe rescue and removal of a fallen or injured worker.

The fall protection system selected must be used by each employee who is working at an elevated level in which the potential exists for a free fall of more than 6 feet. These fall protection systems may include the types described in the following sections.

5.6.1 Guardrail Systems

Guardrails can be used to protect the open edges of a working surface. They create a physical barrier that prevents falling to lower levels. They can be used at any height, and can be a permanent or temporary system.

Guardrail systems must meet the following requirements:

- The top edge height of top rails or equivalent guardrail system members shall be 42" plus or minus 3" above the walking/working level. When conditions warrant, the height of the top edge may exceed the 45" height.
- Midrails shall be installed at a height midway between the top edge of the guardrail system and the walking/working level.
- Screens and mesh, when used, shall extend from the top rail to the walking/working level and along the entire opening between top rail supports.
- When used between posts, intermediate members (such as balusters) shall not be more than 19" apart.
- Other structural members (such as additional midrails and architectural panels) shall be installed such that there are no openings in the guardrail system that are more than 19" wide.
- Guardrail systems shall be capable of withstanding a force of at least 200lbs applied within 2" of the top edge in any outward or downward direction at any point along the top edge.
- When the 200-lb test load is applied in a downward direction, the top edge of the guardrail shall not deflect to a height less than 39" above the walking/working level.
- Midrails, screens, mesh, intermediate vertical members, solid panels and equivalent structural members shall be capable of withstanding a force of at least 150lbs applied in any downward or outward direction at any point along the midrail or other member.
- Material being used for top rails or midrails shall be inspected as frequently as necessary to verify that it continues to meet a force of at least 200-lbs applied within 2" of the top edge in any outward or downward direction at any point along the top edge.
- Guardrail systems shall be surfaced as to prevent injury to a person from punctures or lacerations and to prevent snagging of clothing.
- The ends of all top rails and midrails shall not overhang the terminal posts except where such overhang does not constitute a projection hazard.
- Steel banding and plastic banding shall not be used as top rails or midrails.

- Top rails and midrails shall be at least ¼" nominal diameter or thickness to prevent cuts and lacerations. If wire rope is used for top rails, it shall be flagged at not more than 6' intervals with high-visibility material.

- When guardrail systems are used at hoisting areas, a chain, gate or removable guardrail section shall be placed across the access opening between guardrail sections when hoisting operations are not taking place.

- When guardrail systems are used at holes, they shall be erected on all unprotected sides or edges of the hole.

- When guardrail systems are used around holes that are used for the passage of materials, the hole shall not have more than two sides equipped with removable guardrail sections to allow the passage of materials. When the hole is not in use, it shall be closed with a cover, or a guardrail system shall be installed along all unprotected sides or edges.

- When guardrail systems are used around holes that are used as points of access (such as ladder ways), they shall be installed with gates or be offset so that people cannot walk directly into the holes.

- Guardrail systems used on ramps and runways shall be erected along each unprotected side or edge.

5.6.2 Safety Net Systems

When used, surface safety nets shall be installed as close as practical under the walking/working surface on which employees are working, but not more than 30 feet below such level, and must extend outward 8 feet from the edge of the working surface with up to 5 feet of vertical distance from the working level to the horizontal plane of the net (**Note: Net must extend further out from the working surface when the vertical distance from the working level to the horizontal plane of net exceeds 5 feet**). Safety nets must be capable of withstanding a drop test of 400 pounds and shall have a border rope for webbing that has a minimum breaking strength of 5,000 pounds. Mesh openings cannot exceed 36 square inches nor be longer than 6 inches (15 cm) on any side, and the opening of mesh ropes or webbing, measured center-to-center, shall not be longer than 6 inches (15 cm). Connections between safety net panels shall be as strong as integral net components and shall be spaced not more than 6 inches (15 cm) apart.

Safety nets must be inspected at least once a week for wear, damage, and other deterioration.

5.6.3 Positioning Device Systems

A positioning device system is a body harness system rigged to allow an employee to be supported on an elevated surface, and work with both hands free while leaning.

Positioning devices cannot be used for fall protection; their primary purpose is to provide stationary support.

Positioning devices must be rigged such that an employee cannot free fall more than 2 feet.

They can only be secured to an anchorage capable of withstanding an impact load of two times the potential impact of a fall or 3,000 pounds, whichever is greater.

Only double-locking snap hooks should be used.

Positioning device systems shall be inspected prior to each use for wear, damage, and other deterioration, and defective components shall be removed from service.

5.6.4 Warning Line Systems

Warning line systems only apply to roofing work on low-slope roofs (a roof having a slope less than or equal to 4 in 12 vertical to horizontal distance).

When mechanical equipment is not being used, the warning line shall be erected around all open sides of the roof work area and not less than 6 feet from the roof edge. When mechanical equipment is being used, the warning line shall be erected not less than 6 feet (1.8 m) from the roof edge that is parallel to the direction of mechanical equipment operation, and not less than 10 feet (3.1 m) from the roof edge that is perpendicular to the direction of mechanical equipment operation.

Points of access, materials handling areas, storage areas, and hoisting areas shall be connected to the work area by an access path formed by two warning lines.

When the path to a point of access is not in use, a rope, wire, chain, or other barricade, equivalent in strength and height to the warning line, shall be placed across the path at the point where the path intersects the warning line erected around the work area, or the path shall be offset such that a person cannot walk directly into the work area.

Warning lines can consist of ropes, wires, or chains and their supporting stanchions, and once erected, must be capable of resisting, without tipping over, a horizontal force of 16 pounds. Lines must be flagged at not more than 6-foot intervals with a high-visibility material.

5.6.5 Controlled Access Zones

Controlled access zones only apply to overhead bricklaying and related leading-edge work. Steel erection allows other applications.

A controlled access zone means an area designated and clearly marked, in which leading edge work may take place without the use of guardrail, safety net, or personal fall arrest systems to protect the employees in the area. Control zone systems shall comply with the following provisions:

1. When used to control access to areas where leading edge and other operations are taking place the controlled access zone shall be defined by a control line or by any other means that restricts access. When control lines are used, they shall be erected not less than 6 feet (l.8 m) nor more than 60 feet (18 m) or half the length of the member being erected, whichever is less, from the leading edge.

2. The control line shall extend along the entire length of the unprotected or leading edge and shall be approximately parallel to the unprotected or leading edge.

3. The control line shall be connected on each side to a guardrail system or wall.

4. Control lines shall consist of ropes, wires, tapes, or equivalent materials, and supporting stanchions as follows:

    - Each line shall be flagged or otherwise clearly marked at not more than 6-foot (1.8 m) intervals with high-visibility material.

    - Each line shall be rigged and supported in such a way that its lowest point (including sag) is not less than 39 inches (1 m) from the walking/working surface and its highest point is not more than 45 inches (1.3 m) from the walking/working surface.

    - Each line shall have a minimum breaking strength of 200 pounds (890 N).

5.6.6 Safety Monitoring System

The Safety Monitoring System only applies to work on low sloped roofs (a roof having a slope less than or equal to 4 in 12 vertical to horizontal distance). The Safety Monitoring System alone can be used if the roof is less than 50 feet in width. A roof that has width greater than 50 feet will require the use of a warning line system in addition to the Safety Monitoring System.

The implementation of a Safety Monitoring System shall include the following:

- A designated Competent Person shall work as a safety monitor, in order to ensure the safety of other employees while work is being conducted on the roof.

- The safety monitor shall be competent to recognize fall hazards during the work and warn the employees when they are unaware of a fall hazard or are acting in a manner that leads to a fall hazard.

- The safety monitor shall be on the same working surface as the employees engaged in the work, and shall be within visual sighting distance and capable of communicating verbally with the employees at work.

- The safety monitor shall not have any other responsibilities that would distract their attention from monitoring the work of employees and recognizing fall hazards during their work.

- Each employee working under the direction of a safety monitor, shall promptly comply with any fall hazard warnings from safety monitors.

Mechanical equipment shall not be used or stored in areas where safety monitoring systems are being used to monitor employees engaged in roofing operations on low-slope roofs.

No employee, other than an employee engaged in roofing work on low-sloped roofs or an employee covered by a fall protection plan, shall be allowed in an area where an employee is being protected by a safety monitoring system.

Each employee working in a controlled access zone is directed to comply promptly with fall hazard warnings from safety monitors.

5.6.7 Fall Protection Plan

This option is available only to employees engaged in leading edge work, precast concrete erection work, or residential construction work who can demonstrate (and document) that it is infeasible or it creates a greater safety hazard to use conventional fall protection equipment. The plan must be location specific, prepared by a Qualified Person, and implemented under the supervision of a Competent Person. The plan must identify, by name, each worker designated to work in the controlled access zone.

The fall protection plan shall document the reasons why the use of conventional fall protection systems (guardrail systems, personal fall arrest systems, or safety nets systems) are infeasible or why their use would create a greater hazard.

The fall protection plan shall include a written discussion of other measures that will be taken to reduce or eliminate the fall hazard for employees who cannot be provided with protection from the conventional fall protection systems. For example, the Competent Person must discuss the extent to which scaffolds, ladders, or vehicle mounted work platforms can be used to provide a safer working surface and thereby reduce the hazard of falling.

The fall protection plan shall identify each location where conventional fall protection methods cannot be used. These locations shall then be classified as controlled access zones.

Where no other alternative measure has been implemented, ARCADIS may implement a safety monitoring system.

The fall protection plan must include a statement which provides the name or other method of identification for each employee who is designated to work in controlled access zones. No other employees may enter controlled access zones.

If an employee falls, some other related, serious incident occurs or an employee reports a Near Loss, ARCADIS will investigate the circumstances of the fall or other incident to determine whether the fall protection plan needs to be changed (e.g. new practices, procedures, or training). Any changes shall be implemented to prevent similar types of falls or incidents.

5.6.8 Non-Conforming Guardrail (Construction Work)

The following guidance is based upon a *de minimis* policy established by a Letter of Interpretation issued by Federal OSHA.

At 15 feet from the edge or hole (in the case of a hole, measured from the nearest edge of the hole), a warning line, combined with effective work rules, can be expected to

prevent workers from going past the line and approaching the edge. Also, at that distance, the failure of a barrier to restrain a worker from unintentionally crossing it would not place the worker in immediate risk of falling off the edge. Therefore, OSHA applies a de minimis policy for non-conforming guardrails 15 or more feet from the edge under certain circumstances. Specifically, OSHA considers the use of certain physical barriers that fail to meet the criteria for a guardrail a de minimis violation of the guardrail criteria where all of the following conditions are met:

- A warning line is used 15 feet or more from the edge (or nearest edge of a hole);
- The warning line meets or exceeds the requirements in §1926.502(f)(2);
- No work or work-related activity is to take place in the area between the warning line and the hole or edge; and
- The employer effectively implements a work rule prohibiting the employees from going past the warning line.

5.6.9 Designated Area (General Industry Operations and Maintenance Work)

In May 2003 OSHA republished the proposed Part 1910 rulemaking that included a General Industry “designated area” [proposed 29 CFR 1910.28(d)]. Compliance with a proposed amendment in lieu of compliance with an existing rule is considered a de minimis violation by OSHA. The designated area is similar to the 6-ft warning line for roofers, but several additional conditions must be met for it to apply. The designated area criteria consists of:

- roof slope 4:12 [10 degrees or less (a low-slope roof)];
- constructed with ropes, wires or chains of 500-lb tensile strength (no barrier tape);
- horizontal members within the dimensions of 34 in. to 39 in.;
- must withstand a horizontal force of 16 lb, 30 in. above the base;
- complies with the provisions of proposed rulemaking 29 CFR 1910.28(d);

Several conditions differ from the warning line criteria stated in 29 CFR 1926.502(f)(2) as well:

- work must be of a temporary nature;
- is to be erected as close to the work area as permitted by the task;
- perimeter to be no less than 6 ft from an unprotected edge; and
- access to designated area by a clear path formed by two lines, same criteria for lines and stanchions as in the basic standard.

5.7 Covers

Covers must be capable of supporting at least twice the weight of employees, equipment, and materials that may be imposed on the cover at any one time.

Covers shall be secured when installed so as to prevent displacement, and either color-coded or plainly marked with the word “COVER” or “HOLE” to provide warning of the hazard.

5.8 Personal Fall Arrest System (PFAS)

Fall hazards at heights should be engineered out if possible. A personal fall arrest system should only be used as a backup for those hazards still remaining. Personal fall arrest systems and components, subjected to impact loading, must be removed from service immediately. Personal fall arrest systems must limit the arresting force to 1,800 pounds when using a full body harness.

A personal fall arrest system is used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors and body harness, and may include a lanyard, deceleration device, lifeline, or suitable combinations of these.

The entire system must be inspected prior to each use for wear, damage and/or deterioration. If a system is subject to impact loading, it must not be used again until inspected by a Competent Person.

The following represents the various parts that comprise the PFAS designed to arrest the fall of one person.

5.8.1 Anchorages

The critical requirement in all fall protection is the anchorage point. It is the position on an independent structure to which the fall arrest device, lifeline, or lanyard is securely attached. Anchorages used for attachment of personal fall arrest equipment shall be independent of any anchorage being used to support or suspend platforms and shall be capable of supporting at least 5,000 pounds (2,220 N) per employee attached, or shall be designed, installed, and used as follows:

- As part of a complete personal fall arrest system which maintains a safety factor of at least two; and
- Under the supervision of a qualified person.

A fixture point above head height should always be planned where feasible.

5.8.2 Hardware Connectors

Hardware connectors consist of bolts, shackles, D-rings, snap hooks, and metal links that connect parts of the lifeline system.

One of the major problems with forged safety snap hooks is their susceptibility to “rolling out,” or unlatching during shock or static loading by a twisting process. Care must be taken to ensure the use of “as new” safety locking snap hooks or Carabiner-type snap

hooks with an automatic twist-lock arm. Snap hooks should only be attached to compatible hardware and never to each other.

Connectors shall be drop-forged, pressed or formed steel or made of equivalent materials.

Connectors shall have a corrosion-resistant finish, and all surfaces and edges shall be smooth to prevent damage to interfacing parts of the system.

D-rings and snaphooks shall have a minimum tensile strength of 5,000lbs (22.2kN).

D-rings and snaphooks shall be proof-tested to a minimum tensile load of 3,600lbs (16kN) without cracking, breaking or taking permanent deformation.

Snaphooks shall be a locking-type snaphook designed and used to prevent disengagement or “rolling out” of the snaphook, which may occur when the connected member has contact with the snaphook keeper.

Snaphooks shall not be engaged unless they are a locking type and designed for the following connections:

- Directly to webbing, rope or wire rope.
- To other snaphooks.
- To a D-ring to which another snaphook or other connector is attached.
- To a horizontal lifeline.
- To any object that is incompatibly shaped or dimensioned in relation to the snaphook such that unintentional.

5.8.3 Horizontal Lifeline

A horizontal lifeline is an anchorage cable designed to be rigged between two fixed anchorage points on the same level, which are independent of the work surface. The purpose is to provide a continuous anchorage point for the attachment of lanyards and/or retractable lifelines when no supporting steel or existing structural anchorage points are available.

- Cable-type lifelines must be at least 0.5 inch in diameter and be capable of supporting a 5,000-pound deadweight load per person at the center of the lifeline.
- Anchorage points must also be capable of supporting 5,000 pounds per employee attached.
- A minimum safety factor of 2:1 is required.
- The cable must have an adequate degree of sag. The OSHA Fall Protection regulation and guidance documents discuss the appropriate degree of sag.

- The cable must have supports every 20 to 50 feet. The OSHA Fall Protection regulation and guidance documents discuss appropriate supports.

- The cable must have sufficient shock absorption and design strength at least twice the force calculated for the dynamic fall of an anticipated number of workers who may use the line.

- Appropriate engineering is required for all horizontal lifelines.

- The devices used to connect to a horizontal lifeline shall be capable of locking in both directions on the lifeline.

5.8.4 Vertical Lifeline

A vertical lifeline is a line which extends from an independent anchorage point and to which a lanyard is attached using a grabbing device. This line should be at least 5/8 inch-diameter nylon or 5/8-inch- or 3/8-inch-diameter steel cable, and must have a minimum breaking strength of 5,000 pounds.

NOTE: When vertical lifelines are used, only one employee can be attached to each line.

5.8.5 Lanyards

The lanyard is a short, flexible rope, steel cable, or length of strap webbing, having a minimum strength of 5,000 pounds, that is used to connect a worker's safety harness to either an anchorage point or a grabbing device on a lifeline. The lanyard is designed to permit limited freedom of movement on the job and absorb the shock of a free fall up to 6 feet. As little slack as possible is vital to limit the free fall distance to which the worker is exposed. Only professionally manufactured lanyards with deceleration or shock absorbing devices, which can significantly reduce fall arrest forces on the body and can reduce the potential for compounding injuries, will be used by ARCADIS staff.

To remove the possibility of "roll-out" or of producing a shear point on the lanyard, the practice of looping a lanyard over a pipe or piece of structural steel and then hooking it back onto itself is prohibited. Most lanyard manufacturers have available, in varying lengths, items that are made specifically for this purpose. These are the items that will be used. These may be referred to by any number of names, such as crossover straps, anchorage connector straps, or tie-off adapters. These items are generally similar. Each is made up of a length of 2- to 3-inch-wide webbing with a D-ring on each end. The strap is looped one or more times around the pipe or structural steel and then the lanyard is anchored into both of the D-rings. This is the prescribed method to be used by ARCADIS staff.

5.8.6 Self-Retracting Lifeline Devices

These portable, self-contained devices are fixed to an anchorage point above the work area. The lifeline rope, webbing, or cable is attached directly to the worker's safety harness. The rope pays out of the device as distance increases and retracts as the worker moves closer. At the moment a fall occurs, a centrifugal locking mechanism is activated to arrest the movement, thereby reducing the potential shock load. A good

application can be found on sloping roofs or other areas where the rope is never slack and it does not interfere with the work surface.

NOTE: Because this device is an enclosed, self-retracting mechanism, consideration should be given to the fact that requirements for inspection and maintenance will be much greater and more difficult than with other fall protection systems.

5.8.7 Body Harness

A body harness is the only authorized safety support for employees to wear with a lifeline fall protection system. The body harness shall be used in all applications where a personal fall arrest system is used.

The body harness should be a nylon or web belt system designed to spread the shock load of an arrested fall over the shoulders, thighs and seat area. The D-ring must be positioned on the upper back straps, where it will also provide a practical means of raising or lowering the wearer in a rescue operation.

The body belt, which is a device worn around the waist to which a lanyard or lifeline grabbing device is attached, and the chest harness, which is only used for restraint or positioning, are not authorized for fall protection applications at ARCADIS. The bosun chair may only be used for suspension and positioning where free falls are not anticipated.

5.8.8 Rope Grab Device

This is a grabbing device which connects the worker's safety harness or lanyard to the lifeline and is designed to arrest a fall mechanically, bringing the worker to a full stop. There are two types of mechanical cable or rope grabbing devices that may be used by ARCADIS personnel:

- Manually Operated Grab. The worker moves this device by hand, up and down the lifeline. Preferably, it should be positioned above the work level. This device actuates during a fall by either squeezing the rope, or by tipping in such a way as to lock onto the lifeline by friction.

- Mobile Grab. This grab device is designed to travel freely on the lifeline, helping to provide vertical freedom of movement, but to lock automatically should a fall occur. Most mobile grabs are activated by the inertial and/or frictional forces generated by a fall.

5.8.9 Labeling Requirements

- All safety belts, harnesses and lanyards placed in service or purchased on or before February 1, 1997, shall be labeled as meeting the requirements contained in ANSI A10.14-1975.

- All personal fall arrest, personal fall restraint and positioning device systems purchased or placed in service after February 1, 1997, shall be labeled as meeting the requirements contained in ANSI A10.14-1991 or ANSI Z359.1-1992.

5.9 Fixed Ladder Climbing Protection Systems

Climbing protection is required on all fixed ladders more than 20 feet high or deep. Climbing protection devices offer a personal fall protection system designed to positively limit a worker's fall. Even when a worker is climbing a ladder protected by caging (e.g., metal hoops installed around fixed ladders), some type of climbing protection device must be used. All ladder safety devices must meet the design requirements of the ladders they serve. The two main types of permanently attached climbing safety devices that may be used by ARCADIS personnel are presented below.

5.9.1 Rigid Rail Carrier

The rail, or cable, is called a carrier. In the rigid system, the rail runs the entire length of the ladder and is a permanent part of the ladder. The rigid carrier system is the only climbing system that should be used by ARCADIS personnel for ascending or descending a tall ladder, because fittings every few feet attaching the ladder to the structure make these systems inherently safer and more maintenance free than the cable-type climbing systems.

A sliding device (Saf-T-Lok sleeve or similar) is attach to the rigid rail and a carabiner connected to the sleeve is attached to the ARCADIS worker's safety harness to allow climbing freedom. Should a fall occur, the device must be of the type that is designed to either lock onto the carrier or to limit the descent velocity. Safety harness used with these systems should include a front D-ring if the rail or cable is in the center of the ladder, or side D-rings if the rail or cable is located on the side of the ladder.

5.9.2 Flexible Cable Carrier

The flexible cable-type climbing safety system should only be used for lower heights (generally lower than 100 feet). This type of system must be secured to the ladder at the top and bottom, must be kept taut by tightening devices to prevent damage caused by wind vibration, and should have guides placed every 25 to 40 feet to provide protection from wind whipping and also to control bowing as the climber ascends or descends. Because of the weathering properties of steel cable outdoors, and the reliance on a single upper fixture point, this type of climbing protection system must be thoroughly inspected and maintenance records reviewed and approval granted by ARCADIS Corporate Health & Safety Director before ARCADIS personnel are allowed to use it.

A sliding device attaches the worker's safety harness to the carrier and allows climbing freedom. Should a fall occur, the device must be of the type that is designed to either lock onto the carrier or to limit the descent velocity. Safety harness used with these systems should include a front D-ring if the rail or cable is in the center of the ladder, or side D-rings if the rail or cable is located on the side of the ladder.

Employees must review and comply with rigid rail carrier manufacturer instruction manual and any applicable technical alerts issued by the manufacturer.

5.10 Inspection and Maintenance of Equipment

Before a fall protection system is used, trained workers who will be using the equipment must conduct a detailed inspection of the fall protection system and its equipment to

ensure that it meets the requirements of the job and is acceptable to the workers. This type of inspection must be repeated at regular intervals as part of a maintenance program.

Users of fall protection equipment will be taught how to conduct a visual inspection of each part of their equipment, including the webbing harness, buckles, D-rings, lanyards, and anchor points, what they should be looking for, and whom they should immediately notify in the event they believe they have a problem. ARCADIS staff will be informed that they are required to conduct these visual inspections each time before they use the equipment, and that any indication of tearing, rubbing, weather corrosion, dry rot, damage, cuts, pinching, etc, will be sufficient cause to have the equipment immediately removed from service and marked as unusable.

Fall protection equipment that is found to be defective, damaged, or in need of repair, regardless of the extent of the problem, must be immediately marked as unusable and removed from service.

5.10.1 Formal Inspection

PFAS must be regularly inspected. Any component with any significant defect, such as cuts, tears, abrasions, mold, or undue stretching; alterations or additions that might affect its efficiency; damage due to deterioration; contact with fire, acids, or other corrosives; distorted hooks or faulty hook springs; tongues unfitted to the shoulders of buckles; loose or damaged mountings; non-functioning parts; or wearing or internal deterioration in the ropes must be withdrawn from service immediately, and should be tagged or marked as unusable, or destroyed.

The following sections explain how to inspect each portion of the personal fall arrest system.

5.10.1.1 Safety Harness

Beginning at one end, holding the body side of the harness toward you, grasp the harness with your hands 6 to 8 inches apart. Bend the harness in an inverted “U.” The surface tension resulting will make damaged fibers or cuts much easier to see. Do this, a small section at a time, over the entire harness. Inspect for frayed or broken strands. Broken webbing strands generally appear as tufts on the webbing surface. Any broken, cut, or burned stitches will be readily seen.

Special attention should be given to the attachment of buckles and D-rings to webbing. Note any unusual wear, frayed or cut fibers, or distortion of the buckles or D-rings. Buckle tongues should be free of distortion and should overlap the buckle frames and move freely back and forth in their sockets. The tongue or billet of the harness receives heavy wear from repeated buckling and unbuckling. Inspect for loose, distorted, or broken grommets. Rivets should be tight and unmovable with the fingers. Body side rivet bases and outside rivet burrs should be flat against material.

5.10.1.2 Lanyard and Hardware

When inspecting lanyards, begin at one end and work to the opposite end. Slowly rotate the lanyard so that the entire circumference is checked. Spliced ends require particular attention.

Steel Lanyards. While rotating the steel lanyard watch for cuts, frayed areas, or unusual wearing patterns on the wire. Broken strands will separate from the body of the lanyard.

Webbing Lanyards. While bending webbing over a pipe or mandrel, observe each side of the webbing lanyard. This will reveal any cuts or breaks. Swelling, discoloration, cracks, or charring are obvious signs of chemical or heat damage.

Rope Lanyards. Rotation of the rope lanyard while inspecting from end to end will reveal any fuzzy, worn, broken, or cut fibers. Weakened areas from extreme loads will appear as a noticeable change in the original diameter.

Snap Hooks. Carefully inspect snap hook latching mechanisms for deformation, corrosion, dirt, damage, or abuse. Damaged hooks almost always indicate lack of proper use. Snap hooks that become ineffective because of these problems must be destroyed. Only snap hooks that operate in as-new condition can be used.

5.10.2 Cleaning the Equipment

Wipe all surface dirt from the harness with a sponge dampened in plain water. Squeeze sponge dry and dip sponge into mild solution of water and commercial soap or detergent. Apply to the harness and work up a lather with a vigorous back-and-forth motion. Wipe the harness dry with a clean cloth and hang freely to dry. Do not place near excessive heat.

Basic care of the harness and lanyards will prolong the life of the unit and will contribute to the performance of its vital safety function. Proper storage and maintenance after use are as important as cleansing the equipment of dirt, corrosives, or contaminants. Storage areas should be clean, dry and free of exposure to fumes or corrosive elements.

Recordkeeping procedures will help determine the life and history of individual pieces of fall protection equipment.

5.10.3 Impact Loading

Most manufacturers will not guarantee that a harness or lanyard will provide adequate protection during a second fall. Therefore, ARCADIS policy mandates that equipment that has been subjected to impact loading or an actual fall, must be immediately removed from service and not used again.

5.11 Protection from Falling Objects

Material/equipment must be kept 6 feet from the edge, but the protection needed will depend on the material/equipment that present the hazard.

Employees must be protected from falling objects whenever an affected employee is 6 feet (1.8 meters) or more above a lower level.

Toe boards, when used as falling object protection, must be erected along the edge of the overhead walking/working surface and must be capable of withstanding a force of at least 50 pounds applied in a downward or outward direction. They must be solid, be a minimum of 3.5 inches high, and have not more than 0.25 inch clearance above the walking/working surface.

When materials are piled higher than the toe board, paneling or screening shall be erected from the toe board to the guardrail. Materials and equipment shall not be stored within 6 feet of a roof edge unless guardrails have been erected.

Guardrail systems, when used as falling object protection, shall have all openings small enough to prevent passage of potential falling objects.

No materials or equipment except masonry and mortar shall be stored within 4 feet of working edges. During roofing work, materials and equipment shall not be stored within 6 feet of a roof edge unless guardrails are erected at the edge, and materials piled, grouped, or stacked near a roof edge must be stable and self supporting.

5.12 Rescue Plan

When PFAS are used, ARCADIS must ensure that employees can be promptly rescued or can rescue themselves should a fall occur. The availability of rescue personnel, ladders, or other rescue equipment should be evaluated. In some situations, equipment that allows employees to rescue themselves after the fall has been arrested, such as devices with descent capability, may be desirable. The fallen worker must be rescued safely and quickly. No-one should be allowed to hang suspended by a full body harness for more than 5 minutes. Every effort shall be made for ARCADIS employees to not work alone when wearing a PFAS. If it is not feasible for a specific task and the employee will work alone, then they must have a cellular telephone on their person in order to self-initiate emergency rescue service notification, if an emergency arises.

5.12.1 Advanced Planning

All good rescue systems require advanced planning. Before work begins, the necessary rescue equipment should be determined by the project team and made available at the job site. The client's rescue capabilities should be assessed, and the availability of client staff to assist in a rescue should be verified. The local fire department should be notified to determine whether it can assist in effecting a rescue. Once the plan is developed, training sessions in the use of the plan should be conducted.

5.12.2 Suspension Trauma

Suspension trauma can occur when a person has an arrested fall and is suspended and caught upright in a vertical position that causes the harness straps to put pressure on the leg veins. Because the lower legs have a large storage capacity for blood and gravity pulls blood into them, suspension trauma can occur when a person's legs are immobile in an upright posture for a prolonged period of time. The returned blood flow to the heart is reduced as blood accumulates in the legs. Because the blood supply to the heart is then restricted, the body suddenly slows the heart, causing the person to faint.

Fainting, restriction of movement or loss of consciousness can occur within a few minutes. This can lead to renal failure and eventually death, depending on the person's susceptibility. The condition can be worsened by heat and dehydration.

Susceptibility is unrelated to fitness levels or other physical conditions. Therefore, quick rescue of a person suspended in a full-body harness as soon as possible is vital. Designated and trained workers shall be capable of conducting the rescue of a fallen worker and be familiar with on-site rescue equipment and procedures.

The following shall be considered for preventing suspension trauma as a result of an arrested fall:

- Workers shall never work alone when using a harness for fall protection.
- Suspension-trauma safety straps shall be used. They are an effective way to prevent the effects of suspension trauma after a fall because they allow the worker who is suspended to stand up in the harness to relieve pressure.
- Workers spending time hanging in a harness shall use a 'sit-type' harness, which allows legs to be kept at least partially horizontal.
- The length of time a worker spends in suspension after a fall should be limited to five minutes. When suspension is longer than five minutes, foothold straps or a way of placing weight on the legs shall be provided.
- Workers shall try to use their legs and push against any footholds when these movements are possible.
- Workers shall try to place the legs as high as possible and the head as horizontal as possible.
- Harnesses shall be selected for specific applications with consideration given to comfort, potential injuries and suspension trauma.
- If a person falls, he or she shall be moved by a person who is trained in rescue procedures from suspension in stages. (i.e., the procedure should take 30-40 minutes with the victim moved first into kneeling position, then sitting and finally horizontal; sudden movement to a horizontal position can be potentially fatal).

5.10.3 Type of Rescue

The following questions should be considered when evaluating the type of rescue:

- Will the fallen worker be able, both physically and mentally, to affect his/her own rescue, or will a rescue team be needed to assist him/her?
- Are there devices with descent capability quickly available at the job site, and have employees been trained in their use?
- Will the fallen worker need to be lifted to a landing level where he/she can be rescued or will he/she need to be lowered to the ground?

5.10.4 Communication in the Event of an Emergency

Employees must know who to call and the fastest way to contact them. The Elevated Work Permit contains emergency contact information. As part of the project planning process, emergency responders must be notified of the time/date of planned elevated work. Emergency telephone numbers must be posted in the project Health & Safety Plan or at the work site where they will be readily accessible, and some type of communication link, such as a mobile phone, must be available at the work site. While awaiting help, other employees should communicate frequently with the fallen worker and monitor him/her constantly. The fallen worker should be kept from panicking, and should know that others are working to affect his/her rescue.

6. TRAINING

Fall Protection General Awareness Training by a Competent Person is required for all staff who work on elevated surfaces and where fall hazards may be present.

Project specific fall protection training is to be completed prior to start of those projects requiring the use of fall protection.

6.1 ARCADIS Fall Protection "Competent Person" Training

ARCADIS employees must meet the following requirements to be considered a Competent Person:

- Attend a fall protection training course approved by Corporate Health and Safety or have equivalent training to that provided in the fall protection training course; and
- Approval by Corporate Health and Safety through demonstrating practical field experience and/or knowledge of the subject matter.

Practical field experience and knowledge for Fall Protection includes the following, at a minimum:

1. Elevated work and fall hazard identification and assessment.
2. Fall Hazard Controls: fall protection systems; personal fall restraint, guardrails, covers and warning line systems.
3. Regulatory requirements.
4. Procedures for addressing elevated work and fall hazards.
5. Fall protection equipment maintenance and inspection procedures.
6. Emergency procedures for elevated work.
7. Responsibilities of a Competent Person.
8. Correct usage of Elevated Work Permit.

6.2 Project Specific Training

Project Specific Training must include the following, at a minimum:

1. Fall protection procedures.
2. Review of this "Elevated Work and Fall Protection Standard".
3. Use of fall protection systems and equipment.
4. Inspection of PFAS equipment.
5. Use of the Elevated Work Permit.
6. Daily Safety Tailgate Meetings that address fall protection specific to the project.

6.3 Employee Training Certification

A written certification record, which contains the name of the employee trained, the dates of the training, the subject and type of training, and the signature of the Competent Person who performed the training will be documented by the ARCADIS Training Group.

6.4 Retraining

Retraining must be performed whenever ARCADIS has reason to believe that any affected employee, who has already been trained, is still lacking in the understanding required by the Fall Protection standard. Retraining will also be performed when any of the following occurs:

- changes in the work place render the previous training obsolete
- inadequacies in the employee's knowledge of fall protection
- changes in the type of fall protection equipment

7. REFERENCES

Consensus Standards

29 CFR 1910 Subpart D – Walking-Working Surfaces

29 CFR 1926: Subpart M - Fall Protection

ANSI Z359.1 Safety Requirements for Personal Fall Protection

8. RECORDS

Record Maintenance –All records regarding fall protection permits and inspections must be maintained in the project files. Employee training records will be maintained per ARCADIS training recordkeeping requirements.

9. APPROVALS AND HISTORY OF CHANGE

Approved By: Julie Santaniello, CSP – Corporate H&S, Manager of Technical Programs

History of Change

Revision Date	Revision Number	Reason for change
24 February 2011	1	Conversion to current format; Update standard to include description of fall protection systems and use of elevated work permit
13 April 2012	2	Changed terminology JLA-JSA; LPO-TIP Added Approval line
27 February 2013	3	Updated Safety Monitoring System requirements in section 5.6.6 . Renaming of section 5.6.7
16 February 2018	4	Inserted Section 5.8.9 Labeling Requirements. Updated approve to Julie Santaniello.

Exhibit 1- Definitions

Anchorage - a secure point of attachment for lifelines, lanyards or deceleration devices.

Buckle - any device for holding the body belt or body harness closed around the employee's body.

Competent Person - one who, through education, training, and/or experience, is capable of identifying existing and predictable hazards or working conditions which are unsanitary, hazardous, or dangerous to employees and who has authorization to take prompt corrective measures to eliminate them.

The Competent Person will be “Qualified” in the following areas:

- the nature of fall hazards in the work area
- the correct procedures for erecting, maintaining, disassembling, and inspecting the fall protection systems to be used
- the use and operation of guardrail systems, personal fall arrest systems, safety net systems, warning line systems, safety monitoring systems, controlled access zones, and other protection to be used
- the role of each employee in the safety monitoring system when this system is used
- the limitations on the use of mechanical equipment during the performance of roofing work on low-sloped roofs
- the correct procedures for the handling and storage of equipment and materials and the erection of overhead protection
- the role of employees in fall protection plans
- familiar with the OSHA Regulations pertaining to Fall Protection.

Connector - a device which is used to couple (connect) parts of the personal fall arrest system and positioning device systems together. It may be an independent component of the system, such as a carabiner, or it may be an integral component of part of the system (such as a buckle or D-ring sewn into a body belt or body harness, or a snap-hook spliced or sewn to a lanyard or self-retracting lanyard).

Construction Work - construction, alteration, and/or repair, including roofing, painting and decorating and demolition. Section 1910.12(a) further provides that OSHA's construction industry standards apply "to every employment and place of employment of every employee engaged in construction work. Definition Interpretations: Construction work is not limited to new construction, but can include the repair of existing facilities or the replacement of structures and their components. For example, the replacement of one utility pole with a new, identical pole would be maintenance; however, if it were replaced with an improved pole or equipment, it would be considered construction. In addition to the concept of one-for-one replacement versus improvement, the scale and complexity of the project are relevant. This takes into consideration concepts such as the amount of time and material required to complete the job. For example, if a

steel beam in a building had deteriorated and was to be replaced by a new, but identical beam, the project would be considered a construction repair rather than maintenance because of the replacement project's scale and complexity. Also, if a bridge was to be stripped and re-painted, that would be considered construction work even if the repainting were done on a scheduled basis. Replacement of a section of limestone cladding on a building, though not necessarily a large project in terms of scale, would typically be considered construction because it is a complex task in view of the steps involved and tools and equipment needed to do the work.

Deceleration device - any mechanism, such as a rope grab, rip-stitch lanyard, specially-woven lanyard, tearing or deforming lanyards, automatic self-retracting lifelines/lanyards, etc., which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limit the energy imposed on an employee during fall arrest.

Deceleration distance - the additional vertical distance a falling employee travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which the deceleration device begins to operate. It is measured as the distance between the location of an employee's body belt or body harness attachment point at the moment of activation (at the onset of fall arrest forces) of the deceleration device during a fall, and the location of that attachment point after the employee comes to a full stop.

Elevated Work - any work that is done over another level or surface at heights above 6 feet, or work that is done over a hazardous situation.

Elevated Work Surface - any surface upon which work is conducted above another level or surface.

Equivalent - alternative designs, materials, or methods to protect against a hazard which the employer can demonstrate will provide an equal or greater degree of safety for employees than the methods, materials or designs specified in the standard.

Failure - load refusal, breakage, or separation of component parts. Load refusal is the point where the ultimate strength is exceeded.

Fall Restraint - a system that prevents a worker from reaching an exposed edge of a working surface, by means of tying off or connecting a lifeline to an anchorage point.

Free fall distance - the vertical displacement of the fall arrest attachment point on the employee's body belt or body harness between onset of the fall and just before the system begins to apply force to arrest the fall. This distance excludes deceleration distance, and lifeline/lanyard elongation, but includes any deceleration device slide distance or self-retracting lifeline/lanyard extension before they operate and fall arrest forces occur.

Guardrail system - a barrier erected to prevent employees from falling to lower levels.

Hole - means a gap or void 2 inches (5.1 cm) or more in its least dimension, in a floor, roof, or other walking/working surface.

Infeasible - that it is impossible to perform the construction work using a conventional fall protection system (i.e., guardrail system, safety net system, or personal fall arrest system) or that it is technologically impossible to use any one of these systems to provide fall protection.

Lanyard - a flexible line of rope, wire rope, or strap which generally has a connector at each end for connecting the body belt or body harness to a deceleration device, lifeline, or anchorage.

Leading edge - the edge of a floor, roof, or formwork for a floor or other walking/working surface (such as the deck) which changes location as additional floor, roof, decking, or formwork sections are placed, formed, or constructed. A leading edge is considered to be an "unprotected side and edge" during periods when it is not actively and continuously under construction.

Lifeline - a component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline), and which serves as a means for connecting other components of a personal fall arrest system to the anchorage.

Lower levels - those areas or surfaces to which an employee can fall. Such areas or surfaces include, but are not limited to, ground levels, floors, platforms, ramps, runways, excavations, pits, tanks, material, water, equipment, structures, or portions thereof.

Maintenance - there is no regulatory definition for "maintenance," nor a specified distinction between terms such as "maintenance," "repair," or "refurbishment." "Maintenance activities" have commonly been defined in dictionaries as making or keeping a structure, fixture or foundation (substrates) in proper condition in a routine, scheduled, or anticipated fashion. In OSHA's directive on the general industry confined space standard, the Agency stated that maintenance involves "keeping equipment working in its existing state, i.e., preventing its failure or decline". Work that is anticipated, routine and done on a regularly scheduled/periodic basis to help maintain the original condition of the component, will be suggestive of "maintenance," although this must be considered in light of the scale of the project.

Mechanical Equipment - all motor or human propelled wheeled equipment used for roofing work, except wheelbarrows and mopcarts.

Opening - a gap or void 30 inches (76 cm) or more high and 18 inches (48 cm) or more wide, in a wall or partition, through which employees can fall to a lower level.

Qualified - one who by possession of a recognized degree, certificate, professional standing, or extensive knowledge, training and experience has successfully demonstrated their ability to solve or resolve problems relating to the subject matter, the work, or the project.

Rope grab - a deceleration device which travels on a lifeline and automatically, by friction, engages the lifeline and locks so as to arrest the fall of an employee. A rope grab usually employs the principle of inertial locking, cam/level locking, or both.

Roof - the exterior surface on the top of a building. This does not include floors or formwork which, because a building has not been completed, temporarily become the top surface of a building.

Roofing work - the hoisting, storage, application, and removal of roofing materials and equipment, including related insulation, sheet metal, and vapor barrier work, but not including the construction of the roof deck.

Self-retracting lifeline/lanyard - a deceleration device containing a drum-wound line which can be slowly extracted from, or retracted onto, the drum under slight tension during normal employee movement, and which, after onset of a fall, automatically locks the drum and arrests the fall.

Snaphook - a connector comprised of a hook-shaped member with a normally closed keeper, or similar arrangement, which may be opened to permit the hook to receive an object and, when released, automatically closes to retain the object. Snaphooks are generally one of two types:

- The locking type with a self-closing, self-locking keeper which remains closed and locked until unlocked and pressed open for connection or disconnection; or

- The non-locking type with a self-closing keeper which remains closed until pressed open for connection or disconnection. As of January 1, 1998, the use of a non-locking snaphook as part of personal fall arrest systems and positioning device systems is prohibited.

Toeboard - a low protective barrier that will prevent the fall of materials and equipment to lower levels and provide protection from falls for personnel.

Walking/working surface e- any surface, whether horizontal or vertical on which an employee walks or works, including, but not limited to, floors, roofs, ramps, bridges, runways, formwork and concrete reinforcing steel but not including ladders, vehicles, or trailers, on which employees must be located in order to perform their job duties.

Work area - that portion of a walking/working surface where job duties are being performed.

Exhibit 2 – Elevated Work Permit

ARCADIS

ELEVATED WORK PERMIT

Project Name:		**Project Location:**	
Permit Developed By:		**Date:**	
Project Start Date:		**Project Completion Date:**	
Client:		**Client Contact:**	
Subcontractor Companies			

TRACKing the Elevated Work Permit

THINK THROUGH THE TASK

Job Task: (Summary of what elevated work is proposed)

WORKFORCE INVOLVED IN ELEVATED WORK		Check all the apply						
Name	**Company**	Elevated Work Qualified	Competent Person	Experienced	Can Work Alone	Short Service Employee	Training Required	Supervision Required
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐

Comments/Additional Details:

RECOGNIZE THE HAZARDS (check those that apply) and ASSESS THE RISK (Low - Moderate - High)

YES	NO		SELECT ↓	YES	NO		SELECT
☐	☐	FRAGILE ROOF OR SURFACES		☐	☐	POSSIBLE FALL FROM A HEIGHT BELOW 6' (1.83M)	
☐	☐	MATERIALS OR TOOLS AT HEIGHTS		☐	☐	POSSIBLE FALL FROM A HEIGHT OF 6' (1.83M) OR MORE	
☐	☐	LIFTING, PUSHING OR PULLING		☐	☐	POSSIBLE FALL FROM A LADDER	
☐	☐	WORK NEAR ELECTRICAL LINES		☐	☐	POSSIBLE FALL FROM A WORK PLATFORM	
☐	☐	MANUAL HANDLING MATERIALS		☐	☐	POSSIBLE FALL INTO A HAZARDOUS SUBSTANC	
☐	☐	GROUND LEVEL OBSTRUCTION		☐	☐	POSSIBLE FALL INTO EXCAVATION	
☐	☐	MOVING MATERIALS		☐	☐	POSSIBLE FALL INTO WATER	
☐	☐	OVERHEAD OBSTRUCTIONS		☐	☐	RESTRICTED SPACE	
☐	☐	FALLING OBJECTS		☐	☐	VEHICLES OR TRAFFIC	
☐	☐	SLIPS, TRIPS, FALLS		☐	☐	WEATHER OR TEMPERATURE	
☐	☐	WORKING ALONE		☐	☐	FALLING OBJECTS	
☐	☐	UNGUARDED EDGES		☐	☐	LACK OF SPACE	
☐	☐	UNEVEN FLOOR SURFACES		☐	☐	WORKING ABOVE A HAZARD	

CONTROL THE WORKING ENVIRONMENT

	YES	NO		YES	NO
GENERAL INDUSTRY PROJECT	☐	☐	CONSTRUCTION INDUSTRY PROJECT	☐	☐
CONES/BARRIERS	☐	☐	ISOLATE EQUIPMENT	☐	☐
EMERGENCY RESCUE PROCEDURES IN PLACE	☐	☐	THREE FEET OF LADDER ARE ABOVE STEPPING-OFF POINT	☐	☐
EQUIPMENT MAINTAINED	☐	☐	LADDER PLACED AT 4:1 ANGLE	☐	☐
FIRST AID PROVISION	☐	☐	WEATHER	☐	☐
RESCUE AT HEIGHTS AVAILABLE WITHIN FIVE MINUTES	☐	☐	LADDER SECCURED AT TOP AND ON LEVEL FIRM BASE TO SUPPORT LOAD	☐	☐
SAFE WORKING AREA	☐	☐	WORK EQUIPMENT INSPECTED	☐	☐

Note: General Industry requires fall protection at heights of 4 feet and greater, whearas Construction Industry requires protection at 6 feet and higher.

CONTROL THE HAZARDS: TYPE OF FALL PROTECTION SYSTEM TO BE USED

	YES	NO		YES	NO
GUARDRAILS	☐	☐	FENCES	☐	☐
PFAS	☐	☐	BARRICADES	☐	☐
SAFETY NET	☐	☐	CAGE LADDER SYSTEM	☐	☐
POSITIONING DEVICE SYSTEM	☐	☐	RIGID RAIL	☐	☐
COVERS	☐	☐	WIRE RAIL SYSTEM	☐	☐
CONTROLLED ACCESS ZONE	☐	☐	WARNING LINE SYSTEM	☐	☐

EQUIPMENT REQUIRED

Personal Fall Arrest System	YES	NO	**Guardrail System**	YES	NO
6' (1.83M) FALL-LIMITING LANYARD WITH SHOCK ABSORBER	☐	☐	MID-RAIL PLACED WITH NO GAP OF 19" (48cm)	☐	☐
ANCHORAGE POINTS DESIGNED	☐	☐	GUARD RAILS (DOUBLE ABOVE 6'	☐	☐
FALL ARREST (INSPECTED)	☐	☐	GUARD RAILS (TOP RAIL A MINIMUM OF 39" [1m] ABOVE PLATFORM)	☐	☐
HARNESS (INSPECTED)	☐	☐	TOE BOARDS	☐	☐
Positioning/ Restraint System	YES	NO	**Scaffolding**	YES	NO
DOUBLE LANYARD FOR 100% TIE-OFF	☐	☐	TAGGED	☐	☐
FALL RESTRAINT (INSPECTED)	☐	☐	FIXED SCAFFOLDING ERECTED BY CP	☐	☐
Other Equipment	YES	NO			
LADDERS	☐	☐			
AERIAL LIFT/ MAN LIFT/ SCISSOR LIFT	☐	☐			
RAMPS/STAIRWAYS/STEPS	☐	☐			

KEY ITEMS CHECKLIST

Fall Protection Program	YES	NO	N/A
Has a Competent Person been designated?	☐	☐	☐
Have employees received training (site specific as needed) by a Competent Person?	☐	☐	☐
Is a Qualified Person available for assistance if needed?	☐	☐	☐
Fall Protection Systems	YES	NO	N/A
Are midrails being used with guardrail systems?	☐	☐	☐
Are toeboards being used with guardrail systems?	☐	☐	☐
Will guardrails withstand a 200-pound force from an outward or downward direction?	☐	☐	☐
Are openings on safety nets no greater than 6-inch squares?	☐	☐	☐
Does warning line have a minimum tensile strength of 500 pounds (2,220 N)?	☐	☐	☐
Is warning line capable of supporting, without breaking, loads applied to the stanchions?	☐	☐	☐

Are positioning devices used for fall protection?	☐	☐	☐
Are covers appropriately marked or adequately fastened?	☐	☐	☐
If a fall protection plan is in use, has it been developed by a Qualified Person?	☐	☐	☐
Personal Fall Arrest System	**YES**	**NO**	**N/A**
Are only full body harnesses being used?	☐	☐	☐
Are lanyards with a deceleration device being used?	☐	☐	☐
Are only double-locking safety-type snap hooks being used?	☐	☐	☐
Are anchorage points capable of supporting 5,000 pounds (22.2 kilonewtons)?	☐	☐	☐
Are horizontal lifelines engineered by a Qualified Person?	☐	☐	☐
Are horizontal lifelines designed to support 5,000 pounds for each employee attached?	☐	☐	☐
Is no more than one employee being attached to a single vertical lifeline?	☐	☐	☐
Are personal fall arrest systems being adequately inspected before each use?	☐	☐	☐
Self-Retracting Lifelines	**YES**	**NO**	**N/A**
Do they automatically limit free fall distances to 2 feet?	☐	☐	☐
Are they capable of sustaining a tensile load of 3,000 pounds (13.3 kilonewtons)?	☐	☐	☐
Are self-retracting systems being inspected before and after each use?	☐	☐	☐
Rescue Plan	**YES**	**NO**	**N/A**
Has an effective rescue plan been developed?	☐	☐	☐
Have personnel been trained in the rescue plan?	☐	☐	☐

EMERGENCY CONTACT LIST

Emergency Contact:	**Phone 1:**	**Phone 2:**	**Location:**
Local Police:			
Local Ambulance:			
Local Fire Dept.			
Project Manager:			
Site Manager:			
Client Contact:			
Site Safety Officer:			
H&S Manager:			
Work Care	800-455-6155		

***Include any Task Specific JLA's with this permit.**

KEEP H&S FIRST IN ALL THINGS

I understand the nature of the work for this permit, and certify that this permit meets the requirements specified in the ARCADIS Elevated Work and Fall Protection Standard.

APPROVAL OF ELEVATED WORK PERMIT- By ARCADIS Competent Person:

Name: _____

Title: _____

Office Location: _____

Date: _____

Implementation Date 10 January 2008	Arcadis HS Standard Name First Aid/CPR/AED	ARCADIS Design & Consultancy for natural and built assets
Revision Date 16 August 2018	Arcadis HS Standard No. ARC HSGE004	Revision Number 09

EXECUTIVE SUMMARY

This standard complies with the Occupational Safety and Health Administration's (OSHA's) Medical Services and First Aid Standard as it relates Arcadis work. According to OSHA, the employer will ensure the "ready availability of medical personnel", but how this is implemented is dependent on the circumstances of each place of work.

The First Aid/Cardiopulmonary Resuscitation (CPR)/Automated External Defibrillator (AED) standard applies to all Arcadis offices or job sites that designate or expect employee(s) to act as First Aid Responders. Employees who are not designated or expected to act as a First Aid Responder may render first aid voluntarily if they are trained in first aid, but their actions are not covered under the OSHA standard.

If the office or job site is in near proximity (within 3-4 minutes) to medical services, employees do not need to be designated or expect to act as First Aid Responders unless required to do so by a particular OSHA standard or client requirement. However, if the job site is not in near proximity to medical services and serious accidents are possible, an employee or employees will be designated and trained as a First Aid Responder.

> **Note:** OSHA has long interpreted the term "near proximity" to mean that emergency care must be available within no more than 3-4 minutes from the workplace. Accordingly, in workplaces where serious accidents such as those involving falls, suffocation, electrocution, or amputation are possible, emergency medical services must be available within 3-4 minutes, if there is no employee on the site who is trained to render first aid. OSHA exercises discretion in enforcing the first aid requirements in particular cases. OSHA recognizes that a somewhat longer response time of up to 15 minutes may be reasonable in workplaces, such as offices, where the possibility of such serious work-related injuries is more remote.

The Project Manager (PM), Location Leader, and/or Office Health & Safety (H&S) Coordinator determines if they are required to designate First Aid Responders at the office location and/or at any particular job site. The types of accidents/injuries that could occur, location/availability of medical facilities, and the response time of emergency services are considered in making this determination.

In the absence of an infirmary, clinic or hospital in near proximity to the workplace, an employee(s) will be trained to render First Aid/CPR/AED. This may also be necessary if required to do so by another standard (i.e. more stringent Arcadis standard or State OSHA standard) or client requirements. First aid supplies are readily available if an employee is designated as a First Aid Responder.

Employees designated or expected to act as First Aid Responders must have first aid supplies readily available. The type of work being done, job site and office sites are considered when determining the contents of a first aid kit. If exposure to the weather is possible, the contents of the first aid kit must be protected. Employees designated or expected to act as First Aid Responders will be offered the Hepatitis B vaccination series. The employee may decline the vaccination and, if so, will be asked to sign a declination form.

First Aid/CPR/AED/Bloodborne Pathogens (BBP) training occurs prior to assignment as a First Aid Responder. First Aid/CPR/AED training is certified by the American Heart Association (AHA) or the Red Cross and is required at a minimum on a bi-annual (every two years) basis. BBP training is required annually.

Implementation Date 10 January 2008	Arcadis HS Standard Name First Aid/CPR/AED	ARCADIS Design & Consultancy for natural and built assets
Revision Date 16 August 2018	Arcadis HS Standard No. ARC HSGE004	Revision Number 09

1. POLICY

It is the policy of Arcadis to comply with OSHA's Medical Services and First Aid Standard as it relates to the work we do. According to OSHA, the employer will ensure the "ready availability of medical personnel", but how this is implemented is dependent on the circumstances of each place of work.

2. PURPOSE AND SCOPE

2.1 Purpose

This Health & Safety Standard (HSS) assists Arcadis employees in determining if the OSHA standard applies to their job sites and assists in evaluating appropriate training needs for employees.

2.2 Scope

The First Aid/CPR/AED HSS applies to all Arcadis offices that designate or expect employee(s) to act as First Aid Responders at the office location and/or a job site. Employees who are not designated or expected to act as a First Aid Responder may render first aid voluntarily if they are trained in first aid, but their actions are not covered under the OSHA standard.

If the office or job site is in near proximity to medical services, employees do not need to be designated or expect to act as First Aid Responders unless required to do so by a particular OSHA standard or client requirement. However, if the office or job site is not in near proximity to medical services, an employee or employees will be designated and trained as a First Aid Responder.

3. DEFINITIONS

There are a number of definitions associated with this standard. These definitions are presented in Exhibit 1 of this document.

4. RESPONSIBILITIES

4.1 Project Manager

The PM determines if a First Aid Responder is required for their job site and ensures that employees working on their job sites have the proper training as required by this HSS.

4.2 Location Leader and Office H&S Coordinator

The Location Leader and Office H&S Coordinator determines if a First Aid Responder is required for their office location and ensures that employees working in those locations have the proper training as required by this HSS.

If the office is enrolled in the Cintas® US National First Aid and Safety Cintas First Aid and Safety Program (Cintas® First Aid and Safety Program), H&S Coordinators are responsible for ensuring Cintas has completed and documented all of the required

inspections. In offices not enrolled in the Cintas® First Aid and Safety Program, the H&S Coordinator is responsible for ensuring first aid kits are inspected at a minimum of monthly, maintained, and restocked after use.

4.3 Employees

If designated as a First Aid Responder, employees ensure their training is up to date as required by this HSS.

For job sites not enrolled in the Cintas® First Aid and Safety Program, employees are responsible for ensuring first aid kits are inspected at a minimum of monthly, maintained, and restocked after use.

4.4 Cintas

Cintas® will be responsible for restocking, inspecting and maintaining at locations that have a Cintas® issued first aid kit and/or leased AED.

5. PROCEDURE

5.1 Designation of First Aid Responders

The PM, Location Leader and/or Office H&S Coordinator determines if a designated First Aid Responder is required at the office location and/or at any particular job site. The types of accidents/injuries that could occur, location/availability of medical facilities, and the response time of emergency services are considered in making this determination.

In the absence of an infirmary, clinic or hospital in near proximity to the workplace, an employee(s) will be trained to render First Aid/CPR. This may also be necessary if required to do so by another standard (i.e. more stringent Arcadis standard or State OSHA standard) or client requirements. First aid supplies will be readily available if an employee is designated as a First Aid Responder.

If the office and/or job site is in near proximity of emergency medical services (within 3-4 minutes), and if not required to do so by some other standard or client, there is no requirement to designate First Aid Responders. However, if the decision is made to designate First Aid Responders, all requirements of this HSS apply.

This HSS does not apply to employees who voluntarily obtain First Aid/CPR/AED/BBP certification for their own personal benefit and were not designated by Arcadis as a First Aid Responder.

5.2 Injury/Illness Reporting and Notification

Where the illness/injury is acute or serious (life threating) it is generally best that Emergency Medical Services (EMS) is contacted by dialing 911.

WorkCare must be contacted for every non-emergency, work-related injury or illness to an Arcadis employee via their reporting hotline number (888-449-7787) to ensure proper medical management of the injury. Additional information regarding incident reporting requirements can be found in Incident Reporting and Investigation Standard (ARC HSMS010).

5.3 Transport to Medical Facility

When EMS is contacted, a designated First Aid Responder, if possible, should stay with the injured/ill employee until professional EMS has arrived to transport the employee to the hospital.

Where the injury or illness is minor or where waiting for ambulatory services is impractical, an injured or ill employee may be driven to a medical facility. The injured or ill person should be accompanied by at least one other employee, preferably a designated First Aid Responder, in addition to the operator of the vehicle.

5.4 First Aid Supplies/Kits

Employees designated or expected to act as First Aid Responders must have first aid supplies readily available. The type of work being done, job site and office sites are considered when determining the contents of a first aid kit. If exposure to the weather is possible, the contents of the first aid kit must be protected.

The OSHA standard does not specify what should be in a kit but does reference the recommendations by American National Standards Institute (ANSI) in their Z308.1-1998 publication, “Minimum Requirements for Workplace First Aid Kits” which provides types of kits and basic and optional contents. Since the OSHA regulation was published, the ANSI Z308.1 publication was last updated in 2014. Please note that some state OSHA programs require additional contents within first aid kits. Additional recommendations from WorkCare in regards to the contents of a first aid kit for the State of California are included in Exhibit 4. Employees are responsible for verifying and complying with state-specific requirements. The first aid kit will also contain appropriate personal protective equipment (PPE) and waste disposal supplies as required in OSHA’s BBP standard described in the Arcadis BBP HSS (ARC HSGE005). First aid kits will not contain medications that have potential to cause drowsiness or contain prescription medications.

5.4.1 Types of First Aid Kits

ANSI Z308.1 designates two classes of first aid kits (Class A & B) and four types (Type I, II, III, IV). **Class A** first aid kits are intended to provide a basic range of products to deal with most common types of injuries encountered in the workplace including: major wounds, minor wounds (cuts and abrasions), minor burns and eye injuries. First aid kits designated as Class A shall contain the assortment of compliant supplies in the quantities specified in Exhibit 2.

Class B kits are intended to provide broader range and quantity of supplies to deal with injuries encountered in more populated, complex and/or high-risk workplace environments. First aid kits designated as Class B shall contain the assortment of compliant supplies in the quantities specified in Exhibit 2.

Type I first aid kits are intended for use in stationary, indoor settings where the potential for damage of kit supplies due to environmental factors and rough handling is minimal. Type I first aid kits shall have a means for mounting in a fixed position and are generally not intended to be portable.

> **Note:** Typical applications for Type I first aid kits may include, but are not limited to, the following: general indoor use, an office setting or a manufacturing facility. First aid cabinets would generally fall into the Type I classification. Class B Type I first aid kits are recommended for Arcadis Offices and job site trailers.

Type II first aid kits are intended for portable use in indoor settings where the potential for damage of kit supplies due to environmental factors and rough handling is minimal.

> **Note:** Typical applications for Type II first aid kits may include, but are not limited to, the following: general indoor use, an office setting or a manufacturing facility.

Type III first aid kits are intended for portable use in mobile, indoor and/or outdoor settings where the potential for damage of kit supplies due to environmental factors is not probable. Type III kits shall have a means to be mounted in a fixed position and shall have a water-resistant seal.

> **Note:** Typical applications for Type III first aid kits may include general indoor use and sheltered outdoor use. Class B Type III first aid kits are recommended for Arcadis fleet/rental vehicles and job site.

Type IV first aid kits are intended for portable use in the mobile industries and/or outdoor settings where the potential for damage to kit supplies due to environmental factors and rough handling is significant. Type IV kits shall have a means to be mounted in a fixed position and shall meet specific performance requirements.

> **Note:** Typical applications for Type IV first aid kits may include, but are not limited to, the following: the transportation industry, the utility industry, the construction industry, and the armed forces.

5.5 Office First Aid Kit Program

Arcadis offices with five or more staff will be enrolled in the Cintas® First Aid and Safety Program. Cintas® will provide the Arcadis office with at a minimum one Class B, Type I first aid cabinet. Additional first aid cabinets may be needed based on office configuration or warehouse or shop spaces. Offices located in Puerto Rico are not currently eligible for the Cintas® First Aid and Safety Program.

Arcadis job sites are also eligible to enroll in the Cintas® US National First Aid and Safety Cintas First Aid and Safety Program. To begin the enrollment process, please contact 4-Sight-Support@Arcadis-us.com.

5.6 First Aid Kit Inspections

For offices enrolled in the Cintas® First Aid and Safety Program, Cintas® will conduct the required monthly inspections, restocking and any maintenance associated with the office first aid cabinets. Warehouse/shop spaces must be readily accessible during regular business hours.

Offices and job sites not enrolled in the Cintas® First Aid and Safety Program must complete and document routine inventory of all first aid kits. For job site first aid kits, the inventory is checked when it is initially taken to the job site, weekly thereafter, and anytime

first aid is rendered. For office first aid kits, the inventory is checked monthly and anytime first aid is rendered. An example of an inventory form is included in Exhibit 3.

5.7 Emergency Eyewash and Body Wash Equipment

Where the eyes or body of an employee may be exposed to injurious corrosive materials, suitable facilities for emergency drenching/flushing of the eyes and body will be provided within the "immediate" work area.

5.8 Optional AED Leasing

Arcadis offices and job sites with 5 or more people may opt to evaluate whether an AED is necessary at their location. The office or job site must first complete the AED Evaluation shown in Exhibit 5. Once the evaluation is complete, it must be submitted to Corporate H&S and Procurement at 4-Sight-Support@Arcadis-us.com for review. Upon review of the AED Evaluation, offices or job sites may be enrolled in the Cintas® AED lease program, which will provide the location a minimum of one AED. Additional AEDs may be needed based on office/job site configuration or warehouse/shop space location. The AED lease program includes Medical Direction, Written Plan, Replacement of Pads & Batteries, an AED wall cabinet, signage and on-going monthly checks to ensure regulatory compliance.

Staff must be trained in the use of an AED and be current in First Aid/CPR/AED/BBP training. Offices or job sites requesting an AED must ensure that staff are properly trained as per Section 6 and have at a minimum one staff member trained and designated as First Aid Responder present during normal business/working hours. Additionally, it is recommended that offices or job sites with an AED have at a minimum 10 percent of the staff properly training on the use of an AED and designated as First Aid Responders.

All costs associated with leasing and maintaining AEDs will be covered by office overhead or the project budget. Arcadis prohibits the purchasing or owning of AED units for Arcadis use.

5.9 Hepatitis B Vaccination Series

The Hepatitis B vaccination series will be made available to all employees who are designated or expected to act as First Aid Responders. If an employee declines the vaccination, the declination form will be signed by the employee.

Additional information along with the declination form regarding the Hepatitis B vaccination series can be found in the Arcadis BBP HSS (ARC HSIH005).

6. TRAINING

First Aid/CPR/AED training occurs prior to assignment as a First Aid Responder. Training is certified by the AHA or Red Cross. Exceptions to using the AHA or Red Cross certified training needs to be approved by the Arcadis Corporate Training Team (HRSolutionsCenter.ANA@arcadis.com) before proceeding with training.

First Aid/CPR/AED recertification is provided at a minimum on a bi-annual (every two year) basis. BBP training is required annually per OSHA's BBP standard described in Arcadis BBP HSS (ARC HSIH005).

Implementation Date 10 January 2008	Arcadis HS Standard Name First Aid/CPR/AED	ARCADIS Design & Consultancy for natural and built assets
Revision Date 16 August 2018	Arcadis HS Standard No. ARC HSGE004	Revision Number 09

7. REFERENCES (regulation citation, technical links, publications, etc.)

CFR 1910.151, "Medical Surveillance and First Aid"

CFR 1926.50, "Medical Services and First Aid"

OSHA Technical Links, "Medical and First Aid

OSHA Best Practices Guide: Fundamentals of a Workplace First-Aid Program

OSHA January 16, 2007 – OSHA Interpretation Letter Compliance for "in near proximity" and "serious injury"

ANSI Z308.1-1998 publication, "Minimum Requirements for Workplace First Aid Kits"

ANSI/ISEA Z308.1-2014 American National Standard - Minimum Requirements for Workplace First Aid Kits and Supplies

Arcadis Bloodborne Pathogens Standard (ARC HSIH005)

Arcadis Incident Reporting and Investigation Standard (ARC HSMS010)

8. RECORDS - DATA RECORDING AND MANAGEMENT

Upon completion of the AHA or Red Cross First Aid/CPR/AED and BBP course, certification cards are issued. Employees must send copies of the certification cards to the Arcadis Corporate Training Team (HRSolutionsCenter.ANA@arcadis.com).

9. APPROVALS AND HISTORY OF CHANGE

Approved By: Julie Santaniello, CSP - Corporate H&S, Manager of Technical Programs

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
10 January 2008	01	Mija Coppola	Original document
28 April 2010	02	Cindy Larweth	Add clarification of "near proximity" in section 5.1

Implementation Date 10 January 2008	Arcadis HS Standard Name First Aid/CPR/AED	ARCADIS Design & Consultancy for natural and built assets
Revision Date 16 August 2018	Arcadis HS Standard No. ARC HSGE004	Revision Number 09

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
3 April 2012	03	Camille Carollo/Tony Tremblay	Executive Summary added; Health and Safety Procedure revised to Health and Safety Standard; Serious Injury definition added as Section 3.4; Section 5.1 reference to near proximity changed to 3-4 minutes; OSHA “in near proximity” reference document in Section 8 updated; first aid kit content must comply with state OSHA reference added to Exhibit 1
19 November 2012	04	Pat Vollertsen/Tony Tremblay	Addition of information and exhibit related to Hepatitis B vaccination series
12 February 2013	05	Pat Vollertsen/Tony Tremblay	Section 3 Definitions moved to Exhibit 1; Added Section 5.2 Transport to Medical Facility (information about transport of injured personnel to medical facilities) and renumbered other Section 5 subsections
24 June 2014	06	Pat Vollertsen and Amanda Tine/ Tony Tremblay	Revised Executive summary and section 6 to include Red Cross training; revised section 8 to include Red Cross and revise where records are to be sent; Revised Section 5.3 ANSI Z308.1-2009 Minimum requirements for workplace first aid kit; updated header/footer format; Updated Exhibit 2 First Aid kit contents; Exhibit 5 licensed physician letter for first aid kit content

Implementation Date 10 January 2008	Arcadis HS Standard Name First Aid/CPR/AED	ARCADIS Design & Consultancy for natural and built assets
Revision Date 16 August 2018	Arcadis HS Standard No. ARC HSGE004	Revision Number 09

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
05 April 2016	07	Andrew McDonald/Tony Tremblay/Julie Santaniello	Updated and renumbered Section 5 to included new Section 5.2 Injury/Illness Reporting and Notification, Section 5.4 First Aid Supplies/Kits compliant with ANSI Z308.1-2014, Section 5.5 Office First Aid Kit Program (Cintas® First Aid and Safety Program), Section 5.8 Optional AED Leasing. Renumbered Exhibits. Removal of Exhibit 4 – Hepatitis B Declination Form. New Exhibit 5 AED Evaluation Form.
01 December 2016	08	Andrew McDonald/Julie Santaniello	Updated Exhibit 5 AED Evaluation form to include overhead code / project number. Updated Section 5.8 Optional AED Leasing to clarify the requirement that Office/Project Site must designated at a minimum 1 First Aid Responder and recommend the designation of 10% of the staff at the location.
16 August 2018	09	Andrew McDonald/Julie Santaniello	Updated Exhibit 5 AED Evaluation form to include AED lease duration and pricing. Updated Section 4.4 Cintas responsibilities. Clarified enrollment requirements in Section 5.8. Updated hyperlinks.

Implementation Date 10 January 2008	Arcadis HS Procedure Name First Aid/CPR/AED	ARCADIS Design & Consultancy for natural and built assets
Revision Date 16 August 2018	Arcadis HS Procedure No. ARC HSGE004	Revision Number 09

Exhibit 1 – Definitions

First Aid Responder – An employee designated by Arcadis to receive First Aid/CPR/AED/Bloodborne Pathogen training so that he/she can respond to emergency situations and administer First Aid/CPR/AED until medical attention can be administered by medical professionals.

Near Proximity – The ability to respond and start to administer first aid within 3 to 4 minutes.

> Note: OSHA has long interpreted the term "near proximity" to mean that emergency care must be available within no more than 3-4 minutes from the workplace. Medical literature establishes that, for serious injuries such as those involving stopped breathing, cardiac arrest, or uncontrolled bleeding, first aid treatment must be provided within the first few minutes to avoid permanent medical impairment or death. Accordingly, in workplaces where serious accidents such as those involving falls, suffocation, electrocution, or amputation are possible, emergency medical services must be available within 3-4 minutes, if there is no employee on the site who is trained to render first aid. OSHA exercises discretion in enforcing the first aid requirements in particular cases. OSHA recognizes that a somewhat longer response time of up to 15 minutes may be reasonable in workplaces, such as offices, where the possibility of such serious work-related injuries is more remote.

Serious Injury – Injuries such as those involving stopped breathing, cardiac arrest, or uncontrolled bleeding where first aid treatment must be provided within the first few minutes to avoid permanent medical impairment or death.

Implementation Date 10 January 2008	Arcadis HS Procedure Name First Aid/CPR/AED	ARCADIS Design & Consultancy for natural and built assets
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Exhibit 2 - Basic First Aid Kit Contents (Class A/B Type I/II/III/IV)

(ANSI Publication Z308.1-2014 and Arcadis Best Practice)

First Aid Supply	Minimum Quantity		Minimum Size or Volume	
	Class A Kits	Class B Kits	(US)	(metric)
Adhesive Bandage	16	50	1 x 3 in.	2.5 x 7.5 cm
Adhesive Tape	1	2	2.5 yd (total)	2.3 m
Antibiotic Application	10	25	0.14 fl oz	0.5 g
Antiseptic	10	50	0.14 fl oz	0.5 g
Breathing Barrier	1	1	--	--
Burn Dressing (gel soaked)	1	2	4 x 4 in.	10 x 10 cm
Burn Treatment	10	25	1/32 oz	0.9 g
Cold Pack	1	2	4 x 5 in.	10 x 12.5 cm
Eye Covering, with means of attachment	2	2	2.9 sq. in.	19 sq. cm
Eye/Skin Wash				
	1fl. oz total	--	--	29.6 ml
	--	4 fl. oz total	--	118.3 ml
First Aid Guide	1	1	NA	N/A
Hand Sanitizer	6	10	1/32 oz	0.9 g
Medical Exam Gloves	2 pair	4 pair	N/A	N/A
Roller Bandage				
2 inch	1	2	2 in. x 4 yd	5 cm x 3.66 m
4 inch	0	1	4 in. x 4 yd	10 cm x 6.66 m
Scissors	1	1	N/A	N/A
Splint	0	1	4.5 x 24 in.	11.4 x 61 cm
Sterile pad	2	4	3 x 3 in.	7.5 x 7.5 cm
Tourniquet	0	1	1 in. (width)	2.5 cm (width)
Trauma pad	2	4	5 x 9 in.	12.7 x 22.9 cm
Triangular Bandage	1	2	40 x 40 x 56 in.	101x101x142cm

Note: Optional items and sizes may be added to the basic contents listed above to augment a first-aid kit, based on the specific hazards existing in a particular work environment.

Implementation Date 10 January 2008	Arcadis HS Procedure Name First Aid/CPR/AED	ARCADIS Design & Consultancy for natural and built assets
Revision Date 16 August 2018	Arcadis HS Procedure No. ARC HSGE004	Revision Number 09

Exhibit 2 – Basic First Aid Kit Contents (Class A/B Type I/II/III/IV) Continued

Characteristics of Types of First Aid Kits					
Use	**Portable**	**Mountable**	**Water Resistant**	**Waterproof**	**Performance**
Indoor		X			
Indoor	X				
Indoor/ Outdoor	X	X	X		
Indoor/ Outdoor	X	X		X	ANSI Z308.1-2014

Implementation Date 10 January 2008	Arcadis HS Procedure Name First Aid/CPR/AED	ARCADIS Design & Consultancy for natural and built assets
Revision Date 16 August 2018	Arcadis HS Procedure No. ARC HSGE004	Revision Number 09

Exhibit 3 - Sample First Aid Kit Inspection Form

MONTHLY CHECK OF FIRST AID CABINET

If any items appear missing, **(responsible Arcadis party name or vendor name)** will be contacted that same day so that replacement supplies can be ordered. **(Responsible Arcadis party name vendor name)** will also inspect, replace and remove and replace outdated items every **(#)** days.

Year _____

Date Checked	Checked By	Date Checked	Checked By

Checked by:

1._____

2._____

3._____

Replacement: Place an asterisk (*) beside the date a missing item(s) was noted and when the vendor was called; note below when replacement was delivered. Include any other pertinent comments.

_____

_____

_____

_____

Implementation Date 10 January 2008	Arcadis HS Procedure Name First Aid/CPR/AED	ARCADIS Design & Consultancy for natural and built assets
Revision Date 16 August 2018	Arcadis HS Procedure No. ARC HSGE004	Revision Number 09

Exhibit 4 – WorkCare Recommendations for First Aid Kits in California

WORKCARE™ Making Health Count

November 4, 2013

Brian Kundert
US Director of H&S
ARCADIS
2000 Powell Street, Suite 700
Emeryville CA 94608

Re: First Aid Kits in California

Pat,

WorkCare is providing the following recommendation with regards to First Aid Kits, specifically those in California:

First aid for employees who become sick or injured on the job comes under the OSHA regulations in section 1910.151 of Subpart K. Such first aid may consist of attention to simple problems that require no further treatment or emergency help for the severely injured until professional medical personnel can take over.

First aid supplies should be stored in a water proof container, located in a visible location with ready access in event of an injury or emergency. Kits should have a periodic schedule to be restocked. Kits should be accessible on each floor. Contents should be specifically selected to deal with events in specific or specialized occupations.

Contents should include:

- Gauze roller bandages 3" (i.e., Kerlix) -- 6
- Adhesive bandages (Band-Aids) (various sizes)- box
- Triangular bandage with safety pins- 3
- Antiseptic applicators or swabs) 10ea
- Alcohol 70% swabs (box) 1
- Eye pads 10
- Wire or thin board splints (SAM splint) 2
- Forceps (tweezers) 1
- Neosporin ointment 1 tube or packets
- Gloves- medium & large sizes plastic or latex 5 pairs ea
- Germicidal hand cleansing solution (Purcell, Vivonex, etc) 1 btl
- Tape 1" adhesive (Micropore, Transpore) 1 roll ea

300 S. Harbor Blvd., Suite 600 • Anaheim, CA 92805 • (714) 978-7488 • Fax (714) 456-2154
1320 Harbor Bay Parkway, Suite 115 • Alameda, CA 94502-6556 • (510) 748-6900 • Fax (510) 748-6915
email: info@workcare.com • website: www.workcare.com

- Burn Cream – Water-Jel or equivalent.
- Tylenol or generic – Purchased/stored in single dose, tamper evident packaging
- Ibruprofen tablets 200mg (generic) for inflammation/pain - Purchased/stored in single dose, tamper evident packaging
- Chemical cold packs 4 pks
- Sterile eye irrigation solution 4oz/8oz bottle 2 btl
- Bloodborne Pathogen clean up kit (gloves, eye shield/goggles, apron or protective garment, Chlorox solution, red bag for disposal) 1ea
- Hydrocortisone ointment 1% for itching, rashes 1ea
- Antihistimine – Moore Brand Phenylephrine (or equivalent **NON Drowsy Formula**) (OTC) for allergic reactions, insect bites, bee stings. Purchased/stored in single dose, tamper evident packaging.
- Betadine solution (8oz bottle) to soak lacerations/cuts 1 btl
- CPR mouth shield 1 ea
- Paramedic scissors 1 ea
- Gauze pads (3x3s) & (4x4s) sterile 1 bx of 50 ea size
- Compression bandage or ABD pads 10 ea
- Reference book on first aid 1 ea
- Ace bandages 3", 4" 2 ea
- Emergency blanket 1 ea
- Penlight flashlight 1 ea
- Sterile cotton tip applicators 1 bx of 50

Should you have any questions regarding this recommendation, please do not hesitate to contact me.

Sincerely,

Peter P. Greaney, MD
Medical Director
WorkCare

(800) 455-6155 • info@workcare.com • www.workcare.com

Implementation Date 10 January 2008	Arcadis HS Procedure Name First Aid/CPR/AED	ARCADIS Design & Consultancy for natural and built assets
Revision Date 16 August 2018	Arcadis HS Procedure No. ARC HSGE004	Revision Number 09

Exhibit 5 – AED Evaluation

AED EVALUATION

ARCADIS Design & Consultancy for natural and built assets

The AED Evaluation below must be completed in its entirety prior to being submitted to Corporate Health and Safety for review (4-Sight-Support@Arcadis-us.com). Incomplete evaluations will be returned to the requesting party, potentially delaying enrollment in the Cintas AED Lease Program. Please contact Corporate Health & Safety at the email address above with any questions.

Office / Job Site Evaluation

Location Information	Circle/highlight: Office Project Site Address:
Overhead Office Code / Project Number *Note: AED lease is for 36 months @ $99 a month plus applicable tax.*	
Current Location Leader / Project Manager	Name: Email or Phone Number:
Current Health and Safety Coordinator / Site Safety Officer	Name: Email or Phone Number:
Is an AED located in close proximity to the office/job site (i.e. in the building lobby or common area)? If yes, indicate where.	
Will the building or client provide an AED at no cost?	
What is the average emergency response time for Emergency Medical Services (EMS)? *Note: It is recommended contacting local EMS to help determine average response time*	
Total Headcount:	
Total number of Arcadis employees currently trained in First Aid/CPR/AED	
Total number of Arcadis employees designated as First Aid Responders, per the definition in First Aid/CPR/AED Standard (ARC HSGE004)?	
Total number of AED units requested	
Individual Submitting Request	Name: Email or Phone Number:

Implementation Date 2 April 2008	Arcadis HS Standard Name Hazard Identification, Risk Assessment and Risk Control	ARCADIS Design & Consultancy for natural and built assets
Revision Date 22 November 2017	Arcadis HS Standard No. AUS HSMS002	Revision Number 05

EXECUTIVE SUMMARY

This Health & Safety Standard serves as the foundation for identifying hazards and assessing the associated H&S risks in the Arcadis U.S., Inc. (Arcadis) working environment, and assisting in the identification of the means and methods of controlling those risks.

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

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

Employees are trained on the TRACK process during their initial Behavior Based Safety (BBS) Training. The TRACK process is a less formal tool to be used prior to any activity conducted by an Arcadis employee. It is an undocumented process that follows similar steps as the HARC process but is less formal and is done frequently throughout the activity.

Corporate H&S with business line and Community of Practice experts will review and update the corporate HARC listing on an annual basis which provides a listing of the more likely hazards that Arcadis staff will encounter in the course of their work.

Client Services Director (CSD), Project Manager (PM), and Task Manager (TM) will ensure that the HARC process is used to assess hazards on projects during the planning and implementation stages of the projects.

Health and Safety Plan Writers and Reviewers will use the HARC process when assessing hazards for the development of Health and Safety Plans (HASP).

All Arcadis Employees will use the TRACK process regularly and frequently. In addition, employees read and understand all documented hazard identification and risk assessments conducted using the HARC process and documented in HASPs, Job Safety Analysis (JSAs), and other written plans that are associated with their work.

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

Implementation Date 2 April 2008	Arcadis HS Standard Name Hazard Identification, Risk Assessment and Risk Control	ARCADIS Design & Consultancy for natural and built assets
Revision Date 22 November 2017	Arcadis HS Standard No. AUS HSMS002	Revision Number 05

1.0 POLICY

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

2.0 PURPOSE AND SCOPE

2.1 Purpose

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

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

2.2 Scope

This HSS and the associated tools are to be applied for the identification of hazards, the assessment of the associated risks, and the identification of control methods applicable to the entire Arcadis North America (ANA) operation. It is also to be applied when assessing the risks of hazards identified on individual projects as described herein.

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

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

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

3.0 DEFINITIONS

Key Definitions for terms used within this standard are found in the Arcadis H&S Management System (ARC HSMS000) document.

In general, the definition of hazards is as follows:

Hazard is anything with the potential to cause personal injury or illness or poses potential of damage to property or the environment.

Health hazards including physical, chemical, biological, ergonomic and psychological hazards associated with work. Typically, they involve long-term exposure, although short-term exposure can also result in a health hazard. Typical examples include, but are not limited to:

- Workplace exposure (e.g. to chemicals, noise, heat) that can lead to illness;
- Infections (e.g. insects, snakes, parasites, poisonous plants);
- Ergonomic conditions (e.g. excessive bending, improper lifting, reaching too high or too far and repetitive movements; and
- Psychological conditions (e.g. aspects of work related stress).

Safety hazards that may result in sudden, unwanted, incidents leading to injury (including, but not limited to, back strain, contusion, permanent or temporary disability, a broken arm, skin laceration, fatality, burn, fires and explosions; spills on land or water) that are immediate in nature.

4.0 RESPONSIBILITIES

4.1 Corporate H&S with Business Line and Community of Practice Experts – on a routine basis, review and update the corporate HARC listing which provides a listing of the more likely hazards that Arcadis staff will encounter in the course of their work.

4.2 Client Services Director (CSD), Project Manager (PM), and Task Manager (TM) – Ensures that the HARC process is used to assess hazards on projects during the planning and implementation stages of the projects.

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

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

5.0 STANDARD

5.1 Hazard Assessment and Risk Control (HARC)

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

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

The HARC risk assessment process starts with listing, for each individual hazard, what the consequences could be if the controls for that particular hazard fail. During this step, it is important to consider that particular **credible** worst case scenario's for one hazard can lead to more than one consequence depending on the scenario. The HARC risk assessment process is comprised of a series hazard analysis tables prepared to provide guidance to staff when completing the HARC process. The HARC hazard analysis tables are incorporated into the Arcadis Standard Excel® Health and Safety Plan (Excel® HASP) template to be used by staff when preparing HASPs as part of the project planning stage. The HASP template is provided on the H&S Team Site located on the Source NA. A link to a copy of the HARC hazard analysis spreadsheet is provided in Exhibit 1 of this Standard. Subsequently, for each consequence, the risk is assessed using the "Risk Assessment Matrix" (RAM). Risk is defined as: a combination of the chance or likelihood that a consequence will occur and the severity of that consequence. During the development of this process, frequency was considered as a factor in the risk assessment process. However, as part of our behavior-based apporoach and belief that doing a task one time carries the same level of risk as doing it more frequently, and that the same level of hazard controls needs to be applied every time the task is performed, we consciously decided to not include the frequency of exposure to the hazard assessment and rating process. Workers should not think that completing a task less frequently eliminates or reduces associated risks.

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

The RAM is shown below.

Risk Assessment Matrix		Likelihood Ratings			
Consequences Ratings		A	B	C	D
People	Property	0 Almost Impossible	1 Possible but Unlikely	2 Likely to Happen	4 Almost Certain to Happen
1-Slight or No Health Effect	Slight or No Damage	0-Low	1-Low	2-Low	3-Low
2-Minor Health Effect	Minor Damage	0-Low	2-Low	4-Medium	6-Medium
3-Major Health Effect	Local Damage	0-Low	3-Low	6-Medium	9-High
4-Fatalities	Major Damage	0-Low	4-Medium	8-High	12-High

5.1.1 Using the RAM:

The scale of consequences from “1” to “4” on the vertical axis is used to indicate increasing severity. The consequences are those of credible – worst case- scenarios (taking the prevailing circumstances into account) that can develop from the release of a hazard. The potential consequences, rather than the actual ones, are used. These can be thought of as the consequences that could have resulted from the released hazard if circumstances are less favorable: e.g. the risk controls failed and developed into a consequence.

After estimating the potential consequence(s), the likelihood ratings from “A” to “D” on the horizontal axis is estimated on the basis of historic evidence or experience that such consequences have materialized within the industry, the company or a smaller unit (business line, Community of Practice or project). Note that it is the likelihood of the consequence occurring and not the likelihood of the hazard released.

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

When assessing the risk of a particular scenario, first estimate the severity of the potential consequence starting at the bottom (for people, severity rating 4): “Fatalities”. Ask the question: “in this particular situation can one or more Fatalities occur when all the risk control measures fail?” If this is not possible, move one box up (severity rating 3) and ask the question: “can a Major health effect occur?” If not, again move up one box (severity rating 2) and ask the question: “can a Minor health effect occur?” Suppose the answer is yes, then the next step is the estimation of the likelihood that a “Minor health effect” occurs. In the RAM go first to the likelihood “D”: “Almost certain to happen”. If this is not the case, move to the next box: likelihood “C”: “Likely to happen”. If the likelihood is less, move to likelihood box “B”: “Possible but unlikely”. Suppose this likelihood is correct, then the estimated risk is “People, 2, B”. This is considered a “low risk” in the RAM.

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

Likelihoods “D” through “B” are generally well known by staff. The likelihood rating “A” is often not well known by staff.

Note: The HARC hazard analsysis table in the Excel HASP is embedded as a hidden worksheet that is not available for staff review. The HASP uses an automated rating process which is displayed for the applicable hazard in the Task Hazard Analysis in the HASP. The HASP writer can review the RAM presented above and included in the Excel HASP to confirm the analysis and manually override the automated rating, if required, based on hazard conditions at that project site.

5.1.2 Guidance for Consequence Ratings

Guidance for consequence ratings is provided below:

Severity rating	Description Health	Description Property Damage
1	**Slight or No Health Effect -** No health effect or one requiring first aid or no treatment	**Slight or No Damage -** Slight or no damage to property up to $500
2	**Minor health effects -** Minor injury or health effects: Medical treatment beyond first aid that typically results in lost time of 2 days or less Examples: - Cut on the hand that requires stitches - Prescription medication - Broken leg that requires hard cast but allows person to return to work before missing more than two days	**Minor property damage -** Minor damage: Costs between $500 and $10,000 Example: - Brief disruption of operation or activity
3	**Major health effects -** Major injury or health effects: Injuries or health effects affecting work performance resulting in loss of time at work of 3 days or greater, an overnight hospital stay or irreversible damage to health. Examples: - Any lost time injury or illness resulting in 3 days or more away from work) - Overnight hospitalization	**Local property damage -** Moderate damage: Costs between $10,000 and $100,000 Example: - Partial shutdown of installation or cessation of part of the activity for a while

	- Illnesses such as sensitization, noise induced hearing loss, chronic back injury, repetitive strain injury or stress.	
4	**Fatality** – any work-related fatality	**Major property damage** - Major damage: Costs more than $100,000 Example: - Shutdown of installation for up to 2 weeks or cessation of the whole activity for up to 2 weeks

5.1.3 Likelihood Ratings

Guidance for likelihood ratings is provided below:

Likelihood rating	Category	Description
A	**Almost Impossible**	The chances of an incident resulting from an activity is virtually zero. This may be appropriate for a person sitting in a chair and reading a report. The chances of an incident are virtually impossible. Arcadis will have very few of these levels of likelihood for our activities.
B	**Possible but unlikely**	While there is a chance of an incident with this activity, it is not likely to happen. For example, a person walking on a clear, clean sidewalk, could fall, but it is unlikely to happen. Think about the number of people that walk everyday without falling on a clear, clean sidewalk. Arcadis will have a significant number of these types of hazards.
C	**Likely to happen**	An incident will probably happen. A person working on a ladder that is not set up appropriately will likely fall, but not always. There is a good chance. Arcadis will have a significant number of these.
D	**Almost certain to happen**	An incident will happen. A person that enters an uncontrolled confined space with toxic gases or vapors will almost certainly become sick or die. Nearly all of the activities we perform that are considered high hazard like confined space entry, working at heights, working in an excavation, etc., will all be rated with an "Almost certain to happen" in an uncontrolled situation.

5.1.4 Hierarchy of Risk Controls

Risk control is commensurate with the level of risk. The focus of H&S risk(s) control is primarily on measures to prevent hazardous situations. The hierarchy of controls should be used when determining the appropriate control.

The hierarchy of risk controls is a list, in preferential order, of the means by which H&S risks can be controlled:

- Engineering controls – provide an engineering solution to lessen the hazard. Preferential engineering controls include:
  - Elimination – always look to eliminate the hazard if possible;
  - Substitution – replace the hazard with a less hazardous tool, process, chemical, etc; and
  - Isolation – isolate the hazard or those who could be harmed so the hazard is not accessible.
- Administrative controls – provide training, shorten exposure times, rotate staff, encourage staff behavioural changes, provide signage or warnings to administratively reduce the hazard.
- Personal Protective Equipment (PPE) – use of PPE should be considered a last resort control method, but often used as secondary controls. PPE should not be the first line of defense unless all other controls are not practical, feasible, or it is mandated by local regulatory requirements.

The hierarchy of controls should always be considered when assessing the effectiveness of controls. The higher in the hierarchy, the more effective the control usually is. Elimination of the hazard is always the preferred control. When this is not possible, a control lower in the hierarchy can be considered. This process is repeated until the proper and practical control is selected for each hazard.

5.1.4.1 Control of Low Risks

Risks classified as “Low” can be controlled in a simple manner by reference to specific generic procedures and personal competencies. The basis for control of H&S risks at this level is judgment and experience. For example, walking down the sidewalk often only requires a simple administrative control, the use of TRACK, to ensure a person scans the walking surface for hazards and avoids those hazards that could cause the person to trip or slip and fall.

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

- Newly recruited staff receives basic training in safety aspects in their area of work as part of their education for the job.
- Newly appointed field staff should attend a general H&S orientation program. This is also applicable for office staff. The TRACK process is very suited for this purpose.
- Training on the job by experienced supervisor or peer.
- Refer to Health and Safety Procedures (HSPs).

- Good housekeeping practices as detailed in Field Health & Safety Handbook (FHSHB).
- Tool box meetings before a new activity is being carried out.
- Reading/understanding of and training in company safety standards.
- Understanding of vendor specification for use of equipment.

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

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

5.1.4.2 Control of Medium Risks

Risks classified as “Medium” are controlled in a more rigorous yet simple way. A main point is that more risk specific information and control measures are provided and documented in, for example, a JSA or HASP. The basis for control of H&S risks at this level is appropriate hazard analysis and risk control in addition to judgment and experience.

In addition, controls can include such things as:

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

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

5.1.4.3 Control of High Risks

Risks classified as “High”have to be thoroughly analyzed and controlled. The principles of the analysis and control of high risks are identical to medium risks but more detailed and with more risk control and recovery measures. High risks are brought to the attention of H&S support staff and their analysis is carried out by competent staff with support by Community of Practice experts and Corporate Health & Safety.

5.2 TRACK

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

Think through the task
Recognize the hazards
Assess the risks
Control the risks
Keep H&S first in all things

Every Arcadis employee will use **TRACK** as the hazard awareness methodology:

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

"Think through the task!"

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

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

"Recognize the hazards!"

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

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

"Assess the risks!"

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

- If this hazard was likely to occur, how badly could I or anybody else be hurt?
- How often might I or anybody else be exposed to that hazard as I am doing this task?

- How might I be exposed to identified chemicals and what are the safe levels of those chemicals?
- What is the likelihood of an injury or damage?

"Control the risks!"

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

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

"Keep health and safety first in all things!"

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

- Correct or report safety concerns.
- Suggest ways to improve health and safety and/or eliminate unsafe conditions.
- Monitor health and safety controls for effectiveness.
- Look out for yourself and others.
- Continually be aware of your surroundings and when things change or you have a concern, stop and redo TRACK.
- Stop work if it's not safe.

6.0 TRAINING

All employees are trained on the TRACK process during their initial Health & Safety Orientation training. No formal training is required for the HARC process.

7.0 REFERENCES

7.1 HARC information is built into the Hazard Analysis tab of the Excel® HASP template kept on the H&S Team Site of The Source NA. The standalone HARC Hazard Analysis Worksheet is also located on the H&S Team Site of the Source NA.

7.2 Arcadis Health and Safety Standard ARC HSMS0000 – Health and Safety Management System

8.0 RECORDS

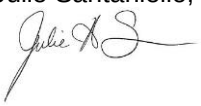
The most current version of the overall company HARC spreadsheet document will be kept on the H&S Team Site of the Source NA.

Implementation Date 2 April 2008	Arcadis HS Standard Name Hazard Identification, Risk Assessment and Risk Control	ARCADIS Design & Consultancy for natural and built assets
Revision Date 22 November 2017	Arcadis HS Standard No. AUS HSMS002	Revision Number 05

9.0 APPROVALS AND HISTORY OF CHANGE

Approved By:

Julie Santaniello, CSP – Corporate Health &Safety, Director of Technical Programs



History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
02 April 2008	01	Mike Thomas/Sam Moyers	Original document
27 June 2012	02	Tony Tremblay	Added Executive Summary; removed Loss Prevention System references to Behavior Based Safety; Updated Header Logo; Updated the HARC process/terms in section 5.1 and updated TRACK in section 5.2
27 January 2014	03	Alec MacAdam and Tony Tremblay	Updated HARC process/terms in Sections 5.1 and 7.0; Include Exhibit 1 hyperlink to HARC Hazard Analysis Spreadsheet.
14 Sept 2015	04	Alec MacAdam and Tony Tremblay	Added statement to paragraph 3 in Section 5.1 discussing how Arcadis addressed “frequency” in the risk assessment process. Updated ARC HSMS0000 Refererence in Section 7.2
22 November 2017	05	Sam Moyers	Revised throughout to reflect current titles and terminology used in the H&S Program. Formatting updates, Clarification of how the HASP utilizes the HARC process in section 5.1.1. Replaced RAM with current RAM used in the HARC hazard analysis table.

Implementation Date 2 April 2008	Arcadis HS Standard Name Hazard Identification, Risk Assessment and Risk Control	ARCADIS Design & Consultancy for natural and built assets
Revision Date 15 November 2017	Arcadis HS Standard No. AUS HSMS002	Revision Number 05

Exhibit 1 – HARC Hazard Analysis Spreadsheet

Link to HARC Hazard Analysis Spreadsheet

EXECUTIVE SUMMARY

The purpose of this Health and Safety Standard (HSS) is to provide direction on the development and implementation of an office location or project specific Hazard Communication (HazCom) program. Each office or project site that is subject to the HazCom standard shall have a written program regarding chemical use and storage.

Arcadis is committed to preventing accidents and ensuring the safety and health of our employees. Arcadis will comply with applicable federal and state health and safety rules. Under this standard, employees will be informed of the contents of the OSHA Hazard Communications standard, the hazardous properties of chemicals in the work area, safe handling procedures and chemical protective measures.

This HazCom HSS applies to all office locations and project sites that store or use hazardous chemicals/products on site (office or field).

Every office within Arcadis shall develop and maintain a written HazCom program specific to their location and activities. With the exception of the sections regarding “Labeling” and “Safety Data Sheets,” use of hazardous chemicals at Arcadis laboratories is exempt from the requirements of this hazard communication standard.

For project sites, the project Health and Safety plan (HASP) shall serve as the documented written HazCom program for that site.

A Master Inventory List (MIL) is an inventory of all chemicals/products found on-site. At each location or project site, an inventory of the hazardous chemicals present shall be completed at least once per year, or as new chemicals are introduced to or removed from the location and more often as necessary. All primary and secondary containers of hazardous chemicals/products listed on the MIL must be labeled.

The SDS shall be obtained, reviewed and then maintained for each chemical subject to the HazCom standard. It shall be readily available to all employees who may use or may be exposed to the hazardous chemicals.

Employees who may be exposed to hazardous chemicals/products under normal operating conditions or in foreseeable emergency situations shall receive HazCom training. Arcadis shall provide employees with effective information and training on hazardous chemicals in their work area at the time of their initial assignment, and whenever a new chemical hazard the employees have not previously been trained about is introduced into their work area.

The SDSs shall be kept at the office location or in the project files.

HazCom training records will be kept in the corporate training database.

1. POLICY

It is Arcadis policy to inform all employees of the hazardous chemicals they may encounter during their work activities. This shall be accomplished through the development and implementation of a location and project specific hazard communication process that includes Safety Data Sheets (SDS), container labeling, and training. Hazard Communication (HazCom) requires a written program specific to each location or project site where hazardous chemicals/products are used or stored.

This HSS meets the requirements outlined in the final rule revising the OSHA Hazard Communication Standard (29 CFR 1910.1200) to be consistent with the United Nations Globally Harmonized system of Classification and Labeling of Chemicals.

2. PURPOSE AND SCOPE

2.1 Purpose

The purpose of this Health and Safety Standard (HSS) is to inform employees, contractors, and subcontractors about potential hazards associated with routinely used chemicals/products. A checklist that will assist in evaluating conformance with this standard is found in Exhibit 2.

Each office or job site that is subject to the HazCom standard shall have a written program regarding chemical use and storage. The program should describe how the requirements of this standard will be met. The program should address the following:

- Master Inventory List (MIL)
- SDS
- Container Labeling
- Chemicals in Pipes
- Contractor Requirements
- Training

The transmittal of information is to be accomplished by means of comprehensive hazard communication programs, which are to include container labeling and other forms of warning, safety data sheets and employee training.

2.2 Scope

This HazCom HSS applies to office locations and job sites that store or use hazardous chemicals/products on site (office or field) in such a manner that employees may be exposed under normal conditions of use or in a foreseeable emergency. Use of a hazardous chemical includes generation of that chemical as a byproduct.

3. DEFINITIONS

There are a number of definitions associated with this standard and its associated procedures. These definitions are presented in Exhibit 1 of this document.

4. RESPONSIBILITIES

4.1 Corporate Health & Safety

Corporate H&S staff are responsible for assisting the locations and project sites with the development and implementation of the required HazCom program. In addition, provide the tools and resources for employees to have access to information on hazardous chemicals. In addition, Corporate H&S shall review the program for effectiveness periodically and when program deficiencies are identified.

4.2 Location Leaders and Office H&S Coordinators

Location Leaders and H&S Coordinators are responsible for the development and implementation of a HazCom program in their location.

As applicable, local H&S Coordinators are responsible for ensuring that employees are provided with training and information about specific labeling systems in use at their office (e.g., HMIS III, NFPA, etc.).

4.3 Employees

Employees are responsible for reviewing SDS of the substances they are going to work with and make sure they understand all relevant information as well as take necessary precautions. They are responsible for ensuring that containers of hazardous chemicals they are using are appropriately labeled and if not, for obtaining the proper labeling.

4.4 Supervisors

Supervisors (or Group Leaders) are responsible for providing the necessary resources for the appropriate development and implementation of an appropriate HazCom program and to ensure the company is operating in accordance with this policy by performing periodic reviews, task observations and/or conformance assessments.

4.5 Project Managers and Principals in Charge

Project Managers (PM) and Principals in Charge (PICs) are responsible for ensuring that a HazCom program is developed and implemented on projects where hazardous chemicals are used or encountered. PMs and PICs are also responsible for understanding their clients' requirements for HazCom and that hazardous chemical information is shared with the client and other affected contractors/subcontractors on site. In addition, PICs and PMs are responsible for ensuring their project staff has had training in HazCom per this HSS.

As applicable, PMs and PICs are responsible for ensuring that employees are provided with training and information about specific labeling systems in use at project sites (e.g., HMIS III, NFPA, etc.).

4.6 Site Safety Officers

Site Safety Officers (SSOs) will act as the HazCom Program Coordinator for the project sites and shall maintain the MIL of hazardous chemicals kept on the job Site. The SSO is responsible for maintaining SDS on Site for those hazardous chemicals being used by Arcadis staff on site. The SSO is responsible to communicate the location of the SDS and the hazards associated with these chemicals to project Site Arcadis employees and potentially affected subcontractors during the initial tailgate safety meeting and/or safety orientation. The SSO shall ensure that all containers of chemicals (bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like) are labeled appropriately and will provide additional details regarding any specific labeling system in use at the project location (e.g., HMIS III, NFPA, etc.).

> **Note:** In those instances where an Arcadis subcontractor is using a hazardous chemical on site, the SSO shall obtain a copy of the SDS and maintain in the on-site project file for reference by Arcadis employees, contractor employees or client/facility staff.

When working at a multi-employer work-site in which Arcadis and/or our subcontractor will produce, use, or store hazardous chemicals at a workplace in such a way that the employees of other employer(s), including but not limited to facility management and/or our client's employees, may be exposed, then the SSO shall ensure the following is addressed:

- A copy of the applicable SDS has been provided to those employers;
- Discuss any necessary precautionary measures that need to be taken to protect employees during the workplace's normal operating conditions and in foreseeable emergencies; and
- The labeling system that will be used in the workplace.

5. PROCEDURE

5.1 Written Program

Every office within Arcadis shall develop and maintain a written HazCom program specific to their location and activities. The program should be developed using the template provided in Exhibit 3 of this standard. The program shall be reviewed annually. The written program shall be maintained in a location that is accessible to each employee when they are in the office. Employees shall be notified of its presence and how to access it.

For project sites, the project H&S plan (HASP) shall serve as the documented written HazCom program for that site. The HASP shall provide information about the chemicals present on the site (inventory), the location of the SDS on site, and the labeling of containers. In addition, the required training shall be part of the site orientation and the daily or more frequent tailgate meetings at the project site.

5.2 Master Inventory List

A Master Inventory List (MIL) is an inventory of all chemicals/products found on-site. At each office location or project site, an inventory of the hazardous chemicals present shall be completed at least once per year, or as new chemicals are introduced to or removed from the location and more often as necessary. This inventory shall be developed into a MIL of hazardous chemicals. This inventory includes hazardous chemicals present in piping and those that may be generated as a byproduct of other activities.

Upon completion of the inventory, it shall be determined if any of the chemicals/products identified are exempt from the appropriate HazCom standard that is applicable to the location. If the chemicals/products at the location are exempt from HazCom, it shall be noted on the MIL. The MIL shall be made available to all employees and should be kept current and accurate. The MIL for a project will be found in the HASP. A sample MIL form for office use is found in Exhibit 4.

Common chemical exemptions include:

1. Foods, drugs, or cosmetics intended for personal consumption by employees;

2. Any consumer product or hazardous substance used in the workplace in the same manner as normal consumer use, and which use results in a duration and frequency of exposure which is not greater than exposures experienced by consumers; and

3. Office products to which office workers would have non-route exposure.

Exhibit 5 provides a listing of those chemicals which are commonly determined to be exempt in Arcadis offices. However, each office and project site must determine what is exempt by using the exemption descriptions above.

The MIL shall be reviewed periodically. Any new chemicals/products will be added and those no longer in use or kept at the office or job site shall be deleted.

5.3 GHS Labeling Requirements

All primary and secondary containers of hazardous chemicals/products listed on the MIL must be labeled. Labels or other forms of warning will be legible, in English, and prominently displayed on the container, or readily available in the work area. For employees who speak another language(s), information may be added in their language to the label or other form of warning. Exhibit 6 provides examples of GHS compliant labels.

5.3.1 Labels on Shipped Containers

The chemical manufacturer, importer, or distributor shall ensure that each container of hazardous chemicals leaving the workplace is labeled, tagged or marked. Hazards not otherwise classified do not have to be addressed on the container. Where the chemical manufacturer or importer is required to label, tag or mark the following information shall be provided on containers shipped to Arcadis:

- Product Identifier;

- A signal word, either “Danger” or “Warning”;
- Hazard statement(s);
- A standard pictogram(s);
- Precautionary statement(s); and
- The name, address and telephone number of the chemical manufacturer, importer or other responsible party.

5.3.2 Workplace Labeling

Arcadis shall ensure that each container of hazardous chemicals in the workplace is labeled, tagged or marked with either:

- A product identifier, a signal word (either “Danger” or “Warning”), hazard statement(s), standard pictogram(s), and precautionary statement(s); or
- Product identifier and words, pictures, symbols, or combination thereof, which provide at least general information regarding the hazards of the chemicals, and which, in conjunction with the other information immediately available to employees under the hazard communication program, will provide employees with the specific information regarding the physical and health hazards of the hazardous chemical.

  Note: Arcadis may use signs, placards, process sheets, batch tickets, operating procedures, or other such written materials in lieu of affixing labels to individual stationary process containers, as long as the alternative method identifies the containers to which it is applicable and conveys the information required by the hazardous chemicals in the workplace labeling requirement. Arcadis must also ensure the written materials are readily accessible to the employees in their work area throughout each work shift.

The supervisor of each work area must ensure that secondary chemical containers are properly labeled. Secondary chemical container labeling can be labeled with the same shipping container labels, or information that communicates the following:

- Identity of the chemical.
- Hazards of the chemical.

The label may use a combination of words, symbols or pictures to communicate this information. The company will use a standard labeling method for all secondary containers.

Note: Arcadis is not required to label portable containers into which hazardous chemicals are transferred from labeled containers, and which are intended only for the immediate use of the employee who performs the transfer, however, best management practice would be that all portable containers, even those intended only for the

immediate use by employees, should be labeled with chemical identity and hazard information, where feasible.

5.3.3 Hazard Communication Standard Pictograms

The Hazard Communication Standard pictograms and hazards are defined as follows:

HCS Pictograms and Hazards

Health Hazard

- Carcinogen
- Mutagenicity
- Reproductive Toxicity
- Respiratory Sensitizer
- Target Organ Toxicity
- Aspiration Toxicity

Flame

- Flammables
- Pyrophorics
- Self-Heating
- Emits Flammable Gas
- Self-Reactives
- Organic Peroxides

Exclamation Mark

- Irritant (skin and eye)
- Skin Sensitizer
- Acute Toxicity
- Narcotic Effects
- Respiratory Tract Irritant
- Hazardous to Ozone Layer (Non-Mandatory)

Gas Cylinder

- Gases Under Pressure

Corrosion

- Skin Corrosion/Burns
- Eye Damage
- Corrosive to Metals

Exploding Bomb

- Explosives
- Self-Reactives
- Organic Peroxides

Flame Over Circle

- Oxidizers

Environment
(Non-Mandatory)

- Aquatic Toxicity

Skull and Crossbones

- Acute Toxicity (fatal or toxic)

5.3.4 Hazard Classifications

Hazard Class	Type of Hazard	Hazard Category	Comment
Hazard Not Otherwise Classified			Added for hazards like combustible dust
Flammable Liquids	Physical	1-4	
Flammable Solids	Physical	1-2	
Self-Reactive Substances	Physical	A-G (types)	
Pyrophoric Liquids	Physical	1	
Pyrophoric Solids	Physical	1	
Self-Heating Substances	Physical	1-2	
Substances – emit flammable gas with contact with water	Physical	1-3 and not classified	

Hazard Class	Type of Hazard	Hazard Category	Comment
Oxidizing Liquids	Physical	1-3	Based on results
Oxidizing Solids	Physical	1-3	Based on results
Organic Peroxide	Physical	A-G (type)	A = detonate as packaged
Substances Corrosive to Metal	Physical	1	Based on results
Acute Toxicity	Health	1-5	Further divided by oral, dermal, gases, vapors, dust/mist
Skin Corrosion	Health	1a – 1c; 2-3	
Skin Irritation	Health	1	
Eye Effects	Health	1; 2a – 2b	
Sensitization	Health	Respiratory 1-2 Skin 1	
Germ Cell Mutagenicity	Health	1a – 1b; 2	
Carcinogenicity	Health	1a – 1b; 2	
Reproductive Toxicity	Health	1a – 1b; 2 and lactation	
Target Organ System Toxicity	Health	Single Exposure: 1-3 Repeated Exposure: 1 - 2	
Aspiration Hazard	Health	1-2	
Hazardous to Aquatic Environment	Environmental	N/A	
Acute Aquatic Toxicity	Environmental	1-3	
Chronic Aquatic Toxicity	Environmental	1-4	
Explosive	Physical	1.1 – 1.6 (divisions)	1.1 most severe
Flammable Gasses	Physical	1-2	Based on results
Flammable Aerosols	Physical	1-2	Based on results
Oxidizing Gases	Physical	1	
Gasses Under Pressure (e.g., compressed gas)	Physical	1-4	1 = entirely gaseous

5.3.5 Missing Labels

Labels on received chemicals must not be removed or defaced. Missing, defaced or illegible labels shall be replaced immediately with clean, properly marked ones. Shipments that show damage/leak/or spill are to be refused.

5.4 Safety Data Sheets

A SDS shall be obtained and then maintained for each chemical subject to the Hazard Communication standard. It shall be readily available to all employees who may use or be exposed to the applicable chemicals. The SDS is the principal means of conveying chemical-specific information to the user. SDS's must be present for each hazardous chemical used in the field.

SDS for those hazardous substances purchased or obtained by Arcadis or are in their original container from the manufacturer or have been transferred from their original container to a secondary container, shall be those specific SDS developed and provided by the manufacturer for that specific substance. Manufacturer SDS often are found on the manufacturer's website. SDS for hazardous substances identified in the environmental media as contaminants can be obtained as generic SDS from an on-line or web-based source.

The SDS shall contain at least the following:

1. Identification
    - Product identifier used on the label;
    - Other means of identification;
    - Recommended use of the chemical and restrictions on use;
    - Name, address, and telephone number of the manufacturer, importer, or other responsible party; and
    - Emergency phone number
2. Hazard(s) identification
    - Classification of the chemical in accordance with paragraph (d) of §1910.1200;
    - Signal word, hazard statement(s), symbol(s) and precautionary statement(s) in accordance with paragraph (f) of §1910.1200. (Hazard symbols may be provided as graphical reproductions in black and white or the name of the symbol, e.g., flame, skull and crossbones);
    - Describe any hazards not otherwise classified that have been identified during the classification process;
    - Where an ingredient with unknown acute toxicity is used in a mixture at a concentration = 1% and the mixture is not classified based on testing of

the mixture as a whole, a statement that X% of the mixture consists of ingredient(s) of unknown acute toxicity is required.

3. Composition/information on ingredients

   For Substances

   - Chemical name;
   - Common name and synonyms;
   - CAS number and other unique identifiers; and
   - Impurities and stabilizing additives which are themselves classified and which contribute to the classification of the substance.

   For Mixtures

   In addition to the information required for substances:

   - The chemical name and concentration (exact percentage) or concentration ranges of all ingredients which are classified as health hazards in accordance with paragraph (d) of §1910.1200 and are present above their cut-off/concentration limits; or present a health risk below the cut-off/concentration limits.
   - The concentration (exact percentage) shall be specified unless a trade secret claim is made in accordance with §1910.1200(i), when there is batch-to-batch variability in the production of a mixture, or for a group of substantially similar mixtures with similar chemical composition. In these cases, concentration ranges may be used.

   For All Chemicals Where a Trade Secret is Claimed

   Where a trade secret is claimed in accordance with paragraph (i) of§1910.1200, a statement that the specific chemical identity and/or exact percentage of composition (concentration) has been withheld as a trade secret is required.

4. First-aid measures

   - Description of necessary measures, subdivided according to the different routes of exposure, i.e., inhalation, skin and eye contact, and ingestion.
   - Most important symptoms/effects, acute and delayed.
   - Indication of immediate medical attention and special treatment needed, if necessary.

5. Fire-fighting measures

   - Suitable (and unsuitable) extinguishing media.

- Specific hazards arising from the chemical (e.g., nature of any hazardous combustion products).

6. Accidental release measures

    - Personal precautions, protective equipment, and emergency procedures.

    - Methods and materials for containment and cleaning up.

7. Handling and storage

    - Precautions for safe handling

8. Exposure controls/personal protection

    - OSHA permissible exposure limit (PEL), American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV), and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the safety data sheet, where available.

    - Appropriate engineering controls.

9. Physical and chemical properties

    - Appearance (physical state, color, etc.);
    - Odor;
    - Odor threshold;
    - pH;
    - Melting point/freezing point;
    - Initial boiling point and boiling range;
    - Flash point;
    - Evaporation rate;
    - Flammability (solid, gas);
    - Upper/lower flammability or explosive limits;
    - Vapor pressure;
    - Vapor density;
    - Relative density;
    - Solubility(ies);
    - Partition coefficient: n-octanol/water;
    - Auto-ignition temperature;
    - Decomposition temperature; and
    - Viscosity.

10. Stability and reactivity

    - Reactivity
    - Chemical stability;
    - Possibility of hazardous reactions;
    - Conditions to avoid (e.g., static discharge, shock, or vibration);

- Incompatible materials; and
- Hazardous decomposition products.

11. Toxicological information

Description of the various toxicological (health) effects and the available data used to identify those effects, including:

- Information on the likely routes of exposure (inhalation, ingestion, skin and eye contact);
- Symptoms related to the physical, chemical and toxicological characteristics;
- Delayed and immediate effects and also chronic effects from short- and long-term exposure;
- Numerical measures of toxicity (such as acute toxicity estimates);
- Whether the hazardous chemical is listed in the National Toxicology Program (NTP) Report on Carcinogens (latest edition) or has been found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest editions), or by OSHA.

12. Ecological information (Non-Mandatory)

To be GHS-compliant the requirements for this section are provided.

- Ecotoxicity (aquatic and terrestrial, where available);
- Persistence and degradability;
- Bioaccumulative potential;
- Mobility in soil.

13. Disposal considerations (Non-Mandatory)

To be GHS-compliant the requirements for this section are provided.

- Description of waste residues and information on their safe handling and methods of disposal, including the disposal of any contaminated packaging.

14. Transport information (Non-Mandatory)

To be GHS-compliant the requirements for this section are provided.

- UN number;
- UN proper shipping name;
- Transport hazard class(es);

- Packing group, if applicable;
- Environmental hazards (e.g., Marine pollutant (Yes/No));
- Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code);
- Special precautions, which a user needs to be aware of, or needs to comply with, in connection with transport or conveyance either within or outside their premises.

15. Regulatory information (Non-Mandatory)

To be GHS-compliant the requirements for this section are provided.

- Safety, health and environmental regulations specific for the product in question.

16. Other information, including date of preparation or last revision.

A master file of SDSs will be maintained and SDSs shall be made readily available to employees at a central office location or a readily available location at the project site. The SDS master file shall be reviewed, at a minimum, annually or any time the MIL is updated. Any obsolete or outdated SDSs shall be removed from the master file and maintained in a secondary “obsolete” or “outdated” SDS file that shall be retained for at least 30 years.

5.4.1 Multi-Employer Work Sites

If appropriate, the written program will include information regarding how other employers at the workplace will be provided the following:

- Access to SDSs for chemicals/products introduced to the workplace by Arcadis;
- Information on precautions that should be taken regarding these chemicals/products; and
- Information regarding any site-specific labeling system.

This information will be communicated as part of a contractor site safety orientation. In addition, clients frequently ask for us to provide SDS for the chemicals Arcadis will bring onto their sites. If Arcadis or our contractor will produce, use, or store hazardous chemicals at a workplace in such a way that the employees of other employer(s) may be exposed, then the Arcadis SSO must provide the appropriate SDS to the client along with information on precautions that should be taken regarding these chemical products and information about our site specific labeling system.

As applicable, Arcadis field and office staff can also ask the client or other parties working in their vicinity for SDS of hazardous substances being used by client or other parties at a project or office location.

5.5 Chemicals in Pipes

Some work activities are performed by employees in areas where chemicals are transferred through pipes. Prior to starting work in these areas, employees should contact owner/operator for information regarding:

- The chemicals in the pipes, or the insulation material on the pipe;
- Potential hazards; and
- Safety and emergency evacuation precautions to be taken.

5.6 Laboratories

With the exception of the sections regarding “Labeling” and “Safety Data Sheets,” use of hazardous chemicals at Arcadis laboratories is exempt from the requirements of this hazard communication standard. Laboratories using hazardous chemicals must comply with the requirements of a Laboratory Chemical Hygiene Plan.

The following Hazard Communication requirements apply to Arcadis laboratories:

- Laboratory staff shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced;
- Laboratory staff shall maintain any safety data sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible during each work-shift to laboratory employees when they are in their work areas;
- Laboratory employees must be provided with information and training in accordance with Section 6 of this standard, excluding information about the location and availability of the written hazard communication program; and
- Arcadis Laboratories that ship hazardous chemicals are considered to be either a chemical manufacturer or a distributor, and thus must ensure that any containers of hazardous chemicals leaving the laboratory are labeled in accordance with Section 5.3 of this Standard, and that a safety data sheet is provided to distributors and other employers.

6. TRAINING

All employees who may be exposed to hazardous chemicals/products under normal operating conditions, or in foreseeable emergency situations, shall receive Hazard Communication training. Arcadis shall provide employees with effective information and training on hazardous chemicals in their work area at the time of their initial assignment, and whenever a new chemical hazard the employees have not previously been trained about is introduced into their work area. Information and training is designed to cover categories of hazards (e.g., flammability, carcinogenicity) or specific chemicals. Chemical-specific information is always available to employees through labels and safety data sheets.

Training will be followed per the requirements and instruction outlined by the Corporate Training group and Corporate H&S.

Arcadis employees will be informed of:

- The requirements contained in the Hazard Communication Standard 29 CFR 1910.1200;
- Any operations in their work area where hazardous chemicals are present;
- The location and availability of the written HazCom program; and
- The location of the MIL and SDS.

Initial HazCom training shall include the following elements:

- Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);
- The physical, health, simple asphyxiation, combustible dust and pyrophoric gas hazards, as well as hazards not otherwise classified, of the chemicals in the work area;
- The measures employees can take to protect themselves from these hazards, including specific procedures Arcadis has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used; and
- The details of the hazard communication program developed by Arcadis, including an explanation of the labels received on shipped containers and any office/project specific labeling system used by Arcadis, the safety data sheet, including the order of information and how employees can obtain and use the appropriate hazard information. The training will reinforce that here at Arcadis the primary and secondary containers of hazardous chemicals/products listed on the MIL must be labeled.

Whenever a new chemical hazard the employees have not previously been trained about on is introduced into their work area, each employee of that area will be given information as outlined above.

7. REFERENCES

29 CFR 1910.1200 “Hazard Communication Standard”

8. RECORDS - DATA RECORDING AND MANAGEMENT

The SDSs shall be kept at the office location or in the project files. The Hazard Communication Standard requires that Arcadis maintain copies of SDSs for each hazardous chemical used in the workplace. Arcadis may discard a SDS for a mixture, if the new data sheet includes the same hazardous chemicals as the original formulation. If the formulation is different, then Arcadis must maintain all versions of these SDS for at least 30 years. OSHA standard, 29 CFR 1910.1020, Access to Employee Exposure and Medical Records defines "employee exposure records" to

include SDSs. The Access to Employee Exposure and Medical Records standard requires all employee exposure records to be maintained for at least 30 years.

Once a SDS is deemed to be “obsolete”, Arcadis will indicate the date of last use on the SDS and then maintain a copy of these SDS be placing them into an “obsolete” SDS folder (paper copy or electronic file copy is acceptable) which will be maintained for at least 30 years past the date of last use by an Arcadis employee.

Employee training records will be kept in the corporate training database.

9. APPROVALS AND HISTORY OF CHANGE

Approved By:

Julie Santaniello, CSP - Corporate H&S, Manager of Technical Programs

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
1 June 2009	01	Mike Thomas	Original document
18 April 2012	02		Executive Summary Added
3 December 2012	03	Amanda Tine/Tony Tremblay	Standard revised to be consistent with the provisions of the United Nations Globally Harmonized System of Classification and Labeling of Chemicals (GHS), Revision 3; Detailed that as applicable, Local H&S Coordinators and PM/PICs must ensure staff are trained/informed about office or project specific chemical labeling systems in use; Clarified SSO responsibilities as it pertains to multi-employer worksites; Definitions Added/Updated; HazCom Template in Exhibit 3 was revised; Exhibit 4 – Master Chemical Inventory List revised; Exhibit 6 labels updated

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
18 January 2013	04	Tony Tremblay	SDS Recordkeeping requirements defined in section 8
27 May 2016	05	Julie Santaniello	Modified Policy, Purpose and Scope (Sections 1, 2.1 and 2.2, respectively); Section 4.5 changed Supervisor to PIC; removed transition language from Sections 5.3.1 and 5.3.2; removed side by side comparison link and exhibit list in reference section; removed Tony Tremblay and added Julie Santaniello as reviewer; removed outdated labels in Exhibit 6; updated template and exhibits to new brand; updated hyperlinks in document.

Exhibit 1 – Definitions

Chemical - Any substance, or mixture of substances

Chemical name - the scientific designation of a chemical in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry (IUPAC) or the Chemical Abstracts Service (CAS) rules of nomenclature, or a name that will clearly identify the chemical for the purpose of conducting a hazard classification.

Classification -to identify the relevant data regarding the hazards of a chemical; review those data to ascertain the hazards associated with the chemical; and decide whether the chemical will be classified as hazardous according to the definition of hazardous chemical. In addition, classification for health and physical hazards includes the determination of the degree of hazard, where appropriate, by comparing the data with the criteria for health and physical hazards.

Container - any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous chemical. For purposes of the Hazard Communication Standard, pipes or piping systems, and engines, fuel tanks, or other operating systems in a vehicle, are not considered to be containers.

Employee - a worker who may be exposed to hazardous chemicals under normal operating conditions or in foreseeable emergencies. Workers such as office workers or bank tellers who encounter hazardous chemicals only in non-routine, isolated instances are not covered.

Exposure or exposed - an employee is subjected in the course of employment to a chemical that is a physical or health hazard, and includes potential (e.g. accidental or possible) exposure. "Subjected" in terms of health hazards includes any route of entry (e.g. inhalation, ingestion, skin contact or absorption.)

Foreseeable emergency - means any potential occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment which could result in an uncontrolled release of a hazardous chemical into the workplace.

Hazard category - the division of criteria within each hazard class, e.g., oral acute toxicity and flammable liquids include four hazard categories. These categories compare hazard severity within a hazard class and should not be taken as a comparison of hazard categories more generally.

Hazard class - the nature of the physical or health hazards, e.g., flammable solid, carcinogen, oral acute toxicity.

Hazard not otherwise classified (HNOC) - an adverse physical or health effect identified through evaluation of scientific evidence during the classification process that does not meet the specified criteria for the physical and health hazard classes addressed in this section. This does not extend coverage to adverse physical and health effects for which there is a hazard class addressed in this section, but the effect either falls below the cut-off value/concentration limit of the hazard class or is under a GHS hazard category that has not been adopted by OSHA (e.g., acute toxicity Category 5).

Hazard statement - a statement assigned to a hazard class and category that describes the nature of the hazard(s) of a chemical, including, where appropriate, the degree of hazard.

Hazardous chemical - any chemical which is classified as a physical hazard or a health hazard, a simple asphyxiant, combustible dust, pyrophoric gas, or hazard not otherwise classified.

Health hazard - a chemical which is classified as posing one of the following hazardous effects: acute toxicity (any route of exposure); skin corrosion or irritation; serious eye damage or eye irritation; respiratory or skin sensitization; germ cell mutagenicity; carcinogenicity; reproductive toxicity; specific target organ toxicity (single or repeated exposure); or aspiration hazard. The criteria for determining whether a chemical is classified as a health hazard are detailed in Appendix A to §1910.1200 -- Health Hazard Criteria.

Label - an appropriate group of written, printed or graphic information elements concerning a hazardous chemical that is affixed to, printed on, or attached to the immediate container of a hazardous chemical, or to the outside packaging.

Mixture - a combination or a solution composed of two or more substances in which they do not react.

Physical hazard - a chemical that is classified as posing one of the following hazardous effects: explosive; flammable (gases, aerosols, liquids, or solids); oxidizer (liquid, solid or gas); self-reactive; pyrophoric (liquid or solid); self-heating; organic peroxide; corrosive to metal; gas under pressure; or in contact with water emits flammable gas. See Appendix B to §1910.1200 - Physical Hazard Criteria.

Pictogram - a composition that may include a symbol plus other graphic elements, such as a border, background pattern, or color, that is intended to convey specific information about the hazards of a chemical. Eight pictograms are designated under this standard for application to a hazard category.

Precautionary statement - a phrase that describes recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to a hazardous chemical, or improper storage or handling.

Product identifier - the name or number used for a hazardous chemical on a label or in the SDS. It provides a unique means by which the user can identify the chemical. The product identifier used shall permit cross-references to be made among the list of hazardous chemicals required in the written hazard communication program, the label and the SDS.

Signal word - a word used to indicate the relative level of severity of hazard and alert the reader to a potential hazard on the label. The signal words used in this section are "danger" and "warning." "Danger" is used for the more severe hazards, while "warning" is used for the less severe.

Simple asphyxiant - a substance or mixture that displaces oxygen in the ambient atmosphere, and can thus cause oxygen deprivation in those who are exposed, leading to unconsciousness and death.

Substance - chemical elements and their compounds in the natural state or obtained by any production process, including any additive necessary to preserve the stability of the product and any impurities deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition.

Use - means to package, handle, react, emit, extract, generate as a byproduct, or transfer.

Workplace - includes any office or job site where hazardous chemicals/products are stored or used.

Exhibit 2 - Hazard Communication Program Compliance Checklist

HAZARD COMMUNICATION PROGRAM COMPLIANCE CHECKLIST

Arcadis Office: _____ **Jobsite** (if applicable):_____

Completed By (name/job title): _____ **Date**:_____

	Yes	No	Comments
1. Do you have a copy of 29 CFR 1910.1200?			
• Have you read and understand the requirements?			
2. Do you have a written program?			
• Have program responsibilities been assigned?			
• Does the program establish a procedure to review and evaluate program on an annual basis?			
3. Has a list of all hazardous chemicals/substances in the office/jobsite been prepared?[1]			
• Does the program contain a method for updating this list?			
4. Is there an SDS for each hazardous chemical/substance?			
• Does the program ensure that incoming hazardous chemicals/substances have an SDS?			
5. Does the program ensure that all incoming hazardous chemicals/substances have labels?			
6. Does the program address how to identify			

[1] The Chemical Inventory Report Form should be used to complete this list.

new chemicals/substances before they are used? • Does the program address how employees will be informed of new chemicals/substances?			
7. Do employees understand how to detect the release of hazardous chemicals/substances?			
8. Are employees: • Aware of HazCom Standard requirements and information specific to this office/jobsite?			
• Familiar with hazards of the chemicals/substances at this office/jobsite? • Informed of the hazards of performing non-routine tasks?			
9. Has training been provided in regard to proper work practices and PPE?			
10. Does the training: • Provide information on emergency procedures/first aid including symptoms of overexposure?			
• Provide an explanation of labels and warnings that are used in the work area?			
• Describe where employees can find the SDS? • Describe how to read/use an SDS?			

COMMENTS: _____

_____

_____

Exhibit 3 - Written HazCom Program Template for Offices

Link to the Hazard Communication Program template

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HAZARD COMMUNICATION PROGRAM

Arcadis Office:
Written By: Date Created:
Revised By: Date Revised:

APPLICABILITY

Where applicable, Arcadis shall comply with the OSHA Hazard Communication ("HazCom") standard (29 CFR 1910.1200) by maintaining a hazardous chemicals list and associated Safety Data Sheets (SDS); by ensuring that containers are labeled; and by providing training to applicable employees. This written HazCom program applies to all work locations where there is potential for exposure to hazardous chemicals under normal working conditions or during an emergency situation. A copy of the written program may be obtained at _____ Program Coordinator

The _____, is the Program Coordinator. The Program Coordinator will be available to answer questions regarding hazards and appropriate protective measures, and shall ensure that:

- The written program is reviewed at least annually, updated as necessary, and that documentation of the reviews are kept with the plan;
- A list of hazardous chemicals is completed on the "Master Chemical Inventory List (MIL) Form" and updated as necessary (see Exhibit 3 of ARC HSGE007);
- An SDS is available for all chemicals on the Chemical Inventory Report form except those that are exempt from the standard;
- SDS that are no longer applicable are archived and maintained for 30 years;
- All hazardous chemicals are properly labeled;
- All applicable employees and new hires have received training before they begin work to which this program applies; and
- Safe work practices are followed in regard to hazardous chemicals.

Exhibit 2 of ARC HSGE007 (Hazard Communication Standard) includes a checklist that may be used as a tool to assure compliance with the HazCom standard.

LIST OF HAZARDOUS CHEMICALS

The Program Coordinator shall make a list of all hazardous chemicals and will review the list at least annually, or more often as necessary, and maintain and update the list as necessary. Hazardous chemicals that are bought for and kept at a particular job site will not be included on this list, but shall be included in the site specific health and safety plan. The completed MIL for the _____ office can be found _____.

The Program Coordinator must be informed of all new hazardous chemicals purchased unless the chemical is being purchased for and kept at a particular job site. Upon receiving this information, the Program Coordinator will update the MIL within 10 business days. Employees in a position to purchase materials must adhere to purchasing department guidelines and assure new chemicals are not used until the SDS information has been obtained and appropriate employee training occurs.

SAFETY DATA SHEETS

SDS provide specific information on the chemicals used by this office. For each chemical listed on the MIL (other than those exempt from the HazCom standard), an SDS shall be kept on file in a location that is easily accessible and known to all applicable employees.

Copies of applicable SDS for this office can be found _____, in a [indicate if the[y] are kept in a binder, folder or electronically] that is labeled _____ [if your office maintains SDS in other locations, such as a work vehicle or job site, note this information here]. Applicable SDS should accompany the hazardous chemical/chemicals to the project site, and the Project Manager shall ensure that each work site has applicable SDS on hand at the job site.

The Program Coordinator is responsible for acquiring and updating SDS and may contact the chemical manufacturer or vendor if additional research is necessary or if an SDS has not been supplied with an initial shipment/purchase.

The Program Coordinator must be informed of all new hazardous chemicals purchased unless the chemical is being purchased for and kept at a particular job site.

LABELING AND OTHER FORMS OF WARNING

All primary and secondary containers of hazardous chemicals/products listed on the MIL must be labeled. Labels or other forms of warning will be legible, in English, and prominently displayed on the container, or readily available in the work area. For employees who speak another language(s), information may be added in their language to the label or other form of warning.

The chemical manufacturer, importer, or distributor shall ensure that each container of hazardous chemicals leaving the workplace is labeled, tagged or marked. Hazards not otherwise classified do not have to be addressed on the container. Where the chemical manufacturer or importer is required to label, tag or mark the following information shall be provided on containers shipped to Arcadis:

- Product Identifer;
- A signal word, either "Danger" or "Warning";
- Hazard statement(s);
- A standard pictogram(s);
- Precautionary statement(s); and
- The name, address, and telephone number of the chemical manufacturer, importer or other responsible party.

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Workplace Labeling

Arcadis shall ensure that each container of hazardous chemicals in the workplace is labeled, tagged or marked with either:

- A product identifier, a signal word (either "Danger" or "Warning"), hazard statement(s), standard pictogram(s), and precautionary statement(s); or
- Product identifier and words, pictures, symbols, or combination thereof, which provide at least general information regarding the hazards of the chemicals, and which, in conjunction with the other information immediately available to employees under the hazard communication program, will provide employees with the specific information regarding the physical and health hazards of the hazardous chemical.

  NOTE: Arcadis may use signs, placards, process sheets, batch tickets, operating procedures, or other such written materials in lieu of affixing labels to individual stationary process containers, as long as the alternative method identifies the containers to which it is applicable and conveys the information required by the hazardous chemicals in the workplace labeling requirement. Arcadis must also ensure the written materials are readily accessible to the employees in their work area throughout each work shift.

The supervisor of each work area must ensure that secondary chemical containers are properly labeled. Secondary chemical container labeling can be labeled with the same shipping container labels, or information that communicates the following:

- Identity of the chemical.
- Hazards of the chemical.

The label may use a combination of words, symbols or pictures to communicate this information. The company will use a standard labeling method for all secondary containers.

NOTE: Arcadis is not required to label portable containers into which hazardous chemicals are transferred from labeled containers, and which are intended only for the immediate use of the employee who performs the transfer, however, best management practice would be that all portable containers, even those intended only for the immediate use by employees, should be labeled with chemical identity and hazard information, where feasible.

Where applicable, the contents of pipes or piping systems shall be described in training sessions, and they should be labeled as to the contents. (This will be a site specific issue that should be addressed in site specific safety plans.)

[If you utilize stationary containers within a work area, include the following information in this program: If stationary containers within a work area have similar contents and hazards, labels shall be posted on them to convey hazard information.]

NON-ROUTINE TASKS

Where applicable, site specific health and safety plans shall address the chemical hazards associated with non-routine tasks (e.g., cleaning tanks, entering confined spaces, etc.). The site specific plan will inform applicable employees of the hazardous chemicals to which they may be exposed and the precautions they must take to reduce or avoid exposure. It will also address any additional training that may be required.

TRAINING

All employees who may be exposed to hazardous chemicals/products under normal operating conditions, or in foreseeable emergency situations, shall receive Hazard Communication training. Arcadis shall provide employees with effective information and training on hazardous chemicals in their work area at the time of their initial assignment,

and whenever a new chemical hazard the employees have not previously been trained on is introduced into their work area. Information and training is designed to cover categories of hazards (e.g., flammability, carcinogenicity) or specific chemicals. Chemical-specific information is always available to employees through labels and SDS.

The Program Coordinator_____ will conduct these training sessions in a _____ [indicate if you will use classroom, or an online/classroom combination] format. [Whether you are using an online or classroom program, information specific to your office must be part of the training. For example, who is the program coordinator, where is the chemical inventory form kept, where are the SDS located, etc.]

Whenever a new chemical hazard is introduced, additional information shall be provided to applicable employees.

Arcadis employees will be informed of:

- The requirements contained in the Hazard Communication Standard 29 CFR 1910.1200;
- Any operations in their work area where hazardous chemicals are present;
- The location and availability of the written HazCom program; and
- The location of the MIL and SDS.

Initial HazCom training shall include the following elements:

- Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);
- The physical, health, simple asphyxiation, combustible dust and pyrophoric gas hazards, as well as hazards not otherwise classified, of the chemicals in the work area;
- The measures employees can take to protect themselves from the[illegible]s, including specific procedures Arcadis has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used; and
- The details of the hazard communication program developed by Arcadis, including an explanation of the labels received on shipped containers and the workplace labeling system used by Arcadis; the SDS, including the order of information and how employees can obtain and use the appropriate hazard information.

The Program Coordinator or his/her designee will provide each employee with office specific information regarding location of the MIL and SDS, any label specific information in use at the office and who to contact about questions. Additional information will be provided to employees when hazards change or when a new chemical hazard is introduced into the workplace.

CONTRACTORS

The Program Coordinator shall advise contractors performing work in Arcadis offices of any chemical hazards that may be encountered in the normal course of their work on the premises, the location of SDS, the labeling system in use, the protective measures to be taken, and the safe handling procedures to be used. Each contractor bringing chemicals on-site must provide the Program Coordinator with the appropriate hazard information for these substances, including SDS, labels, and precautionary measures to be taken when working with or around these chemicals.

Project Managers for Arcadis projects will follow the requirements of the project health and safety plan for communication with the contractors used on projects.

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ADDITIONAL INFORMATION

Employees can obtain further information on this written program, the hazard communication standard, applicable SDS, and chemical information lists from the Program Coordinator.

Exhibit 4 – Master Chemical Inventory List Form

Link to the Master Chemical Inventory List Form

MASTER CHEMICAL INVENTORY LIST (MIL) FORM

(Hazardous chemicals/substances bought specifically for one job and kept at that job site aren't listed here, but should be listed in the site specific Health and Safety Plan)

Arcadis Office: _____

Jobsite Address (if applicable): _____

Date Of Inventory: _____ Completed By (name/job title): _____

Chemical Name	Amount On Hand[1]	Container Size	Container Type (e.g., plastic, metal, drum)	Hazard Class (nature of the physical or health hazards)	Type of Hazard (physical, health, environmental)	Hazard Category	SDS On Hand (if no, explain below)	Work Practice(s) Associated With The Chemical	Check if Exempt (Per Arcadis definition and example list)

EXAMPLE

Explain each "No" listed under the SDS column: _____

Page ___ of ___

[1] Indicate the amount that is usually kept on hand.

Exhibit 5 – List of Common Exemptions

The following chemicals are exempted from the labeling requirements of the HazCom program:

- Any pesticide as such term is defined in the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 136 et seq.), when subject to the labeling requirements of that Act and labeling regulations issued under that Act by the Environmental Protection Agency;
- Any chemical substance or mixture as such terms are defined in the Toxic Substances Control Act (15 U.S.C. 2601 et seq.), when subject to the labeling requirements of that Act and labeling regulations issued under that Act by the Environmental Protection Agency;
- Any food, food additive, color additive, drug, cosmetic, or medical or veterinary device or product, including materials intended for use as ingredients in such products (e.g. flavors and fragrances), as such terms are defined in the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 301 et seq.) or the Virus-Serum-Toxin Act of 1913 (21 U.S.C. 151 et seq.), and regulations issued under those Acts, when they are subject to the labeling requirements under those Acts by either the Food and Drug Administration or the Department of Agriculture;
- Any distilled spirits (beverage alcohols), wine, or malt beverage intended for nonindustrial use, as such terms are defined in the Federal Alcohol Administration Act (27 U.S.C. 201 et seq.) and regulations issued under that Act, when subject to the labeling requirements of that Act and labeling regulations issued under that Act by the Bureau of Alcohol, Tobacco, Firearms and Explosives;
- Any consumer product or hazardous substance as those terms are defined in the Consumer Product Safety Act (15 U.S.C. 2051 et seq.) and Federal Hazardous Substances Act (15 U.S.C. 1261 et seq.) respectively, when subject to a consumer product safety standard or labeling requirement of those Acts, or regulations issued under those Acts by the Consumer Product Safety Commission; and
- Agricultural or vegetable seed treated with pesticides and labeled in accordance with the Federal Seed Act (7 U.S.C. 1551 et seq.) and the labeling regulations issued under that Act by the Department of Agriculture.

For purposes of the Arcadis HazCom program and to comply with the Occupational Safety and Health Administration Hazard Communication Standard (HCS), the following categories of materials are exempted from the requirements of the HazCom program:

- Any hazardous waste as such term is defined by the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6901 et seq.), when subject to regulations issued under that Act by the Environmental Protection Agency;
- Any hazardous substance as such term is defined by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (42 U.S.C. 9601 et seq.) when the hazardous substance is the focus of remedial or removal action being conducted under CERCLA in accordance with Environmental Protection Agency regulations;
- Tobacco or tobacco products;

- Wood or wood products, including lumber which will not be processed, where the chemical manufacturer or importer can establish that the only hazard they pose to employees is the potential for flammability or combustibility (wood or wood products which have been treated with a hazardous chemical covered by this standard, and wood which may be subsequently sawed or cut, generating dust, are not exempted);
- Articles defined as:
    - Items that are formed to a specific shape or design during manufacture; and
    - Items that have end use functions dependent in whole or in part upon its shape or design during end use; and
    - Items that do not pose a physical hazard or health risk to employees; and
    - Items that, under normal use, do not release more than very small quantities (e.g., minute or trace amounts of a hazardous chemical).

        Note: If the use and/or repair of the article requires a modification that results in severe alterations of the article (e.g. grinding, cutting, welding, brazing, soldering, etc.), then the material that make up the article and any other material being used to alter the article ARE NOT exempted from the HazCom standard.
- Food or alcoholic beverages which are sold, used, or prepared in a retail establishment (such as a grocery store, restaurant, or drinking place), and foods intended for personal consumption by employees while in the workplace;
- Any drug, as that term is defined in the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 301 et seq.), when it is in solid, final form for direct administration to the patient (e.g., tablets or pills); drugs which are packaged by the chemical manufacturer for sale to consumers in a retail establishment (e.g., over-the-counter drugs); and drugs intended for personal consumption by employees while in the workplace (e.g., first aid supplies);
- Cosmetics which are packaged for sale to consumers in a retail establishment, and cosmetics intended for personal consumption by employees while in the workplace;
- Any consumer product or hazardous substance, as those terms are defined in the Consumer Product Safety Act (15 U.S.C. 2051 et seq.) and Federal Hazardous Substances Act (15 U.S.C. 1261 et seq.) respectively, where the employer can show that it is used in the workplace for the purpose intended by the chemical manufacturer or importer of the product, and the use results in a duration and frequency of exposure which is not greater than the range of exposures that could reasonably be experienced by consumers when used for the purpose intended;
    - Examples of products used at Arcadis that are used as a consumer would use them are:
        - window cleaner
        - paper correction fluid
        - sealed containers of cartridge toner for copiers
        - cleaning supplies in consumer-available quantities
        - dry cell batteries that could be used in consumer equipment

    Note: The following are examples of products that **are not exempt** because they are used in a manner not considered consumer use:

        - spray paint used for surveying, utility locates, etc,

  - lab chemicals and supplies
  - chemicals used for environmental testing equipment (pH buffers, chemical packets and dyes)
  - cleaning supplies associated with lab work and decontamination (e.g., Alconox detergent)
  - Cements and primers used for making PVC pipe connections
  - Spray lubricants used for industrial equipment maintenance (e.g., WD-40 and rust removers)
  - spray adhesives used as drafting supplies

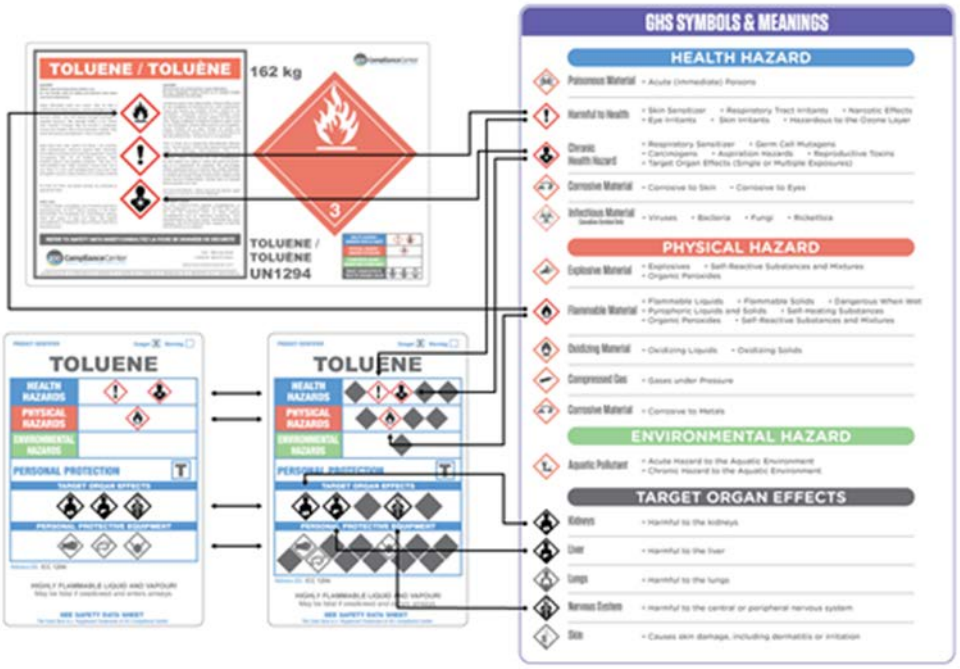
- Nuisance particulates where the chemical manufacturer or importer can establish that they do not pose any physical or health hazard covered under this section;
- Ionizing and non-ionizing radiation.
- Biological hazards (e.g. bloodborne pathogens, snake venom, poison ivy/oak, etc.

Exhibit 6 – GHS Compliant Labels

Elements

As of June 1 2015, HCS OSHA-GHS labels will be required to have the following six elements:

1. product identifier & code
2. pictogram(s)
3. signal word
4. hazard statements
5. precautionary statements
6. supplier identification



Implementation Date 1 December 2007	Arcadis HS Standard Name Hearing Conservation Health & Safety Standard	ARCADIS Design & Consultancy for natural and built assets
Revision Date 20 April 2017	Arcadis HS Standard No. ARC HSIH008	Revision Number 08

EXECUTIVE SUMMARY

The purpose of the Arcadis Hearing Conservation Health and Safety Standard (HSS) is to provide a standard policy on the health and safety requirements and processes for all employees with potential exposure to excessive noise (levels in excess of 80 decibels in the A scale (dBA)) and to comply with occupational exposure limits established by the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV), detailed in Exhibit 2 and the Occupational Safety and Health Administration (OSHA) Occupational Noise Exposure Standard (29 CFR 1910.95).

This HSS and associated procedures apply to every project and all operations conducted by Arcadis. Hearing Protection Devices (HPDs) are supplied and/or approved by Arcadis for use by employees in carrying out their assignments. All employees conducting work where the potential for noise exposure exceeds 85 dBA as an 8-hour time-weighted average (TWA) are required to use their assigned HPDs as required by the project Health and Safety Plan (HASP), Job Safety Analysis (JSA), and/or client requirements.

When information indicates that an employee's exposure may equal or exceed an 8-hour TWA of 80 dBA, Arcadis shall conduct a noise exposure evaluation (e.g., review of historical exposure monitoring data, published sound levels for anticipated activities) and, as warranted, develop and implement a monitoring program. This evaluation and/or assessment where excessive noise may be present is conducted in order to evaluate potential engineering/administrative controls and to assist in identifying the necessity for HPDs.

Arcadis will make hearing protection devices available to staff to wear when exposed to noise that exceeds an 8-hour TWA of 80 dBA or a peak sound pressure level of 130 dB C-weighted (dBC) for any amount of time.

Where noise exposure cannot be eliminated or minimized by engineering and administrative controls and an Arcadis employee will be exposed to noise at or over an 8-hour TWA of 85 dBA, employees will be required to wear appropriate hearing protection. When in doubt, Arcadis will provide hearing protection.

If an employee is exposed to noise at 85 dBA or higher for an 8-hr TWA, then they are required to have audiometric testing included as part of their workplace medical surveillance. Audiometric tests will be scheduled in conjunction with pre-placement, periodic, and termination medical examinations as required by the Medical Surveillance Program.

Where work area noise levels exceed 85 dBA and it is feasible to do so, Arcadis shall require that noise hazard signs be posted.

Managers have the responsibility to steward the Health & Safety (H&S) program to ensure that staff in their practice are appropriately equipped with the necessary HPDs and have been provided the appropriate training.

Employees required to wear HPDs will receive training in the use and care of all hearing protectors provided to them. The training program shall be repeated annually for each employee included in the hearing conservation program.

All records regarding noise exposure measurements will be maintained by the offices for two years. All audiometric test records will be maintained the third party administrator (TPA) for the Arcadis medical surveillance program (currently WorkCare) for the duration of the affected employee’s employment.

Implementation Date 1 December 2007	Arcadis HS Standard Name Hearing Conservation Health & Safety Standard	ARCADIS Design & Consultancy for natural and built assets
Revision Date 20 April 2017	Arcadis HS Standard No. ARC HSIH008	Revision Number 08

1. POLICY

It is the policy of Arcadis to assess noise hazards resulting from or encountered by our staff during job activities and to control such noise hazards to minimize and eliminate hearing loss among our staff, subcontractors, clients, and the public. Arcadis will make hearing protection devices available to staff to wear when exposed to noise that exceeds an 8-hour time-weighted average (TWA) of 80 decibels in the A scale (dBA) or a peak sound pressure level of 130 dB C-weighted (dBC) for any amount of time. Where noise exposure cannot be eliminated or minimized by engineering and administrative controls and an Arcadis employee will be exposed to noise at or over an 8-hour TWA of 85 dBA, employees will be required to wear appropriate hearing protection. When in doubt, Arcadis will provide hearing protection.

2. PURPOSE AND SCOPE

2.1 Purpose

Arcadis is committed to providing a healthy and safe work environment for our employees, subcontractors, clients and visitors. The purpose of the Arcadis Hearing Conservation Health and Safety Standard (HSS) is to provide a standard policy on the health and safety requirements and processes for employees with potential exposure to excessive noise (levels in excess of 80 dBA) and to comply with occupational exposure limits established by the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV), detailed in Exhibit 2 and the Occupational Safety and Health Administration (OSHA) Occupational Noise Exposure Standard (29 CFR 1910.95)..

2.2 Scope

This HSS applies to every project and all operations conducted by Arcadis. Hearing Protection Devices (HPDs) will be supplied and/or approved by Arcadis for use by employees in carrying out their assignments. All employees conducting work where the potential for noise exposure exceeds 85 dBA as an 8-hour TWA are required to have their assigned HPDs available and used as required by the project Health & Safety Plan (HASP), Job Safety Analysis (JSA) and/or client requirements.

3. DEFINITIONS

There are a number of definitions associated with this standard. These definitions are presented in Exhibit 1 of this document.

4. RESPONSIBILITIES

4.1 Employees

Employees are required to wear prescribed HPDs during activities where noise levels will exceed 85 dBA as an 8-hour TWA. The requirements for availability, selection and use of HPDs shall be defined by project HASPs, JSAs and/or client requirements.

In addition, employees have the responsibilities to adhere to this HSS and to communicate H&S concerns, issues and questions to their supervisor or their respective H&S resource. In addition, all employees have the responsibility to:

- Maintain hearing protectors in sanitary condition and proper working order;
- Use the **TRACK** process prior to any activity;
- Follow all Arcadis and client requirements;
- Participate in the medical surveillance program, including annual audiogram and hearing conservation training, as applicable based on their job duties;
- Notify both their Supervisor and Corporate Health and Safety if they were exposed to high noise levels and required to wear hearing protection during the previous year and are not already in the medical surveillance program; and
- Understand and appropriately use the “Stop Work Authority” concept.

4.2 Supervisors and Operations Managers

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

4.3 Project Managers and Task Managers

Project Managers (PMs) and Task Managers (TMs) have the responsibility to know and follow applicable Arcadis and client H&S requirements for ensuring work is conducted in accordance with this HSS, and for implementing the requirements in this HSS on any project and/or office that pose hazards to Arcadis employees or employees of its subcontractors, clients, and other organizations present in the vicinity of work controlled by Arcadis.

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

- Taking appropriate steps to minimize the risk of noise-induced hearing loss that may include implementing noise control measures, as well as the provision of hearing protection devices to employees, as required;
- Communicating with and appropriately managing subcontractors, ensuring that employees have appropriate training and qualifications, and for ensuring all client HS requirements are met;

- Involving the appropriate Arcadis H&S staff and project client staff, as necessary;
- Ensuring that all subcontractors have been communicated with concerning the minimum H&S requirements for the project;
- Providing adequate resources and budget for personal protective equipment (PPE), including HPDs, at no cost to the employee; and
- Ensure that Arcadis employees working on their projects are properly using and caring for their HPDs.

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

- Stewarding H&S and setting expectations that all Arcadis employees working on their projects must comply with H&S rules and requirements;
- Guaranteeing each employee the absolute right to exercise “Stop Work Authority” in good faith without fear of retribution or disciplinary action; and
- Using the Arcadis Incident Investigation process for formally resolving a “Stop Work” condition.

Using this “Stop Work Authority” process, the Project and/or Task Manager and the employee will:

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

4.4 Corporate H&S Staff

Corporate H&S Staff have the responsibility for:

- Communicating the policy and standard requirements in this HSS with Arcadis staff;
- Ensuring that Operations Management, Supervisors, Project/Task Managers, and staff affected by excessive noise are aware of this HSS;
- Ensuring this HSS is being implemented effectively;
- Provide technical services and advice regarding control measures, assist employees in the selection of appropriate hearing protective devices and provide instruction on their use, maintenance and care, as requested;
- Provide required training or guidance on approved training options; and

- Review, evaluate and maintain this HSS on a routine basis.

4.5 Health & Safety Managers, Specialists and Site Safety Officers

Health and Safety Managers and Specialists and Site Safety Officers are responsible for facilitating the policy and standard requirements in this HSS in their area of responsibility and for providing “hands-on” assistance to Arcadis staff to ensure this standard is appropriately implemented.

5. PROCEDURES

5.1 Noise Monitoring and Exposure Assessments

When information indicates that an employee's exposure may equal or exceed an 8-hour TWA of 80 dBA, Arcadis shall conduct a noise exposure evaluation (e.g., review of historical exposure monitoring data, published sound levels for anticipated activities) and, as warranted, develop and implement a monitoring program. This evaluation and/or assessment where excessive noise may be present is conducted in order to evaluate potential engineering/administrative controls and to assist in identifying the necessity for HPDs.

Noise monitoring will be prescribed by H&S professionals during the development of HASP and/or JSA. Noise monitoring may also be conducted at the discretion of the Site Safety Officer (SSO) or any staff members that have questions or concerns about potential noise exposure that could result in employee exposure above 85 dBA as an 8-hour TWA. If noise monitoring is not feasible, Arcadis staff will assume that exposures that require elevated speech are above 85 dbA and will use appropriate hearing protection. Noise monitoring results will be collected in accordance with the OSHA *Occupational Noise Exposure Standard* (29 CFR 1910.95). Monitoring results will be communicated to staff and used to determine adequate types and effectiveness of hearing protection device.

The measurement of the A-weighted sound pressure level in a work place shall be performed instantaneously, during normal working conditions, using the slow response setting of a sound level meter. Noise exposure level is determined through the integration of all continuous, intermittent and impulsive sounds between 80 dB and 130 dB.

During this noise hazard investigation, the following matters shall be considered:

- the sources of sound in the work place;
- the A-weighted sound pressure levels to which the employee is likely to be exposed and the duration of such exposure;
- the methods being used to reduce this exposure;
- whether the exposure of the employee is likely to exceed the 85 dBA as an 8-hour TWA or other limits defined in the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices; and
- whether the employee is likely to be exposed to a noise exposure level equal to or greater than 85 dBA as an 8-hour TLV-TWA.

On completion of the noise hazard assessment or monitoring, the person appointed to carry out the assessment or monitoring shall document:

- observations with regards to potential noise exposure;
- recommendations respecting the measures that should be taken to limit employee exposure to noise;
- requirements that HPDs will be made available to staff to wear when exposed to noise that exceeds an 8-hour TWA of 80 dBA or a peak sound pressure level of 130 dBC for any amount of time; and
- requirements for use of hearing protection by employees who are exposed to a noise exposure level equal to or greater than 85 dBA as an 8-hour TWA.

5.2 Reduction / Control of Noise Exposure

Insofar as is reasonably practicable, Arcadis shall, by engineering controls or physical means other than hearing protectors, reduce the exposure to sound of employees to a level that does not exceed an 8-hour TWA noise exposure level of 85 dBA or other limits defined in the ACGIH TLV – refer to Exhibit 2.

The hierarchy of control that must be followed:

1. *Eliminating the Noise Source* - The elimination of a source of noise is the most effective way to prevent risks to employees, and should always be considered when new work equipment or workplaces are planned.

2. *Engineering Controls* – The next best method of dealing with noise in the workplace is to reduce the noise at the source through the use of engineering controls. Engineering controls can eliminate the need for hearing protection; audiometric testing, and other elements of a hearing conservation program. Even if noise cannot be reduced to safe levels at the source, reducing noise increases the likelihood that hearing protection will be even more effective in reducing noise exposures below the 85 dBA exposure limit. Some possible options include reduction of noise at source, enclosure of noise source, enclosure of employees, acoustical treatment of room, separating workers from the noise source and a combination of these controls. In addition, substitution controls may be employed, as part of the engineering control measures.

3. *Administrative Controls* - Education and training are the primary administrative controls for hearing protection. Administrative controls also include measures such as work-rest cycles and infrequent work tasks. These controls are aimed at reducing the time a worker is potentially exposed to noise.

4. *Use of Personal Protective Equipment (PPE)* - When engineering controls cannot eliminate the noise hazard, HPDs will be used to lower noise exposures to acceptable levels. Hearing protection in the form of ear plugs and/or ear muffs are examples of hearing protection devices that can help serve to minimize noise exposures.

5.3 Warning Signs

Workplaces in which the noise level exceeds 85 dBA TWA, and where it is feasible to do so, will have signs posted. Signs shall read “Caution - Hearing Protection Required." In extreme noise areas with measured noise levels greater than 105 dBA, signs shall read “Danger – Hearing Protection Required.” In some cases, the responsibility will fall upon the client and/or contractor to post these warning signs. For temporary work locations, Arcadis will coordinate/discuss required warning sign requirements with the controlling contractor.

5.4 Audiometric Testing

Arcadis has established and maintains an audiometric testing program by making audiometric testing available to all employees whose exposures equal or exceed an 8-hour TWA of 85 decibels.

Within 6 months of an employee's first exposure at or above the action level, Arcadis shall establish a valid baseline audiogram against which subsequent audiograms can be compared.

At least annually after obtaining the baseline audiogram, Arcadis shall obtain a new audiogram for each employee exposed at or above an 8-hour TWA of 85 decibels.

Audiometric tests will be scheduled in conjunction with pre-placement, periodic, and termination medical examinations as required by the Medical Surveillance Program (ARC HSGE010). All employees that are not already part of the medical surveillance program must inform their supervisor and Corporate Health and Safety if they were exposed to high noise levels as part of their job duties. Employees that were exposed to high noise levels must receive an audiogram as specified by the Medical Surveillance Program. Employees will be informed of the requirement that they avoid both non-occupational and occupational noise exposure for 14 hours prior to audiometric testing.

Audiograms will be compared to baseline and prior tests to determine if a standard threshold shift has occurred. The TPA for the Arcadis Medical Surveillance Program (currently WorkCare) will directly notify an employee and the Arcadis Corporate Health and Safety Medical Surveillance Program Administrator in writing of a standard threshold shift within 21 days of determination. If a shift is detected, retesting may be done within 30 days. If a shift is confirmed, the employee will be informed in writing and may need to be refitted and retrained in hearing protection use. If subsequent testing shows that a standard threshold shift is not present, the employee will be informed. Additional audiometric testing may be conducted at the discretion of Health and Safety.

The TPA physician or audiologist will determine if further evaluation is needed and, if so, will provide to the specialist all the information that is required. If the physician determines that the medical pathology is unrelated to work exposure or wearing hearing protectors, the employee will be informed by the physician.

The Audiometric Testing program will be managed by Arcadis’ TPA for the medical surveillance program.

5.5 Hearing Protection Devices

HPDs will be available to all workers exposed to noise levels that exceed 80 dBA as an 8-hour TWA and will be required when workers are exposed to noise levels that exceed

85 dBA as an 8-hour TWA. HPDs will be provided at no cost to the employee. Some types of hearing protection include:

- Ear Muffs – fit over the whole ear and seal the ear from noise. The efficiency of the muff type may decrease if the muff is not fitted properly or if glasses are worn with them.
- Ear Plugs – which are worn in the internal part of the ear and they are made of a variety of materials (rubber, plastic, or other material) that will fit tightly in the ear.

Arcadis shall supply a hearing protector that:

- Has appropriate Environmental Protection Agency (EPA) labeling for hearing protectors (40 CFR 211), which requires manufacturers to identify the noise reduction capability of all hearing protectors on the hearing protector package. This measure is referred to as the noise reduction rating (NRR); and
- Prevents the employee using the hearing protector from being exposed to a level of sound that exceeds the limits detailed in Exhibit 2.

Note: The actual effectiveness of any individual hearing protector cannot be determined under workplace conditions. However, OSHA's noise standards (29 CFR 1910.95(j)(2) and 29 CFR 1926.52(b)) require that personal hearing protection be worn to attenuate the occupational noise exposure of employees. Arcadis chooses to implement the ACGIH-TLV for noise exposure. OSHA Occupational Noise Exposure Standard, Appendix B: Methods For Estimating the Adequacy of Hearing Protector Attenuation provides information on how to determine the adequacy of hearing protector attenuation using the NRR of a given hearing protector.

As a Best Management Practice, Arcadis employees working in **extreme** noise areas are directed to wear “dual” hearing protection, consisting of earplugs along with earmuffs. Additional engineering and/or administrative controls limiting the exposure time to keep the sound from reaching the worker’s ear drum below 85 dBA TWA must also be initiated. *Extreme noise areas are defined as areas with measured noise levels greater than 105 dBA for any amount of time*. Based on current OSHA policy, the wearing of ear muffs over ear plugs will boost the overall attenuation of the earplugs by 5 dB.

Employees will be given the opportunity to select their HPDs from a suitable variety.

Arcadis shall provide training in the use and care of all HPDs provided to employees.

6. TRAINING

Employees who have noise exposure exceeds 80 dBA as an 8-hour TWA value, will be required to receive training on noise hazards, the selection, use and care of HPDs.

Employees required to wear hearing protection will receive training as provided by Corporate H&S. The training will be provided at least annually with refresher training as necessary and will include:

- information regarding: effects of noise on hearing;
- purpose of hearing protectors;

- advantages, disadvantages, and attenuation of various types of hearing protectors;
- selection, fitting, use, and care of hearing protectors; and
- purpose of audiometric testing and an explanation of the test procedures.

7. REFERENCES (regulation citation, technical links, publications, etc.)

- OSHA Standard 29 CFR 1910.95
- ACGIH Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices
- Noise Navigator™ Sound Level Database with over 1700 Sound Level Measurement Values; E-A-R 88-34/HP; 3M Occupational Health & Environmental Safety Division; July 6, 2010; Version 1.5 (Refer to Noise Hazard question #2 link to excel file)

8. RECORDS

Record Maintenance – All records regarding noise exposure measurements will be maintained by the offices for two years. All audiometric test records will be maintained by the TPA for the Arcadis Medical Surveillance Program for the duration of the affected employee's employment.

9. APPROVALS AND HISTORY OF CHANGE

Approved By: Julie Santaniello, CSP – Corporate H&S, Manager of Technical Programs

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
1 December 2007	01	Mike Thomas/Tony Tremblay	Original document
30 January 2008	02		Change to new template
5 October 2010	03		Change name from Procedure to Standard; revision of section 5.3

Implementation Date 1 December 2007	Arcadis HS Standard Name Hearing Conservation Health & Safety Standard	ARCADIS Design & Consultancy for natural and built assets
Revision Date 20 April 2017	Arcadis HS Standard No. ARC HSIH008	Revision Number 08

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
12 December 2012	04		Executive Summary Added; HSP changed to HSS; Definitions relocated to Exhibit 1 and added Representative Exposure definition; Added BMP regarding use of both ear plugs and ear muffs when noise level exceeds 105 dBA; Requirement for use of HPD aligned with ACGIH Noise TLV; Training Section updated; References hyperlinked; Section 7 Hyperlinks added, including link to Common Noise Level Reference table; NRR to assess hearing protector adequacy calculation added to Exhibit 1 NRR definition
10 June 2013	05	Tony Tremblay	Noise Exposure values clarified in Executive Summary; Section 5 reformatted to include noise monitoring exposure and assessment, reduction/control of noise exposure, warning signs, audiometric testing and HPDs; Section 6 determining when noise exposure Training clarified
01 October 2013	06	Lauren Edwards	Changed the requirement for an audiometric exam within in 6 months if an employee is exposed to noise at 85 dBA or higher for an 8-hr TWA. Section 5.4
6 October 2014	07	Amanda Tine/Tony Tremblay	Clarified employee audiometric testing requirements in Section 5.4 based on OSHA 29 CFR 1910.95

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Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
20 April 2017	08	Sharon Lingle, Tony Tremblay/Julie Santaniello	New format. Added TPA will notify the Arcadis employee within 21 days of a threshold shift. Updated requirements include making hearing protection devices available to staff to wear when exposed to noise that exceeds an 8-hour TWA of 80 dBA or a peak sound pressure level of 130 dBC for any amount of time; and staff are required to wear prescribed HPDs during activities where noise levels will exceed 85 dBA as an 8-hr TWA. Excessive noise definition modified.

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Exhibit 1 – Definitions

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

Excessive Noise – noise levels in excess of 80 dBA for any amount of time (noise environment that requires speech levels above those used for normal conversation).

Extreme Noise Areas are defined as areas with measured noise levels greater than 105 dBA for any amount of time.

HSS – Health and Safety Standard

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

> When using the NRR to assess hearing protector adequacy and the sound level measurement reported is in the "A" scale, the following method is used to evaluate the adequacy of the hearing protector attenuation:
>
> Step 1: Convert the A-weighted dose to TWA (dBA)
>
> Step 2: Subtract 7 dB from the NRR
>
> Step 3: Subtract the remainder of Step 2 from the A-weighted TWA (Step 1 value) to obtain the estimated A-weighted TWA under the ear protector.

Representative Exposure - Measurements of an employee's noise dose or 8-hour time-weighted average sound level that the employers deem to be representative of the exposures of other employees in the workplace.

Sound Level Meter means a device for measuring sound pressure level that meets the performance requirements for a Type 2 instrument as specified in the International Electrotechnical Commission Standard 651 (1979).

Sound Pressure Level means 20 times the logarithm to the base 10 of the ratio of the root mean square pressure of a sound to the reference sound pressure of 20 µPa, expressed in decibels.

Summary of Noise Trigger Levels:

- 80 dBA – Noise exposure assessment will be conducted if worker is or is likely to be exposed to noise at a workplace in excess of 80 dBA.
- 80 dBA – HPDs will be made available to staff to wear when exposed to noise that exceeds an 8-hour TWA of 80 dBA or a peak sound pressure level of 130 dBC for any amount of time. This will also trigger training on the selection, use and care of HPDs.
- 85 dBA – AUS staff will be **required** to use HPDs for noise levels at or exceeding 85 dBA as an 8-hour TWA.

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- 85 dBA as 8-hour TWA – If employee exposed at 85 dBA or higher for an 8-hr TWA, then they are required to have audiometric testing included as part of their workplace medical surveillance.
- 85 dBA or higher – noise hazard signs posted.
- 105 dBA or higher – Employee must use both ear plugs and ear muffs together for exposure to noise for any amount of time that exceeds 105 dBA.

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

Implementation Date 1 December 2007	Arcadis HS Standard Name Hearing Conservation Health & Safety Standard	ARCADIS Design & Consultancy for natural and built assets
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Exhibit 2 – ACGIH TLV FOR NOISE

	Duration per Day	Sound Level dBA (slow response)
Hours	24	80
	16	82
	8	85
	4	88
	2	91
	1	94
Minutes	30	97
	15	100
	7.5	103
	3.75	106
	1.88	109
	0.94	112
Seconds	28.12	115
	14.06	118
	7.03	121
	3.52	124
	1.76	127
	0.88	130
	0.44	133
	0.22	136
	0.11	139

Note: No exposure to continuous, intermittent, or impact noise in excess of a peak C-weighted level of 140 dB.

Implementation Date 31 August 2011	Arcadis HS Standard Name Heat Stress Prevention	ARCADIS Design & Consultancy for natural and built assets
Revision Date 15 March 2017	Arcadis HS Standard No. ARC HSIH013	Revision Number 07

EXECUTIVE SUMMARY

Illness related to heat stress (Heat Illness) can be controlled and minimized by using safe work practices such as administrative controls, engineering controls, and personal protective equipment (PPE). This Health and Safety Standard (HSS) identifies responsibilities, risk factors for heat illness, signs and symptoms, first aid procedures, and Arcadis training requirements.

Personal risk factors for heat illness include poor health, age, weight, and pre-existing medical conditions; inadequate acclimation to working in the heat; and experience with previous heat illness. Environmental risk factors include workload severity and duration, high temperature and humidity, direct sun exposure, and air movement. Heat stroke is a life-threatening condition, and emergency personnel should be contacted immediately.

Preventive safe work practices involve avoidance of working in the heat when possible, taking regularly scheduled shade breaks, acclimatization, rotating personnel, avoiding beverages containing caffeine or sugar, staying appropriately nourished, and providing readily available fresh, pure ("fresh and pure" defined as being free of odors), and suitably cool potable water access at all times.

Engineering controls that should be implemented include monitoring and measuring temperature and heat index factors, designing appropriate work/rest cycles, and choosing clothing that allows for wicking of perspiration.

Training for heat stress prevention shall be provided to all supervisory employees prior to project assignment. Topics will include the importance of acclimatizing, risk factors, signs and symptoms of various heat illnesses, and procedures to follow in the event of an emergency. Staff working in California, Washington, or other states with specific heat illness standards must receive documented training prior to assignment. Other affected employees not working in these states must be familiar with this HSS and the information detailed in the Field Health & Safety Handbook. Corporate H&S recommends that all staff that might be reasonably be anticipated to have exposure to the risk of heat illness complete the online heat stress training course.

Project managers (PMs), and task managers (TMs) are responsible for addressing heat stress in project planning, ensuring that personnel have proper training, and that the site-specific Health and Safety Plan (HASP) and Heat Illness Prevention Plan (HIPP) HASP Supplement has been developed to document and communicate the site-specific heat illness prevention provisions for projects in California and Washington State (Best Management Practice for other states).

The Site Safety Officer (SSO) is responsible for coordinating and verifying that the provisions for shade and adequate water are available at a job site. Supervisory Personnel (e.g., SSOs, PMs, or TMs) who are managing staff on site and are responsible for ensuring that affected personnel, who might reasonably be anticipated to have exposure to the risk of heat illness, have received the proper training on heat illness prevention and ensuring that the requirements in this HSS are followed.

Project personnel are responsible for understanding the conditions, signs, and symptoms that can lead to heat stress and adhere to the prescribed control and mitigation and methods. Personnel will report to the SSO and/or PM any signs and symptoms of heat stress exhibited by themselves or by other personnel.

Implementation Date 31 August 2011	Arcadis HS Standard Name Heat Stress Prevention	ARCADIS Design & Consultancy for natural and built assets
Revision Date 15 March 2017	Arcadis HS Standard No. ARC HSIH013	Revision Number 07

1. POLICY

It is Arcadis policy that employees who are required to work in hot, outdoor places of employment or in other areas where the environmental risk factors for heat illness are present, are at risk for developing heat illness if they do not protect themselves from the hazards.

Heat-related illness may be prevented by using safe work practices including administrative controls, , engineering controls, and/or PPE.

2. PURPOSE AND SCOPE

2.1 Purpose

The purpose of this procedure is to provide employee awareness regarding heat illness symptoms, direction on the controls and prevention of heat-related illnesses, and guidance on appropriate response actions if symptoms do occur.

2.2 Scope

This procedure applies to Arcadis projects which include, but are not limited to: indoor operations in hot environements or outdoor operations conducted in hot weather such as construction, refining, oil and gas extraction, asbestos removal, and hazardous waste site activities, especially those that require employees to wear semipermeable or impermeable protective clothing that are likely to cause heat stress among the exposed. California and Washington enforce specific occupational heat illness prevention requirements which are addressed in this HSS. It should be noted that for all other states and US territories, the information provided in this HSS will be used as Best Management Practices (BMPs) for addressing Heat Stress and heat related illness prevention.

Project sites located in California and Washington must comply with the requirements set forth in this HSS, which has been developed to comply with the California Occupational Safety and Health Administration (Cal/OSHA) Title 8 California Code of Regulations (CCR) 3395 Heat Illness Prevention Standard and the Washington State Outdoor Heat Exposure Regulations 296-62-09510 thru 09560. Project sites in California and Washington State must complete the HIPP HASP Supplement and include this HSS as an attachment to the field copy of the HASP, along with the completed HIPP HASP Supplement.

3. DEFINITIONS

Definitions relating to Heat Stress Prevention are provided in Exhibit 1.

4. RESPONSIBILITIES

4.1 Project Managers and Task Managers

Are responsible for ensuring that heat stress is considered and addressed in project task hazard analysis, risk assessment, and project planning.

Ensure that the project HASP addresses the need for adequate water, provisions for shade are available at a job site, and that time is available for staff to eat when the environmental risk factors for heat illness are present.

Ensure that the HASP addresses the need for affected employees to receive applicable training on heat illness prevention and that staff are provided time to complete the training prior to starting work.

4.2 Supervisory Personnel

Supervisory personnel (e.g., SSOs, PMs, and/or TMs who are supervising employees working on site and in the heat) must review this HSS and complete training in the prevention of heat related illnesses prior to supervising employees that work in the heat (risk of heat illness). Supervisory personnel will be trained in heat illness prevention and procedures to follow when an employee exhibits symptoms consistent with possible heat illness, including emergency response procedures. Supervisory personnel must ensure personal risk factors that contribute to heat-related illness are considered before assigning a task where there is the possibility of a heat-related illness occurring (See Section 5.2 for risk factors) and plan for and implement preventive measures and controls when heat advisories are issued for those areas in which staff will be working.

Ensure that effective communication by voice, observation, or electronic means is maintained so that site employees can contact a supervisor, WorkCare or emergency medical services when necessary. Devices, such as radios or a cell phone, may be used for this purpose only if reception in the area is reliable. If an electronic device will not furnish reliable communication in the work area, the project team must ensure a suitable means of summoning emergency medical services is available.

Ensure that affected employees working on site have received proper training on heat illness prevention.

Ensure that the requirements in this HSS are documented and followed.

Ensure that staff working in the heat have constant access to suitably cool, fresh, pure potable water and access to shade.

4.3 Corporate Health and Safety

Corporate H&S is responsible for keeping this HSS up-to-date with regulatory requirements and best work practices.

As requested, provide training to potentially impacted employees and their supervisors on the risks and prevention of heat illness, including how to recognize symptoms and how to respond when they appear.

4.4 Affected Employees

Employees are responsible for understanding the conditions, signs, and symptoms that can lead to heat stress and for using and adhering to the prescribed control and mitigation and methods. Personnel will report to the SSO and/or PM any signs and

symptoms of heat stress exhibited by themselves or by other personnel on the project site.

If site personnel have not received heat stress training prior to conducting work, then site personnel will be educated on heat stress prevention by reviewing this HSS, reading the site HASP (including the site-specific HIPP HASP Supplement as required for California and Washington States), and by attending the daily tailgate meeting.

Employees must review and comply with the provisions of this HSS.

Employees must ensure they have suitably cool, fresh, pure (potable) water available at all times and that they eat prior to starting work and during the day when the environmental risk factors for heat illness are present.

Employees will ensure they have constant access to a shaded area to prevent or recover from heat-related symptoms.

5. PROCEDURE

5.1 Safe Work Practices

Arcadis staff shall follow these general safe work practices when working in the heat:

- Staff will avoid working in the heat when possible. This can be accomplished by avoiding work in the hottest parts of the day or working in cooled enclosures or providing cooling units in the work area. Severe heat conditions can be cause for stopping or not starting work.
- Allow personnel to acclimatize and adapt to the heat; specifically, those employees new to the project or working in high heat areas.
- The SSO will be particularly watchful of the condition of new employees and stay alert to the onset of heat-related symptoms. New employees will be assigned a “buddy” or experienced co-worker for monitoring each other closely for symptoms of heat illness.
- Whenever possible, rotate personnel in/out of working conditions in which heat is a factor.
- Personnel shall have constant access to suitably cool, fresh, pure (potable) water. Where the supply of water is not plumbed or otherwise continuously supplied, water shall be provided at no cost to the employee(s) (or employee will be reimbursed) in sufficient quantity at the beginning of the work shift and for the shift duration.

  Note: *Thirst cannot be relied on as a guide for hydration. Employees need to drink cool, fresh water throughout the day (four 8-oz cups per hour) during hot weather. Electrolyte replacement drinks or “Sports Drinks” can be used to replace essential minerals lost during sweating. Generally, such drinks should supplement water intake such as one “sports drink” to every three bottles of water. Also, a teaspoon of salt added to every gallon of water could also be used.*
  Electrolyte replacement and/or “Sport Drinks” should never be used as the primary or substitute source of fluid intake or as a substitute for food.

- Employees will be notified of the location(s) of the closest drinking water supplies.
- Employees should choose non-carbonated water over sodas or other beverages containing caffeine or sugar.
- Employees should eat prior to work and then during the work rotation.
- Employees and SSO must understand the individual, pre-disposing susceptibilities to heat illness.
- Employees must understand the signs and symptoms of heat illness including: discomfort, excessive sweating, headache, poor concentration, muscle pain, cramping, dizziness, fatigue, irritability, loss of coordination, vomiting, blurry vision, confusion, lack of sweating, fainting, and seizures.
- Employees must understand first aid and emergency response procedures associated with heat illness.
- See Exhibit 2 for more safe work practices information.
- See Exhibit 3 for a link to the HIPP HASP Supplement. A copy of the HIPP is also provided in the Standard HASP template.

5.2 Risk Factors for Heat-Related Illnesses

The personal and environmental risk factors for heat-related illness must be considered as part of the TRACK process before performing a task.

5.2.1 Personal Risk Factors

- No recent exposure to high heat work areas is a risk factor because the individual is not acclimatized to working in the heat.
- Individual susceptibilities such as age, weight, degree of physical fitness, use of medications, and certain medical conditions such as hypertension and diabetes all affect the potential to experience a heat-related illness.
- A person is at greater risk for heat illness when they are in poor health, are dehydrated, have not eaten, have not been acclimated to working in the heat, and have experienced previous heat illness.
- Working in a hot environment tends to lower the mental alertness and physical performance of an individual. Increased body temperature and physical discomfort promote irritability, anger, and other emotional states which have the potential to cause personnel to overlook safety procedures or to divert attention from hazardous tasks.
- Wearing PPE that increases the potential for the onset of heat illness symptoms.

5.2.2 Environmental Risk Factors

- High temperature and humidity, direct sun exposure, no breeze or wind
- Radiant heat, air movement
- Workload severity and duration

Heat tends to promote accidents due to the slipperiness of sweaty palms, dizziness, or the fogging of safety glasses. The frequency of accidents, in general, appears to be higher in hot work environments than in more moderate environmental conditions.

5.3 Administrative and Engineering Controls

When feasible, Arcadis staff shall implement the following administrative and engineering controls:

- Avoid scheduling work during the hottest parts of the day when possible. Alternatively, schedule more strenuous tasks or tasks that include semi-permeable or nonpermeable PPE early in the morning when conditions are typically cooler than midday or afternoon conditions.

- Monitor and measure temperature and heat index factors so the magnitude of the heat hazard is understood. This can be accomplished with on-site instrumentation when working indoors or in enclosed spaces or by monitoring outdoor weather conditions through the internet, radio, or local weather bureaus. See Section 5.3.4.

- Encourage personnel to wear appropriate clothing that allows for the wicking away of perspiration.

- Implement appropriate work/rest cycles to allow for adequate cool-down periods.

- Employees suffering from heat illness related symptoms must be allowed and shall be encouraged to take a preventative cool down rest in an area with shade that is either open to the air or provided with ventilation or cooling (e.g. cooling stations, misters, air-conditioned spaces). While taking a preventative rest, the employee will be monitored for heat illness symptoms and encouraged to remain in the shade and not return to work until the symptoms are gone. Access to shade shall be permitted at all times.

5.3.1 Procedure for Acclimatization

Supervisors, SSOs, and employees will be trained on the importance of acclimatization, how it is developed, and how to implement an acclimatization process that is consistent with applicable regulations and the guidelines set forth in this HSS. An employee is at risk of heat illness during a sudden rise in temperatures if not given time to adjust to the changing conditions. Acclimatization (the physiological process of becoming accustomed to changing conditions) is necessary, especially in conditions of high heat and physical stress. In addition to acclimatization, other factors can affect employees working at sites where high temperatures are anticipated, such as: poor general health, age, weight, pre-existing medical conditions, and having previously experienced heat illness. Employees are not required to share personal information about some factors such as pre-existing medical conditions. However, including these factors in the Tailgate Safety Meeting discussion of heat illness raises awareness of the risks involved with heat illness.

A gradual acclimatization period will be implemented for new employees that have not been exposed to a work environment where high temperatures are present (e.g., employees not accustomed to the conditions of the work site will be given slower paced, less physically demanding tasks during the hot parts of the day and given the heavier tasks during cooler parts of the day). New employees will be closely monitored during their acclimatization period which can last up to two weeks. The steps taken to reduce the workload intensity for employees not yet acclimated to working in high heat conditions will be documented in the field copy of the HIPP HASP Supplement.

The SSO or designee is responsible for implementing the following procedures for acclimatization. These procedures include, but are not limited to, the following:

- Observing employees closely for signs of heat illness. Specific site conditions warranting close observation include but are not limited to any day where the temperature is 80 degrees (°) Fahrenheit (F) (26° Celsius [C]) or greater and is at least 10° F (6° C) higher than the average daily temperature for the preceding five days.
- Providing effective acclimatization procedures for employees during exposure to a sudden increase in temperature; and
- Weather will be monitored daily by the SSO, who will be on the lookout for sudden heat wave(s) or increases in temperatures that employees haven't been exposed to for several weeks or longer per Section 5.3.4 Weather Monitoring Procedures, detailed in this HSS.

5.3.2 Provisions for Water at the Site

At the start of work, the importance of drinking water, the signs and symptoms of heat illness, the location(s) of the water/water coolers, and the schedule of water/rest breaks will be communicated to all staff during each Tailgate Safety Meeting. The SSO or the designated alternate shall provide for distribution of suitably cool, fresh, clean potable (drinking) water at the project site. An adequate supply of suitably cool, fresh, clean potable water will be maintained on site at all times to allow each employee to consume one quart (one liter [1 L]) of water per hour (e.g., 2 gallons (8 L) per employee for an 8-hour shift). Where unlimited drinking water is not immediately available from a plumbed system or otherwise continuously supplied, water will be provided to staff via coolers containing bottled water, or insulated drinking water dispensers (verify coolers/dispensers are of a sufficient capacity to support the amount of field staff present) accompanied with disposable cups to maintain sanitary conditions for potable water consumption. When conditions are anticipated to exceed 80° F (26° C), SSOs and/or supervisors shall encourage employees to drink water before they "feel" thirsty. Ideally, drinking 8 ounces of water every 15 minutes will allow the body to remain properly hydrated while working in high temperature conditions.

If the decision is made not to provide all site employees the full-shift quantity of drinking water at the start of a work shift (e.g., 2 gallons (8 L) per employee for an 8-hour shift), then effective procedure(s) must be documented and implemented to ensure drinking water replenishment to allow each employee to drink 1 quart (1 L) per hour. This means a sufficient quantity of water must always be present and readily accessible to allow every employee to consume at least 1 quart of water per hour until the water supply has been replenished.

- The HIPP HASP Supplement provides a formula to calculate the number of quarts of water required per employee per hours worked per shift.
- Coolers containing bottled water or drinking water coolers should be maintained to provide for a minimum of 3 hours of water per employee (at least 1 quart (32 ounces) (1 L) of water will be made available per employee per hour) to account for a sufficient quantity of water to always be present.
- Water supplies will be positioned as close as reasonable possible to site workers. Ideally water supplies will be positioned within 50 feet of employee activity or in

vehicles used by employees to gain access to individual work areas; however, coolers will be stationary when employees are essentially stationary. Placing water only in shaded areas or by toilet facilities is not sufficient, particularly at large work sites or at multi-story construction sites. Drinking water sources need to be close enough to workers to allow for routine consumption.

- Coolers will be inspected and replenished with water and ice for cooling periodically (e.g., every 30 minutes, every hour based on site temperature and number of employees present) by the SSO or designee.
- Ice will be added to the coolers, as necessary, during the required inspections.

***Note**: When the temperature exceeds 90° F (32° C), inspections will be increased in frequency and ice will be added as need to keep water cool*.

- Ice will be distributed from a separate cooler or service and added to coolers to ensure that the drinking water remains potable and appropriately cool for employee consumption. Ice used to chill the water will be stored separately to remain sanitary. Sanitary ice storage can include storage of ice in bags when bottled water is used or use of separate storage coolers when using drinking water dispensers.
- Coolers will be inspected and cleaned after each work shift or prior to starting work each shift. The SSO will oversee cooler maintenance and provide appropriate cleaning supplies in support of this effort.
- The SSO or designee will document the weekly review of the HIPP HASP Supplement and make the necessary adjustments each week for weather changes or when new employees are introduced to the project. The reminder may include water ordering information if purchased in bulk from appropriate supplier.

5.3.3 Access to Shade

The project team is responsible for making sure the necessary equipment to provide shade is available at the project site. The temperature threshold for shade to be in place is when site temperatures exceed 80° F (26° C). The SSO or designee is responsible for directing how shade will be coordinated and placed. The term “shade”, for the purposes of complying with applicable regulations shall be defined as “The blockage of sunlight to the extent that no shadow is cast while sitting in the designated area”. Flecks of sunlight are acceptable as long as, overall, the shade provides substantially complete blockage of sunlight. Where trees or other vegetation are used to provide shade, the thickness and shape of the canopy must cast sufficient shadow, given the changing angles of the sun, to protect employees from the sun during the entire shift.
At the start of each shift, the importance of taking shade breaks, recognizing the signs and symptoms of heat illness, the schedule of shade breaks (> 5 minutes per break), and the shade location will be addressed during each Tailgate Safety Meeting. Access to shade must be allowed at all times.

***Note**: Where required by regulation, shade breaks will be taken at a minimum rate of 10 minutes of shade for every two-hour work period. As temperature increases shade breaks will increase in frequency. See the Heat Index table in Section 5.4 for Heat Index specific Action Levels defining shade break frequency and duration.*

Establishing adequate shaded areas for employees involves:

- If the temperature at the site exceeds 80° F, shade structures will be opened and made available to employees.
- Shaded areas must be able to accommodate all employees taking a recovery or rest break including those employees who are on meal breaks. This doesn't mean that the shaded area(s) must provide shade to accommodate all employees on a site or working a shift *at the same time.* An example includes rotating routine breaks among employees. Also, additional portable shade structures can be erected on an "as-needed" basis.
- Employees must have enough shaded space to sit comfortably while fully shaded and to allow for sitting without being in physical contact with each other.

  ***Note**: When establishing shade, it is important to ensure that employees who desire access to shade will not be deprived of it due to lack of space. One such procedure to address this point would be to rotate employees in and out of shaded areas to ensure all have sufficient access for the 5-minute interval required. Another option would be to have additional shade structures on hand to deploy as needed.*

- Shade structures will be relocated to follow along with the crew for moving tasks.
- Shade structures will be placed within 50 feet of the work area, if practical. A key consideration when placing a shade structure is that it is a short walk away (e.g., 2 to 3 minutes) from the work area. This consideration becomes critical as the temperature rises above 80° F (26° C).
- In situations where it is not safe or feasible to provide shade, notes will be made to the HIPP HASP Supplement of the unsafe or unfeasible conditions. The SSO will also document the steps taken to provide alternative cooling measures equivalent to providing shade, such as vehicles equipped with air conditioning or air conditioned office trailers.
  - An employee who takes a preventative cool-down rest
    - Shall be monitored and asked if they are experiencing symptoms of heat stress;
    - Shall be encouraged to remain in the shade;
    - Shall not be ordered back to work until any signs or symptoms of heat illness have abated.
    - If an employee exhibits signs or symptoms of heat illness while taking a preventative cool-down rest the SSO will provide appropriate first aid or emergency response.

5.3.4 Monitoring of Weather and Procedures for Heat Waves

The SSO or designee will be trained in consulting weather forecasting resources and is responsible for checking the extended weather forecast weekly in advance of work. Work schedules will be adjusted in advance, considering whether high temperatures or a heat wave is expected. The SSO will be responsible for obtaining a thermometer prior to the start of the project and ensuring that it is readily accessible or posted on site so it can easily be monitored throughout the course of the day. The following web pages are considered accurate and reliable sources for checking weather forecasts:

- http://www.noaa.gov/

- http://www.weather.com/

Prior to each work day, and before starting each shift, the SSO or designee will review the forecasted temperature and humidity for the work site and compare conditions against the National Weather Service Heat Index (See Table 1) to evaluate the risk level for heat illness. A “heat wave,” as defined by the National Oceanic and Atmospheric Administration (NOAA), is a period of abnormally and uncomfortably hot and unusually humid weather.” Typically, a heat wave lasts 2 or more days.

5.4 Heat Index Table and Heat Index Action Levels and Recommended Hazard Controls

The following action levels and controls information is intended to be used as recommended guidance by project teams for work conducted in all states except where heat related illness hazard controls are required by regulation. During the planning stages for future field work, develop a communications plan where field staff will contact the project team when conditions are expected that will trigger Heat Index Action Levels.

Each Heat Index level detailed below is additive.

- If Heat Index indicates "CAUTION" 80° - 89° F (26° – 32° C). Implement one or more of the following:
  - Provide hydration, schedule breaks, wear lightweight clothing, shaded break areas.

- If Heat Index indicates "EXTREME CAUTION" 90° - 97° F (32° – 39° C). Implement all the above and add one or more of the following:
  - Provide light duty PPE, cooled break areas, shaded work areas.

  Note: *“Light Duty PPE” includes items such as hard hat sun shades, sun hats, and dry or wet evaporative cooling vests, microfiber towels, scarves, headbands, hard hat neck shades, hard hat suspension inserts and sweatbands*

- If Heat Index indicates "DANGER" 98° - 107° F (39° – 43° C.) Add one or more of the following:
  - Provide cooled work areas, modify work schedule, provide heavy duty PPE, vital sign monitoring & Stop Work.

  Note: *“Heavy Duty PPE” includes phase-change cooling vests, gel pack and ice pack equipped cooling vests.Ice pack vests are generally offer the coldest option and should not be worn directly against the skin.*

- If Heat index indicates "EXTREME DANGER" +108° F (44° + C) or greater Stop Work until conditions change or hazards are effectively controlled.

Implementation Date 31 August 2011	Arcadis HS Standard Name Heat Stress Prevention	ARCADIS Design & Consultancy for natural and built assets
Revision Date 15 March 2017	Arcadis HS Standard No. ARC HSIH013	Revision Number 07

Table 1

NOAA's National Weather Service

Heat Index

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution | Extreme Caution | Danger | Extreme Danger

Use the information in Table 1 to determine if employees will be exposed to a combination of temperature and humidity that pose a risk for heat illness. If the site conditions are characterized as falling inside the ranges for “Extreme Caution,” "Danger," or “Extreme Danger” for heat illnesses, additional steps must be taken. It is important to note that the NOAA Heat Index was devised for sites with partial shade & light wind conditions. Work conducted in direct/full sunlight (e.g. no breeze or partial shade) adds up to 15° F (8° C) to the Heat Index evaluation.

5.4.1 Procedures for High Heat and Heat Waves

High heat procedures will be put in effect when the temperature rises above 95° (35° C). High heat procedures include:

- Tailgate Safety Meeting that will review the high heat procedures, encourage employees to drink plenty of water, and remind employees of the importance to take a preventative or recovery cool-down rest when necessary.

- Arcadis will ensure effective employee observation and monitoring procedures are put in place including:
    - SSO or designee will supervise 20 or fewer employees,
    - The “Buddy System” is mandatory;
    - Regular communication with SSO or designee via mobile phone or radio;
    - Designating one or more employees as authorized to contact emergency medical services and communicating that if no designate is identified and the SSO is unavailable that any employee can call for emergency medical assistance.
- Employees will be reminded throughout the shift to drink plenty of water.
- The “Buddy System” must be implemented. Particular attention needs to be paid to new employees or employees who have yet to acclimate to high heat conditions. Additionally, frequent communication will be maintained with employees working by themselves (via cell phone or two-way radio), to be on the lookout for possible symptoms of heat illness.
- During high heat conditions, employees will be provided with a minimum 10-minute cool-down period every two hours.
- Employees will be observed for alertness and signs and symptoms of heat illness at regular intervals to be documented in the field book or field log.
- When the SSO is not available, an alternate responsible person must be assigned to look for signs and symptoms of heat illness. Such a designated observer will be trained to know what steps to take if heat illness occurs.

Heat Wave Procedures:

A “heat wave” as defined by NOAA, is a period of abnormally and uncomfortably hot and unusually humid weather. Typically, a heat wave lasts 2 or more days. A "heat wave" as defined for the purposes of this HSS is when temperatures are sustained above 80°F (26° C), or if site conditions indicate the potential for “Extreme Caution,” "Danger," or “Extreme Danger” per Table 1, the following steps will be taken:

- The SSO or designee, in coordination with the project team, will use their Stop Work Authority; evaluate the following actions; and document the action in the daily field log:
    - Modify the work shift or cut the work day short (e.g., 12:00 pm).
    - Reschedule the work (e.g., conduct the remaining work during cooler times of the day) or suspend tasks that are strenuous.
    - Use Stop Work Authority to cease work for the day.
- If schedule modifications are not possible, the Heat Illness Prevention Plan will be reviewed before work resumes. At a minimum, procedures for heat illness prevention, the provisions for high heat procedures, the weather forecast, and emergency response protocols will be reviewed.
- Employees will be provided with additional water and rest breaks and will be observed more frequently. They will also be reminded throughout the shift to drink plenty of water.

- During work activities and rest breaks, employees will be observed for signs and symptoms of heat illness.
- All employees will maintain frequent communication with the SSO or designee, who will be monitoring employees for possible symptoms of heat illness.

***Note**: In the event of large project sites where the SSO is unable to be near the employees (to directly observe or communicate with them), then communication via a cell phone or radio may be used for this purpose provided that reception in the area is reliable.*

5.5 Heat Exhaustion and Heat Stroke First Aid and Emergency Procedures

Emergency procedures include recognizing the symptoms of heat related illness. A critical step also involves ensuring that effective communication is established either through voice, direct observation or electronic means such as via mobile phones or 2-way radios. In an emergency situation, it is critical that employees understand the process and contact information for requesting emergency medical support. The reception coverage for the site must be evaluated and understood to ensure adequate communication is in place across the project site.

5.5.1 Heat Exhaustion and Heat Stroke Symptoms

Signs of Heat Exhaustion:

- Cool, moist, pale, or flushed skin
- Heavy sweating
- Headache
- Nausea, dizziness, and exhaustion
- Normal or below normal body temperature.

Signs of Heat Stroke

- Hot, red skin which can be dry or moist from exercise
- Changes in consciousness
- Rapid, weak pulse
- Rapid, shallow breathing, vomiting
- A person experiencing heat stroke can have a very high body temperature—sometimes as high as 106°F (41° C).

5.5.2 First Aid Procedures for Heat Exhaustion

1. Move the person to a cooler place.
2. Remove or loosen tight clothing and apply cool, wet cloths, such as towels or sheets soaked in water.
3. If the person is conscious, give him or her cool water to drink. Make sure the person drinks slowly. Give a half glass of cool water every 15 minutes.
4. Contact the employees' supervisor, the project manager and Work Care 1-888-449-7787 (US & Canada).
5. Let the person rest in a comfortable position.
6. Watch carefully for changes in his or her condition.

Do not give liquids that contain alcohol or caffeine because they can cause further dehydration, making conditions worse.

5.5.3 First Aid and Emergency Procedures for Heat Stroke

Heat stroke is a life-threatening situation. If you suspect someone is suffering from heat stroke, call 9-1-1 or the local emergency number immediately.

1. Move the person to a cool place.
2. Loosen tight clothing.
3. Remove perspiration-soaked clothing.
4. Apply cool, wet cloths to the skin.
5. Fan the person.
6. If conscious, give small amounts of cool water to drink.
7. Place the person on his or her side.
8. Contact the employees' supervisor, the project manager and Work Care 1-888-449-7787 (US & Canada).
9. Continue to cool the person by using ice or cold packs on the wrists, ankles, groin, and neck and in the armpits.
10. Continue to check breathing and circulation.

Do not give liquids that contain alcohol or caffeine because they can cause further dehydration, making conditions worse. Ensure 9-1-1 or the local emergency number is called if the person refuses water, vomits, or starts to lose consciousness.

Emergency contact telephone numbers and hospital directions/map must be included in each site-specific HASP for employee reference.

6. TRAINING

The Arcadis Heat Illness Prevention online training offered though the Arcadis Learning Center is required to be completed before Supervisory Personnel and Affected Employees working in California or Washington States will be permitted to begin work. Project teams conducting work in locations other than California or Washington States are expected to complete the training prior to conducting work as defined in the H&S training matrices specific to each Business Line. Completion of the training once is generally considered sufficient to satisfy the training requirement; however, the training may be required to be completed again as determined by Arcadis policy or management, or by client or specific state requirements. Refresher training is encouraged for all staff that infrequently conducts or supervises work where heat stress is a hazard.

6.1 Supervisory Personnel

Supervisory personnel supervising staff on a California or Washington State site who might reasonably be anticipated to be exposed to the risk of heat illness shall be provided training in the following topics prior to assignment:

- The environmental and personal risk factors for heat illness
- The importance of frequent consumption of small quantities of water, up to four cups

per hour, when the work environment is hot and employees are likely to be sweating more than usual in the performance of their duties

- The importance of staying appropriately nourished
- The importance of acclimatizing
- The different types of heat illness and the common signs and symptoms
- The importance for employees to immediately report to the employer, directly or through the employee's supervisor, symptoms or signs of heat illness in themselves or in co-workers
- The procedures to follow for responding to symptoms of possible heat illness, including how emergency medical services will be provided should they become necessary
- The procedures for contacting emergency medical services, and if necessary, for transporting employees to a point where they can be reached by an emergency medical service provider
- The procedures for ensuring that, in the event of emergency, clear and precise directions to the work site can and will be provided as needed to emergency responders

In addition, these supervisory personnel must review and understand:

- This Heat Stress Prevention HSS and the associated HIPP HASP Supplement
- How to implement the emergency response procedures detailed in the site-specific HASP when an employee exhibits symptoms consistent with possible heat illness
- Weather monitoring reports as detailed in the field Health & Safety Handbook
- How to monitor weather reports and how to plan for and respond to hot weather advisories

This training will be documented with details on the subject matter covered and date of training recorded.

6.2 **Affected Employees**

For those employees who work in California or Washington, or when using this HSS as a Best Management Practice in any other state and might reasonably be anticipated to be exposed to the risk of heat illness, training in the following topics is required prior to assignment:

- The environmental and personal risk factors for heat illness
- The importance of frequent consumption of small quantities of water, up to four cups per hour, when the work environment is hot and employees are likely to be sweating more than usual in the performance of their duties

- The importance of acclimatizing
- The different types of heat illness and the common signs and symptoms
- The importance for employees to immediately report to the employer, directly or through the employee's supervisor, symptoms or signs of heat illness in themselves or in co-workers
- The procedures for responding to symptoms of possible heat illness, including how emergency medical services will be provided should they become necessary
- The procedures for contacting emergency medical services, and if necessary, for transporting employees to a point where they can be reached by an emergency medical service provider
- The procedures for ensuring that, in the event of emergency, clear and precise directions to the work site can and will be provided as needed to emergency responders

This training will be documented within the Learning Center database along with details on the subject matter covered and date of training recorded.

Note: For those staff who are not working in California, Washington, or other states that have specified heat illness training requirements, staff that might reasonably be anticipated to be exposed to the risk of heat illness shall at a minimum review the information detailed in the Field Health & Safety Handbook and this HSS. Corporate H&S recommends that all staff that might be reasonably be anticipated to be exposed to the risk of heat illness complete the online heat stress training course through the Learning Center.

7. REFERENCES (regulation citation, technical links, publications, etc.)

- OSHA Technical Manual – Section III Chapter 4
- National Institute of Occupational Safety and Health (NIOSH) Publication Number 86-112
- American Conference of Governmental Industrial Hygienists (ACGIH) 1992
- American Red Cross 2007
- Cal/OSHA Title 8 CCR 3395 Heat Illness Prevention Standard and Title 8 CCR 3202 Injury and Illness Prevention Program
- Washington State Outdoor Heat Exposure Regulations 296-62-09510 thru 09560
- See Exhibit 2 for links to additional regulatory resources.

8. RECORDS - DATA RECORDING AND MANAGEMENT

This HSS will be reviewed routinely and revised as appropriate. When revised, the revision date/number will be documented under "History of Change" and the prior plan archived per company policy.

Heat illness training records will be maintained by the Arcadis Training Team.

Implementation Date 31 August 2011	Arcadis HS Standard Name Heat Stress Prevention	ARCADIS Design & Consultancy for natural and built assets
Revision Date 15 March 2017	Arcadis HS Standard No. ARC HSIH013	Revision Number 07

9. APPROVALS AND HISTORY OF CHANGE

Approved by: Julie Santaniello, CSP - Corporate H&S, Manager of Technical Programs

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
31 August 2011	01	Tony Tremblay & Mija Coppola	Original document
13 March 2012	02	Tony Tremblay	Detailed Supervisory Personnel requirement to plan/detail preventive measures/controls when heat advisories are issued; clarified training requirements for staff and supervisory personnel; inserted heat advisory and excessive heat warning definitions
19 June 2012	03	Pat Vollertsen	Information added in regard to nourishment
16 June 2014	04	Pat Vollertsen & Alec MacAdam/Tony Tremblay	Revised standard format and History of Change Section. Updated to include specific prescriptive language to address Cal OSHA and Washington State requirements. Inclusion of HASP supplement and preparation guidance. Clarification of the use of sports/electrolyte drinks
7 August 2014	05	Alec MacAdam	Update guidance for use of “Sports Drinks”

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Revision Date 15 March 2017	Arcadis HS Standard No. ARC HSIH013	Revision Number 07

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
6 April 2015	06	Alec MacAdam	Revise temperature threshold from 85 to 80 deg. F, provisions for shade, guidance for preventative rest breaks, revised high heat procedures and clarification of acclimatization procedures
15 March 2017	07	Alec MacAdam & Denis Balcer/ Tony Tremblay & Julie Santaniello	Updated brand. Updated links to Exhibits 2 & 3, Revised Admin. Controls in Section 5.3, Aditional regulatory detail in Sections 5.3.2 and 5.3.3. Added Section 5.4 Heat Index Action Levels and Recommended Hazard Controls. Revised the HIPP HASP Supplement to reflect changes in the HSS.

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Exhibit 1 – Definitions

Acclimation –a process by which the body adjusts to increased heat exposure. The body needs time to adapt when working in hotter environments. Employees working in a hot environment are more like to develop heat illness if not allowed or encouraged to allow their body to acclimate when a heat wave strikes or when starting a job that newly exposes them to heat. Acclimatization is fully achieved in most people within 4 to 14 days of regular work involving at least 2 hours per day in the heat.

Excessive Heat Warning - Extreme heat index making it feel very hot, typically above 110 °F (43 °C) for 3 hours or more during the day for two consecutive days or above 110 °F (43 °C) at any time. Specific criteria vary over different county warning areas.

Heat Advisory - Issued when the "heat index" is expected to exceed 105 °F (40 °C) during the day and 80 °F (27 °C) during the night for at least two consecutive days.

Heat Cramps – normally caused by performing hard physical labor in a hot environment. These cramps have been attributed to an electrolyte imbalance caused by sweating. Salt tablets should not be taken.

Heat Collapse – Commonly known as “Heat Stress” technically referred to as Heat Syncope. Heat Collapse or syncope (fainting) is the condition where the brain does not receive enough oxygen because blood pools in the extremities. To prevent heat collapse, the employee should gradually become acclimatized to the hot environment.

Heat Exhaustion – less severe than heat stroke, but the victim must be treated as soon as possible. Symptoms include clammy and moist skin, pale or flushed complexion, sweating along with extreme weakness or fatigue, giddiness, nausea or headache may occur and, in more serious cases, vomiting or loss of consciousness.

Heat Fatigue – The signs and symptoms of heat fatigue include impaired performance of skilled sensorimotor, mental or vigilance jobs. There is no treatment for heat fatigue except to remove the heat stress before a more serious heat-related condition develops.

Heat Index – an “apparent temperature” that is a measure of how hot it feels when relative humidity is added to the actual air temperature.

Heat Rashes – Also referred to as prickly heat is the most common problem in hot work environments. Prickly heat is manifested as red papules and usually appears in areas where the clothing is restrictive.

Heat Stress – a physiological condition induced when high temperatures and humidity compromise the body’s ability to cool itself, resulting in heat-related illness.

Heat Stroke – the body's system of temperature regulation fails and body temperature rises to critical levels. This condition is caused by a combination of highly variable factors, and its occurrence is difficult to predict. **Heat stroke is a medical emergency.** The primary signs and symptoms of heat stroke include confusion, irrational behavior, loss of consciousness, convulsions, a lack of sweating (usually), hot, dry skin and an abnormally high body temperature.

Heat Wave - A “heat wave” as defined NOAA, is a period of abnormally and uncomfortably hot and unusually humid weather. Typically, a heat wave lasts 2 or more days. A "heat wave" as defined for the purposes of this HSS is when temperatures are sustained above 80 degrees Fahrenheit.

Provision of Water - Employees shall have access to potable drinking water meeting the requirements of Section 5.3.2 of this HSSs including but not limited to the requirements that it be fresh, pure (water must be potable and free of odors), suitably cool (the water must be cooler than the ambient temperature but not so cool as to cause discomfort), and provided to employees free of charge. The water shall be located as close as practicable to the areas where employees are working. Where drinking water is not plumbed or otherwise continuously supplied, it shall be provided in sufficient quantity at the beginning of the work shift to provide one quart per employee per hour for drinking for the entire shift. Employers may begin the shift with smaller quantities of water if they have effective procedures for replenishment during the shift as needed to allow employees to drink one quart or more per hour. The frequent drinking of water shall be encouraged. The purpose of requiring that water is “fresh, pure, suitably cool, and provided to employees free of charge” and “located as close as practicable to the areas where employees are working” is to encourage workers to drink water often and avoid making the workers interrupt their work in order to do so. To ensure that water is fresh, pure, and suitably cool, Cal/OSHA advises employers or supervisors visually examine the water and pour some on their skin.

Shade - the blockage of direct sunlight. Canopies, umbrellas and other temporary structures or devices may be used to provide shade. One indicator that blockage is sufficient is when objects do not cast a shadow in the area of blocked sunlight. Shade is not adequate when heat in the area of shade defeats the purpose of shade, which is to allow the body to cool. For example, a car sitting in direct sunlight does not provide acceptable shade to a person inside it, unless the car engine is operating with air conditioning on. Shade may be provided by any natural or artificial means that does not expose employees to unsafe or unhealthy conditions and that does not deter or discourage access or use.

Transient Heat Fatigue – the temporary state of discomfort and mental or psychological strain arising from prolonged heat exposure. Employees unaccustomed to the heat are particularly susceptible and can suffer, to varying degrees, a decline in task performance, coordination, alertness and vigilance.

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Exhibit 2 – Heat Stress Links

Heat Illness Symptoms

Heat Illness Thermometer and PPE

OSHA Working Outdoors Fact Sheet

OSHA Worker Protection from Heat Stress

California Heat Illness Prevention Enforcement Q&A

Washington State Outdoor Heat Exposure Enforcement Procedures

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Exhibit 3 Heat Illness Prevention Plan (HIPP) HASP Supplement Template

Hyperlink to Heat Illness Prevention HASP Supplement

A copy of the Heat Illness HASP Supplement is also available by right clicking on the lower toolbar of the excel HASP template and selecting "Unhide" and selecting the "Heat Illness Prevention Plan".

ARCADIS Infrastructure · Water · Environment · Buildings	ARCADIS HS Standard Name Heavy and Mechanized Equipment	Revision Number 04
Implementation Date 22 November 2011	ARCADIS HS Procedure No. ARC HSCS006	Revision Date 2 March 2018

EXECUTIVE SUMMARY

ARCADIS employs a wide range of heavy and mechanized equipment in various operations. ARCADIS staff operating heavy equipment requires, at minimum, compliance with the policies set forth in this Health and Safety Standard (HSS). In addition to federally mandated requirements, each state may enforce more stringent standards related to training, licensure, inspection and documentation.

The requirements set forth in this policy provide direction in heavy equipment operations:

- Specific training for Powered Industrial Trucks (forklifts) will be in compliance with OSHA 29CFR 1910.178. Refer to ARCADIS Forklifts HS Procedure ARC HSSP006 for additional details and requirements.

- All employees involved in Heavy Equipment Operations shall read and understand documented hazard identification and risk assessments conducted using the Hazard Assessment and Risk Control (HARC) Process. Understand and actively use TRACK and Stop Work Authority during heavy equipment operations.

- ARCADIS Utility Location Standard ARCHSFS019 shall be followed prior to beginning subsurface intrusive work which involves heavy or mechanized equipment.

- Preventative maintenance and pre-operation checks shall be conducted in accordance with the manufacturer's requirements and documented daily prior to equipment usage.

- All prospective ARCADIS Heavy and Mechanized Equipment Operators and Heavy and Mechanized Equipment Site Supervisors (Site Supervisors) must complete Online Heavy Equipment General Awareness Training, and review & understand this HSS. Prospective ARCADIS Heavy and Mechanized Equipment Operators and Site Supervisors will be evaluated by the Heavy and Mechanized Equipment Review Board and designated as Heavy and Mechanized Equipment Operator Awareness Trained, requires additional training or designate as Heavy and Mechanized Equipment Site Supervisor.

- Only authorized personnel will operate heavy and mechanized equipment.

- Site Supervisors will complete the ARCADIS Heavy Equipment Operator Authorization Form (Task Specific Hazard Review, Operator Evaluation and Operator Authorization for Heavy Equipment Operators) prior to authorizing any ARCADIS employee to operate heavy equipment. A copy of this form must be maintained onsite and kept in project files for review. Authorization is only valid for the project, operational task, and piece of heavy or mechanized equipment listed on the ARCADIS Heavy Equipment Operator Authorization Form. The required Task Specific Hazard Review, Operator Evaluation and Operator Authorization form for Heavy Equipment Operators can be found in Exhibit 2.

- Authorized Operators must maintain all current & applicable licensing, ARCADIS Heavy Equipment Operator Authorization Form (Task Specific Hazard Review, Operator Evaluation and Operator Authorization for Heavy Equipment Operators), and project documentation as required by federal and state regulations.

- PICs, PMs and TMs will be responsible for verifying operator training, operator authorization and maintenance documentation, identifying all operations which use heavy equipment in the work plan and researching and adhering to any additional policies required by the state in which the project operates.

ARCADIS Infrastructure · Water · Environment · Buildings	ARCADIS HS Standard Name Heavy and Mechanized Equipment	Revision Number 04
Implementation Date 22 November 2011	ARCADIS HS Procedure No. ARC HSCS006	Revision Date 2 March 2018

1. POLICY

It is ARCADIS-US policy to be proactive in the identification, assessment and control of health and safety hazards and associated risks. To those means, it is ARCADIS' policy that ARCADIS staff will be adequately trained and experienced before authorized to operate heavy and mechanized equipment. If it becomes necessary for ARCADIS employees to operate heavy or mechanized equipment, this HSS, at a minimum, will be strictly followed.

2. PURPOSE AND SCOPE

2.1 Purpose

ARCADIS developed this HSS to effectively mitigate or eliminate the hazards presented by working with or around heavy or mechanized equipment (i.e., back-hoes, track-hoes, bobcats, concrete crushers, etc.).

2.2 Scope

This HSS includes an Equipment Inspection Checklist (Exhibit 3) and an ARCADIS Heavy Equipment Operator Authorization Form (Task Specific Hazard Review, Operator Evaluation and Operator Authorization for Heavy Equipment Operators) (Exhibit 2) that applies to employees of ARCADIS that operate heavy or mechanized equipment. Only trained and authorized personnel are permitted to operate heavy or mechanized equipment. For work with Powered Industrial Trucks (Forklifts) refer to ARCADIS Standard ARC HSSP006 for details.

3. DEFINITIONS

Definitions related to Heavy Equipment Operations can be found in Exhibit 1.

4. RESPONSIBILITIES

4.1 Corporate H&S with Business Line and Practice Experts

- Review and update, as necessary, this standard, associated attachments and training requirements.
- Audit Project, Business Line, and Training Team documentation files of Authorized Operators and Site Supervisors.
- A Heavy and Mechanized Equipment Review Board (Review Board) consisting of Corporate H&S with Business Line and Practice Experts will conduct heavy and mechanized equipment operator general awareness reviews for nominated individuals. The Review Board will approve and designate staff as heavy and mechanized equipment operator general awareness trained, requires further training or designate as a Site Supervisor using the Review Board Evaluation Form for Heavy and Mechanized Operations & Site Supervisor (Exhibit 5).
- Provide technical assistance regarding proper heavy and mechanized equipment for excavations, trenching, grading, PPE, hazard assessment and research information on unusual hazards.

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

- Verify that all activities that require use of heavy or mechanized equipment are properly identified and addressed within the project work plan, project health & safety plan, and/or other project-related documents.
- Investigate the State and Local licensure and/or certification requirements for mechanized equipment operation and verify ARCADIS operators or subcontractors have required licenses and certifications.
- Verify that their divisional or project team employees have received the proper training and have the required experience and skills to operate heavy or mechanized equipment.
- Verify that copies of the completed ARCADIS Heavy Equipment Operator Authorization Form (Task Specific Hazard Review, Operator Evaluation and Operator Authorization for Heavy Equipment Operators) are maintained on site and in project files.
- Verify that copies of the completed Heavy Equipment Inspection Checklists are maintained on site and in project files

4.3 Health and Safety Plan Writers and Reviewers

Use this procedure as guidance to ensure the appropriate identification, assessment and control of heavy and mechanical equipment operations are covered in the HASP.

Investigate the State and Local licensure and permit requirements for mechanized equipment operation and verify all ARCADIS operators or subcontractors have required licenses and certifications. A summary of state specific requirements is provided in Exhibit 4. However, the current regulations should be consulted.

4.4 Heavy and Mechanized Equipment Site Supervisors

Heavy and Mechanized Equipment Site Supervisors (Site Supervisors) must complete the Online Heavy and Mechanized Equipment General Awareness Training and have been designated by the Review Board as a Site Supervisor. Site Supervisors are responsible for evaluating, authorizing, monitoring and coaching/mentoring of heavy equipment operators.

Site Supervisors will have a minimum of 5 years construction management and/or hands-on operating experience and demonstrated proficiency with the skills required for heavy and mechanized equipment. Site Supervisors will have completed the 10-hour or 30-hour OSHA Construction Training. If working on an environmental project where HAZWOPER training is required by ARCADIS, the Site Supervisor must also have completed the 40-hour HAZWOPER training, be current on their annual 8-hour HAZWOPER refresher and complete the 8-hour Hazwoper Supervisor Training. A list of qualified Site Supervisors will be maintained by the Corporate Training Team.

Specific job responsibilities include:

- Interface with the client representative to identify hazards associated with the client's project site.

- Review the client's equipment operating procedures and permit requirements, as applicable.

- ARCADIS Utility Location Standard ARCHSFS019 shall be followed prior to beginning subsurface intrusive work which involves heavy or mechanized equipment.

- Above grade utilities in proximity to a heavy equipment work area must be marked with warning signs, shields or other protective measures, if the minimum required clearance distances cannot be maintained.

- Ensure Authorized Operators have completed the Online Heavy and Mechanized Equipment General Awareness Training and have been designated as heavy and mechanized equipment operator general awareness trained.

- Ensure Authorized Operators are certified or licensed if required by state/local regulations.

- Evaluate prospective Authorized Operators using the attached ARCADIS Heavy Equipment Operator Authorization Form (Task Specific Hazard Review, Operator Evaluation and Operator Authorization for Heavy Equipment Operators) and determine if an adequate level of hands-on skill has been demonstrated to safely operate the equipment.

- Upon completing the ARCADIS Heavy Equipment Operator Authorization Form (Task Specific Hazard Review, Operator Evaluation and Operator Authorization for Heavy Equipment Operators), the Site Supervisors will either authorize the Operator to operate the equipment or require additional training prior to authorizing the Operator to operate the equipment. Operator Authorization will be documented on the ARCADIS Heavy Equipment Operator Authorization form and must be available on the project site for review and retained in project files.

- Ensure Daily Equipment Inspection Form or an equivalent inspection form provided by the manufacturer or vendor is completed and maintained at the project site and retained with the project files.

- Conduct Task Improvement Process (TIP's) Observations on Authorized Operators and provide coaching and feedback as necessary. All TIP's will be recorded in the 4-Sight Database.

- Revoke operating privileges as necessary, if required skill level is not maintained. Outline a specific Corrective Action Plan and discuss with employee and supervisor.

4.5 Authorized Operators

Authorized Operators must complete the Online Heavy and Mechanized Equipment General Awareness Training and have been designated by the Review Board as Heavy and Mechanized Equipment Operator awareness Trained. Additionally Authorized Operators must have adequate training and instruction in their duties and responsibilities regarding equipment operation, as documented in the ARCADIS Heavy Equipment

Operator Authorization Form (Task Specific Hazard Review, Operator Evaluation and Operator Authorization for Heavy Equipment Operators).

Responsibilities include:

- Complete required daily preventive maintenance and pre-operation checks in accordance with the manufacturer's requirements and the attached Equipment Inspection Checklist (Equipment/Manufacturer Specific Checklists may be used in lieu of this form where appropriate to cover all required items).
- Conduct TRACK Assessment in order to identify, assess and control the hazards which may be faced during equipment operation as well as the signs and symptoms of exposure to the hazard(s) of the work environment.
- Above grade utilities in proximity to a heavy equipment work area must be marked with warning signs, shields or other protective measures, if the minimum required clearance distances cannot be maintained.
- ARCADIS Utility Location Standard ARCHSFS019 shall be followed prior to beginning subsurface intrusive work which involves heavy or mechanized equipment.
- Maintain visual contact and/or verbal communications with the spotters and other personnel in the area at all times.
- Use the PPE, air monitoring and testing equipment as specified in the HASP.
- Maintain an awareness of all barriers, operating limits and other warning devices required to protect from external hazards (e.g., traffic, pedestrians) and the proper use of those barriers.
- Obey "Stop Work" orders given by personnel in the area automatic alarm activation, or when self-perceived.

4.6 Affected Employees

- Complete online Heavy Equipment General Awareness Training.
- Conduct TRACK Assessment and monitor activities near areas where heavy and mechanized equipment is in operation.
- Maintain visual contact or verbal communication with all Authorized Operators and Designated Signal Person prior to approaching or when within the operating range of the equipment.
- Order evacuation of the area if a hazard develops, either within or outside the operating area.
- Warn unauthorized persons away from the operating area.
- Summon rescue and other emergency services as necessary.
- Minimum Class II High visibility vest/clothing shall be worn by Affected Employees.

4.7 All ARCADIS Employees

Use the TRACK process described below regularly and frequently. In addition, employees read and understand all documented hazard identification and risk assessments conducted using the HARC process. ARCADIS employees will:

- Participate in entry operations only if trained and authorized to do so.
- Never enter an active work area without first getting acknowledgment and approval of the operator and Designated Signal Person, as applicable.
- Use STOP WORK Authority if unsafe or unexpected conditions arise during operation and immediately notify other personnel in the area.

5. PROCEDURE

Heavy and mechanized equipment operation can present a unique set of hazards. Only trained, qualified and, authorized employees will be allowed to operate heavy or mechanized equipment in accordance with this standard (Authorized Operator). Prior to starting work with heavy or mechanized equipment all of the required permits, clearance and required project documentation will be in place. ARCADIS Utility Location Standard ARCHSFS019 shall be followed prior to beginning subsurface intrusive work which involves heavy or mechanized equipment.

For work with Powered Industrial Trucks (Forklifts) refer to ARCADIS Standard ARC HSSP006 for details.

5.1 Operator Approval

Prior to operating any heavy or mechanized equipment including but not limited to:

- Track-hoes and Wheel Mounted Excavators
- Back-hoes
- Articulating Trucks
- Street Sweepers
- Compactors
- Tractors
- Water Trucks Concrete Pulverizing Equipped Machinery
- Hydraulic Shearing Equipped Machinery
- Hydro seeding and other truck or vehicle mounted equipment
- Other Heavy Mechanized Equipment

All operators must be evaluated by a Site Supervisor and be observed on the specific equipment that will be in use. The Site Supervisor will complete the attached ARCADIS

Heavy Equipment Operator Authorization Form (Task Specific Hazard Review, Operator Evaluation and Operator Authorization for Heavy Equipment Operators) to deem the operator as an Authorized Operator. The form must be completed in full to demonstrate employees have been evaluated, deemed qualified, and have been "Authorized" by ARCADIS as Heavy Equipment operators. This form must be maintained on site and in the project files and is only valid for the project, operational task, and piece of heavy or mechanized equipment listed on the form. It should be noted that in some cases, state specific licensing or registration may be required for heavy equipment operators.

All heavy and mechanized equipment will be inspected daily prior to use, using the attached Equipment Inspection Form or an equivalent inspection form provided by the manufacturer or vendor to address equipment specific items.

Note: **Forklifts, Gantry & Bridge Cranes and other equipment that require more formal certification or licensure are not covered by this procedure. Project Managers are required to verify that selected contractors have the required training, certification and equipment maintenance programs in place.**

5.2 Heavy Equipment Requirements

All vehicles used in construction must have:

- brake lights;
- appropriate lights or reflectors, or barricades equipped with appropriate lights or reflectors, to identify the location of the equipment;
- service, parking and emergency brakes;
- fenders on vehicles with rubber tires made after 1972;
- mud flaps on vehicles with rubber tires made before 1972;
- seats and compliant seat belts for the intended number of passengers;
- an audible warning system;
- an audible reverse alarm if the vehicle travels in reverse with an obstructed view;
- lights, if the vehicle operates in dimness or darkness;
- a defroster, if windshields fog;
- a windshield and wipers on vehicles with cabs
- *rollover protective structure* (ROPS); and
- properly secured fire extinguisher with a minimum rating of 10-B:C

5.3 General Requirements

The following Work Practices must be followed for heavy and mechanized equipment operations:

- Must be equipped with appropriate lights or reflectors.
- Controls must be in a neutral position, with the motors stopped and brakes set, unless work being performed requires otherwise.
- Whenever the equipment is parked, the parking brake shall be set. Wheeled equipment parked on inclines shall have the wheels chocked and the parking brake set.
- All cab glass shall be safety glass, or equivalent, that introduces no visible distortion affecting the safe operation of equipment.
- Do not move heavy or mechanized equipment or vehicles upon any access roadway or grade unless the access roadway or grade is constructed and maintained to accommodate the safe movement of the equipment and vehicles involved.
- Maintain 3-points of contact with the steps and hand rails while getting on/into the equipment. Do not use the controls or steering wheel as a handhold.
- Operate equipment only in well ventilated areas.
- Select a gear that will prevent excessive speed when going downhill – Do not coast downhill.
- Lower all the hydraulic equipment before shutting down or getting off the machine.
- Adequate illumination in accordance with OSHA standards and work activities must be provided for all work areas. An approved type (explosion-proof as necessary) lighting device must be used.
- Rigging and lifts will only be made when the operator judges it a safe operation.
- Personnel in the vicinity of equipment will wear hard hats, safety-toe shoes, high visibility vests and safety glasses. Personnel are also strongly encouraged to wear hearing protection in the vicinity of operating heavy equipment.
- Hoist hooks will have safety latches.
- Equipment will only be used within the maximum rated capacity.
- Personnel will remain at a distance from overhead loads.
- Test directional and speed controls prior to operation.
- Test limit switches (as applicable) and the emergency stop.
- Do not engage in practices that will divert attention while operating the equipment.
- Cellphones and other hand held electronic devices are prohibited from being used while equipping is in operation.
- Respond to signals only from the person who is directing the lift or appointed signal person.

- Do not move a load over people.
- Do not exceed the rated capacity of the equipment or rigging.
- Determine the center of gravity and balance of the equipment and the load before moving it.
- Verify the stability of the structure or area that the equipment will be used on. When working on an elevated level a Professional Engineer or qualified building inspector must determine the adequacy of the work surface prior to placing equipment.
- Initially lift the load only a few inches to test the rigging and balance.
- Check the travel path in order to avoid personnel and obstructions.
- Center the sling over the load to keep the cables from slipping, and to prevent the load from swinging when it is lifted.
- Use a tag line when loads require precise control.
- Lift the load only high enough to clear the tallest obstruction in the travel path.
- Start and stop slowly.
- Choose a safe landing.
- Land the load when the move is finished.
- Never leave suspended loads unattended.
- When Heavy or Mechanized equipment is in transit with no load and boom is lowered, the equipment clearance shall be a minimum of 4 feet for voltage less than 50kV, and 10feet for voltages over 50kV, or twice the length of the line insulator, but never less than two feet.

5.3.1 Motor Vehicle Specific Requirements

- Must be inspected at the beginning of each shift to ensure that the equipment and safety controls are in safe operating condition.
- Must have a service brake system, an emergency brake system, and a parking brake system.
- When working in areas of low visibility, motor vehicles must be equipped with at least two headlights and two taillights, which are operable.
- If motor vehicle has an obstructed rear view, it must be equipped with reverse signal alarm that must be audible above the surrounding noise level or the vehicle is backed up only when an observer signals that it is safe to do so.
- Dumping, lifting and hauling vehicles must have overhead protection for the operator.
- Operating levers controlling hoisting or dumping devices on haulage bodies must be equipped with a latch or other device which will prevent accidental starting or tripping of the mechanism.

- Trip handles for tailgates of dump trucks shall be so arranged that, in dumping, the operator will be in the clear.
- Never exceed load capacities for the vehicle.
- Use seat belts and do not carry passengers were not intended on the vehicle.
- Use the parking brake when parking and chock the wheels when needed to prevent rolling.
- Secure loose tools in the cab with workers.
- Dumping and lifting mechanisms must be secured when not in use.
- Verify that areas are clear before lifting, loading and unloading.
- All controls shall be in a neutral position, with the motors stopped and brakes set, unless work being performed requires otherwise

5.3.2 Earthmoving Equipment

- Use seat belts and do not carry passengers where not intended on the vehicle. Seat belts need not be provided for equipment which is designed only for standup operation.
- All bidirectional machines, such as rollers, compacters, front-end loaders, bulldozers, and similar 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.
- Use the audible reverse alarm or signals from another worker when driving in reverse with an obstructed view.

5.3.3 Working in the Vicinity of Overhead Power Lines

Unless the overhead power lines are deenergized and visibly grounded at the worksite, with confirmation from utility owner, encroachment prevention measures must be implemented to prevent the heavy equipment from breaching a minimum clearance distance. For heavy equipment work near energized electrical lines up to 350kV, the minimum clearance distance options would be:

1. Maintain 20 feet clearance distance from electrical line by maintaining encroachment prevention measures (refer to section 5.3.4); or
2. Determine the actual electric line voltage and implement encroachment prevention measures (refer to section 5.3.4) to maintain minimum clearance distance specified in Table 1 below.

Table 1: Minimum Clearance Distance

Voltage (nominal, kV, alternating current)	Minimum Clearance (feet)
Up to 50	**10**
>50 to 200	**15**
>200 to 350	**20**
>350 to 500	**25***
>500 to 750	**35***
>750 to 1,000	**45***
> 1,000	**Determined by utility/owner**

***** According to OSHA 29 CFR 1926.1409, for power lines over 350 to 1,000 kV, the minimum distance is presumed to be 50 feet. Over 1,000 kV, the utility/owner or a registered engineer, who is a qualified person with respect to electrical power transmission and distribution, must establish the minimum distance.

If any vehicle or mechanical equipment (e.g., crane or drilling rig) capable of having parts of its structure elevated near energized overhead power lines is operated in California, a durable warning sign legible at 12 feet reading: "Unlawful To Operate This Equipment Within 10 Feet Of High-Voltage Lines of 50,000 Volts Or Less" shall be posted and maintained in plain view of the operator and driver. In addition to the above wording, the following statement in small lettering shall be provided on the warning sign: "For Minimum Clearances of High-Voltage Lines In Excess of 50,000 Volts, See California Code of Regulations, Title 8, Article 37, High-Voltage Electrical Safety Orders."

5.3.4 Preventing Encroachment/Electrocution

Where encroachment precautions are required under Option (1) or Option (2) of section 5.3.3, all of the following requirements must be met:

1. Conduct a planning meeting with the operator and the other workers who will be in the area of the equipment or load to review the location of the power line(s), and the steps that will be implemented to prevent encroachment/electrocution.

2. If tag lines are used, they must be non-conductive.

3. Erect and maintain an elevated warning line, barricade, or line of signs, in view of the operator, equipped with flags or similar high-visibility markings, at 20 feet from the power line (if using Option 1 of this section) or for Option 2, at the minimum approach distance listed under Table 1. If the operator is unable to see the elevated warning line, a dedicated spotter must be used.in addition to implementing one of the following measures:

    i) A proximity alarm set to give the operator sufficient warning to prevent encroachment;

    ii) A device that automatically warns the operator when to stop movement, such as a range control warning device. Such a device must be set to give the operator sufficient warning to prevent encroachment;

    iii) A device that automatically limits range of movement, set to prevent encroachment; or

iv) An insulating link/device installed at a point between the end of the load line (or below) and the load; and

4. Implement at least one of the following measures:

   i. A proximity alarm set to give the operator sufficient warning to prevent encroachment;

   ii. A dedicated spotter who is in continuous contact with the operator. Where this measure is selected, the dedicated spotter must:

   - Be equipped with a visual aid to assist in identifying the minimum clearance distance. Examples of a visual aid include, but are not limited to: A clearly visible line painted on the ground; a clearly visible line of stanchions; a set of clearly visible line-of-sight landmarks (such as a fence post behind the dedicated spotter and a building corner ahead of the dedicated spotter).
   - Be positioned to effectively gauge the clearance distance.
   - Where necessary, use equipment that enables the dedicated spotter to communicate directly with the operator.
   - Give timely information to the operator so that the required clearance distance can be maintained.

   iii. A device that automatically warns the operator when to stop movement, such as a range control warning device. Such a device must be set to give the operator sufficient warning to prevent encroachment;

   iv. A device that automatically limits range of movement, set to prevent encroachment; or

   v. An insulating link/device installed at a point between the end of the load line (or below) and the load; and

5.3.5 Designated Signal Person

The site will use only Designated Signal Person(s) to direct heavy equipment.

Only persons who are competent and qualified by experience and/or training with the operations being directed shall be used as signal persons.

Where manual (hand) signals are used, only one person shall be designated to give signals to the operator. This signal person shall be located to see the load and be clearly visible to the operator at all times.

Manual (hand) signals may be used when the distance between the operator and signal person is not more than 100 ft. (30.4 m). Radio, telephone, or a visual and audible electrically operated system shall be used when the distance between operator and signal person is more than 100 ft. (30.4 m) or when they cannot see each other.

Standard hand signals shall be posted onsite and/or in a job trailer, signal control points, and other points as necessary to inform those concerned.

Signal persons shall back one vehicle at a time. While under control of a signal person, the heavy equipment driver shall not back or maneuver until directed and the driver shall stop when visual contact with the signal person is lost.

The signal person shall have a warning device, clear range of vision and a penetrating sound to warn persons when the load is coming in so they have time to get in the clear.

Minimum Class II High visibility vests shall be worn by flag and signal persons.

5.3.6 Refueling

- If refueling on site, the fueling area must be clearly marked (NO SMOKING), and ignition sources eliminated.
- Turn off the engine before refueling.
- If refueling could result in gasoline/diesel coming into contact with hot engine parts, shut off and cool the engine and any electrical equipment before refueling.
- Ensure the fueling area is well ventilated.
- Do not smoke while refueling. Keep open flames and sparks away from area.
- Ground the funnel or fuel nozzle against the filler neck to avoid sparks when refueling.
- Do not use gasoline or diesel fuel for cleaning parts.
- A dry chemical or carbon dioxide fire extinguisher (rated 10:BC or larger) is in a location accessible to the fueling area.
- A 5 gallon or larger spill kit is in a location accessible to the fueling area.
- Diesel cold start systems containing ether, which is explosive, are prohibited from being used.

6. TRAINING

All affected employees must complete online Heavy Equipment General Awareness Training.

All prospective ARCADIS Heavy and Mechanized Equipment Operators and Site Supervisors must complete the following.

- Online Heavy Equipment General Awareness training.
- Review and understand this HSS prior to participating in the competency review.
- Be evaluated by the Review Board and designated as Heavy and Mechanized Equipment Operator Awareness Trained and/or Site Supervisors.

Additionally, Site Supervisors will have a minimum of 5 years construction management and/or hands-on operating experience and demonstrated proficiency with the skills required for heavy and mechanized equipment. Site Supervisors will have completed the 10-hour or 30-hour OSHA Construction Training. If working on an environmental project

where HAZWOPER training is required by ARCADIS, the Site Supervisor must also have completed the 40-hour HAZWOPER training, be current on their annual 8-hour HAZWOPER refresher and complete the 8-hour Hazwoper Supervisor Training. A list of qualified Site Supervisors will be maintained by the Corporate Training Team.

Hands on training, including on-the-job training, when required, will be provided by a qualified vendor or through supervised operation by a Site Supervisor under controlled conditions and must be document on the ARCADIS Heavy Equipment Operator Authorization Form (Task Specific Hazard Review, Operator Evaluation and Operator Authorization for Heavy Equipment Operators). A copy of this form must be maintained onsite and keep in project files for review.

7. REFERENCES

ARCADIS Health and Safety Procedure ARC HSCS003 – Hoisting and Rigging (Cranes, Mobile Cranes, Pile Drivers, Derricks, and variations of such equipment)

ARCADIS Health and Safety Procedure ARC HSSP006 – Powered Industrial Trucks (Forklifts)

ARCADIS Health and Safety Procedure ARCHSFS019 – Utility Location and Clearance

ARCADIS Employee Field Health & Safety Handbook

OSHA 29 CFR 1926 Subpart O - Motor Vehicles, Mechanized Equipment and Marine Operations

US Army Corps of Engineers EM 385-1-1. 15 Sep 08 18.G Machinery and Mechanized Equipment

8. RECORDS - DATA RECORDING AND MANAGEMENT

Certification and Training records will be kept by the individual employee with copies of such certificates kept by Corporate Training Team. Training dates and times will be kept by Corporate Training Team.

Online Heavy Equipment General Awareness training, and designated as heavy and mechanized equipment operator general awareness training will be maintained by the Corporate Training Team.

A list of qualified Site Supervisors will be maintained by the Corporate Training Team.

ARCADIS Heavy Equipment Operator Authorization Form (Task Specific Hazard Review, Operator Evaluation and Operator Authorization for Heavy Equipment Operators) documentation will be maintained at the project site and retained with the project files.

All daily Equipment Inspection Form or an equivalent inspection form provided by the manufacturer or vendor documentation will be maintained at the project site and retained with the project files.

9. APPROVALS AND HISTORY OF CHANGE

Approved by: Julie Santaniello, CSP – Corporate H&S, Manager of Technical Programs

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
22 November 2011	01	Greg Ertel	Original document
22 November 2013	02	Tony Tremblay	Section 5.3 added that it's encouraged that hearing protection be worn. Formatted History of Change table, Updated Header, and fixed links.
10 March 2015	03	Andrew McDonald/Tony Tremblay	Removal of Heavy Equipment Operator Permit and adjusted text within standard to accommodate the establishing of a single ARCADIS Heavy Equipment Operator Authorization Form (Task Specific Hazard Review, Operator Evaluation and Operator Authorization for Heavy Equipment Operators) to evaluate equipment operators and authorize equipment operators; Header and Footer format update; History of Change Format update
2 March 2018	04	David Kobe/Julie Santaniello	Added CA-specific signage text in Section 5.3.3. Updated approver to Julie Santaniello.

ARCADIS Infrastructure · Water · Environment · Buildings	ARCADIS HS Standard Name Heavy and Mechanized Equipment	Revision Number 04
Implementation Date 22 November 2011	ARCADIS HS Procedure No. ARC HSCS006	Revision Date 2 March 2018

EXHIBIT 1 – DEFINITIONS

Affected Employees – Employees who are trained and authorized to work on projects where heavy or mechanized equipment is in use by either ARCADIS employees or subcontractors.

Authorized Operator – A trained, authorized individual with the experience, training, license (as applicable) and demonstrated skills to safely operate heavy or mechanized equipment in accordance with this procedure and applicable regulatory requirements.

Backhoe-Loader – As the name implies, it has a loader assembly on the front and a backhoe on the back.

Bulldozer – A powerful crawler (caterpillar tracked tractor) equipped with a blade.

Crane – A machine for hoisting and moving heavy objects by means of cables attached to a movable boom. Cranes can include the following types: overhead, gantry, locomotive and truck. Requirements for cranes are covered under ARCADIS standard ARCHSCS003. Cranes are not usually operated by ARCADIS employees; the PM is responsible for verifying proper qualifications and licensure for crane operation by subcontractors.

Earthmoving Equipment – Scrapers, loaders, crawler or wheel tractors, bulldozers, off-highway trucks, graders, agricultural and industrial tractors, and similar equipment.

Excavator – An engineering vehicle consisting of a backhoe and cab mounted on a pivot (turntable is a more apt description) atop an undercarriage with tracks or wheels.

Heavy Equipment – includes excavators/track-hoes, back-hoes, bucket loaders, bulldozers, articulating all terrain trucks, graders, agricultural and industrial tractors, sweepers and other powered mechanical equipment.

Manlifts – includes boom lifts, scissor lifts and other powered equipment designed to provide an elevated work surface. Manlifts require training by an authorized vendor or provider that includes a hands-on demonstration of competency that meets regulatory requirements and meets fall protection requirements. Refer to the ARCADIS Aerial Lifts Standard ARC HSFS017 for details.

Motor Vehicles (as referenced in this standard) – Vehicles that operate within an off-highway jobsite, not open to public traffic. The definition of Motor Vehicles does not include earthmoving equipment.

Powered Industrial Truck (Forklift) – includes fork trucks, tractors, platform lift trucks, motorized hand trucks and other specialized industrial trucks powered by electric motors or internal combustion engines. Forklifts require training by an authorized vendor or provider that includes a hands-on demonstration of competency and meets the regulatory requirements. Refer to the ARCADIS Powered Industrial Truck (Forklift) Standard ARC HSSP006 for details.

Heavy and Mechanized Equipment Site Supervisor – The employee responsible for reviewing the project scope and determining if an acceptable skill level has been achieved and demonstrated by an employee, prior to being considered an Authorized Operator.

Skid Loader – Also called a skid steer, is a compact, low capacity machine used for pushing or lifting material and for digging. It is typically used for earth moving during construction and landscaping in limited spaces but is also used to move loose materials in farming and industry.

Skidder – A type of vehicle used in forestry for pulling cut down trees (timber) out of a forest (logging).

ARCADIS Infrastructure · Water · Environment · Buildings	ARCADIS HS Standard Name Heavy and Mechanized Equipment	Revision Number 04
Implementation Date 22 November 2011	ARCADIS HS Procedure No. ARC HSCS006	Revision Date 2 March 2018

EXHIBIT 2 – Heavy Equipment Operator Authorization Form (Task Specific Hazard Review, Operator Evaluation and Operator Authorization for Heavy Equipment Operators)

EXHIBIT 3 – Heavy Equipment Inspection Checklist

ARCADIS Infrastructure · Water · Environment · Buildings	ARCADIS HS Standard Name Heavy and Mechanized Equipment	Revision Number 04
Implementation Date 22 November 2011	ARCADIS HS Procedure No. ARC HSCS006	Revision Date 2 March 2018

EXHIBIT 4 – State by State Summary of Equipment Operations Regulations

ARCADIS Infrastructure · Water · Environment · Buildings	ARCADIS HS Standard Name Heavy and Mechanized Equipment	Revision Number 04
Implementation Date 22 November 2011	ARCADIS HS Procedure No. ARC HSCS006	Revision Date 2 March 2018

EXHIBIT 5 – Review Board Evaluation Form for Heavy and Mechanized Equipment Operators & Site Supervisors

Implementation Date 28 January 2014	Arcadis HS Standard Name Hoisting and Rigging (Cranes, Mobile Cranes, Pile Drivers, Derricks, and variations of such equipment)	ARCADIS Design & Consultancy for natural and built assets
Revision Date 26 July 2016	Arcadis HS Standard No. ARC HSCS003	Revision Number 03

EXECUTIVE SUMMARY

This Health and Safety Standard (HSS) identifies the requirements for Arcadis personnel to safely conduct work involving hoisting and rigging equipment. This includes the responsibilities, training, permits and regulatory requirements for hoisting and rigging equipment operation by Arcadis staff. In addition to federal standards, individual states may require a more stringent scope of regulations relating to the hazards of mechanized lifting equipment that staff must identify and comply with.

In many cases, Arcadis staff will not be using a crane, but may be working at a site where another contractor is using a crane and Arcadis might be in the role of controlling entity. Because Arcadis staff may be exposed to hazards caused by a crane's operation, staff must be aware of potential crane hazards and taking steps to protect themselves against hazards that can reasonably be foreseen.

Arcadis has a duty to train our employees in the hazards associated with their work, including those that might arise from working near a crane.

Where Arcadis staff are involved in a lift, a designated person on the project team (Arcadis employee or subcontractor) will serve as the Lift Leader and is ultimately accountable for a lift. The Lift Leader will issue the lifting permit and be responsible for the overall lifting operation.

Equipment Operators are responsible for completing the lifting activities per the permit requirements and as directed by the Lift Leader. The equipment operator must have the necessary training, knowledge and experience for the class of lift and the type of equipment they will be operating.

Section 5 of this HSS identifies the standards and general safe practices for crane operation, hoisting and rigging. This includes safety precautions for specific equipment types, requirements for the different types of lifts and the use of the lifting operations permit.

Section 5.8 of this standard details requirements for using overhead cranes. Section 5.9.6 of this standard details requirements for mobile truck-mounted cranes with a lifting capacity of 2,000 pounds or less, which is the type of crane that might be used by Arcadis staff.

Hand signals are used for effective communication of important information while lifting. A standard of universal hand signals has been developed and is shown in Exhibit 5 – Standard Hand Signals for Crane Operators.

In terms of training, safety and health regulations require that only qualified or certified personnel operate cranes, hoists and lifting equipment. In addition, only trained, qualified and competent personnel can perform rigging or work in the role as a Lift Leader or Signal Person. As applicable, Arcadis shall provide training for crane operators, signalers and riggers, which meets the requirements described in this HSS.

Implementation Date 28 January 2014	Arcadis HS Standard Name Hoisting and Rigging (Cranes, Mobile Cranes, Pile Drivers, Derricks, and variations of such equipment)	ARCADIS Design & Consultancy for natural and built assets
Revision Date 26 July 2016	Arcadis HS Standard No. ARC HSCS003	Revision Number 03

1. POLICY

It is Arcadis policy that any mechanized lifting operations are appropriately planned and executed according to federal and/ or state specific regulations, and as set forth in this HSS. To this extent, cranes, mobile cranes, pile drivers, derricks, and variations of such equipment will be designed, tested, inspected and operated within the requirements detailed by the United States Occupational Safety and Health Administration (OSHA) regulations and state specific requirements.

2. PURPOSE AND SCOPE

2.1 Purpose

The purpose of this HSS is to set forth practices and policies to be used by employees and subcontractors of Arcadis when working with hoisting and rigging equipment on behalf of Arcadis. It provides the minimum requirements and methodology for safe mechanical lifting operations, which includes the hazard evaluations, inspections, and training to conduct the lifting work safely.

2.2 Scope

This HSS and associated practices apply to those Arcadis projects involving hoisting and rigging work, including those where lifting hazards by others is present. This HSS applies to Arcadis employees and Arcadis Subcontractors who perform hoisting, lifting and rigging work on behalf of Arcadis. This standard does not address all hoisting and rigging requirements detailed in OSHA and/or state/local requirements. Arcadis staff involved with hoisting and rigging operations must review and understand applicable OSHA, state and local hoisting and rigging requirements. In addition, manufacturer's recommendations should be considered during all crane operations, repairs, and maintenance activities.

This HSS applies to power-operated equipment, when used in construction, that can hoist, lower and horizontally move a suspended load. Such equipment includes, but is not limited to:

- Articulating cranes (such as knuckle-boom cranes);
- Crawler cranes;
- Floating cranes;
- Cranes on barges;
- Locomotive cranes;
- Mobile cranes (such as wheel-mounted, rough-terrain, all-terrain, commercial truck-mounted, and boom truck cranes);
- Multi-purpose machines when configured to hoist and lower (by means of a winch or hook) and horizontally move a suspended load; industrial cranes (such as carry-deck cranes);
- Dedicated pile drivers;
- Service/mechanic trucks with a hoisting device;
- A crane on a monorail;
- Tower cranes (such as a fixed jib, *i.e.*, "hammerhead boom"), luffing boom and self-erecting;
- Pedestal cranes;
- Portal cranes;

- Overhead and gantry cranes;
- Straddle cranes;
- Sideboom cranes;
- Derricks; and
- Variations of such equipment.

This HSS does not address:

- Power shovels, excavators and concrete pumps, which have been converted or adapted for a non-hoisting/lifting use;
- Elevators;
- Drilling rigs;
- Power shovels, excavators, wheel loaders, backhoes, loader backhoes, track loaders - This machinery is also excluded when used with chains, slings or other rigging to lift suspended loads;
- Automotive wreckers and tow trucks when used to clear wrecks and haul vehicles;
- Digger derricks when used for augering holes for poles carrying electric and telecommunication lines, placing and removing the poles, and for handling associated materials to be installed on or removed from the poles;
- Machinery originally designed as vehicle-mounted aerial devices (for lifting personnel) and self-propelled elevating work platforms;
- Telescopic/hydraulic gantry systems;
- Stacker cranes;
- Powered industrial trucks (forklifts), except when configured to hoist and lower (by means of a winch or hook) and horizontally move a suspended load;
- Mechanic's truck with a hoisting device when used in activities related to equipment maintenance and repair;
- Machinery that hoists by using a come-a-long or chainfall;
- Dedicated drilling rigs;
- Gin poles when used for the erection of communication towers;
- Tree trimming and tree removal work;
- Anchor handling or dredge-related operations with a vessel or barge using an affixed A-frame;
- Roustabouts;
- Helicopter cranes;
- Material delivery via:
    - Articulating/knuckle-boom truck cranes that deliver material to a construction site when used to transfer materials from the truck crane to the ground, without arranging the materials in a particular sequence for hoisting; and
    - Articulating/knuckle-boom truck cranes that deliver material to a construction site when the crane is used to transfer building supply sheet goods or building supply packaged materials from the truck crane onto a structure, using a fork/cradle at the end of the boom, but only when the truck crane is equipped with a properly functioning automatic overload prevention device;

      Note: This exclusion does not apply when the articulating/knuckle-boom crane is used to hold, support or stabilize the material to

facilitate a construction activity, such as holding material in place while it is attached to the structure or the material being handled by the articulating/knuckle-boom crane is a prefabricated component or the material being handled by the crane is a structural steel member (for example, steel joists, beams, columns, steel decking (bundled or unbundled) or a component of a systems-engineered metal building.

When using rigging hardware or slings with lifting equipment not covered by this HSS, the applicable rigging hardware and slings sections of this HSS shall still apply.

3. DEFINITIONS

Definitions related to Hoisting and Rigging can be located in Exhibit 1.

4. RESPONSIBILITIES

4.1 Employees and Subcontractors

It is the responsibility of those carrying out mechanical lifting operations to understand and comply with legal and regulatory requirements.

In many cases, Arcadis staff will not be using a crane, but may be working at a site where another contractor is using a crane. Because Arcadis staff may be exposed to hazards caused by a crane's operation (e.g., crane collapse or crane contact with an energized power line), Arcadis employees working on the site or touching/standing near the crane can be injured or killed.

Even though Arcadis staff may not be operating the crane, Arcadis staff must be aware of potential crane hazards and taking steps to protect themselves against hazards that can reasonably be foreseen. One way is to ask the company operating the crane or the controlling contractor on the site whether all necessary precautions are being taken to ensure the crane's stability. Arcadis has a duty to train our employees in the hazards associated with their work, including those that might arise from working near a crane.

Affected Employees must comply with the following requirements when working in a lift hazard area:

- Apply the TRACK concept to identify, assess and control predictable hazards involving hoisting and rigging operations;
- Taking prompt corrective measures to ensure that any hazardous conditions associated with lifting work are eliminated, including, but not limited to stopping work. This includes ensuring that crane operators or controlling contractors are notified of a potentially hazardous condition and the need for corrective actions.
- Attend a daily tailgate meeting and/or consult with Lift Leader so that they understand safety requirements to be used to protect themselves and others during hoisting and rigging work activities.
- To prevent employees from entering swing radius hazard areas, Arcadis staff will consult with the Lift Leader in order to identify the swing radius hazard areas.

Arcadis employees not involved with lifting operations must avoid working within the swing radius hazard area to avoid being struck-by and/or being pinched/crushed by the rotating structure/superstructure.

- Understand that warning signs (such as ‘‘Danger—Swing/Crush Zone’’) and high visibility markings on the equipment will identify the swing hazard areas that affected employees must avoid.
- Attend training as assigned and provide Arcadis with training documentation prior to beginning work.

4.2 Task Managers and Project Managers

Task Managers (TMs) and Project Managers (PMs) have the responsibility to know and follow applicable Health and Safety regulatory requirements and for ensuring work on their projects is conducted in accordance with policies/procedures established in this HSS.

This includes:

- Reviewing and understanding this Hoisting and Rigging HSS;
- Initiating and ensuring that a hazard analysis is conducted to identify, evaluate and control or eliminate hoisting and rigging work hazards;
- Communicating with and ensuring that employees and Arcadis subcontractors have appropriate training and qualifications;
- Involving the appropriate Arcadis H&S Staff and project staff, as necessary;
- Providing adequate resources and budget for hoisting and rigging work;
- Verifying that employees under their direction adhere to the requirements of this HSS, task specific Job Safety Analysis (JSA) and procedures specified in the project specific HASP;
- Ensuring that an appropriate lift plan is developed, designating a Lift Leader and ensuring a qualified Signal person is available as necessary; and
- Reviewing the qualifications of the Lift Leader, operators, riggers and signal person.

4.3 Lift Leader

In the scope of this HSS, the project manager will designate a person on the project team (Arcadis employee or subcontractor) who will serve as the lift leader and is ultimately accountable for an Arcadis lift. The Lift Leader will issue the lifting permit and be responsible for the overall lifting operation.

At locations in which Arcadis is not performing or directing a lift, Arcadis staff should determine who has been defined as the lift leader for the contractor performing this work.

Additionally, the Lift Leader for Arcadis lift work shall:

- Be qualified and/or trained as a rigger and/or equipment operator;
- Issue the Lifting Operations Permit, when applicable;

- Ensure that personnel involved understand how the lift is to be made;
- Ensure that personnel involved in the lift are current in training and qualification.
- Survey the lift site for hazardous/unsafe conditions and ensure corrective actions are implemented;
- Ensure that that lifting equipment, rigging and other accessories are properly selected such that their rated capacities are not exceeded;
- Ensure that a Competent Person checks all cranes/hoist to verify that they are still within the inspection interval;
- Ensure that a pre-operational check of all lifting equipment and rigging is performed by a Competent Person;
- Ensure that equipment is properly set up and positioned;
- Ensure that hoisting routes minimize exposure to personnel and critical equipment from the hoisted load and that only essential personnel are allowed within the fall zone;
- Ensure that a signal person is assigned, if required, and is identified to the operator;
- Ensure that the load hook is directly over the center of gravity of the load to the extent possible. Check load lines after strain is put on them but before the load is lifted clear of the ground; if load lines are not plumb, reposition the slings or equipment so that the lines are plumb before continuing;
- Understand that they have overall responsibility to ensure that the lift is completed safely and efficiently by Equipment Operator, Rigger and Qualified Signal Person; and
- Stop the job when any potentially unsafe condition is recognized.

4.4 Equipment Operator

Equipment Operator(s) are responsible for completing the lifting activities in accordance with regulatory requirements, permit requirements and as directed by the Lift Leader. The equipment operator must have the necessary training, knowledge and experience for the class of lift and the type of equipment they will be operating. Equipment operators must perform the lift as planned. Any deviation from the permit or lift plan must be reviewed and approved by the Lift Leader.

4.5 Qualified Signal Person

The qualified signal person, when required, shall:

- Complete training and meets qualification requirements. This means that the Signal Person has documentation from a third party or Arcadis qualified evaluator showing that the signal person knows and understands the Standard Method for hand signals, is competent in the application of the type of signals used, has a basic understanding of equipment operation and limitations, including the crane dynamics involved in swinging and stopping loads and boom deflection from hoisting loads, knows and understands signal requirements detailed in 29 CFR 1926.1419 thru 1422 and can demonstrate that he/she has passed an oral, written or practical test documenting that they meet the qualifications as a signal person.

- Be responsible for observing the load and lift.
- Provide direct instructions to the crane operator.
- Have sufficient knowledge and experience to confirm that the lift is not maneuvered in a hazardous manner.

A signal person is required when:

- The point of operation is not in full view of the operator;
- The operator's view is obstructed in the direction the equipment is traveling; and
- Either the operator or the person handling the load determines that a signal person is needed because of site-specific safety concerns.

4.6 Qualified Rigger

- Assembly/disassembly must be directed by a person who meets the criteria for both a competent person and a qualified person,
- Qualified riggers are required during hoisting activities for the assembly and disassembly work. They are also required when workers are within the fall zone and hooking, unhooking, or guiding a load, or doing the initial connection of a load to a component or structure.
- Each qualified rigger must complete training and meet qualification requirements. This includes knowledge of hoisting procedures and understanding the assembly/ disassembly procedures.

4.7 Competent Person

- A competent person must begin a visual inspection of assembled equipment and wire rope prior to each shift the equipment will be used, which must be completed before or during that shift.
- Where traveling with a load is permitted by equipment manufacturer, then the Competent Person must supervises the operation, to determine if it is necessary to reduce rated capacity, and makes determinations regarding load position, boom location, ground support, travel route, overhead obstructions, and speed of movement necessary to ensure safety.
- When leaving equipment unattended, the Competent Person determines that it is safe to do so and implements measures necessary to restrain the boom hoist and telescoping, load, swing, and outrigger or stabilizer functions.
- When a local storm warning has been issued, the competent person must determine whether it is necessary to implement manufacturer recommendations for securing the equipment.
- If the competent person determines that there is a slack rope condition requiring re-spooling of the rope, it must be verified (before starting to lift) that the rope is seated on the drum and in the sheaves as the slack is removed.
- The competent person must adjust the equipment and/or operations to address the effect of wind, ice, and snow on equipment stability and rated capacity.

- When traveling with a load, the competent person supervises the operation, determines if it is necessary to reduce rated capacity, and makes determinations regarding load position, boom location, ground support, travel route, overhead obstructions, and speed of movement necessary to ensure safety.

4.8 Corporate Health and Safety Staff

Have the responsibility for:

- Ensuring that staff involved with hoisting or rigging are aware of this HSS.
- Reviewing and updating this HSS, as necessary.
- Providing and/or identifying required training or guidance on approved training options.

5. STANDARDS AND PRACTICES

5.1 General Lifting Requirements

When using any type of power-operated equipment during construction that can hoist, lower and horizontally move a suspended load (e.g., cranes, mobile cranes, derricks, dedicated pile driver, etc.), it is necessary to follow these general requirements for a safe and successful lift.

These requirements include:

- All material handling equipment shall be certified/inspected as required by regulatory requirements.
- A competent person must visually inspect all lifting devices and equipment prior to use. More frequent visual inspections should be performed based on the site, the type of lift and site conditions. Results of the inspection shall be recorded in a daily inspection log.
- Lifting operations shall not commence unless a visual assessment of the lift has been completed and the Competent Person has determined the lifting methods and equipment are safe and ready for use.
- During visual assessment of equipment, if any deficiency is identified, an immediate determination must be made by the competent person as to whether the deficiency constitutes a safety hazard.
- All cranes, hoisting and lifting equipment shall be inspected by a competent person at least annually.
- Defective rigging will be immediately removed from service and all defects or repairs needed shall be recorded in the log.
- Rigging equipment not in use shall be removed from the immediate work area so as not to present a hazard to employees.
- Cranes and/or lifting equipment are not to be moved when the boom is elevated or in a working position unless manufactured for pick and carry purpose.

- Rated load capacity charts, recommended operating speeds, special hazard warnings and other essential information shall be conspicuously posted in all cranes, hoists and other equipment. Rated load capacities will not be exceeded.
- Hand signal charts must be either posted on the equipment or conspicuously posted in the vicinity of the hoisting operations.
- Wire ropes shall be free of damage that results in distortion of the rope structure, this includes kinking, crushing, bird caging or wear of one-third of the diameter of the rope.
- Safety latches shall be required on all crane and spreader cable hooks (with the exception of shakeout hooks that are used for their intended purpose).
- Tag lines should be used unless their use creates an unsafe condition. Gloves shall be worn when handling and using a tag line.
- Workers shall not handle rope or cables when wearing finger jewelry.
- Unless the power lines are de-energized and visibly grounded at the worksite, with confirmation from utility owner, encroachment prevention measures have to be implemented to prevent the crane from breaching a minimum clearance distance. For crane work near energized electrical lines up to 350kV, the minimum clearance distance options would be: (1) maintain 20 feet clearance distance from electrical line by maintaining encroachment prevention measures; or (2) determine the actual electric line voltage and implement encroachment prevention measures to maintain minimum clearance distance specified in Table 1 of Section 5.2 of this HSS.
- Any overhead line shall be considered energized unless a responsible utility company representative ensures that it is not (refer to the Arcadis Utility Clearance and Electrical Safety Standard for additional details).
- Proper barricades shall be placed around the swing radius of cranes and other lifting equipment as appropriate.
- Lifting operations will only be performed by qualified staff.
- The operator of the lifting equipment shall not leave the operating controls while the load is suspended.
- All personnel who are not involved with the lift shall be kept at a distance outside of the swing radius of the load (workers shall not stand or pass under a suspended load). Hard hats, eye protection, safety vest and steel toe boots shall be worn by all employees on projects involving hoisting and rigging operations.
- Employees shall not work or walk under a suspended load.
- Suspended loads shall be attended constantly unless they are physically secured to prevent unintended movement.
- The Lift Leader shall evaluate and consider the stability of the ground prior to each lift. The equipment must not be assembled or used unless ground conditions are firm, drained, and graded to a sufficient extent so that, in conjunction (if necessary) with the use of supporting materials, the equipment manufacturer's specifications for adequate support and degree of level of the equipment are met. The requirement for the ground to be drained does not apply to marshes/wetlands.

- When assembling or disassembling equipment (or attachments), Arcadis must comply with applicable manufacturer prohibitions and must comply with the manufacturer procedures applicable to assembly and disassembly,
- Assembly/disassembly must be directed by a person who meets the criteria for both a competent person and a qualified person, or by a competent person who is assisted by one or more qualified persons.
- Before commencing assembly/disassembly operations, crew members understand their tasks, the hazards associated with their tasks and the hazardous positions/locations that they need to avoid.
- All safety devices on the lifting equipment must be operational.
- No modifications or additions which affect the capacity and safe operation of the equipment shall be made without the manufacturer's written approval.
- The crane shall be uniformly level within one percent of level grade and located on firm footing.
- Lifting operations shall not commence if the load exceeds the dynamic or static capacities of the lifting equipment.
- Establish clear pick-up and lay-down areas that are within the crane's load lifting radius.
- Ensure the load path from the beginning of the lift to the lay-down area is clear of obstructions.
- Rig loads appropriately and ensure loads are free of possible restraints.
- Place load in designated lay-down area and remove rigging equipment after load is securely in place and free of support from the crane.
- The load being lifted shall be watched until it is set in place and disconnected from the lifting device.
- Workers shall stand clear of any rope, line, or cable that is under strain.
- Workers shall not get any part of their bodies between unsecured objects (pinch points – caught by/struck by hazard).
- Workers shall not wear loose clothing when working near rotating machinery.
- When wind speed (sustained or gusts) exceeds 20 mph at the personnel platform, a qualified person must determine if, in light of the wind conditions, it is not safe to lift personnel. If it is not, the lifting operation must not begin (or, if already in progress, must be terminated).
- Wind must not exceed the speed recommended by the manufacturer or, where manufacturer does not specify this information, the wind speed determined by a qualified person.
- For a tower crane, a device must be provided to display the wind speed and must be mounted above the upper rotating structure on tower cranes. On self-erecting cranes, it must be mounted at or above the jib level. Temporary alternative measures: Use of wind speed information from a properly functioning indicating device on another tower crane on the same site, or a qualified person estimates the wind speed.

- For a floating crane or barge crane, a competent person must determine if wind is a factor that needs to be considered; if wind needs to be considered, a wind speed and direction indicator must be used.
- When a local storm warning has been issued, the competent person must determine whether it is necessary to implement manufacturer recommendations for securing the equipment.
- When working near transmitter/communication towers where the equipment is close enough for an electrical charge to be induced in the equipment or materials being handled, the transmitter must be de-energized or the following precautions must be taken:
    1. The equipment must be provided with an electrical ground.
    2. If tag lines are used, they must be non-conductive.

- The use of floating cranes/derricks or land cranes/derricks on some means of floatation shall meet requirements outlined in the OSHA standard (29 CFR 1926.1437).

5.2 Crane Operation Safety Precautions

A crane operator shall observe the following minimum safety precautions:

- Prior to moving a crane into an area, evaluate soil conditions for crane stability and the possibility of damage to the underground facilities or injury to personnel.
- Follow the manufacturer's instructions for entering and exiting the cab.
- Follow the manufacturer's recommendations for maximum allowable loads, maximum loads and maximum boom lengths. (Booms shall be lowered when storms or winds exceed the limits in the manufacturer's recommendations).
- Know the radius of the load at all times.
- Keep the load directly under the trolley at all times.
- Keep personnel away from the loading and unloading areas and swing path.
- Barricade the swing radius of the counterweight.
- Be alert constantly to the effects of dynamic loading when swinging, hoisting and lowering the load or when moving the crane.
- Do not:
    - Allow anyone else on the crane when it is in use.
    - Leave the controls when the load is suspended.
    - Operate cranes when sustained wind speeds (as measured by the mast tip anemometer) exceed 30 mph (48 kph) or any other wind speed established by the Lift Leader.
- Store loose items, such as tools, lubrication cans and waste materials, in a toolbox inside the cab.

- Wear seat belts at the controls when provided by the manufacturer.

In addition, the crane operator shall verify the following minimum safety requirements. This evaluation should be part of the lift analysis:

- The hoist line is vertical and plumb at all times.
- The crane hooks safety latches are in good working order and are used properly.
- The crane is level to 1 percent of grade before operations begin.
- The truck's cab is unoccupied when crane is loading or unloading trucks.
- The equipment is shut down and a fire extinguisher (minimum acceptable is a 30# BC) is available during refueling.
- The tag lines are:
  - Used to control the load at all times and long enough to keep people out from underneath the load.
  - Not used where an individual cannot control or guide the load. Control lines utilizing mechanized systems should be used in those cases.

No one shall work or walk under a suspended crane load, nor ride the ball or load. Everyone not directly participating in the move shall stay far enough from the base of the crane when moving a tracked crane to avoid contact with moving parts or with pieces thrown out by the tracks. Under normal circumstances, telescoping boom cranes shall be retracted and lowered when not in use. Unless lattice-boom cranes can safely be left unattended to weather-vane, the booms shall be pointed downwind according to the prevailing wind direction with the load block or headache ball lowered to grade and tied off to restrict weather-vaning.

Before assembly or disassembly of a crane, a determination must be made if it could come within 20 feet of a power line.

Unless the power lines are de-energized and visibly grounded at the worksite, with confirmation from utility owner, encroachment prevention measures have to be implemented to prevent the crane from breaching a minimum clearance distance. For crane work near energized electrical lines up to 350kV, the minimum clearance distance options would be:

1. Maintain 20 feet clearance distance from electrical line by maintaining encroachment prevention measures (refer to section 5.2.1); or
2. Determine the actual electric line voltage and implement encroachment prevention measures (refer to section 5.2.1) to maintain minimum clearance distance specified in Table 1 below.

Table 1: Minimum Clearance Distance

Voltage (nominal, kV, alternating current)	Minimum Clearance (feet)
Up to 50	**10**
>50 to 200	**15**
>200 to 350	**20**

>350 to 500	**25***
>500 to 750	**35***
>750 to 1,000	**45***
> 1,000	**Determined by utility/owner**

***** According to OSHA 29 CFR 1926.1409, for power lines over 350 to 1,000 kV, the minimum distance is presumed to be 50 feet. Over 1,000 kV, the utility/owner or a registered engineer, who is a qualified person with respect to electrical power transmission and distribution, must establish the minimum distance.

5.2.1 Preventing Encroachment/Electrocution

Where encroachment precautions are required under Option (1) or Option (2) of section 5.2, all of the following requirements must be met:

1. Conduct a planning meeting with the operator and the other workers who will be in the area of the equipment or load to review the location of the power line(s), and the steps that will be implemented to prevent encroachment/electrocution.

2. If tag lines are used, they must be non-conductive.

3. Erect and maintain an elevated warning line, barricade, or line of signs, in view of the operator, equipped with flags or similar high-visibility markings, at 20 feet from the power line (if using Option 1 of this section) or for Option 2, at the minimum approach distance listed under Table 1. If the operator is unable to see the elevated warning line, a dedicated spotter must be used.in addition to implementing one of the following measures:

   i) A proximity alarm set to give the operator sufficient warning to prevent encroachment;

   ii) A device that automatically warns the operator when to stop movement, such as a range control warning device. Such a device must be set to give the operator sufficient warning to prevent encroachment;

   iii) A device that automatically limits range of movement, set to prevent encroachment; or

   iv) An insulating link/device installed at a point between the end of the load line (or below) and the load; and

4. Implement at least one of the following measures:

   i. A proximity alarm set to give the operator sufficient warning to prevent encroachment;

   ii. A dedicated spotter who is in continuous contact with the operator. Where this measure is selected, the dedicated spotter must:

   - Be equipped with a visual aid to assist in identifying the minimum clearance distance. Examples of a visual aid include, but are not limited to: A clearly visible line painted on the ground; a clearly visible line of

stanchions; a set of clearly visible line-of-sight landmarks (such as a fence post behind the dedicated spotter and a building corner ahead of the dedicated spotter).

- Be positioned to effectively gauge the clearance distance.
- Where necessary, use equipment that enables the dedicated spotter to communicate directly with the operator.
- Give timely information to the operator so that the required clearance distance can be maintained.

iii. A device that automatically warns the operator when to stop movement, such as a range control warning device. Such a device must be set to give the operator sufficient warning to prevent encroachment;

iv. A device that automatically limits range of movement, set to prevent encroachment; or

v. An insulating link/device installed at a point between the end of the load line (or below) and the load; and

5.2.2 Personnel Lifting Operations

The use of equipment to hoist employees is prohibited except where Arcadis or our Subcontractor demonstrates that the erection, use, and dismantling of conventional means of reaching the work area, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform, or scaffold, would be more hazardous, or is not possible because of the project's structural design or worksite conditions.

Personnel lifting operations shall include, but not limited to the following requirements:

1. Cranes and/or lifting equipment used for personnel handling (e.g., personnel platforms, marine hoisted personnel transfer devices or other personnel transfer devices) and attachment/suspension systems) must be intended and certified for such use or designed by qualified personnel to meet applicable legal requirements.

2. Cranes and/or lifting equipment used to lift personnel shall be classified and labeled as “personnel handling”.

3. Personnel platforms, marine hoisted personnel transfer devices or other personnel transfer devices shall be set-up, rigged, used and loaded to meet applicable legal requirements, as well as accepted best practices.

4. Personnel platforms marine hoisted personnel transfer devices or other personnel transfer devices attachment/suspension systems shall be inspected and tested by qualified personnel prior to first use per shift.

5. Personnel platforms (e.g., personnel baskets) shall undergo a trial lift and proof testing to 125% of the platform’s rated capacity prior to first use per shift for personnel.

6. Tag lines shall be used, when required (e.g., Billy Pugh personnel transfer basket).

7. Personal fall arrest systems shall be used, with the exception of marine transfers is required.

8. Personal floatation devices approved for such use for personnel in marine personnel transfers shall be used.

5.3 Appropriate Lifting Equipment

Cranes, chain hoists and lifting equipment shall be tested, inspected and maintained in accordance with the manufacturer's recommendations by the equipment operator or other qualified person.

A crane capacity evaluation shall be completed before a lift is attempted. The evaluation shall include the gross load, boom radius, boom angle, boom length and jib length. The operator should consult the crane load chart to obtain the gross capacity percentile of the crane as it was configured.

Backhoes, track hoes, front-end loaders, side loaders and similar earth-moving equipment will be used for ordinary lifting only as they are designed. Use of this equipment shall comply with the equipment manufacturer's requirements, specifications and designs for lifting.

Any time that a crane or lifting device is shock loaded, it shall be red-tagged and removed from service pending an inspection and re-certification by a qualified agency.

Non-certified fabricated or modified lifting and rigging equipment will not be used for lifting.

5.4 Hazard Analysis for the Lifting Operation

Each lift must be classified as an Ordinary Lift or a Critical Lift prior to planning the lift. A hazard analysis of the lift shall be completed during the planning phase of the lift project. All lifts shall include a task specific Job Safety Analysis (JSA), which is reviewed by the Lift Leader and the persons participating in the lift. Critical lifts and lifts that are more complex require a Lift Plan in addition to the JSA.

5.5 Lifting Operations Permit

A Lifting Operations Permit (Exhibit 2) shall be prepared prior to a critical lift. All fields and line items on the permit shall be completed.

The permit shall be signed by the qualified equipment operator, designated Lift Leader and designated rigger.

No critical lift may proceed without a signed Lifting Operations Permit.

5.6 Ordinary Lift

The Lift Leader shall be present at the lift site during non-critical or ordinary lift operations. If the lift is being made by only one person, that person assumes all responsibilities of the designated Lift Leader. The Lift Leader shall have the necessary knowledge and experience of the specific type of equipment and assigned lifting operations.

Cranes, Backhoes, track hoes, front-end loaders, side loaders and similar earth-moving equipment shall be used only for the lifting for which they are designed. Such use of this equipment shall comply with the equipment manufacturer's requirements, specifications and designs for lifting.

A written lifting operations permit/plan beyond normal site work planning and control documents (JSA, etc.) is not required for an ordinary lift, though may be desirable for more complex lifts. Also, for construction lifts involving multiple mobile cranes or temporarily installed overhead cranes, a competed permit is required. For each and every lift, the operator shall complete the pre-lift checklists (Exhibit 3 and Exhibit 4).

For any type of lift, personnel shall not be allowed within the load swing path.

5.6.1 Lift Planning for Ordinary Lifts

The Lift Leader shall ensure that all pre-lift planning issues are addressed, which includes:

- Identify the item to be moved, its characteristics, weight, dimensions, its center of gravity, and whether it contains any hazardous or toxic materials;
- Validate the loads path and clearances;
- Identify lifting equipment and rigging to be used by type and rated capacity;
- Evaluate the work area for conditions impacting crane setup and operations; and
- Identify any special or site-specific operating procedures and requirements.

The Ordinary Lift Planning can be documented in the form of a JSA.

5.7 Critical Lift

5.7.1 Critical Lift Conditions

A lift is designated as critical if it has one or more of the following conditions present:

- Loss of control of the item being lifted is likely to result in declaration of an emergency.
- The load item is unique, and if damaged would be irreplaceable or not repairable and is vital to a system, facility or project operation.
- If the mishandling or dropping of the load would cause irreplaceable damage or delays involving a negative impact on a facility or project site.
- The total load to be lifted exceeds 75 percent of the rated capacity of the crane or lifting device.

  Note: No lift is allowed if it exceeds 90 percent of the load chart for any given configuration of the crane.

- Loads that require exceptional care in handling because of size, weight, shape, close-tolerance or high susceptibility to damage.

- Lifts where the load cannot be reasonably estimated, triggers the critical lift procedure.
- Lifts that require multiple cranes for the lift, or the use of two or more cranes or lifting devices to lift one load simultaneously.
- Lifting where the operator of the lifting equipment cannot see the load.
- Lifts involving man riding work baskets.
- Lifting loads over the top of live process equipment/piping (e.g., gasoline, crude oil, natural gas, etc.) or high voltage electrical lines.
- Further site specific criteria imposed by site or project safety requirements.

When any of these conditions is present, a Critical Lift Plan (refer to the Lifting Operations Permit in Exhibit 2) is required.

5.7.2 Critical Lift Plan

In addition to a task specific JSA, a Lift Plan (Lifting Operation Permit – Exhibit 2) will be developed for all critical lifts.

The Equipment Operator and the Lift Leader must discuss the inspection and lifting procedures before the lift occurs.

The planning shall consider the wind conditions and how to mitigate the motion energy created by wind. Lifts should not be conducted when winds create an unsafe or hazardous condition, regardless of wind speed. Conditions that would result in a suspension of lifts such as if visibility is impaired by environmental conditions such as dust, snow, rain, fog or darkness, will be documented in the lift plan.

The planning will include the following:

- The methods used to control and protect personnel from the lifting equipment and the lifted load. For example, use of a tagline instead of direct manual contact with the load;
- The limitations of the lifting equipment and how the load will be evaluated to ensure it will not exceed the limitations including the safety factors used. For example, the load will be limited to 75 percent of the lifting equipment capability;
- The limitations of the dynamic or static capabilities of the lifting equipment; and
- The requirements for completing an evaluation of lifting equipment capacity for each lift and keep it for the duration of the job.

5.7.3 Critical Lift Plan Components

The Critical Lift Plan shall include at a minimum, but not limited to, the following:

- Identify the item to be moved, its characteristics, weight, dimensions, its center of gravity, and whether it contains any hazardous or toxic materials.

- Identification of operating equipment to be used by type and rated capacity (e.g., mobile crane, overhead crane) and verification that the selection of equipment and rigging is appropriate for the type of lift.
- Rigging sketches and/or descriptions that include (as applicable):
    - Identification and rated capacity of slings, lifting bars, rigging accessories, and below-the-hook lifting devices. Calculate and provide the rated capacity of equipment in the configuration in which it will be used;
    - Load-indicating devices;
    - Load vectors;
    - Lifting points;
    - Sling angles.
    - Required lifting equipment movement (e.g., boom and swing angles, trolley and bridge motions);
    - Methods of attachment;
    - Crane orientations; and
    - Other factors affecting equipment capacity (e.g., load path sketch, key point heights, floor or soil bearing capacity).
- Operating procedures and special instructions to operators including rigging precautions and safety measures to be followed as applicable;
- The type and number of personnel required, their specific roles and competencies, and how they will be briefed;
- Pick up and set down points and constraints such as space and stacking;
- Step-by-step instructions;
- Communication methods to be used;
- Emergency and rescue plans;
- Restrictions on the lift such as weather, light, sea state, etc.;
- Simultaneous, conflicting or nearby operations or work;
- Whether Permit to Work procedures are applicable;
- Inspection prior to use requirements that meet criteria established in this HSS;
- Load integrity check;
- Load charts for generic lift plans and for heavy or complex lifts;
- An assessment of whether tag lines should be used, their hazards and limitations; and
- Critical Lift Documentation, Approval, and Review.

5.7.4 Critical Lift Requirements

For an Arcadis lift, Arcadis shall appoint a Lift Leader for critical lifts. The Lift Leader shall be present at the lift site during the entire Arcadis lifting operation.

The Lift Leader must understand the site rules and procedures addressing:

Administrative requirements for lifting operations.

Personnel assignments and responsibilities commensurate with job requirements.

Selection of proper slings, rigging hardware, and lifting equipment.

Recognition and control of hazardous or unsafe conditions.

Job efficiency and safety.

Critical-lift determination and documentation.

Equipment Operator(s) must have the necessary knowledge and experience with the specific type of equipment used and assigned lifting operations.

All rigging equipment used in critical lifts (i.e., slings, below-the-hook lifting devices, and rigging hardware) shall be proof load tested in accordance with applicable American Society of Mechanical Engineers (ASME) standards.

Experienced operators who have been trained and qualified to operate the specific equipment to be used shall be assigned to make the lift.

Only designated, qualified signalers shall give signals to the operator. However, the operator shall obey a STOP signal at all times, no matter who gives the signal.

The procedure and rigging sketches shall be reviewed and approved by the Lift Leader before the lift is made.

Subsequent revisions shall be approved per site specific procedures.

A pre-lift meeting involving participating personnel shall be conducted prior to making a critical lift. The critical lift plan/procedure shall be reviewed and questions shall be resolved.

Prior to executing a critical lift, the Lift Leader shall verify that the as-installed rigging matches the configuration in the approved lifting plan.

If required by the critical lift procedure, a practice lift shall be done before the critical lift. Conditions for a practice lift should closely simulate actual conditions involving: weight, rigging selection and configuration, load movement path, and other relevant factors. Practice lifts should be done by the same crew using the same lifting equipment that will be used in the lift.

Although individual plans are generally prepared for critical lifts, multi-use plans may be employed to accomplish recurrent critical lifts. For example, a multi-use plan may be used to lift an item or series of similar items that are handled repeatedly in the same manner. However, if the lifting equipment or rigging must change to accomplish the lift, the critical lift plan must be revised and approved accordingly.

5.7.5 Pre-Critical Lift Meeting

A formal pre-lift review meeting should be scheduled prior to a lift. Where appropriate, this meeting shall be attended by the Arcadis site representative, the personnel involved in the lift, the designated rigging person, superintendent, lift leader, signal person and equipment operator for the lift.

5.8 Overhead Cranes and Hoists

5.8.1 Maintenance Program

A preventive maintenance program based on the crane manufacturer's recommendations shall be established. The documentation of the maintenance shall be retained.

5.8.2 Inspections Program

An inspection program based on the manufacturer's recommendations for inspections and equipment condition shall be established. Inspections of overhead hoists shall include, but are not limited to, the items listed in Exhibit 3 – Hoisting Equipment Inspection Checklist (Each Shift and Monthly). Particular attention shall be given to the condition and correctness of sheaves used on lifting equipment. The inspection timeframe/criteria must also meet both state and local inspection requirements, as applicable.

At a minimum, overhead hoists shall be inspected prior to use, monthly and at least annually.

Deficiencies or hazards found during an inspection shall be corrected or repaired before the overhead crane or hoist is used. The operator shall approve and sign off on any repairs made to any lifting equipment.

A written verification of the crane or hoist inspection shall be available upon request.

Note: **CalOSHA specific requirement.** For Cranes above 3 Ton Capacity, an Annual Crane Inspection is required to be performed and this inspection must be performed by a Cal-OSHA Certified Crane Inspector. After completion of inspection, a Plate V Certificate is issued documented that the Crane has passed Inspection.

5.8.3 Testing Program

Prior to initial use, testing shall be conducted on any new or extensively repaired or altered hoists and overhead cranes for the following functions:

- Hoisting and lowering.
- Trolley travel.
- Bridge travel.
- Limit switches, locking and safety devices.

A load test shall be conducted and documented.

Tests shall not exceed 100 percent of the crane's rated load capacity. The rated load capacity of each hoist shall be plainly marked on each side of the hoist. This marking should be clearly legible from the ground/floor level. The traveling beam shall be marked with the maximum load capacity.

5.9 Mobile Cranes

5.9.1 Anti-Two Block Systems

Anti-two block systems shall be in place on all mobile cranes so that, when activated, they can disengage all crane functions that can cause two-blocking when in motion. Anti-two block systems shall be function tested prior to use daily and after the crane has been turned off and left unattended for any length of time.

5.9.2 Maintenance Program

A preventive maintenance program based on the crane manufacturer's recommendations shall be established. Documentation of the maintenance shall be retained.

5.9.3 Inspections Program

The manufacturer's recommendations for inspections and equipment condition shall be followed. At a minimum, cranes shall be inspected prior to use, monthly and at least annually. A written verification of the crane or hoist inspection shall be available upon request and inspection records maintained for at least 3 months. The inspections program must meet applicable regulatory requirements.

Any deficiencies or hazards found during inspection shall be corrected, repaired or mitigated before the lifting equipment is placed into service. The qualified operator should verify, approve and sign off on the repairs and mitigating actions prior to use. Only qualified personnel shall do work on lifting equipment.

5.9.4 Testing

Mobile cranes shall have an accurate load-rating chart affixed to the unit in plain view of the operator when the crane is in use. Prior to initial use, new or extensively repaired or altered mobile cranes and hoists shall be load tested and documented. Load tests shall not exceed 100 percent of the crane's rated load capacity.

5.9.5 Crane Movement

Before moving a mobile crane or derrick the following conditions shall be met:

- The entire route should be checked to verify adequate clearances.
- Booms are to be lowered and secured against swinging.
- Handling gear attached to the boom shall be secured against swinging.

5.9.6 Mobile Crane or Derrick with Maximum Rated Hoisting Capacity (2000 lbs. or less)

Operators of this type of equipment are exempted from the Operator requirements detailed in Section 6.2 and 6.4 of this HSS. Prior to operating this type of mobile crane or

derrick, Arcadis must ensure that each operator of this equipment is trained on safe operation of the equipment.

Trained and qualified operators of this type of equipment must comply with the following requirements:

- Procedures applicable to the operation of the equipment, recommended operating speeds, special hazard warnings, instructions, and operator's manual must be readily available for use by the operator;
- The selection of components, and the configuration of the equipment, that affect the capacity or safe operation of the equipment complies with either the:
    - Manufacturer instructions, recommendations, limitations, and specifications. When these documents and information are unavailable, a registered professional engineer familiar with the type of equipment involved must approve, in writing, the selection and configuration of components; or
    - Approved modifications that meet the requirements of OSHA 29 CFR § 1926.1434 (Equipment modifications);
- Comply with applicable equipment manufacturer prohibitions;
- The equipment shall be inspected, maintained and operated in accordance with manufacturer specifications and procedures;
- Prior to use, the equipment shall undergo a load test by a qualified inspector. A copy of the inspection report shall be kept on file and readily available to appointed personnel;
- Inspections of the equipment shall include an initial inspection, pre-operational checks and periodic inspections by a qualified inspector. All safety devices, controls, and operating parts shall be checked during each inspection to ensure that they are in good working order;
- The load chart must be available to the operator at the control station;
- The equipment shall be marked with safety markings, decals, rating charts, and capacity as provided by the manufacturer;
- Operating controls shall be readily visible and accessible to the operator, and shall not subject the operator to pinch points, sharp edges or snagging hazards;
- The equipment shall operate with a smooth, regular motion without any hesitation, binding or irregularity;
- Latch-equipped hooks shall be used for all operations unless deemed impractical or unsafe to use;
- Anti two-blocking equipment or equivalent design to prevent load failure shall be used on equipment that is manufactured after November 8, 2011;

- Operators must be trained on the safe operation of the specific equipment prior to operation;
- Should a signal person be required for the lifting operation, each signal person shall be trained in the proper use of signals applicable to the equipment, but the signal person does not need to meet the qualification requirements detailed in section 6.6 of this HSS;
- When the manufacturer's procedures are unavailable, the trained equipment operator must develop, and ensure compliance with the following:
    - all procedures necessary for the safe operation of the equipment and attachments;
    - procedures for the operational controls are developed by a qualified person; and
    - that procedures related to the capacity of the equipment are developed and signed by a registered professional engineer familiar with the equipment.
- Ensure that the equipment is designed by a qualified engineer and used according to manufacturer recommendations.

5.10 Slings/Rigging Equipment Safety

When using wire ropes, chains and slings, the following safety measures shall be implemented:

5.10.1 Safety (Design) Factor

The strength of a wire rope is a function of its size, grade, and construction. It must be sufficient to accommodate the applied maximum load. The maximum load limit is determined by means of an appropriate multiplier. This multiplier is the number by which the ultimate strength of a wire rope is divided to determine the working load limit. Thus, a wire rope sling with a strength of 10,000 pounds (4,545 kilograms) and a total working load of 2,000 pounds (909 kilograms) has a design factor (multiplier) of 5. New wire rope slings have a design factor of 5. As a sling suffers from the rigors of continued service, however, both the design factor and the sling's ultimate strength are proportionately reduced. If a sling is loaded beyond its ultimate strength, it will fail. So, older slings must be more rigorously inspected to ensure that rope conditions adversely affecting the strength of the sling are considered in determining if a wire rope sling should be allowed to continue in service. Slings and manufactured rigging equipment shall not be loaded in excess of their total working load capacities (adjusted in accordance with manufacturer criteria).

5.10.2 Approval and Stamps

All spreader bars, eye pads and other custom lifting devices shall be engineered, and a registered professional engineer shall stamp their designs. Copies of the designs and seals shall be on site prior to use. Manufacturer’s specific lifting devices shall have specifications sheets for each device that shall be on location. Stamps and approvals that are not legible or missing will result in the equipment being tagged as non-usable.

Makeshift and job-made devices shall not be used.

Arcadis and its subcontractors shall control the issuing and use of all lifting and hoisting equipment during Arcadis lifts.

5.10.3 General Sling Requirements

Slings are generally one of six types: chain, wire rope, metal mesh, natural fiber rope, synthetic fiber rope, or synthetic web. In general, use and inspection procedures tend to place these slings into three groups: 1) Chain; 2) wire rope and mesh; and 3) fiber rope web.

Each type has its own particular advantages and disadvantages. Factors to consider when choosing the best sling for the job include the size, weight, shape, temperature, and sensitivity of the material to be moved, as well as the environmental conditions under which the sling will be used.

Chains are commonly used because of their strength and ability to adapt to the shape of the load. Care should be taken, however, when using alloy chain slings because sudden shocks will damage them. Misuse of chain slings could damage the sling, resulting in sling failure and possible injury to an employee. Chain slings are the best choice for lifting very hot materials. They can be heated to temperatures of up to 1,000° Fahrenheit (538° centigrade); however, when alloy chain slings are consistently exposed to service temperatures in excess of 600° Fahrenheit (3 16° centigrade), operators must reduce the working load limits in accordance with the manufacturer's recommendations.

A second type of sling is made of wire rope. Wire rope is composed of individual wires that have been twisted to form strands. Strands are then twisted to form a wire rope. When wire rope has a fiber core, it is usually more flexible but is less resistant to environmental damage. Conversely, a core that is made of a wire rope strand tends to have greater strength and is more resistant to heat damage.

Wire rope may be further defined by the "lay." The lay of a wire rope describes the direction the wires and strands are twisted during the construction of the rope. Most wire rope is right lay, regular lay-which means that the strands pass from left to right across the rope and the wires in the rope are laid *opposite* in direction to the lay of the strands. This type of rope has the widest range of applications.

Lang lay (where the wires are twisted in the same direction as the strands) is recommended for many excavating, construction, and mining applications, including draglines, hoist lines, dredgelines, and other similar lines. Lang lay ropes are more flexible and have greater wearing surface per wire than regular lay ropes. In addition, since the outside wires in lang lay rope lie at an angle to the rope axis, internal stress due to bending over sheaves and drums is reduced causing lang lay ropes to be more resistant to bending fatigue.

A left lay rope is one in which the strands form a left-hand helix similar to the threads of a left-hand screw thread. Left lay rope has its greatest usage in oil fields on rod and tubing lines, blast hole rigs, and spudders where rotation of right lay would loosen couplings. The rotation of a left lay rope tightens a standard coupling.

When selecting a wire rope sling to give the best service, there are four characteristics to consider: strength, fatigue (ability to bend without distortion), ability to withstand abrasive wear, and ability to withstand abuse.

Fiber rope and synthetic web slings are used primarily for temporary work, such as construction and painting jobs, and in marine operations. They also are the best choice for use on expensive loads, highly finished parts, fragile parts, and delicate equipment. Fiber rope deteriorates on contact with acids and caustics. Fiber ropes slings, therefore, must not be used around these substances unless the manufacturer recommends them for that use.

- Slings shall be:
  - Visually inspected by a competent person prior to use.
  - Attached securely to their loads.
  - Padded or protected with softeners from the sharp edges of their loads.
  - Free from defects and removed from service if damaged or defective.
- Rigging shall be performed by competent riggers only.
- All employees shall remain a safe distance from suspended loads and loads that are about to lifted.
- Suspended loads shall avoid all obstruction.
- Hands or fingers shall not be placed between the sling and its load while the sling is being tightened around the load or at any other time.
- Shock loading is prohibited.

5.10.4 Sling and Rigging Maintenance Program

A maintenance program shall be used when using wire ropes, chains and slings as follows:

- Any defective sling shall be removed from service immediately and made permanently unusable. Refer to the manufacturer's specifications for determining when a sling is defective.
- Prior to the initial use, any new, repaired or reconditioned chain sling shall be proof-tested by the manufacturer and the applicable certification stored on file.

5.10.5 Sling and Rigging Inspection Program

A sling/rigging equipment inspection checklist is included as Exhibit 4. At a minimum, slings shall be inspected prior to use and documentation of the inspection shall be readily available.

Inspections of slings, shackles, eyebolts and wire ropes shall be conducted by a competent person prior to each shift the equipment is used. Visually inspect lifting equipment for damage before use. Synthetic fabric slings, wire rope slings and steel alloy chain slings shall have a legible load rating attached. If the load rating is missing or cannot be read, the sling shall be taken out of service.

When inspecting alloy steel chain slings, pay special attention to any stretching, wear in excess of the allowances made by the manufacturer, and nicks and gouges. These signs indicate that the sling may be unsafe and they must be removed from service. For an Arcadis lift, Arcadis must be certain to inspect the total length of the sling, periodically looking for stretching, binding, wear, or nicks and gouges. If a sling has stretched so that it is now more than three percent longer than when it was new, it is unsafe and must be discarded.

The qualified operator or rigger should check the twists or lay of the wire rope sling. If ten randomly distributed wires in one lay are broken, or five wires in one strand of a rope lay are damaged, the sling must not be used. It is not sufficient, however, to check only the condition of the wire rope. End fittings and other components should also be inspected for any damage that could make the sling unsafe.

When inspecting a fiber rope sling, look first at its surface. Look for cuts, gouges, or worn surface areas; dry, brittle, scorched, or discolored fibers; or melting or charring of any part of the sling. If any of these conditions are found, the Lift Leader or Operator must be notified and a determination made regarding the safety of the sling. If the sling is found to be unsafe, it must be discarded.

Deficiencies or hazards that are found during an inspection shall be corrected before the slings, shackles, eyebolts and wire ropes are placed into service. The operator or rigger shall approve and sign off on any corrective actions or repairs of rigging prior to use. It should be noted that fiber ropes and synthetic webs are generally discarded rather than serviced or repaired. Riggers and Operators must always follow the manufacturer's recommendations.

Shift Inspection

A competent person must begin a visual inspection prior to each shift the equipment is used, which must be completed before or during that shift. The inspection must consist of observation of wire ropes (running and standing) that are likely to be in use during the shift for apparent deficiencies. Untwisting (opening) of wire rope or booming down is not required as part of this inspection.

Where a wire rope is required to be removed from service under this section, either the equipment (as a whole) or the hoist with that wire rope must be tagged-out until the wire rope is repaired or replaced.

Slings and rigging equipment shall be inspected prior to each use by a competent person to verify that they are in proper working order:

- Damaged or defective slings shall be destroyed.
- Damaged or defective rigging equipment shall be tagged "Do Not Use."
- Under no circumstances shall any slings and rigging equipment in need of inspection or repair remain in service.

Monthly Inspection

Slings and rigging equipment shall be inspected monthly by a competent person:

- This inspection shall be documented on an inspection form that will be retained by the competent person until the sling is taken out of service.
- Employees using slings and rigging equipment shall verify that the marking system remains legible between inspections and/or that the monthly inspection forms are on file.

Slings or rigging equipment with illegible marking systems shall be considered unsafe and shall be removed from service and made unusable.

Annual Inspection

Slings and rigging equipment shall be inspected on an annual basis by a qualified person:

- This inspection shall be indicated by an attached marking system.
- Employees using slings and rigging equipment shall verify that the marking system remains legible between inspections.

5.11 Standard Hand Signals for Lifting Operations

For effective communication of important information while lifting, a standard of universal hand signals has been developed. Exhibit 5 – Standard Hand Signals for Crane Operators describes these hand signals.

The following rules for successful use of hand signals shall be used:

- One trained and competent individual shall be designated as the signal person to communicate with the operator. The signal person shall be positioned to have continuous visual contact with the operator. If visual contact cannot be maintained, a Critical Lift Plan should be developed.
- The signal person should wear clothing that allows him/her to be easily seen by the operator. This includes a high visibility reflective traffic vest.
- Hand signals to the mobile crane/lift equipment operator should be in accordance with the standards prescribed in the relevant local and federal regulations for the type of crane being used.
- Voice communications equipment can be used for lifts, however, it is required if the line of sight with the signal person is not possible.
- Constant visual or audio communication is always required between the operator and the signal person.
- Some special operations may require additions or modifications to the standard hand signals. For such cases, the operator and signal person shall agree upon and thoroughly understand these special or nonstandard signals, which shall not be in conflict with the standard signals.
- If communication is interrupted or lost, the operator shall stop moving the load immediately until communication is re-established.

5.12 Moving and Lifting the Load

Moving and lifting of a load demands complex requirements to complete a task safely and successfully.

The following requirements shall be fulfilled:

- In the case of personnel changes during the lift, the lift plan, lift permit and the JSA shall be reviewed prior to proceeding with the work. If a change in rigging and set up (e.g., change to a different size of rigging components) occurs during a lift, a new permit shall be required. In general, any change in the conditions of the lift (i.e., wind, weather, etc.) requires “Stop Work” and a review of the permit with reissuance.
- When multiple personnel are involved in a lift, there can be only one designated signal person.
- Hoisting and rigging operations for critical lifts require a designated Lift Leader who shall be present at the lift site during the entire lifting operation. The Lift Leader designation shall be by written instructions, specific verbal instructions for the particular job or clearly defined responsibilities within the crew’s organizational structure. If only one person is conducting the lift, that person is the designated Lift Leader. The designated Lift Leader shall verify that the load is correctly rigged.
- When eyebolts or other lifting attachments are used, verify that they are of sufficient strength and are used in accordance with the manufacturer’s requirements. Eyebolts shall not be side-loaded.
- Personnel near the lifting operations who are not directly involved with the lift shall stay out of the area of maximum boom radius plus swing distance of rigging. The supervisor may establish this radius based on the site specifics and risk assessment.
- In order to prevent worker injury, use either permanent or temporary barricades to block off accessible areas within the swing radius of the rear of the rotating superstructure of the crane.
- Counterweight shall never swing outside of the barricaded area.
- Do not carry loads over people. Personnel shall not pass under suspended loads or the loaded crane boom. Never allow anyone to get close to or under the load.
- Do not work on suspended loads.
- No one shall be on the load, hook or rigging during hoisting, lowering or swinging of the load or traveling with the lifting equipment, except as stated in Section 5.5 Non-critical Lift or Incidental Lift.
- Suspended loads shall not be unattended unless they are physically secured to prevent unintended movement.
- Tag lines are the preferred method to control the load. Evaluate the need for tag lines in the lifting JSA. Only the Lift Leader can approve the decision not to use tag lines. Additional risks associated with handling a load without tag lines will be addressed in the JSA.
- The load weight should include the weight of the load, block, ball, lattice extension, jib, hoist rope, rigging and any other weight that would affect the gross load.

- Avoid placing hands on loads. Where there is no alternative but to physically guide or stab loads into place by hand, implement precautions to minimize exposure to personnel.
- Secure and balance the load in the sling or lifting device before it is lifted more than a few inches.
- During the planning of the lift, if clearances from structures are a concern, station an individual to observe the clearance and warn the signal person of any impeding danger.
- If the potential exists for people to move into the area of the lift, assign a person to control access to the area. The individual shall be located outside any pitch points in a position that offers a view of the area of concern.

5.13 Personal Protective Equipment

PPE for lifting operations will include, at minimum:

- Steel toed boots
- Safety glasses
- High visibility vests (min. class II)
- Hard hats

PPE may be upgraded based on working conditions as determined by the hazard analysis or by direction of Lift Leader or Project Manager.

5.14 Controlling Entity

Where Arcadis is considered the controlling entity for a project (e.g., overall responsibility for the construction of the project - its planning, quality and completion), Arcadis must:

1. Ensure that ground preparations necessary to meet the following requirements are provided:

    - The equipment must not be assembled or used unless ground conditions are firm, drained, and graded to a sufficient extent so that, in conjunction (if necessary) with the use of supporting materials, the equipment manufacturer's specifications for adequate support and degree of level of the equipment are met. The requirement for the ground to be drained does not apply to marshes/wetlands.

2. Inform the user of the equipment and the operator of the location of hazards beneath the equipment set-up area (such as voids, tanks, utilities) if those hazards are identified in documents (such as site drawings, as-built drawings, and soil analyses) that are in the possession of the controlling entity (whether at the site or off-site) or the hazards are otherwise known to that controlling entity.

3. Discuss ground preparations with the Assembly/Disassembly director or the operator if either determines that ground conditions do not meet the requirements in paragraph 1 of this section. The discussion is needed so that, with the use of suitable supporting materials/devices (if necessary), the requirements in paragraph 1 of this section can be met.

4. Institute a system to coordinate operations where any part of a crane/derrick is within the working radius of another crane/derrick. If there is no controlling entity, the employer (if there is only one employer operating the multiple pieces of equipment), or employers, must institute such a system.

6. TRAINING

OSHA regulations require that only qualified or certified personnel operate cranes, hoists and lifting equipment. In addition, only trained, qualified and competent personnel can perform rigging or work in the role as a Lift Leader or Signal Person. Where the work requires Arcadis staff to be trained as a crane operator, rigger, signal person or inspection or maintenance/repair personnel, Arcadis shall provide this training at no cost to the employee. The training provider shall include a mechanism for verifying employee comprehension of the work process and associated equipment by a written test and observation and evaluation by a competent trainer. Specific competency requirements regarding lifting are addressed below.

In general, Arcadis does not act as a designated Operator, Lift Leader, Rigger or Signal Person (Spotter). In the event that an Arcadis staff member wishes to be qualified/certified as a designated Operator, Lift Leader, Rigger or Signal Person, Corporate H&S must be contacted **prior to** taking any steps, including attendance at a training course, to be so qualified/certified.

There may be state specific licensing requirements for machinery and hoisting operators within the state of operation. For further information regarding this refer to the state specific standards referenced in Exhibit 7 of this HSS.

6.1 Mobile Crane or Derrick with Max Rated Hoisting Capacity (2000 lbs. or less)

In general, this is the type of lifting operation that Arcadis staff would be directly involved with.

Operators of this equipment are exempted from the General and Crane Operator training requirements detailed in Section 6.2 and 6.4 of this HSS and the Qualified Rigger requirements detailed in Section 6.5 of this HSS. However, Arcadis must still ensure that each operator is trained on the safe operation of the type of equipment the operator will be using prior to operating the equipment.

Signal persons, if used under this scenario, must be adequately trained but need not meet the qualification requirements detailed in Section 6.6 of this HSS.

Documentation of this training provided by the manufacturer, equipment vendor or other qualified training instructor/vendor must be documented and submitted to the Training Team.

6.2 Training – Power Line Safety Training Requirements

If Arcadis staff will be performing lift operations, Arcadis shall ensure that each Arcadis operator, rigger and signal person assigned to work with cranes or other hoisting equipment is made aware of the following requirements and that these topics will be included in third-party vendor training curriculum (section 6.1 excluded):

1. The procedures to be followed in the event of electrical contact with a power line. Such training must include:

    a. Information regarding the danger of electrocution from the operator simultaneously touching the equipment and the ground.

    b. 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.

    c. The safest means of evacuating from equipment that may be energized.

    d. The danger of the potentially energized zone around the equipment (step potential).

    e. The need for crew in the area to avoid approaching or touching the equipment and the load.

    f. Safe clearance distance from power lines.

2. Power lines are presumed to de-energized unless the utility owner/has been and continues to be de-energized and visibly grounded at the worksite.

3. Power lines are presumed to be uninsulated unless the utility owner/ operator or a registered engineer who is a qualified person with respect to electrical power transmission and distribution confirms that a line is insulated.

4. The limitations of an insulating link/device, proximity alarm, and range control (and similar) device, if used.

5. The procedures to be followed to properly ground equipment and the limitations of grounding.

6. To prevent employees from entering swing radius hazard areas Arcadis will advise/train each employee assigned to work on or near the equipment (''authorized personnel'') in how to recognize struck-by and pinch/crush hazard areas posed by the rotating superstructure.

Employees working as dedicated spotters must be trained to enable them to effectively perform their task, including training on the applicable requirements of this section.

6.3 Lift Leader Competence

To be competent as a Lift Leader under the Arcadis HSS, the person shall meet the criteria as either a qualified operator or a qualified rigger.

6.4 Crane Operator Qualification and Certification

To be qualified or certified as a crane operator, Arcadis staff must meet one of these four training qualification criteria:

1. Be certified by an accredited crane operator testing organization. Hoisting and rigging personnel certified by a nationally recognized certifying organization or a state/local agency recognized by Federal OSHA may be accepted as having met the basic qualification requirements for both construction and general industry hoisting and rigging operations. Certification issued under this paragraph is valid for 5 years.

   Note: With respect to certification from an accredited testing organization, an operator must be certified for the *type* and *capacity* of crane he or she is going to operate. Each accredited testing organization develops its own categories for crane type and capacity;

2. Qualification by an audited employer program. A qualification under this paragraph is not portable and is valid for 5 years;

3. Qualification by the U.S. military. Certification issued under this paragraph is valid for the period of time stipulated by the issuing entity; or

4. Licensing by a government entity. Certification issued under this paragraph is valid for the period of time stipulated by the licensing department/office, but no longer than 5 years;

As required by state regulations, Arcadis staff and/or subcontractor operating cranes or derricks may need to be certified/licensed to operate this type of equipment in certain states.

Exceptions: Operator qualification or certification under this section is not required for operators of derricks (*see* OSHA 29 CFR § 1926.1436), sideboom cranes (*see* OSHA 29 CFR § 1926.1440), or equipment with a maximum manufacturer-rated hoisting/lifting capacity of 2,000 pounds or less (*see* OSHA 29 CFR § 1926.1441).

6.4.1 Pre-qualification/certification training period

An employee who is not qualified or certified is permitted to operate equipment only as an operator-in-training and only where the following requirements are met:

1. Arcadis must provide each operator-in-training with sufficient training prior to operating the equipment to enable the operator-in-training to operate the equipment safely under limitations established by this section (including continuous monitoring) and any additional limitations established by Arcadis.

2. The tasks performed by the operator-in-training while operating the equipment must be within the operator in-training's ability.

3. While operating the equipment, the operator-in-training must be continuously monitored by an individual (''operator's trainer'') who meets all of the following requirements:

   - The operator's trainer is an employee or agent of the operator-in-training's employer
   - The operator's trainer is either a certified operator under this section, or has passed the written portion of a certification test and is familiar with the proper use of the equipment's controls.

- While monitoring the operator-in-training, the operator's trainer performs no tasks that detract from the trainer's ability to monitor the operator-in-training.
- For equipment other than tower cranes: The operator's trainer and the operator-in-training must be in direct line of sight of each other. In addition, they must communicate verbally or by hand signals. For tower cranes: The operator's trainer and the operator-in-training must be in direct communication with each other.

4. Continuous monitoring. The operator-in-training must be monitored by the operator's trainer at all times, except for short breaks where all of the following are met:
   - The break lasts no longer than 15 minutes and there is no more than one break per hour.
   - Immediately prior to the break the operator's trainer informs the operator-in-training of the specific tasks that the operator-in-training is to perform and limitations to which he/she must adhere during the operator trainer's break.
   - The specific tasks that the operator-in-training will perform during the operator trainer's break are within the operator-in-training's abilities.
5. The operator-in-training must not operate the equipment in any of the following circumstances:
   - If any part of the equipment, load line or load (including rigging and lifting accessories), if operated up to the equipment's maximum working radius in the work zone could get within 20 feet of a power line that is up to 350 kV, or within 50 feet of a power line that is over 350 kV.
   - If the equipment is used to hoist personnel.
   - In multiple-equipment lifts.
   - If the equipment is used over a shaft, cofferdam, or in a tank farm.

6.5 Rigger Competence

To be competent as a rigger, the person shall complete a formal accredited or nationally recognized rigging program or its equivalent.

A *qualified rigger* is a rigger who meets the criteria for a qualified person. Arcadis (Corporate H&S and/or Lift Leader) must determine and document whether a person is qualified to perform specific rigging tasks. Each *qualified rigger* may have different credentials or experience. A *qualified rigger* is a person that:

- possesses a recognized degree, certificate, or professional standing, or
- has extensive knowledge, training, and experience and can successfully demonstrate the ability to solve problems related to rigging loads.

Staff designated as a *qualified rigger* must have the ability to properly rig the load for a particular job. It does not mean that a rigger must be qualified to do every type of rigging job.

Determining whether a person is a *qualified rigger* is based on the nature of the load, lift, and equipment used to hoist that load plus that person's knowledge and experience. A

certified/qualified operator may meet the requirements of a *qualified rigger*, depending on the operator's knowledge and experience with rigging.

6.6 Signal Person (Spotter) Competence

To meet the criteria as a Qualified Signal Person, Arcadis staff shall:

- Complete a formal signaler training program or its equivalent and have documentation from a third party qualified evaluator showing that he or she meets the qualification requirements.
- Training documentation will be submitted to and maintained by the Arcadis Training Team.

6.7 Retraining

Arcadis shall provide refresher training in relevant topics for each employee when, based on the conduct of the employee or an evaluation of the employee's knowledge, there is an indication that retraining is necessary.

7. REFERENCES (regulation citation, technical links, publications, etc.)

OSHA 29 CFR Part 1926 Subpart CC- Cranes and Derricks in Construction

OSHA 29 CFR Part 1926.251 Rigging Equipment for Material Handling

OSHA 29 CFR Part 1910.179 Overhead and Gantry Cranes

OSHA Small Entity Compliance Guide for Final Rule for Cranes and Derricks in Construction

Department of Energy Hoisting and Rigging Standard - 1090-2011

8. RECORDS

Record Maintenance –All records regarding hoisting and rigging, which include permits and inspections must be maintained on site and/or in the project files. Employee training records will be maintained per Arcadis training recordkeeping requirements.

9. APPROVALS AND HISTORY OF CHANGE

Approved By: Julie Santaniello, CSP – Corporate H&S, Manager of Technical Programs

Implementation Date 28 January 2014	Arcadis HS Standard Name Hoisting and Rigging (Cranes, Mobile Cranes, Pile Drivers, Derricks, and variations of such equipment)	ARCADIS Design & Consultancy for natural and built assets
Revision Date 26 July 2016	Arcadis HS Standard No. ARC HSCS003	Revision Number 03

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
28 January 2014	01	Brent Oakeson and Amanda Tine / Tony Tremblay and James Briscoe	Original document
26 March 2014	02	Amanda Tine/Tony Tremblay	Added reference to potential for state specific licensing in section 6 and added hyperlink to MA 520 CMR 6.00 in Exhibit 7
26 July 2016	03	Sharon Lingle/Julie Santaniello	Reformatted text into the new Arcadis-logoed format; added “Rigging equipment not in use shall be removed from the immediate work area so as not to present a hazard to employees” to Section 5.1.

Implementation Date 28 January 2014	Arcadis HS Standard Name Hoisting and Rigging (Cranes, Mobile Cranes, Pile Drivers, Derricks, and variations of such equipment)	ARCADIS Design & Consultancy for natural and built assets
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Exhibit 1 – Definitions

Accessory – **s**tandard hardware items, such as eye bolts, shackles, bolts, etc., used to attach the sling to the load.

Attachments - any device that expands the range of tasks that can be done by the equipment.

Before Use Inspection – a walk-around visual examination, prior to daily use, to detect any apparent material defects for lifting operations of the equipment that may constitute a hazard.

Boom – long structural member that supports the upper hoisting tackle on a crane or derrick. A horizontal structure that can be moved up and down, and can be extendible, cantilevered or articulating.

Competent person - means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Controlling entity - means an employer that is a prime contractor, general contractor, construction manager or any other legal entity which has the overall responsibility for the construction of the project--its planning, quality and completion

Crane/Derrick – a fixed or mobile machine that has a hoisting mechanism as an integral part; used for lifting and lowering a load and moving it horizontally.

Crane or Hoist Operator – means a person who is operating the equipment.

Critical Lift – a lift in which the dropping, upset or collision of parts, components or assemblies could present a significant risk of personal injury or property damage. A lift can also be designated as critical by Arcadis or a subcontractor because of special circumstances or hazards not mentioned or recognized in this document.

Dedicated spotter - to be considered a dedicated spotter, the individual must meet Signal person qualifications and his/her sole responsibility is to watch the separation between the power line and the equipment, load line and load (including rigging and lifting accessories), and ensure through communication with the operator that the applicable minimum approach distance is not breached. Dedicated Spotter must:

- Be equipped with a visual aid to assist in identifying the minimum clearance distance. Examples of a visual aid include, but are not limited to: A clearly visible line painted on the ground; a clearly visible line of stanchions; a set of clearly visible line of-sight landmarks (such as a fence post behind the dedicated spotter and a building corner ahead of the dedicated spotter);
- Be positioned to effectively gauge the clearance distance;
- Where necessary, use equipment that enables the dedicated spotter to communicate directly with the operator; and
- Give timely information to the operator so that the required clearance distance can be maintained.

Directly under the load - means a part or all of an employee is directly beneath the load.

Encroachment Prevention Measures - (1) Conduct a planning meeting with the operator and the other workers who will be in the area of the equipment or load to review the location of the

power line(s), and the steps that will be implemented to prevent encroachment/electrocution. (2) If tag lines are used, they must be non-conductive. (3) Erect and maintain an elevated warning line, barricade, or line of signs, in view of the operator, equipped with flags or similar high-visibility markings, at 20 feet from the power line or at the minimum approach distance under Table 1 of this HSS. If the operator is unable to see the elevated warning line, a dedicated spotter who is in continuous contact with the operator must be used in addition to one of these measures:

1. A proximity alarm set to give the operator sufficient warning to prevent encroachment;
2. A device that automatically warns the operator when to stop movement, such as a range control warning device. Such a device must be set to give the operator sufficient warning to prevent encroachment.
3. A device that automatically limits range of movement, set to prevent encroachment.
4. An insulating link/device, as defined in OSHA § 1926.1401, installed at a point between the end of the load line (or below) and the load.

Hoist – means a mechanical device for lifting and lowering loads by winding a line onto or off a drum.

Hoisting – the act of raising, lowering or moving a load in the air with equipment covered in this standard.

Lifting Operations Permit – a document issued giving the operator the approval to conduct lifting activities. The permit is required prior to certain types of lifts as defined in this standard.

Lift Plan – a document which details how the lift will be completed, under what conditions the lift can proceed or when it must be prohibited, how personnel will be protected, and what the limitations are of the lift.

Load – the objects being hoisted and/ or the total weight of the objects and load-attaching equipment on the equipment.

Load Rating – the lifting capacity for various angles and positions of a crane/ hoist/ boom.

Load Test – a nondestructive tension test performed to verify the rated working load limit of a sling or item of tooling. Load tests never exceed the rated capacity.

Mobile Crane –a lifting device incorporating a cable suspended lattice boom or hydraulic telescopic boom designed to be moved between operations by transport over the road.

Ordinary Lift – a non-critical lift. A classification of a type of lift that involves general lifting, hoisting and rigging equipment. The use of equipment such as cranes, backhoes, track hoes, front-end loaders, side loaders and similar earth-moving equipment for lifting according to its design.

Operating Radius – the horizontal distance from the axis of rotation to the center of gravity of the freely suspended load.

Qualified Evaluator (not a third party) - means a person employed by the signal person's employer who has demonstrated that he/she is competent in accurately assessing whether individuals meet the Qualification Requirements for a signal person.

Qualified Evaluator (third party) - means an entity that, due to its independence and expertise, has demonstrated that it is competent in accurately assessing whether individuals meet the Qualification Requirements for a signal person.

Qualified Inspector – an experienced craftsperson or engineer who has demonstrated the ability or competency to inspect equipment.

Q**ualified Person -** means a person who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, successfully demonstrated the ability to solve/resolve problems relating to the subject matter, the work, or the project.

Qualified Rigger - is a rigger who meets the criteria for a qualified person. The person designated as the *qualified rigger* must have the ability to properly rig the load for a particular job. Determining whether a person is a qualified rigger is based on the nature of the load, lift, and equipment used to hoist that load plus that person's knowledge and experience. A certified/qualified operator may meet the requirements of a qualified rigger, depending on the operator's knowledge and experience with rigging.

Rated Capacity – the maximum load permitted on the sling, lift fixture, shackles, tools, etc. under specified working conditions. Also called safe working load or working load. Factors for the rated capacity include configuration, radii, boom length, and other parameters of use.

Rigging - refers to two things: the process of safely moving loads with slings, hoists, jacks, and other types of lifting equipment and the equipment used to lift and move these loads.

Rigger – an individual with the appropriate training, as outlined in this standard, and demonstrated knowledge, competence and skill in the safe operation of the appropriate rigging equipment.

Shock Load – an undesirable event arising from sudden accelerations and decelerations during a lifting operation where a cable, rope or similar sling device is utilized.

Tagline – means a rope attached to a lifted load for purposes of stabilizing a hoisted load, and controlling load spinning or pendular motions.

Two blocking - means a condition in which a component that is uppermost on the hoist line such as the load block, hook block, overhaul ball, or similar component, comes in contact with the boom tip, fixed upper block or similar component. This binds the system and continued application of power can cause failure of the hoist rope or other component.

Visual Inspection – a thorough visual inspection of components to uncover damage, excessive wear, deformation or signs of deterioration which may affect the safe operation of the equipment.

Wire rope - means a flexible rope constructed by laying steel wires into various patterns of multi-wired strands around a core system to produce a helically wound rope.

Implementation Date 28 January 2014	Arcadis HS Standard Name Hoisting and Rigging (Cranes, Mobile Cranes, Pile Drivers, Derricks, and variations of such equipment)	ARCADIS Design & Consultancy for natural and built assets
Revision Date 26 July 2016	Arcadis HS Procedure No. ARC HSCS003	Revision Number 03

Exhibit 2 – Lifting Operation Permit

ARCADIS Design & Consultancy for natural and built assets

Lifting Operations Permit (Critical Lift Plan)

Project Name:	**Date:**
Project Location:	**Project Manager:**

Weight of Load Estimated or Known (Circle One) _____	Method by Which Weight was determined: _____	Center of Gravity was Estimated or Calculated (circle one): _____

Crane (if the answer to any of the following questions is NO, lifting operations shall not proceed)	Yes	No	N/A
1. Was a pre-lifting operations meeting held?	☐	☐	☐
2. Is the yearly crane/hoist inspection current and documented?	☐	☐	☐
3. Has the daily visual inspection been completed? (copy attached to permit)	☐	☐	☐
4. Are safety devices (e.g., two-block) installed and tested?	☐	☐	☐
5. Has qualified person assessed and accounted for wind and other environmental conditions?	☐	☐	☐
6. Is wind speed below manufacturer specified limit or 30 miles per hour (26.1 knots; 48.3 km/hour) – whichever is more conservative? If wind speed exceeds manufacturers limit or 30 mph, lifting operations shall not proceed	☐	☐	☐
7. Have precautions been established to keep other personnel out of the lift area?	☐	☐	☐
8. Was the need to protect the swing area and lift/landing zones been considered?	☐	☐	☐
9. Has the ground stability been assessed and is the ground stability adequate for the lift?	☐	☐	☐
Load (if the answer to any of the following questions is NO, lifting operations shall not proceed)	**Yes**	**No**	**N/A**
10. Has the need for taglines been evaluated and addressed?	☐	☐	☐
11. Is the load to be lifted stable? (no liquid or other material that could shift load)	☐	☐	☐
12. Have the lifting lugs and pad eyes been inspected?	☐	☐	☐
13. Have we identified/ accounted for the characteristics, weight, dimensions, center of gravity, and whether the item to be moved contains any hazardous or toxic materials?	☐	☐	☐
Critical Lift Assessment (if the answer to any of the following questions is YES, a Critical Lift Plan must be completed	**Yes**	**No**	**N/A**
14. Could loss of control of the item being lifted result in a declaration of an emergency?	☐	☐	☐
15. Could mishandling or dropping of the load result in irreplaceable damage or delays that involve a negative impact of facility or project site?	☐	☐	☐
16. Does the total load to be lifted exceed 75% of the rated capacity of the crane? (no lift is allowed if it exceeds 90% of the load chart for given crane configuration)	☐	☐	☐
17. Does the load require exceptional care in handling because of size, weight, shape, close tolerance or high susceptibility to damage?	☐	☐	☐
18. Is this a lift where the load cannot be reasonably estimated?	☐	☐	☐
19. Does this lift require multiple cranes for the lift, or the use of two or more cranes or lifting devices to lift one load simultaneously?	☐	☐	☐
20. **Will this lift be performed while the operator of the lifting equipment cannot see the load? If yes, answer the following questions:** **Insufficient communication between the signal person, hoist operator and/or lift leader?** Detail the type of communication (circle one): RADIO RELAYED HAND SIGNAL or OTHER	☐ ☐	☐ ☐	☐ ☐

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21. Are people being lifted?	☐	☐	☐
22. Will the load be lifted over the top of live process equipment/piping (e.g., gasoline, crude oil, natural gas, ~~etc~~)?	☐	☐	☐
23. Could the crane come within 20 feet of an energized power line? (all power lines must be considered to be energized without proper verification) (if the answer is YES, contact the Electrical Service Provider to determine the actual electric line voltage and implement encroachment prevention measures (refer to section 5.2.1 of HSS)	☐	☐	☐

Pre-Lift Notes:	**Post Lift Notes:**

Critical Lift Details	
Crane Make:	**Model #:**

Total Weight of Required Rigging:	
Total Weight of the Lift to be made:	
Additional Weight to be added to the load:	
Total Weight of the Lift:	
Allowable Load (from the load chart):	
Ratio Calculation: Total Lift Weight divided by the Crane Lift Weight Capacity x 100 (if value exceeds 90%, **STOP WORK**)	
Maximum Operating Boom Radius:	
Planned Operating Boom Radius:	

Rigging Diagram (attach separate page if needed):	**Crane Setup Diagram** (attach separate page if needed):

Emergency and Rescue Plan
Detail Emergency Planning and Notification Procedures (attach separate page if needed):

Critical Lift Plan Signatures

I certify that the weight of the lift is less than 90% of the allowable load (from the load chart) at the planned boom radius:

Lift Leader Name:	Lift Leader Signature:	Date:
Rigger Name:	Rigger Signature:	Date:
Crane/Hoist Operator Name:	Crane/Hoist Operator Signature:	Date:

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Exhibit 3 - Hoisting Equipment Inspection Checklist (Each Shift and Monthly)

General Equipment Inspection Items	OK	Defective	N/A	Date Corrected	Verified By
1. Control mechanisms	☐	☐	☐		
2. Drive mechanisms	☐	☐	☐		
3. Hydraulic system fluid level	☐	☐	☐		
4. Latches, Load Hook & Blocks	☐	☐	☐		
5. Wire Rope/Reeving or Chains	☐	☐	☐		
6. Cracked or Worn	☐	☐	☐		
7. Sheaves & Drums	☐	☐	☐		
8. Bridge Wheels and Bearings	☐	☐	☐		
9. Trolley and Rails	☐	☐	☐		
10. Hydraulic Hoses, Pump & Controls	☐	☐	☐		
11. Tires and Wheels (Where Applicable)	☐	☐	☐		
12. Bumpers/End Stops	☐	☐	☐		
13. Current Inspection Sticker	☐	☐	☐		
14. Capacity Posting	☐	☐	☐		
15. Electrical Disconnect Accessible	☐	☐	☐		
16. Electrical apparatus	☐	☐	☐		
17. Lubrication	☐	☐	☐		
18. Other Rigging Equipment (Synthetic Slings)	☐	☐	☐		
19. Structural	☐	☐	☐		
20. Ground conditions around the equipment for proper support	☐	☐	☐		
21. Equipment Level Position	☐	☐	☐		
22. Rails, rail stops, rail clamps and supporting surfaces when the equipment has rail traveling	☐	☐	☐		
23. Safety devices and operational aids	☐	☐	☐		
24. Personal Protective Equipment	☐	☐	☐		
Crane-Specific Inspection Items	**OK**	**Defective**	**N/A**	**Date Corrected**	**Verified By**
25. Manufacturer's Operating and Maintenance Manuals	☐	☐	☐		
26. Guarding	☐	☐	☐		
27. Swing Clearance Protection	☐	☐	☐		
28. High-Voltage Warning Sign	☐	☐	☐		
29. Boom Stops	☐	☐	☐		
30. Jib Boom Stops	☐	☐	☐		
31. Boom Angle Indicator	☐	☐	☐		
32. Boom Hoist Disconnect, Automatic Boom Hoist Shutoff	☐	☐	☐		
33. Two-Blocking Device	☐	☐	☐		
34. Power Controlled Lowering	☐	☐	☐		

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35. Leveling Indicating Device	☐	☐	☐		
36. Sheaves	☐	☐	☐		
37. Main Hoist and Auxiliary Drums System	☐	☐	☐		
38. Main Boom, Jib Boom, Boom Extension	☐	☐	☐		
39. Load Hooks and Hook Blocks	☐	☐	☐		
40. Air, Hydraulic Hoses Fittings and Tubing	☐	☐	☐		
41. Outriggers	☐	☐	☐		
42. Load Rating Chart	☐	☐	☐		
43. Wire Rope	☐	☐	☐		
44. Cab	☐	☐	☐		
45. Braking Systems	☐	☐	☐		
46. Turntable/Crane Body	☐	☐	☐		
47. Counterweight	☐	☐	☐		

An explanation of the inspection line items and the inspection procedures can be found as an attachment to this form. All items must be checked by a competent person (shift and monthly inspections) before using the equipment and rigging.

Date of Inspection:_____

Name of (Qualified) or (Competent) Inspector:_____

Signature of (Qualified) or (Competent) Inspector:_____

Shift or Monthly Inspection Action Item Requirement

If any deficiency is identified during a shift or monthly inspection, an immediate determination must be made by the competent person as to whether the deficiency constitutes a safety hazard. If the deficiency is determined to constitute a safety hazard, the equipment must be taken out of service until it has been corrected. See OSHA Regulation 29 CFR 1926.1417.

Annual Inspection Action Item Requirement

Annual inspections must be performed by a Qualified Person.

If any deficiency is identified, an immediate determination must be made by the qualified person as to whether the deficiency constitutes a safety hazard or, though not yet a safety hazard, needs to be monitored in the monthly inspections. If the qualified person determines that a deficiency is a safety hazard, the equipment must be taken out of service until it has been corrected, except when temporary alternative measures are implemented. If the qualified person determines that, though not presently a safety hazard, the deficiency needs to be monitored, the employer must ensure that the deficiency is checked in the monthly inspections.

Inspection Recordkeeping Requirements

This completed inspection form must be maintained in the project file for a minimum of 3 months.

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Equipment Line Item Inspection Guidance

1. Control mechanisms for maladjustments interfering with proper operation.
2. Control and drive mechanisms for apparent excessive wear of components and contamination by lubricants, water or other foreign matter.
3. Hydraulic system for proper fluid level
4. Latches, Load Hook & Blocks – Inspect the load hook for deformation, cracks, twist, expansion of throat opening, excessive wear or damage such as from chemicals or heat . Inspect the load blocks for obvious damage (cracks, wear, rust, etc.) and lubrication. Any damage that jeopardizes the workability of the equipment or its ability to carry a load should be noted.
5. Wire Rope, Wire Rope Reeving or Chains – Check the twists or lay of the wire rope sling. Inspect the wire rope for broken wires, distortion (e.g., kinking, bird-caging, chemical damage, etc.) and wire rope reeving (refers to the configuration of the wire rope, blocks and drum of the hoist for compliance with manufacturers specifications). End fittings and other components should also be inspected for any damage that could make the sling unsafe. Inspect chains for worn links, stretching, nicks, gouges, etc. Refer to the wire rope inspection category details below.
6. Cracked or Worn – Check for surface defects such as catches, binding, lubrication, etc.
7. Sheaves and Drums – Check for surface defects such as catches, binding, lubrication, etc.
8. Bridge Wheels and Bearings – Check wheels for damage/wear and bearings for damage and lubrication.
9. Trolley and Rails – Inspect trolley and rails for smooth operation, no damaged welds, proper connections, etc.
10. Hydraulic Hoses, Pump & Controls – Inspect hoses, pump and controls for leakage, splits/cracks in hoses and any obvious damage.
11. Tires/Wheels – For mobile hoists/cranes inspect the tires or wheels for proper inflation and check for damage. Ensure they are lubricated for smooth operation.
12. Bumpers/End Stops – Inspect bumpers and end stops to ensure they are in place and firmly secured.
13. Current Inspection Sticker – Ensure the annual inspection sticker is current. If not, contact ESH&A or Engineering Services for inspection.
14. Capacity Posting – Inspect the hoist/crane to ensure the unit is posted with the maximum weight load capacity.
15. Electrical Disconnect Accessible – For electrical hoists/cranes ensure the electrical disconnect is immediately accessible.
16. Electrical apparatus for malfunctioning, signs of apparent excessive deterioration, dirt or moisture accumulation.
17. Lubrication – Inspect all moving parts to ensure they move freely.
18. Rigging Equipment (Synthetic Slings, Chains): Inspect Synthetic Slings for melting or charring, acid or caustic burns, snags, punctures, tears or cuts, broken or worn stitches and distortion of hardware or fittings. Inspect Chains for stretching, binding, wear, nicks and gouges. Inspect Wire Ropes for kinking, bird caging, wear, broken wires, etc.
19. Structural – Inspect welds and frame for any obvious damage.
20. Ground conditions around the equipment for proper support, including ground settling under and around outriggers/stabilizers and supporting foundations, ground water accumulation, or similar conditions. This paragraph does not apply to the inspection of ground conditions for railroad tracks and their underlying support when the railroad tracks are part of the general railroad system of transportation that is regulated pursuant to the Federal Railroad Administration under 49 CFR part 213.
21. The equipment for level position within the tolerances specified by the equipment manufacturer's recommendations, both before each shift and after each move and setup.
22. Rails, rail stops, rail clamps and supporting surfaces when the equipment has rail traveling. This paragraph does not apply to the inspection of rails, rail stops, rail clamps and supporting surfaces

when the railroad tracks are part of the general railroad system of transportation that is regulated pursuant to the Federal Railroad Administration under 49 CFR part 213.

23. Safety devices and operational aids for proper operation.
24. PPE (Personal Protective Equipment) – Inspect PPE including gloves, steel-toed shoes and hard hats to ensure proper fit and effective protection.
25. Manufacturer's Operating and Maintenance Manuals - Manufacturer's operating and maintenance manuals shall accompany all mobile hoisting equipment. These manuals set forth specific inspection, operation and maintenance criteria for each mobile crane and lifting capacity.
26. Guarding - All exposed moving parts such as gears, chains, reciprocating or rotating parts are guarded or isolated.
27. Swing Clearance - Protection Materials for guarding rear swing area.
28. High-Voltage Warning Sign - High-voltage warning signs displaying restrictions and requirements should be installed at the operator's station and at strategic locations on the crane.
29. Boom Stops - Shock absorbing or hydraulic type boom stops are installed in a manner to resist boom overturning.
30. Jib Boom Stops - Jib stops are restraints to resist overturning.
31. Boom Angle Indicator - A boom angle indicator readable from the operator station is installed accurately to indicate boom angle.
32. Boom Hoist Disconnect, Automatic Boom Hoist Shutoff - A boom hoist disconnect safety shutoff or hydraulic relief to automatically stop the boom hoist when the boom reaches a predetermined high angle.
33. Two-Blocking Device - Cranes with telescoping booms should be equipped with a two-blocking damage prevention feature that has been tested on-site in accordance with manufacturer’s requirements. All cranes hydraulic and fixed boom used to hoist personnel must be equipped with two- blocking devices on all hoist lines intended to be used in the operation. The anti-two-blocking device has automatic capabilities for controlling functions that may cause a two-blocking condition.
34. Power Controlled Lowering - Cranes for use to hoist personnel must be equipped for power controlled lowering operation on all hoist lines. Check clutch, chains, and sprockets for wear.
35. Leveling Indicating Device - A device or procedure for leveling the crane must be provided.
36. Sheaves - Sheave grooves shall be smooth and free from surface defects, cracks, or worn places that could cause rope damage. Flanges must not be broken, cracked, or chipped. The bottom of the sheave groove must form a close fitting saddle for the rope being used. Lower load blocks must be equipped with close fitting guards. Almost every wire rope installation has one or more sheaves -- ranging from traveling blocks with complicated reeving patterns to equalizing sheaves where only minimum rope movement is noticed.
37. Main Hoist and Auxiliary Drums System - Drum crushing is a rope condition sometimes observed which indicates deterioration of the rope. Spooling is that characteristic of a rope which affects how it wraps onto and off a drum. Spoiling is affected by the care and skill with which the first larger of wraps is applied on the drum. Manufacturer's criteria during inspection usually specify:
    - Minimum number of wraps to remain on the drum.
    - Condition of drum grooves.
    - Condition of flanges at the end of drum.
    - Rope end attachment.
    - Spooling characteristics of rope.
    - Rope condition.
38. Main Boom, Jib Boom, Boom Extension - Boom jibs, or extensions, must not be cracked or corroded. Bolts and rivets must be tight. Certification that repaired boom members meet manufacturers original design standard shall be documented. Non-certified repaired members shall not be used until recertified.
39. Load Hooks and Hook Blocks - Hooks and blocks must be permanently labeled with rated capacity. Hooks and blocks are counterweighted to the weight of the overhaul line from highest hook

position. Hooks must not have cracks or throat openings more than 15% of normal or twisted off center more than 10' from the longitudinal axis. All hooks used to hoist personnel must be equipped with effective positive safety catches -especially on hydraulic cranes.

40. Air, Hydraulic, and Other pressurized Hoses Fittings and Tubing - Flexible hoses must be sound and show no signs of deterioration or leaking at the surface or its junction with the metal and couplings. Hoses must not show blistering or abnormal deformation to the outer covering and no leaks at threaded or clamped joints that cannot be eliminated by normal tightening or recommended procedures. There should be no evidence of excessive abrasion or scrubbing on the outer surfaces of hoses, rigid tubing, or hydraulic fittings. Lines for deterioration or leakage, particularly those which flex in normal operation.
41. Outriggers - Outrigger number, locations, types and type of control are in accordance with manufacturer's specifications. Outriggers are designed and operated to relieve all weight from wheels or tracks within the boundaries of the outriggers. If not, the manufacturer's specifications and operating procedures must be clearly defined. Outriggers must be visible to the operator or a signal person during extension or setting.
42. Load Rating Chart - A durable rating chart(s) with legible letters and figures must be attached to the crane in a location accessible to the operator while at the controls. The rating charts shall contain the following:
    - A full and complete range of manufacturer's crane loading ratings at all stated operating radii.
    - Optional equipment on the crane such as outriggers and extra counterweight which effect ratings.
    - A work area chart for which capacities are listed in the load rating chart, i.e. over side, over rear, over front.
    - Weights of auxiliary equipment, i.e. load block, jibs, boom extensions.
    - A clearly distinguishable list of ratings based on structural, hydraulic or other factors rather than stability.
    - A list of no-load work areas.
    - A description of hoistline reeving requirements on the chart or in operator's manual.
43. Wire Rope - Main hoist and auxiliary wire rope inspection should include examining for:
    - Broken wires,
    - Excess wear.
    - External damage from crushing, kinking, cutting or corrosion.
44. Cab - Contains all crane function controls in addition to mechanical boom angle indicators, electric wipers, dash lights, warning lights and buzzers, fire extinguishers, seat belts, horn, and clear unbroken glass (confirm no other deficiencies that would hamper the operator’s view).
45. Braking Systems - Truck cranes and self-propelled cranes mounted on rubber-tired chassis or frames must be equipped with a service brake system, secondary stopping emergency brake system and a parking brake system. Unless the owner/operator can show written evidence that such systems were not required by the standards or regulations in force at the date of manufacture and are not available from the manufacturer. The braking systems must have been inspected and tested and found to be in conformance with applicable requirements. Crawler cranes are provided with brakes or other locking devices that effectively hold the machine stationary on level grade during the working cycle. The braking system must be capable of stopping and holding the machine on the maximum grade recommended for travel. The brakes or locks are arranged to engage or remain engaged in the event of loss of operating pressure or power.
46. Turntable/Crane - Body Make sure that the rotation point of a crane gears and rollers are free of damage, wear and properly adjusted and the components are securely locked and free of cracks or damage. The swing locking mechanism must be functional (pawl, pin) and operated in the cab.
47. Counterweight - The counterweight must be approved and installed according to manufacturer’s specifications with attachment points secured.

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Defined categories for apparent deficiencies for Wire Rope Inspection:

1. Category I. Apparent deficiencies in this category include the following:
   a. Significant distortion of the wire rope structure such as kinking, crushing, unstranding, birdcaging, signs of core failure or steel core protrusion between the outer strands.
   b. Significant corrosion
   c. Electric arc damage (from a source other than power lines) or heat damage
   d. Improperly applied end connections.
   e. Significantly corroded, cracked, bent, or worn end connections (such as from severe service).
2. Category II. Apparent deficiencies in this category are:
   a. Visible broken wires, as follows:
      i. In running wire ropes: Six randomly distributed broken wires in one rope lay or three broken wires in one strand in one rope lay, where a rope lay is the length along the rope in which one strand makes a complete revolution around the rope.
      ii. In rotation resistant ropes: Two randomly distributed broken wires in six rope diameters or four randomly distributed broken wires in 30 rope diameters.
      iii. In pendants or standing wire ropes: More than two broken wires in one rope lay located in rope beyond end connections and/or more than one broken wire in a rope lay located at an end connection.
   b. A diameter reduction of more than 5% from nominal diameter.
3. Category III. Apparent deficiencies in this category include the following:
   a. In rotation resistant wire rope, core protrusion or other distortion indicating core failure.
   b. Prior electrical contact with a power line.
   c. A broken strand.

   The competent person must give particular attention to all of the following critical review items:
      i. Rotation resistant wire rope in use.
      ii. Wire rope being used for boom hoists and luffing hoists, particularly at reverse bends.
      iii. Wire rope at flange points, crossover points and repetitive pickup points on drums.
      iv. Wire rope at or near terminal ends.
      v. Wire rope in contact with saddles, equalizer sheaves or other sheaves where rope travel is limited.
4. Removal from service

a. If a Category I deficiency is identified, an immediate determination must be made by the competent person as to whether the deficiency constitutes a safety hazard. If the deficiency is determined to constitute a safety hazard, operations involving use of the wire rope in question must be prohibited until:

   i. The wire rope is replaced, or

   ii. If the deficiency is localized, the problem is corrected by severing the wire rope in two; the undamaged portion may continue to be used. Joining lengths of wire rope by splicing is prohibited. If a rope is shortened under this paragraph, the employer must ensure that the drum will still have two wraps of wire when the load and/or boom is in its lowest position.

b. If a Category II deficiency is identified, operations involving use of the wire rope in question must be prohibited until:

   i. Arcadis complies with the wire rope manufacturer's established criterion for removal from service or a different criterion that the wire rope manufacturer has approved in writing for that specific wire rope (see Sec. 1926.1417),

   ii. The wire rope is replaced (see Sec. 1926.1417), or

   iii. If the deficiency is localized, the problem is corrected by severing the wire rope in two; the undamaged portion may continue to be used. Joining lengths of wire rope by splicing is prohibited. If a rope is shortened under this paragraph, Arcadis must ensure that the drum will still have two wraps of wire when the load and/or boom is in its lowest position.

c. If a Category III deficiency is identified, operations involving use of the wire rope in question must be prohibited until:

   i. The wire rope is replaced (see Sec. 1926.1417), or

   ii. If the deficiency (other than power line contact) is localized, the problem is corrected by severing the wire rope in two; the undamaged portion may continue to be used. Joining lengths of wire rope by splicing is prohibited. Repair of wire rope that contacted an energized power line is also prohibited. If a rope is shortened under this paragraph, the employer must ensure that the drum will still have two wraps of wire when the load and/or boom is in its lowest position.

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Exhibit 4 – Sling/ Rigging Equipment Inspection Checklist

Sling and Rigging Inspection Items	OK	Defective	N/A	Date Corrected	Verified By
1. Slings and fastenings (check for any defects or damage)	☐	☐	☐		
2. Alloy steel chain slings (check for cracked master links, coupling links or other damaged components)	☐	☐	☐		
3. Alloy steel chain slings (check for wear, defective welds, deformation and increased length)	☐	☐	☐		
4. Alloy steel chain slings (check for cracked hooks that have been opened more than 15% of the normal throat opening or twisted more than 10 degrees from the plane of the unbent hook. These are to be removed from service immediately)	☐	☐	☐		
5. Wire rope slings (check for randomly distributed broken wires; any wear or scraping of one-third the original diameter of outside individual wires; for kinking, crushing, bird caging or any other distortion of the wire rope structure; evidence of heat damage; end attachments that are cracked, deformed or worn; corrosion of the rope or end attachments (i.e., external and internal core damage)	☐	☐	☐		
6. Synthetic web slings (check for acid or caustic burns).	☐	☐	☐		
7. Synthetic web slings (check for melting or charring of any part of the sling surface)	☐	☐	☐		
8. Synthetic web slings for snags, punctures, tears or cuts.	☐	☐	☐		
9. Synthetic web slings for broken or worn stitches.	☐	☐	☐		
10. Synthetic web slings for a distortion of fittings.	☐	☐	☐		
11. Synthetic web slings for the appearance of wear/overload indicator threads.	☐	☐	☐		

All items must be checked by a competent person (each shift and annual inspections) before using the sling.

Date of Inspection:_____

Name of Competent Inspector:_____

Signature of Competent Inspector:_____

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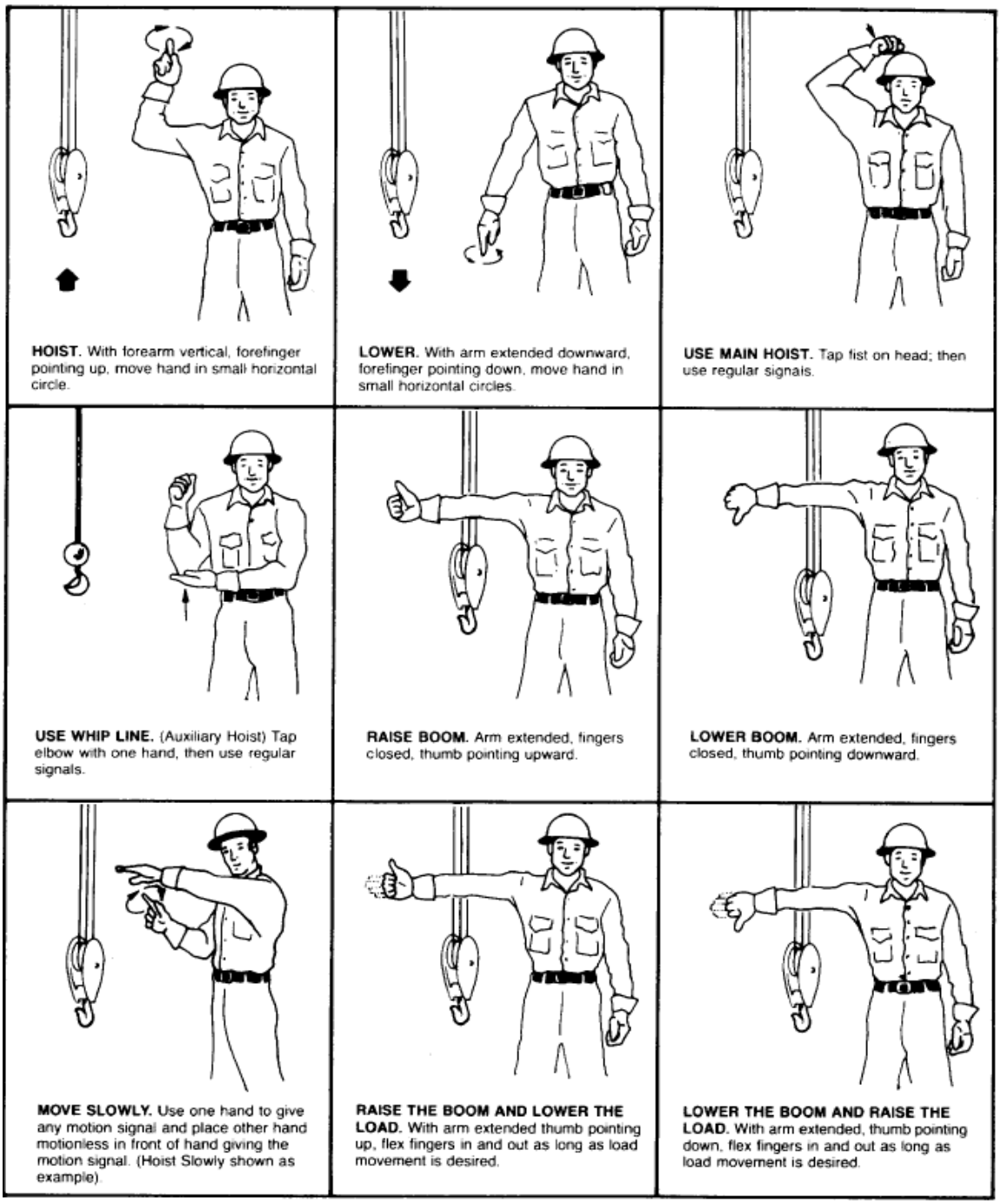
Exhibit 5 - Standard Hand Signals for Crane Operators



HOIST. With forearm vertical, forefinger pointing up, move hand in small horizontal circle.

LOWER. With arm extended downward, forefinger pointing down, move hand in small horizontal circles.

USE MAIN HOIST. Tap fist on head; then use regular signals.

USE WHIP LINE. (Auxiliary Hoist) Tap elbow with one hand, then use regular signals.

RAISE BOOM. Arm extended, fingers closed, thumb pointing upward.

LOWER BOOM. Arm extended, fingers closed, thumb pointing downward.

MOVE SLOWLY. Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal. (Hoist Slowly shown as example).

RAISE THE BOOM AND LOWER THE LOAD. With arm extended thumb pointing up, flex fingers in and out as long as load movement is desired.

LOWER THE BOOM AND RAISE THE LOAD. With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired.

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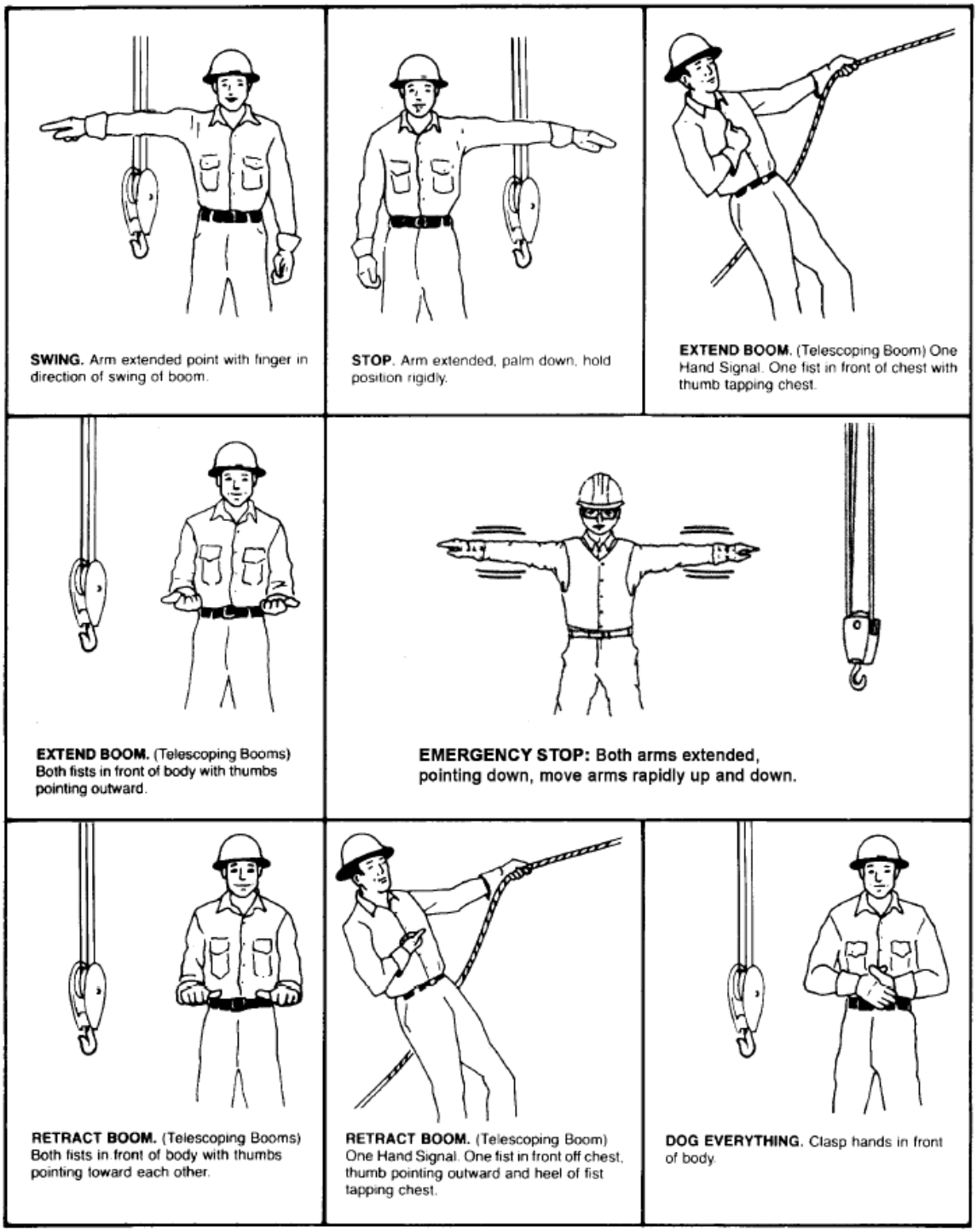

SWING. Arm extended point with finger in direction of swing of boom.

STOP. Arm extended, palm down, hold position rigidly.

EXTEND BOOM. (Telescoping Boom) One Hand Signal. One fist in front of chest with thumb tapping chest.

EXTEND BOOM. (Telescoping Booms) Both fists in front of body with thumbs pointing outward.

EMERGENCY STOP: Both arms extended, pointing down, move arms rapidly up and down.

RETRACT BOOM. (Telescoping Booms) Both fists in front of body with thumbs pointing toward each other.

RETRACT BOOM. (Telescoping Boom) One Hand Signal. One fist in front off chest, thumb pointing outward and heel of fist tapping chest.

DOG EVERYTHING. Clasp hands in front of body.

Exhibit 6 - Questions to Ask a Crane Operator

Question	Answer
What is your radius?	Should be the horizontal distance in feet from the center of rotation to the center of the hook.
What is your boom length?	Is a fixed number for lattice booms, measured from the boom heel pin to the center of the tip sheave? For a telescopic boom, length is given by an indicator.
How much weight is on the hook?	Should be the load plus all attached rigging.
May I see your load chart?	Should be an offer of a durable chart such as laminated paper, or a metal data plate riveted to the inside of the cab. A few of the newest cranes may have a digital chart on a screen similar to a computer screen.
What is the weight of your block (or ball)?	Should be on a data plate on the block or ball, but the operator must know this number.
What is your rope type, size and weight?	Should be type RB, ZB or similar code plus rope structure (such as 6x19) plus a rope diameter, plus a weight per foot of the rope. The answer should match one of the rope specifications on the load chart.
What is your net hook capacity?	Should be the gross capacity from the load chart less deductions for all attachments including blocks, balls, unused jibs, excess rope.
When was your last crane inspection?	Should be today's date.
When was your last annual inspection?	Should be available on a sticker, certificate or document on the crane.
When did you last check your level?	Should be today, and should not have been made with the target level in the crane. A carpenter's level should have been used each shift, plus any time the crane is moved to a new location.

If an operator cannot immediately and accurately answer any of these questions, they should be removed from service until they complete a training program. If an operator says "I don't need to know that, the computer does all that for me" there should be concern. The only acceptable reliance on a crane computer should be if the operator enters all of the data (boom length, block weight, etc.), the computer may serve as a backup to the operator, and to perform some load chart calculations to deduct the attachments from the internal load chart.

Implementation Date 28 January 2014	Arcadis HS Standard Name Hoisting and Rigging (Cranes, Mobile Cranes, Pile Drivers, Derricks, and variations of such equipment)	ARCADIS Design & Consultancy for natural and built assets
Revision Date 26 July 2016	Arcadis HS Procedure No. ARC HSCS003	Revision Number 03

EXHIBIT 7 - State Specific Crane Operation Requirements

The following states have standards that may exceed those of the federal standard for hoisting and lifting with cranes. This section highlights some of those state specific standards that may differ from federal standards. However, this is not a cumulative listing of all differences. If your office or work location is in a state that has specific crane operation standards, please review the regulations and ensure that state specific requirements are met. This includes any crane and operator certification, training or licensing requirements.

- California – General Industry Safety Orders. Subchapter 7, Group 13. Cranes and Other Hoisting Equipment
- California - Construction Safety Orders. Subchapter 4. Article 15. Cranes and Derricks in Construction
- 520 CMR 6.00: Hoisting Machinery (Massachusetts State Regulation)
- Michigan –General Industry Safety Standards. Part 18. Overhead and Gantry Cranes.
- Michigan – Construction Safety Standards. Part 10. Lifting and Digging Equipment.
- Washington – Chapter 296-155, WAC Construction Work. Part L – Cranes, Rigging and Personnel Lifting.

EXECUTIVE SUMMARY

This Health and Safety standard (HSS) establishes ARCADIS' minimum requirements for the conduct of activities that could result in ignitions, sparks and/or fire and for issuing permits to conduct work in such situations. The Hot Work Permitting process serves a dual purpose as an administrative control to prevent unauthorized work and to identify all precautions and restrictions necessary to do the work safely. The ARCADIS Hot Work Permit program is focused on hazard assessment, implementation of required hazard controls and verification of required training.

This HSS applies to all ARCADIS projects where hot work or other activities that can create fire.

Project and task managers are responsible for providing funding and implementing this HSS and associated standards on any project that requires Hot Work authorization and practices.

Where feasible, ARCADIS shall consider cold work alternatives before performing hot work.

Project personnel are responsible for completing Hot Work training as required by this HSS, and for following all hazard control processes designated by the Project Manager, Project Health and Safety Staff, and the project HASP.

Fire Watch personnel are primarily responsible for the protection of employees engaging in Hot Work activities as well as warning others in the area if complications arise

Hot wok operators shall obtain proper authorization to perform hot work operations via the Hot Work Permit and any client/site specific requirements and shall conduct activities per this standard to minimize and eliminate hot work hazards.

Corporate H&S with division and practice experts on a regular basis, shall review and update, as necessary, this standard.

ARCADIS personnel involved in hot work will be trained on this Hot Work HSS.

Fire watch personnel will be trained in the proper use of a fire extinguisher, fire extinguishing methods, and in section 4.3 of this HSS.

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

Hot Work permits and cancelled permits will be kept in the project files with copies of cancelled permits kept by Corporate H&S.

1. POLICY

ARCADIS understands the hazards and potential for injury that can result from unexpected ignitions, sparks, and/or fires. Based on this understanding, ARCADIS will implement the appropriate controls to minimize or eliminate the hazards of Hot Work. It is the practice of ARCADIS and its affiliated companies to implement appropriate, reasonable and practical procedures within acceptable and customary industry practices to promote the health and safety of its employees, and avoid and mitigate exposure of risk in the performance of their work.

2. PURPOSE AND SCOPE

2.1 Purpose

This Health and Safety standard (HSS) establishes ARCADIS' minimum requirements for the conduct of activities that could result in ignitions, sparks and/or fire and for issuing permits to conduct work in such situations.

The Hot Work Permitting process serves a dual purpose as an administrative control to prevent unauthorized work and to identify all precautions and restrictions necessary to do the work safely. The ARCADIS Hot Work Permit program is focused on hazard assessment, implementation of required hazard controls and verification of required training.

Issuing a permit does not, by itself, make a job safe; that can only be achieved through the acts of those preparing for the work, those supervising the work and those carrying it out. All ARCADIS employees and subcontractors must follow applicable policies and standards. The Hot Work HSS does not replace the need for all employees to review the site HASP prior to beginning work activity. All employees and subcontractors are expected to continually monitor the work environment using the ARCADIS TRACK process and to stop work in the event of an unsafe condition or deviation from approved procedures. ARCADIS has a supportive "stop work authority" policy that must be communicated to contractors and subcontractors as part of the Hot Work standard.

2.2 Scope

This HSS applies to all ARCADIS projects where hot work or other activities that can create fire. The Hot Work standard will be followed for such activities as, but not limited to: cutting, grinding, burning, welding, cad welding , use of non-explosion proof portable power tools or electrical equipment, hot taps, sandblasting, internal combustion engines (gas or diesel) or any other work capable of producing an ignition source. This HSS applies to all projects where ARCADIS employees, subcontractors and other effected personnel are or could be performing and or exposed to Hot Work practices.

Subcontractors and visitors are required to comply with the requirements outlined in this standard and Hot Work Permits, as well as all other applicable client requirements when working at ARCADIS controlled sites; or to their own equivalent procedures.

3. DEFINITIONS

Exhibit 1 includes relevant definitions to this HSS.

4. RESPONSIBILITIES

4.1 Project and Task Managers

Project and task managers are responsible for providing funding and implementing this HSS and associated standards on any project that requires Hot Work authorization and practices. In addition, the project or task manager is responsible for determining client requirements with respect to Hot Work authorization and practices. Project and Task Managers are responsible for ensuring that project staff has the appropriate and applicable training for Hot Work authorization and practices prior to those staff beginning work. In addition, PMs and TMs are responsible to:

- Verify that all hot work activities and areas susceptible to fire are properly identified and addressed within the project work plan, project health & safety plan, and/or other project-related documents.

- Verify that their divisional or project team employees have received the appropriate information, education and/or training provided by Corporate Health & Safety or qualified training source prior to conducting hot work activities.

- Verify that the proper hot work-related equipment, including personal protective equipment (PPE), atmospheric testing equipment, fire protection equipment and other appropriate safety equipment, is available for use by project employees.

- Verify that copies of the completed and canceled Hot Work Permits are properly disseminated to Corporate Health and Safety and retained with the project files

4.2 Project Personnel

Project personnel are responsible for completing Hot Work training as required by this HSS, and for following all hazard control processes designated by the Project Manager, Project Health and Safety Staff, and the project HASP. The project Site Safety Officer is to ensure all necessary site preparation, equipment preparation, monitoring, and review with personnel is complete prior to completing the Hot Work Permit. If project personnel believe that Hot Work procedures specified for a project are not complete, they should stop work and notify the project manager immediately and not proceed until authorized.

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

4.3 Fire Watch

Fire Watch personnel are primarily responsible for the protection of employees engaging in Hot Work activities as well as warning others in the area if complications arise. The designated fire watch will be responsible for observing activities during Hot Work and verifying that all conditions on the Hot Work Permit are being met. The attendant must be present at the site and monitor activities during the duration of the Hot Work and for 60 minutes following completion. Attendants must be trained in Hot Work activities and responsibilities, including the following:

- Inspection of area and detection of combustible and fire hazards
- Completion of Hot Work Permit
- Observation of hot work for signs of smoldering or potential to spread fire
- Authority and use of STOP WORK
- Control spread of sparks/fire
- Inspection, selection and use of Fire Extinguishers

4.4 Hot Work Operators

Hot wok operators shall obtain proper authorization to perform hot work operations via the Hot Work Permit and any client/site specific requirements and shall conduct activities per this standard to minimize and eliminate hot work hazards.

4.5 Corporate H&S with Division and Practice Experts

Corporate H&S with division and practice experts on a regular basis review and update, as necessary, this standard. In addition, review cancelled entry permits periodically to ensure conformance to this standard. Provide the initial applicable hot work training and retraining, or recommend qualified training provider. Provide technical assistance regarding hot work protocol, atmospheric testing equipment, PPE, hazard assessment and research information on unusual hazards. Audit project-specific confined space entry for compliance with this SOP. Retain a file of cancelled Hot Work Permits for annual review.

4.6 Health and Safety Plan Writers and Reviewers

Use this standard as guidance to ensure the appropriate identification, assessment and control of hot work activities and areas for documentation in project HASPs

5. PROCEDURE

Hot work is typically described as a specific activity that uses equipment that creates fire or spark like welding, cutting, brazing, etc. However, hot work situations can also arise when conditions are present where fire could start (i.e., dry grasses or other vegetation, combustible materials present, equipment use that could cause a spark when striking another object such as a back hoe bucket striking a rock, etc.). It is required that during the daily or semi-daily safety briefings that conditions and activities be reviewed and assessed to determine if fire danger is present.

For obvious hot work activities as defined above, a permit system is in place as described below.

5.1 General Guidance for Hot Work

- Equipment will be used only for operations for which it is approved, and as recommended by the manufacturer.
- Workers assigned to operate or maintain oxygen/fuel-gas supply equipment, arc welding and cutting and resistance welding equipment will be properly instructed in the safe use of such equipment and qualified to operate such equipment.

- Workers assigned to operate or maintain oxygen/fuel-gas supply equipment, arc welding and cutting equipment must be familiar with and comply with 29 CFR 1910.252 (Welding, Cutting and Brazing General Requirements) and 29 CFR 1910.254 (Arc Welding and Cutting) part d (Operations and Maintenance).

- Engineering controls will be implemented to control hot work hazards to the extent feasible.

- Before any hot work is completed, the area will be inspected by the supervisor responsible for authorizing hot work. When appropriate, a written Hot Work Permit (Attached) will also be completed to designate specific approvals needed and precautions to be taken.

- If hot work is to be performed inside a confined space in addition to a Hot Work permit, a Confined Space Entry Form must also be issued.

5.2 General Guidelines for Hot Work Permit Issuance

Any activity that involve a source of ignition, i.e., where the use of heat, spark or flame used or being generated by tools used are of sufficient intensity to cause the ignition of any flammable or combustible material in a hazardous area, requires a Hot Work Permit to be issued.

These activities include but are not limited to the following:

- Acetylene or gas burning

- Welding

- Brazing

- Soldering

- Use of open flames

- Use of electric resistance heaters

- Metal chipping

- Grinding

- Use of non-explosion proof electrical equipment (including mobile phones, inspection and testing equipment such as ultra-sounds and X-rays if not certified intrinsically safe)

- Abrasion blasting, use of high-pressure hydro-jet, etc.

- Operating motorized vehicles within a hazardous area/diked area where flammable vapors may be present

- Using electric or air-driven power tools capable of causing “hot” sparks or enough energy to ignite a flammable mixture

- Using any equipment that generates an exposed flame or hot filament
- Use of jack-hammers
- Hot Tapping

Locations where a Hot Work Permit is required include any area where a fire may occur due to ignition of flammable of combustible liquids or materials, or ignitable materials such as dry grass wood, etc.

Locations where a Hot Work Permit is not required include designated nonhazardous areas where no flammable or combustible materials are present.

A documented hazard evaluation of the site and/or JSA will be conducted to determine hazards of the Hot Work location prior to permit issuance.

Lower explosive limit (LEL) monitoring equipment will be checked and calibrated as necessary according to manufacturer's instructions. Calibration must be documented in site personnel field notes or on calibration logs and maintained in the project file.

Permits will normally be designated for one shift, but in no case for longer than 24 hours. Permits are valid only for the time and date specified. If Hot Work continues beyond the term of the permit, a new permit must be issued.

At the conclusion of the Hot Work or upon permit expiration, the permit will be closed and the closed permit placed in the project files.

5.3 Preparation of Hot Work Permit

The ARCADIS SSO will complete the Hot Work Permit (refer to Exhibit 2) and ensure that all requirements of the permit are met before initiating work. The SSO will insure preparation of appropriate equipment, completion of air monitoring, and arrange for appropriate fire watch personnel.

ARCADIS personnel will notify client facility personnel of any Hot Work being conducted on their site and coordinate these activities with the client and the client's requirements.

5.4 Fire Watch

- ARCADIS personnel who prepare the permit will work with the client, as appropriate, in determining if Fire Watch personnel are necessary for the work being performed.
- ARCADIS will maintain a properly charged 20 pound fire extinguisher in the immediate work area of hot work at all times. Designated fire watch personnel will remain in the vicinity of the Hot Work and within immediate reach (outside of vehicles and not-mounted) of the fire extinguisher equipment at all times during the Hot Work. If a fire occurs, fire watch personnel should notify workers, and try to safely extinguish it if possible. ARCADIS personnel are required to sound an alarm and get help. Fire watch personnel must remain onsite in the immediate vicinity of the hot work and monitor for ignition of combustible materials for at least 30 minutes after hot work has ceased.

- Fire watch personnel will be responsible for monitoring the surrounding area and looking for leaks, spills, ignition sources, and emergency exit routes prior to starting hot work. Fire watch personnel have full support of Stop Work Authority and can shut down operations if unsafe conditions arise.

- Fire watch personnel must remain on site at all times and only perform fire watch duties, and cannot leave unless they are replaced by another designated fire water person.

- The operator will ensure full compliance with the requirements of this standard and use appropriate safety equipment including PPE. The operator should also be qualified to perform required Hot Work and verify that their equipment and tools are in good working order. Hot Work operators are responsible for ensuring that fire watch has started before beginning Hot Work activities and ceasing when conditions change from those that were approved in the permit.

5.5 Completing Hot Work Activities

- The ARCADIS SSO will review the Hot Work Permit with all ARCADIS employees working at the site. Any special conditions must be noted on the permit and discussed with affected personnel. Personnel will be informed that it is their responsibility to discontinue Hot Work immediately if an unsafe condition develops or could develop, and report to the project manager.

- The work area must be tested for combustible gases using the properly calibrated combustible gas analyzer by staff qualified to operate the test equipment. The LEL must be less than 10% (value must be less than 5% if working in a Confined Space). Any concentration greater than 10% LEL will prohibit Hot Work except in areas with oxygen readings less than 10% (i.e. nitrogen purged equipment).

- All equipment and tools to be used will be inspected, and must be in satisfactory condition and in good repair.

- Typical preparations specific to Hot Work may include, but are not limited to the following:

    - Equipment positively isolated (refer to Isolation Standard)
    - Sealing all drains within 15 m (50 ft)
    - Barricading of area
    - Stopping product movements
    - Placement of fire-fighting equipment
    - Designated fire-watch at job site
    - Gas testing of job site and surrounding 15 m (50 ft) by staff qualified to operate the test equipment
    - Communications to all affected parties

- Any combustible materials such as paper clippings, wood shavings or textile fibers must be located a minimum of 35 feet away from the Hot Work activity. Flammables/combustibles may need to be shielded or covered by guards or flameproof covers if they cannot be moved.

- All personal protective equipment (PPE) listed on the permit must be in good condition and used as required. All fire suppression equipment listed must be available and operational.

- When Hot Work is to be performed on tanks, lines, or other equipment all associated pipes, lines, or other connections shall double blocked and bleed valve, or blanked/blinded to assure complete isolation of the Hot Work area from combustible gases.

- Nearby moving or energized equipment that may create a safety hazard will be de-energized.

- Sewers and manholes in the immediate area will be tested and sealed as necessary.

- Used containers will be cleaned before any welding or cutting is performed on them.

- When Hot Work or a hot tap is to be performed on a vessel or line while in service, it must be performed in accordance with the approved Hot Work Permit.

- Continuous monitoring or periodic retesting of the area by qualified tester must be conducted as per the conditions in the Hot Work Permit or instruction of project health and safety staff and/or project management.

- Closed Hot Work Permits and instrument calibration records will be kept in the project file for the duration of the project.

5.6 Conditions for Work Stoppage

Work must be stopped and the Hot Work Form returned to the Permit Issuer for re-evaluation to assess if the permit can be revalidated under the following conditions:

- Changes in job site condition that present a hazard after permit issuance

- LFL/LEL >10% is detected (value must be less than 5% if working in a Confined Space)

- Portable or Continuous Gas Test equipment failure (e.g. battery depleted)

- Change in scope of work such as additional work not originally anticipated

- Whenever a safety concern has been raised by a worker/Company representative

- Facility emergency alarms activated

- Occurrence of a minor incident or near miss/loss during a job task
- Lunch breaks or after any work stoppage greater than 30 minutes where job site is left unattended
- Original time listed on the Hot Work Form reached

5.7 Permit Cancellation

Work must be stopped and the Hot Work Form cancelled under any of the following conditions:

- Change out of entire work crew
- Change of Permit Requestor/Holder
- Change in job site conditions, such as a hydrocarbon leak or spill
- Withdrawal of work permit by Permit Issuer
- No qualified Fire Watch is at hot work area
- Serious injury, incident or near miss occurs at the job site

5.8 Extension/Renewal of Hot Work Permit

· The date, starting time and expiration time must always be listed in the appropriate space on the Hot Work Form. A Hot Work Form may be extended daily for up to a maximum of 16 total hours provided the Permit Issuer remains on site. A Hot Work Form may be renewed on a daily basis for up to a maximum of six consecutive working days.

· Before a Hot Work Form may be extended or renewed the Permit Issuer must confirm the following:

  - The Permit Requester/Holder has not changed
  - The entire work crew has not changed
  - That all conditions, requirements, and controls required by the Hot Work Form, any related confined space or other work permits, and the JSA remain in place
  - On duty Qualified Gas Tester has performed required gas testing for LFL/LEL
  - Less than 10% LFL/LEL present
  - A valid General Work Permit is in place
  - Approved Fire Watch is assigned and present in hot work area
  - Required firefighting equipment is on hand and in good operating condition

- The Permit Issuer and Permit Requester/Holder have reviewed the job site and are both in agreement the work can be continued safely

5.9 Welding, Cutting, Brazing, Soldering Hot Work

5.9.1 Gas Welding and Cutting Safety

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

- When parallel sections of oxygen and fuel-gas hose are taped together, not more than 4 inches out of 12 inches will be covered by tape.

- All hoses in use will be inspected at the beginning of each work shift. Defective hose will be removed from service.

- Hoses, cables, and other equipment will be kept clear of walkways, ladders, and stairs.

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

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

- Torches will be ignited by friction lighters or other approved devices only. Matches, flame lighters, or hot work will not be used to ignite a torch.

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

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

- Torches and hoses will be completely depressurized (bled) of pressurized gas, prior to storage, or at the end of each shift.

- Torches and hoses will not be stored in enclosed areas (e.g., gang boxes, lockers) while connected to cylinders and gauges will be removed at the end of shift.

- Oxygen connections will include a means to prevent backflow.

- Fuel gas cylinders will be provided flashback protection.

5.9.2 Arc Welding and Cutting Safety

- Electrode holders which are designed for arc welding/cutting and are capable of safely handling the maximum rate current required will be used.
- 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, will be fully insulated against the maximum voltage encountered to ground.
- All arc welding/cutting cables will be completely insulated and flexible, capable of handling the maximum current requirements of the work.
- Only cables free from repair or splices for a minimum distance of 10 feet from the electrode holder will be used. Cables with standard insulated connectors or splices with insulating quality that is equal to that of the cable are permitted.
- If it is necessary to splice lengths of cable, insulated connectors equivalent to that of the cable will be used. If connections are made by cable lugs, they will be securely fastened together and provide a good electrical contact. Exposed metal parts of the lugs will be completely insulated.
- If electrode holders are left unattended, the electrodes will be removed and the holder placed so that they cannot make electrical contact with employees or conducting objects.
- To avoid the possibility of electric shock, electrode holders will not be dipped in water.
- 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 will be turned off.
- Any faulty or defective equipment will be reported to the supervisor and tagged out of service until repaired.
- All arc welding/cutting operations will be shielded by noncombustible or flameproof screens to protect employees and other persons working in the vicinity from the direct ray of the arc.

5.9.3 Storage and Handling of Compressed Gas Cylinders

- Compressed gas cylinders will be legibly marked with either the chemical or trade name of the gas. Such markings will be stenciled, stamped, or labeled and will not be easily removable.
- The marking will be located on the shoulder of the cylinder.
- Compressed gas cylinders will be equipped with approved connections.

- Acetylene cylinders will be stored and used valve end up.
- Cylinders will not be stored near highly combustible/flammable materials, especially oil or grease.
- Cylinders will be stored in an upright and secure position with caps installed and separated from fuel-gas cylinders or combustible materials (especially oil or grease), by a minimum distance of 20 feet, or by a noncombustible barrier at least 5 feet high and having a fire resistance rating of at least one half hour.
- Cylinders will be not dropped, struck by objects, or permitted to strike each other violently.
- Cylinder valves will be closed and gauges removed before moving cylinders.
- Cylinder valves will be closed and gauges removed at the end of the shift or when work is finished.
- Valves of empty cylinders will be closed.
- Cylinders will be kept far enough away from the actual welding/cutting operation so that sparks, hot slag, or flames will not reach them.
- Cylinder valves will always be opened slowly.
- An acetylene cylinder valve will not be opened more than one and one-half turns of the valve stem and preferably no more than three-fourths of a turn.
- Where a special wrench is required to operate a cylinder valve, it will 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 will be available for immediate use.
- Regulators will be removed, valve caps in place, and valves closed when cylinders are transported by vehicles. All vehicles used to transport cylinders will have a proper support rack installed.
- A suitable cylinder truck, chain, or other steadying device will be used to prevent cylinders from being knocked over while in use or storage.
- Cylinders will not be placed where they may become part of an electric circuit. Tapping of an electrode against a cylinder to strike an arc will be prohibited.

5.10 Personal Protective Equipment for Welding, Cutting and Brazing

5.10.1 Selection and Use

Selection and use of personal protective equipment will comply with Personal Protective Equipment.

5.10.2 Eye and Face Protection

Eye and face protection will comply with the following:

- Welding helmets and hand shields will be used during all arc welding/ cutting operations, excluding submerged arc welding. Cutting/welding goggles will 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. Helpers or attendants will wear proper eye protection.

- Safety goggles or other approved eye/face protection are for use during gas welding operations on light work, torch brazing, or inspection.

- All operators and attendants on resistance welding or brazing equipment will use face shields or goggles, depending on the particular job.

5.10.3 Protective Clothing

Hot work will require the following protective clothing:

- Except when engaged in light work, all welders will wear flameproof gauntlet gloves.

- Flameproof aprons made of leather, or other suitable material, may also be desirable for protection against radiated heat and sparks.

- Woolen clothing will be worn in preference to cotton because it is not so readily ignited. Nylon clothing is not permitted for welding/cutting operations. All outer clothing, such as jumpers or overalls, will be reasonably free from oil or grease.

5.10.4 Respiratory Protective Equipment

Respiratory protective equipment will comply with the following:

- Respiratory protective devices will be required when one or more of the following conditions exist:

    - Feasible engineering controls are insufficient to mitigate the hazards.

    - 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.

    - Too much heat is generated.

    - Hazardous fumes, gases, or dusts of toxic metals, particularly lead, cadmium, chrome, beryllium, and zinc are present in the base metal or in coatings.

- Respiratory protective equipment will be selected, used, and maintained in accordance with Respiratory Protection.

5.11 Mechanical Ventilation for Welding, Cutting and Brazing

- Mechanical ventilation will consist of either general dilution systems or local exhaust systems. Local exhaust systems are preferred.

- General mechanical ventilation will 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.

- General ventilation may not be used as the only means of control when toxic metals are involved in the operation.

- Local exhaust ventilation will consist of freely movable hoods intended to be placed by the welder or burner as close as practicable to the work. This system will 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.

- Contaminated air exhausted from a working space will 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.

- All makeup air will be clean and suitable for breathing.

- Oxygen will not be used for ventilation purposes, comfort cooling, blowing dust from clothing, or for cleaning the work area.

- The SSO will be consulted prior to proceeding with this work. The project SSO will 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.

5.12 Fire Protection

- When possible, objects to be welded, cut, or heated will be moved to a designated safe location. If this is not possible, all movable fire hazards in the workspace will be taken away to a safe place.

- If the object to be welded, cut, or heated cannot be moved and all fire hazards cannot be removed (e.g., equipment, walls, floors, etc.), positive means will be taken to confine the heat, sparks, and slag to protect the immovable fire hazards as well as opposite sides.

- No welding, cutting, or heating will be done where the application of flammable paint, the 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 will be taken so that no sparks will drop through the floor. The same

precautions will be taken in the presence of cracks or holes in walls, open doorways, and open or broken windows.

- Approved fire extinguishing equipment will be present in the immediate work area.

5.13 Welding/Cutting on Containers

- No welding, cutting, or other hot work will be performed on empty drums, barrels, tanks, or other containers until they have been thoroughly cleaned. (This is to ensure 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 a hazard.) Any connection to the drum or vessel will be disconnected or blanked off.

- All hollow spaces, vacancies, or containers will be ventilated to remove gases before preheating, cutting, or welding. Purging with inert gas is recommended.

- In addition to the requirements presented in Confined Space Entry Program, welding/cutting in confined spaces such as a tank, boiler, pressure vessel, or small compartment will require the following precautionary measures:

  - Local exhaust ventilation will be provided, unless workers wear supplied-air respirators.

  - Gas cylinders and/or welding machines will be placed outside the confined space.

5.14 Manifolding of Cylinders

- Cylinder manifolds will be installed under the supervision of an experienced person(s) and must comply with proper practices in construction and use.

- All manifolds and parts will be appropriate for the gases for which they are approved.

- When acetylene cylinders are manifolded, approved flashback arresters will 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 will be provided with a backflow check valve.

5.15 First Aid Equipment

- First-aid equipment will be available at all times. Refer to AUS First Aid/CPR Standard (ARC HSGE004) for details on first aid kit maintenance and contents.

- All employee injuries must be reported as soon as possible for medical attention.

- If an employee injury does occur, first aid shall be rendered until medical attention can be provided.

6. TRAINING

ARCADIS personnel involved in hot work will be trained on this Hot Work HSS.

Fire watch personnel will be trained in the proper use of a fire extinguisher, fire extinguishing methods, and as outlined in section 4.3.

7. REFERENCES

ARCADIS Health and Safety Standard ARC HSFS010– Health and Safety Planning

NFPA 51B Standard for Fire Protection during Welding, Cutting and Other Hot Work

29 CFR 1910 Subpart Q

California Code of Regulations (CCR) Title 8; 4848

8. RECORDS

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

Hot Work permits and cancelled permits will be kept in the project files with copies of cancelled permits kept by Corporate H&S.

Copies of all HASPs that document hot work procedures will be kept in the project files.

9. APPROVALS AND HISTORY OF CHANGE

Approved By:

Tony Tremblay, CSP – Corporate Health & Safety, Director of Technical Programs

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
5 May 2008	01	Mike Thomas/Sam Moyers	Original document
16 April 2012	02	Tremblay	Executive Summary added; HSP changed to HSS; references to JLA changed to JSA
22 August 2012	03	Tremblay	Clarified training reference in section 5.1; grammatical corrections in Executive Summary and opening paragraph of Section 6; Section 5.15 First Aid added to standard
26 September 2013	04	Tremblay	Header logo updated and header format revised; Added language to Executive Summary and Section 5.1 that ARCADIS shall consider cold work alternatives before performing hot work; detailed description of hot work added into section 2.1; Definitions moved from Section 3 to Exhibit 1 and other exhibits renumbered; Clarified that air testing to be conducted by those qualified to operate such test equipment in Section 5.5; In Section 5.5 and 5.6, the 0% LEL value was deleted and revised to match the AUS Confined Space Standard criteria – LEL value must be less than 5% if working in a Confined Space; Blanking/Blinding and Double-Block and Bleed definitions added to Exhibit 1; Fire Watch references in document changed from Section 5.1 to 4.3; Standard review on a regular basis in lieu of annual review

Exhibit 1 – Definitions

Blanking or blinding means the absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

Designated Safe Hot Work Area--areas that have been designed and constructed for performing open-flame or spark-producing work.

Double block and bleed means the closure of a line, duct, or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

Fire Watch--personnel who are in attendance during the entire hot work operation and are immediately available to extinguish a fire or take other effective action if needed.

Hot Work--any activity that results in arcs, sparks, fire, molten slag, or hot material that has the potential to cause fires or explosions. According to OSHA, hot work is any work that involves burning, welding, using fire- or spark-producing tools, or that produces a source of ignition.

Hot Work Permit--written authorization allowing Hot Work, which is used to document the conditions of a work area and safety-related safeguards for work that involves welding, cutting, burning, or other spark producing ignition sources.

Exhibit 2 – Hot Work Permit

ARCADIS HOT WORK PERMIT

Hot Work Permit Number: _____

ALL COPIES OF THE PERMIT MUST REMAIN POSTED AT JOB SITE UNTIL THE WORK IS COMPLETE

Date & Time: _____
Project Number: _____
Permit Expires at: _____ (cannot exceed 8 hours)

Hot Work: any activity that results in arcs, sparks, fire, molten slag, or hot material that has the potential to cause fires or explosions.

Location and Description of Hot Work:

_____

_____

WARNING: Stop work and depart the work area if known, documented, and communicated conditions change or if work activities deviate from the established and approved written procedures.

CHANGES TO THE HOT WORK OR THIS PERMIT, AUTOMATICALLY VOID THIS PERMIT

ANY NO RESPONSES REQUIRE ADDITIONAL CONTROLS IN COMMENT COLUMN

Checklist	YES	NO	NA	COMMENT
Approaches that do not include hot work or conducting the work in a designated hot work area have been considered but are not feasible?				
The area within 75 feet of the hot work is free from explosive or propellant materials.				*If the answer is no, equipment and the area must be decontaminated and confirmed to be free of energetics prior to hot work. If this is not possible risk mitigating features such as tarps, barricades, water etc. may be used.*
Hot Work equipment in good repair?				
Material to be welded is non-combustible and without combustible covering or insulation?				
Are all fire hazards, combustibles and flammable liquid, vapors, and gases at least 35 feet away?				
Combustible materials such as paper clippings, wood shavings, or textile fibers are on the floor, the floor have been swept				

Checklist	YES	NO	NA	COMMENT
clean for a radius of 35 feet (10.7 m). Combustible floors must be kept wet, covered with damp sand, or protected by fire-resistant shields. Where floors have been wet down, personnel operating arc welding or cutting equipment are protected from possible shock.				
Combustible materials adjacent to the opposite side of partitions, walls or ceilings are protected by guards or moved 35 feet away from the surface?				*If no is checked second fire watch is required*
All fire hazards are removed or are protected with fire-resistant tarpaulins or metal shields?				
Combustible walls and equipment: Where cutting or welding is done near walls, partitions, ceiling or roof of combustible construction, fire-resistant shields or guards are provided to prevent ignition.				
Noncombustible walls: If welding is to be done on a metal wall, partition, ceiling or roof, precautions are taken to prevent ignition of combustibles on the other side, due to conduction or radiation, preferably by relocating combustibles. Where combustibles are not relocated, a fire watch on the opposite side from the work is provided.				
Cutting or welding on pipes or other metal in contact with combustible walls, partitions, ceilings or roofs is sufficient distance to prevent ignition by conduction.				
Welding is prohibited on a metal partitions, walls, ceiling or roof having a combustible covering or partitions of combustible sandwich-type panel construction.				
Holes in the floor or wall within 35 feet are properly protected to prevent ignition of combustible material from sparks or slag?				
Work on enclosed equipment is cleaned of all combustibles?				
Have containers or pipe containing flammable liquids/vapors been purged and checked with an LEL meter prior to welding?				
Danger of conduction of heat into another area is controlled with adequate barriers?				
Are ducts, plenums, and conveyer systems suitably protected and/or turned off to				

Checklist	YES	NO	NA	COMMENT
prevent transfer of heat, sparks or slag?				
Floors around the welding area swept clean?				
Suitable fire extinguishing equipment, with current inspection is on hand and ready for immediate use?				
Is a trained fire watch in place?				
Is the sprinkler system and alarm in the area operational? Have precautions been taken to prevent accidental discharge or alarm?				
Employees in an area are protected from flying sparks or slag by distance or barriers?				
Have precautions been implemented to prevent injury to the employees working in the area?				
Has the Station Supervisor been notified?				
All required energy control/LOTO has been completed?				
Adequate ventilation to remove smoke/fumes from the work area is present?				
Is appropriate PPE i.e., radiant lenses, heat resistance clothes, respiratory protection being used?				
Is air monitoring being conducted, as necessary; for welding in area with limited ventilation or area that may exceed the LEL, List results below.				

Time of Reading	% Oxygen 19.5> <23.5	% LEL <10%	Other

Monitoring Frequency ☐Continuous ☐ Every 30 Min ☐Other_____

Designated Air Monitors Name _____

Designated Fire Watch Name: _____

Fire watch must be present during all Hot Work activities and must monitor the site for 60 minutes after completion of the hot work and inspect the site 30 minutes after the attended monitoring.

Signatures:

We have verified the above location has been examined, the precautions on the checklist have been taken to prevent fire, and permission is authorized to work.

ARCADIS Work Supervisor: _____

ARCADIS Health and Safety Officer: _____

Appropriate Fire Department or Responder _____

Fire Watch _____
(signed after completion of all required monitoring)

Exhibit 3 – Hyperlinks to OSHA Welding, Cutting and Brazing Standards

1910 Subpart Q – Welding, Cutting and Brazing

- 1910.251 - Definitions
- 1910.252 – General Requirements
- 1910.253 - Oxygen-Fuel Gas Welding and Cutting
- 1910.254 - Arc Welding and Cutting
- 1910.255 – Resistance Welding

1926 Subpart J – Welding and Cutting

- 1926.350 – Gas Welding and Cutting
- 1926.351 – Arc Welding and Cutting
- 1926.352 – Fire Prevention
- 1926.353 – Ventilation and Protection in Welding, Cutting and Heating
- 1926.354 - Welding, Cutting, and Heating in way of Preservative Coatings

Implementation Date 1 October 2008	Arcadis HS Standard Name Control of Hazardous Energy (Lockout/Tagout)	ARCADIS Design & Consultancy for natural and built assets
Revision Date 29 September 2016	Arcadis HS Standard No. ARC HSFS004	Revision Number 13

EXECUTIVE SUMMARY

This Health and Safety Standard (HSS) sets forth minimum requirements for Arcadis personnel to conduct work that involves stored energy sources, and to prevent employees from injuries by controlling the associated hazardous energy and unexpected start-up of equipment by means of Lockout/Tagout (LO/TO) procedures.

This HSS applies:

- To hazardous energy including but not limited to kinetic, electrical, chemical, thermal, hydraulic, gravitational, and pneumatic.
- When servicing or performing maintenance on equipment.
- When required to remove or bypass a guard or other safety device.
- When required to place any part of their body in an area where a danger zone exists during a machine or equipment operating cycle.

Through this standard, Arcadis requires:

- Only Authorized Employees to initiate LO/TO isolation procedures.
- Development of a written LO/TO plan Exhibit 2.
- Arcadis must use the Permit to Work process, as outlined in Exhibit 3 prior to initiating the energy isolation process.
- Use of a lockout device and an attached tag on all isolating devices capable of being locked out or accepting lockout devices.
- At a minimum, the use of a tagout system designed to provide full employee protection against equipment start-up, if an energy isolating device is not capable of being locked out.
- Notification of all affected personnel prior to equipment deactivation and isolation, and also prior to equipment reactivation after isolation measures have been removed.
- Those authorized to perform energy isolation will use their own locking device.
- Authorized Employee(s) are to conduct a periodic inspection of their energy control procedure(s) **at least annually** to ensure that the requirements of the established energy control procedure and the LO/TO standard are being followed. The periodic inspection (LO/TO Task Improvement Process – TIP or Periodic Inspection Checklist) shall be performed by an authorized employee other than the ones(s) utilizing the energy control procedure being inspected.
- Awareness level training of all affected employees who work in areas or with equipment where LO/TO will be performed, in order to recognize the hazards of energized and locked or tagged out equipment, and to understand the basic requirements of LO/TO.

Implementation Date 1 October 2008	Arcadis HS Standard Name Control of Hazardous Energy (Lockout/Tagout)	ARCADIS Design & Consultancy for natural and built assets
Revision Date 29 September 2016	Arcadis HS Standard No. ARC HSFS004	Revision Number 13

1. POLICY

It is Arcadis policy to be proactive in the identification, assessment and control of health and safety hazards and associated risks. To those means, any equipment that utilizes or stores hazardous energy will be controlled following this Health & Safety Standard (HSS) at any time Arcadis staff or its subcontractors must perform maintenance on this equipment. Whenever possible, Arcadis will de-energize equipment before performing maintenance, troubleshooting, or other activities where hazardous energy is present. When controlling hazardous energy, this standard, at a minimum will be strictly followed.

When fulfilling the Authorized Employee role, Arcadis will provide the necessary equipment to isolate, secure or block unexpected energization of equipment. This equipment includes but is not limited to locks, tags, chains, wedges, key blocks, plug lockouts, adapter pins, self-locking fasteners or other hardware for isolating, securing or blocking of machines or equipment to prevent incidents involving hazardous energy.

2. PURPOSE AND SCOPE

2.1 Purpose

This HSS details the administration and necessary provisions for protecting employees from injuries associated with hazardous energy release, and unexpected start-up of equipment through the use of Lockout/Tagout (LO/TO) procedures.

2.2 Scope

This standard applies to all Arcadis employees and on all projects where equipment that utilizes hazardous energy is present and maintained by Arcadis staff. Arcadis subcontractors must have LO/TO programs that meet the minimum requirements of this standard.

Only trained and authorized personnel are permitted to use the procedures outlined in this HSS for locking or tagging out equipment to ensure it does not unexpectedly energize and/or start while an Authorized Employee is performing maintenance or service activities. This standard applies specifically to employees that operate, service or maintain equipment requiring the removal or by-passing of a machine guard or protective enclosure. In addition, it applies to personnel who must place any part of their body in a place where the accidental energization of equipment, release of stored energy, or release of stored hazardous materials may cause injury.

Arcadis staff who design and develop equipment and processes that require energization, must do so to allow for LO/TO and include information as to how to LO/TO such equipment or processes.

If any device must be worked on in an electrically energized capacity, the work will be done following the Arcadis Electrical Safety Standard (ARC HSFS006). If other energized equipment must be worked on in an energized state, contact Corporate Health & Safety or the client H&S resource for guidance.

Note: Requirements of this HSS do not apply when work on cord and plug connected electric equipment for which exposure to the hazards of unexpected energization or startup of the equipment is controlled by the unplugging of the equipment from the energy source and by the plug being under the exclusive control of the employee performing the servicing or maintenance.

3. DEFINITIONS

Definitions relating to LO/TO can be found in Exhibit 1.

4. RESPONSIBILITIES

4.1 Corporate H&S with Business Line and Practice Experts

On an annual basis, review and update, as necessary, this standard. In addition, Corporate Health & Safety along with Business Line and practice expert staff shall:

- Review LO/TO procedures in the field periodically using the Task Improvement Process (TIP) to ensure conformance to this standard;
- Provide and/or coordinate the initial LO/TO training and retraining, and/or recommend qualified training provider, to staff based on needs;
- Provide technical assistance regarding LO/TO processes; and
- As requested, assess project-specific LO/TO programs for compliance with this HSS.

4.2 Project Manager and Task Manager

The Project Manager (PM) and Task Manager (TM) shall:

- Verify that LO/TO protocols are properly identified and addressed within the project work plan, project health & safety plan, and/or other project-related documents.
- Verify that their project team employees have received the proper LO/TO training provided by Corporate Health & Safety or qualified training source prior to conducting LO/TO activities.
- Verify that the proper LO/TO equipment, including PPE, electrical testing equipment and safety equipment, is available for use by their project employees.

4.3 Health and Safety Plan Writers and Reviewers

Reference this standard as guidance and regulatory requirements to ensure the appropriate identification, assessment and control of equipment with hazardous energy for documentation in project HASPs.

4.4 Authorized Employees

Authorized employees must have training and instruction in their duties and responsibilities regarding LO/TO. Authorized employees must:

- Recognize the hazards which may be faced during LO/TO activities.
- Develop an equipment specific LO/TO procedure for the specific LO/TO work to be done.
- Conduct a periodic inspection of energy control procedure at least annually to ensure that the requirements of the established energy control procedure and the LO/TO standard are being followed.
- Follow the requirements of this HSS, the project HASP, JSAs and any other specific LO/TO procedures applicable to the work being done.
- Use the appropriate and applicable PPE and testing equipment that has been provided.
- Conduct periodic inspections using the TIP process.

Information about Arcadis Authorized LO/TO staff can be obtained from the Arcadis Training Team.

4.5 Affected Employees

Affected Employees are responsible to:

- Understand the hazards of energized and de-energized equipment.
- Follow the instructions provided by supervisors and authorized employees who are conducting LO/TO work.
- Acknowledge LO/TO hazardous energy control work by reviewing and signing the Permit to Work.
- Not tamper with or remove LO/TO devices.
- Not perform servicing or maintenance on a machine or piece of equipment which is locked or tagged out. Servicing or maintenance work on a piece of equipment that is locked out/tagged out can only be conducted by an Authorized Employee.

4.6 All Arcadis Employees

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

- Participate in entry operations only if trained and authorized to do so;
- Never tamper with equipment that is under LO/TO control; and
- Never attempt to work on energized or de-energized equipment without appropriate training and authorization.

5. PROCEDURE

LO/TO procedures are used to control energy hazards associated with service and maintenance of equipment which uses hazardous energy to operate. This HSS applies to all types of energy including kinetic, potential, electrical, chemical, thermal, hydraulic, gravitational, and pneumatic. The HSS applies when servicing or performing maintenance on equipment and during normal production operations if personnel are:

- Required to remove or bypass a guard or other safety device, or
- Required to place any part of their body in an area where a danger zone exists during a machine or equipment operating cycle.

5.1 General Requirements

An Energy Control Program is developed to ensure that before service or maintenance of equipment is performed, the equipment is isolated from its energy source and made inoperable so that unexpected energizing, startup or release of stored energy during equipment service and maintenance is prevented. The written LO/TO procedure template in Exhibit 2 can be used to developed specific LO/TO procedures as part of as the project HASP, a JSA, or to include the requirements of this HSS and our clients.

Prior to initiating the LO/TO process, Arcadis employees will complete and use the Permit to Work (Exhibit 3). Completed Permit(s) to Work will be retained in project file for a minimum of 12 months.

5.2 Equipment List

5.2.1 Hardware

Arcadis will provide, as necessary to execute project work, locks, tags, chains, wedges, key blocks, plug lockouts, adapter pins, self-locking fasteners or other hardware for isolating, securing or blocking of machines or equipment to control energy sources.

5.2.2 Lockout/Tagout - Devices

Lockout devices and tags shall be issued by Arcadis, and are the only device(s) used for controlling energy. LO/TO locks and tags must not be used for other purposes. All locks and tags provided by Arcadis are capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected. Locks and tags are of substantial construction in order to prevent inadvertent or accidental removal. All tags are required to be marked to identify the employee applying the lock(s)/tag(s). All locks will be uniquely keyed and may be color coded.

5.2.3 Lockout/Tagout - Tags

Only standard “Danger – Do Not Operate” (black, red and white) tags will be used. Tags are constructed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or the message on the tag to become illegible. Tags will warn against hazardous conditions if the machine or equipment is energized, and will include a legend such as the following: “Do Not Start,” “Do Not Open,” “Do Not Close,” “Do Not

Energize," or "Do Not Operate," depending on application. Used tags are to be destroyed and the tags will not be re-used unless designated for re-use.

5.2.4 Energy Isolating Devices

When replacement or major repair, renovation, or modification of a machine or equipment is performed, and when new machines or equipment are installed, energy-isolating devices designed to accept a lockout device for such machines or equipment will be installed. If equipment for de-energizing is in a confined space, the confined space will be cleared of all employees prior to testing the energy source for de-activation.

5.3 General Safety Procedures for Lockout/Tagout and Isolation

Lockout/tagout isolation procedures will be initiated only by an Authorized Employee. Personnel not trained in lockout/tagout procedures are not authorized to install, inspect, repair, adjust, remove, maintain or service equipment where the potential for injury due to accidental start-up, energization, or release of stored energy exists.

All affected employees must be notified prior to equipment deactivation and isolation and must be notified prior to equipment reactivation after isolation measures have been removed. Personnel involved with lockout/tagout isolation of equipment shall receive information concerning the specific type and magnitude of energy or hazardous material involved, the hazards involved, and the method of control to be utilized.

Authorized Employees shall de-energize equipment by following the written procedure developed specifically for the equipment involved and consistent with this HSS and or other applicable laws and client requirements.

Prior to performing any work on equipment, all isolation devices shall be in place. Locks and tags shall be affixed to each energy-isolating device by Authorized Employees. These must secure the isolated equipment in the "off" position. Each person involved with servicing the isolated equipment shall attach a lock to the isolating device. In situations involving two or more persons, multiple lock hasps shall be utilized. **Tags shall be attached with all locks and must identify the authorized individual responsible for each lock, must be signed, dated and must have the name of the contractor with which the employee is employed.**

Prior to work, Authorized Employees shall verify and document that the equipment has been disengaged, de-energized, and isolated. All potentially stored or residual energy must be released, relieved or disconnected. If there is a potential of accumulation, verification of isolation shall be conducted and documented throughout the project (see the next section).

If a machine must be re-energized after initial isolation (i.e., for testing or repositioning), then LO/TO procedures must be followed as outlined to re-isolate the equipment.

5.4 General Lockout/Tagout Procedures

Specific written LO/TO procedures will be developed for each piece of energized equipment requiring maintenance or service. These specific procedures can be developed using LO/TO Procedure Template (Exhibit 2). If a client has specific written

LO/TO procedures for its facility equipment with which employees of Arcadis are working, the procedure will be reviewed and used or revised by Arcadis, as appropriate.

The following information provides general LO/TO procedures to be used for the development of equipment specific procedures. Prior to initiating the LO/TO process, Arcadis employees will complete and use the Permit to Work (Exhibit 3).

5.4.1 Lockout/Tagout Sequence

- The authorized employee(s) shall notify all affected employees prior to the shutdown and isolation of the equipment/machine. Affected employees should be informed of the reason for shutdown and approximate length of time required for servicing or maintenance.
- The authorized employee(s) shall review the type(s) and magnitude(s) of energy present and the hazards present.
- If the machine/equipment is operating, the authorized employee(s) shall have the machine/equipment operator explain the standard shutdown procedure and then shut it down according to the procedure.
- The energy isolating devices shall be deactivated so the machine/equipment is isolated from the energy source(s).
- Each isolating device shall be locked out and tagged out. If lockout is not feasible, only tagout of the isolating device will be conducted, and additional precautions will be required to provide employee protection equivalent to the protection provided when lockout procedures are utilized. Each Authorized Employee conducting activities on the equipment/machine shall attach a(n) individually assigned safety lock to each isolating device. A standard tag shall also be attached to each individual's lock that identifies, by name, the authorized employee responsible for each lock. Stored or residual energy must be released or dissipated from each system to reach a zero energy state. Visual inspection shall be made to confirm that all moving parts have stopped. Any stored or residual energy shall be drained, blocked, repositioned, restrained, or bled. Electrical circuits shall be grounded to discharge electricity stored in capacitors.
- To ensure that the equipment is completely isolated from the energy source(s), it is necessary to test the equipment to make certain that it will not operate. The following methods shall be used to test the equipment:
    - Check the area and equipment to assure that no personnel are exposed to the start-up of equipment
    - Activate all start-up devices and operating controls
    - Use tic-tracers or voltage indicators to test electrical circuits
    - Return all operating control(s) to the neutral or off position after verifying the isolation of the equipment

5.4.2 Release of Lockout/Tagout and Return of Equipment to Service

When the equipment/machine is ready to be returned to service at the conclusion of work activities, the following steps shall be taken to safely return equipment to service:

- Check the machine/equipment and immediate area to ensure that non-essential items and tools have been removed
- Check to ensure that all guards and covers have been replaced
- Check to ensure that all employees are safely positioned or have left the area
- Check to ensure that all operating controls are in the neutral or off position
- All authorized employees shall personally remove their individual locks and tags from the isolation devices and destroy used danger tags unless tags are designed for reuse
- All affected employees must be notified that the work activities are completed and the equipment/machine is ready for use

If work activities are not completed prior to a shift ending (or other personnel change), then the procedures in Section 5.4.3 Transfer of Lockout/Tagout During Shift and Personnel Changes must be followed.

5.4.3 Transfer of Lockout/Tagout During Shift and Personnel Changes

The supervisor shall designate an authorized employee who shall control the lockout/tagout devices at the end of a shift and shall be responsible for transferring lockout/tagout authority to the next shift.

The designated authorized employee shall not remove his/her lock from any of the isolation devices until at least one of the arriving authorized employees has locked out and tagged out all of the isolation devices.

If the arriving authorized employees assuming responsibility for lockout/tagout do not attach locks prior to the previous shift employees removing all of their locks, then the employees assuming lockout/tagout authority shall repeat the entire lockout/tagout sequence.

5.5 Group Lockout/Tagout

Authorized employees shall obtain specific site lockout instructions from the project manager or designee and shall coordinate extended lockout requirements with the project manager or designee. When more than two employees are involved in work activities on the machine or equipment covered by this HSS, each authorized employee will attach a lock to a multi-lock hasp on each isolation device.

When group lockout/tagout is used, the last authorized employee with a lock attached to isolation devices will be responsible for removing the isolation devices and restoring equipment to use conditions according to the equipment-specific or general HSS.

When more than one crew, trade, or contractor, etc., is used on a project that requires equipment lockout/tagout, one specific employee shall be designated to coordinate affected work forces and to ensure continuity of protection.

5.6 Tagout System

Arcadis requires the use of a lockout device and an attached tag on all isolating devices capable of being locked out or accepting lockout devices. If an energy isolating device is not capable of being locked out, Arcadis requires the use of a tagout system designed to provide full employee protection against equipment start-up. When a tagout device is used on an energy-isolating device, the tag shall be attached at the same location that the lockout device would have been attached. Additional precautions will be implemented to provide a level of safety equivalent to that obtained by using a lockout device. Additional safety measures may include such steps as the removal of an isolating circuit element, blocking of a controlling switch, opening of an extra disconnecting device, or removal of a valve handle to reduce the likelihood of inadvertent energization.

Use of tagout procedures without the use of locks can only be utilized if the equipment to be de-energized will not accept a lock and the following conditions are met:

- Tagout procedures will provide protection to personnel equivalent to the use of locks.
- Additional measures, sufficient to ensure protection of employees, are taken to prevent accidental start-up or energization.
- If equipment for de-energizing is in a confined space, the confined space will be cleared of all employees prior to testing the energy source for deactivation.

5.7 Employee Unavailable to Release Lockout/Tagout

If the employee who installed a locking device is not available, the following procedure shall be used to unlock the device(s):

- The individual requesting device removal will attempt to contact the authorized employee via cell phone, hotel phone or home phone and request the employee return to remove the device. If the authorized employee is contacted but cannot come in, the status of the locked equipment will be documented and the requesting entity notified of the equipment status. All of the above including unanswered attempts at contact will be documented. If contact is not made, a message will be left to indicate that the locking device will be removed. Upon removal a red warning tag will be left where the device was placed indicating to the authorized employee that the device was removed and the equipment is now energized.
- The Project Manager or designee will verify that the authorized employee is not at the facility and is not potentially in harms way relative to the affected equipment.
- The Project Manager or designee will notify the Business Line Director of H&S or the client H&S resource of the reason for device removal and the status of the affected employee.

- The device shall be removed after verifying that no employees are in harms way.
- The entire sequence of events will be documented in the form of a memorandum addressed to the Business Line Director of H&S.

5.8 Written Lockout/Tagout Procedure Exception

If the following elements exist, a written LO/TO Procedure is not required for a particular machine or equipment:

- The machine or equipment has no potential for stored or residual energy or accumulation of stored energy after shut down which could endanger employees;
- The machine or equipment has a single energy source which can be readily identified and isolated;
- The isolation and locking out of that energy source will completely deenergize and deactivate the machine or equipment;
- The machine or equipment is isolated from that energy source and locked out during servicing or maintenance
- A single lockout device will achieve a locked-out condition;
- The lockout device is under the exclusive control of the authorized employee performing the servicing or maintenance;
- The servicing or maintenance does not create hazards for other employees; and
- There have been no accidents involving the unexpected activation or reenergization of the machine or equipment during servicing or maintenance.

The Authorized Employee is responsible for ensuring the elements listed above are met prior to proceeding with LO/TO operations without a specific written LO/TO procedure. In addition, the Authorized Employee must still complete and use the Permit to Work (Exhibit 3).

5.9 Periodic Inspections

Authorized Employee(s) are to conduct a periodic inspection of their energy control procedure(s) **at least annually** to ensure that the requirements of the established energy control procedure and the LO/TO standard are being followed**:**

- The periodic inspection shall be performed by an Authorized Employee other than the ones(s) utilizing the energy control procedure being inspected;
- The periodic inspection shall be conducted to correct any deviations or inadequacies identified;

- Where lockout is used for energy control, the periodic inspection shall include a review, between the inspector and each Authorized Employee, of that employee's responsibilities under the energy control procedure being inspected; and

- Where tagout is used for energy control, the periodic inspection shall include a review, between the inspector and each authorized and affected employee, of that employee's responsibilities under the energy control procedure being inspected, and the elements set forth in the standard.

The periodic inspection maybe completed and documented in two ways.

- LO/TO Task Improvement Process (TIP) shall be performed by an Authorized Employee other than the ones(s) utilizing the energy control procedure being inspected. The completed TIP must be entered into 4-Sight. It is recommended that a copy of the TIP be printed and placed in the project file.

- LO/TO Periodic Inspection Checklist (Exhibit 4) shall be completed by an Authorized Employee other than the one(s) utilizing the energy control procedure being inspected. The completed Periodic Inspection Checklist will be attached to and documented on the LO/TO Periodic Inspection Log. All files will be retained in the project file.

Note: The Authorized Employee conducting the inspection must document that the periodic inspections have been performed. This certification shall identify the machine or equipment on which the energy control procedure was being utilized, the date of the inspection, the employees included in the inspection, and the Authorized Employee performing the inspection.

5.10 Additional Precautions

Whenever outside servicing personnel, subcontractor, contractor, or client are to be engaged in the LO/TO process, Arcadis and the outside party shall inform each other of their respective LO/TO procedures. This process will be documented using Exhibit 5, LO/TO Exchange of Information Documentation.

6. TRAINING

All affected employees who work in areas or with equipment where or on which LO/TO will be performed will complete awareness level training as provided by Arcadis in order to recognize the hazards of energized and locked or tagged out equipment and to understand the basic requirements of LO/TO.

Authorized Employees will receive Lockout/Tagout – Authorized Employee training, available through the Arcadis Learning Center. In addition, staff who wish to be considered as an Authorized Employee must obtain equipment specific hands-on instruction from an Authorized Employee for the equipment he or she will work on, and participate in a lockout/tagout TIP as the Observee to verify that they understand the concepts and requirements of lockout/tagout.

Documentation of training certification received by attendance at any training course including externally provided training courses will be kept by the employee with copies provided to HR Operations (HROperations.ANA@arcadis.com) for upload to the Arcadis Learning Center.

6.1 Retraining

Retraining is required when there is a change in job assignments, machines, or the energy control procedures, or a new hazard is introduced. Documentation of this retraining is accomplished by working with the vendor or supplier to complete or revise Exhibit 2 for the relevant piece of equipment. This revised form is then attached to the Lockout/Tagout Permit to Work and both are reviewed with applicable staff prior to LO/TO activity.

7. REFERENCES (regulation citation, technical links, publications, etc.)

- Arcadis Health and Safety Standard ARC HSFS010– Health and Safety Plan
- Arcadis Health and Safety Standard ARC HSFS003 – Confined Space Entry
- Arcadis Health and Safety Standard ARC HSFS006 – Electrical Safety
- OSHA 29 CFR 1910.147, The Control of Hazardous Energy

8. RECORDS - DATA RECORDING AND MANAGEMENT

- Training records will be kept by the individual employee with copies of such certificates provided to HR Operations (HROperations.ANA@arcadis.com).
- Copies of all HASPs that document LO/TO procedures will be kept in the project files.
- Active specific written LO/TO procedures and JSAs will be kept with equipment or readily accessible on site.
- Historic equipment specific written LO/TO procedures and JSAs will be kept in the project file for the life of the equipment.
- Completed Permit(s) to Work shall be kept readily available for examination at the project location for a period of 12 months, and thereafter, equipment specific permits shall be kept on file for the life of the equipment.
- Lockout/Tagout Periodic Inspection Checklists will be kept with project files or 4-Sight database.

9. APPROVALS AND HISTORY OF CHANGE

Approved by: Julie Santaniello, CSP - Corporate H&S, Manager of Technical Programs

Implementation Date 1 October 2008	Arcadis HS Standard Name Control of Hazardous Energy (Lockout/Tagout)	ARCADIS Design & Consultancy for natural and built assets
Revision Date 29 September 2016	Arcadis HS Standard No. ARC HSFS004	Revision Number 13

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
1 October 2008	01	Mike Thomas / Michael Ramer	Original document
26 February 2009	02		Corrected title and document number in the Exhibit
6 October 2010	03		Addition to section 6.0
28 February 2011	04		Reviewed and Updated to new Standards Format. Added Executive Summary Section.
1 August 2011	05		Updated training section to reflect live offering
14 March 2012	06	Brent Oakeson/Tony Tremblay	Standard Reviewed; Section 5.6, bullet 3 reference changed to Authorized Employee; Definitions moved to Exhibit 1
13 April 2012	07	Tony Tremblay	Replaced terminology JLA to JSA
16 October 2012	08	Pat Vollertsen/Tony Tremblay	Section 5 - clarified that plug connected electric equipment may be exempt from this LO/TO HSS; Revision of section 6.0; LO/TO Permit to Work (refer to Exhibit 3) process instituted; Permit to Work record keeping detailed in Section 8; Exhibit 5 Exchange of Information form added
15 February 2013	09	Tremblay/Vollertsen	Inserted statement that Authorized Employee(s) to conduct a periodic inspection of their energy control procedure(s) at least annually into Executive Summary, Section 4.4 and Exhibit 2 – Equipment Specific LO/TO Procedure; Added reference to locating information about Authorized LO/TO staff from the Training Team into Section 4.4
20 February 2013	10	Pat Vollertsent/Tony Tremblay	Section 6 Retraining clarified

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Revision Date 29 September 2016	Arcadis HS Standard No. ARC HSFS004	Revision Number 13

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
25 November 2013	11	Tony Tremblay	Section 1 Policy, Clarified that when fulfilling the Authorized Employee role, Arcadis will provide the necessary equipment to isolate, secure or block unexpected energization of equipment; Section 4.5 Affected Employee, now includes a note that Affected Employees CAN NOT service or maintain a piece of equipment that has been locked out/tagged out; Section 5.2 bullets renumbered; Section 7 OSHA Control of Hazardous Energy reference - hyperlink added; Exhibit 1: Clarified Affected Employee definition, so staff understand that they CAN NOT service or maintain a piece of equipment that has been locked out/tagged out; Authorized Employee definition includes more detail; Servicing or Maintenance definition added
13 August 2014	12	Tony Tremblay	Removed references to Qualified Employee and replaced with Authorized Employee to match terminology with OSHA standard. Exhibit 3 and 5 references to Qualified Employee changed to Authorized Employee; Authorized Employee definition had training requirements added
29 September 2016	13	Andrew McDonald/Julie Santaniello	Updated for branding and terminology consistency. Added Section 5.6 Tagout System, Section 5.8 Written Lockout/Tagout Procedure Exception, Section 5.9 Periodic Inspections and 5.10 Additional Precautions. Clarified recordkeeping requirements (Section 8). Updated Exhibits 2, 3, 4 and 5.

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Exhibit 1 – Definitions

Affected Employee operates or uses equipment that is subject to lockout/tagout procedures or works around or in the vicinity of equipment subject to lockout/tagout processes.

Note: An affected employee becomes an authorized employee when the affected employee's duties are expanded to include performing servicing or maintenance on a machine or piece of equipment which must be locked or tagged out. See the definition of an *Authorized Employee* below. Before performing service or maintenance on a piece of equipment that is locked or tagged, that employee must receive the training detailed in Section 6 of this standard.

Authorized Employee is someone who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. Each authorized employee shall receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy isolation and control. Arcadis HR Operations maintains a list of LO/TO Authorized Employees.

Energy Isolation Device is a mechanical device that physically prevents the transmission or release of energy. It does not include control circuit type devices, but rather physical devices that control circuit operation designed to accept a lockout device. They are installed when replacement or major repair, renovation, or modification of a machine or equipment is performed, and when new machines or equipment are installed.

Hazardous Energy covered by this standard includes, but is not limited to:

- Electrical
- Mechanical
- Hydraulic
- Pneumatic
- Chemical
- Thermal
- Gravitational (stored)
- Pressure (stored)
- Hazardous materials

Lockout Device is a device that utilizes a positive means, such as a lock, chain, block, etc. to hold an energy-isolating device in a safe position ensuring that the energy isolating device and equipment cannot be operated. All locks shall be uniquely keyed.

Servicing and/or maintenance are workplace activities such as constructing, installing, and 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 the employee may be exposed to the *unexpected* energization or startup of the equipment or release of hazardous energy.

Tagout Device is a prominent warning device, such as a tag, to indicate that the isolating energy device and equipment may not be operated.

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Exhibit 2 – Template for Equipment Specific Lockout/Tagout Procedure

Lockout Tagout (LOTO) Procedure

ARCADIS Design & Consultancy for natural and built assets

Project Name:		**Project Location:**	
Project Number:		**Project Manager:**	
Developed By:		**Reviewed By:**	
Origin Date:	**Revision #:**	**Revision Date:**	**Revised By:**
Equipment #:		**Equipment Manufacture:**	
Equipment Description:		**Equipment Location:**	

Warning: Only Authorized Employees who have been Trained and Authorized can perform the LOTO procedures below

Equipment Diagram

Insert photos of equipment or schematic showing location of equipment to be locked out

Adjacent & Associated Equipment

Adjacent & Associated Equipment	Location of Adjacent & Associated Equipment and Action to be Taken

Lockout Tagout (LOTO) Procedure

Energy Source	Lockout Device	Isolation Location	Lockout Method	Zero Energy Check, Verification & Testing

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Exhibit 3 – Equipment Lockout/Tagout Permit to Work

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Equipment Lockout / Tagout (LO/TO) Permit to Work

Equipment:		**Project Number:**	
Project Name:		**Project Location:**	
Name of Authorized Person in Control of LO/TO Process:		**Name of Authorized Person applying Equip Isolation Device:**	
Name of Authorized Person that verified Hazardous Energy Source is controlled:		**Name of NFPA 70e Authorized Person (If Required):**	
Start Date for LO/TO Procedure:		**Estimated Date of Completion for LO/TO Procedure:**	
Estimated Start Time for LO/TO Procedure:		**Estimated Completion Time for LO/TO Procedure:**	

TRACKing the LO/TO Work Permit

THINK THROUGH THE TASK

Job Task: (Brief summary of what hazardous energy control work is proposed)

EXAMPLE

WORKFORCE INVOLVED/AFFECTED BY LO/TO WORK — **Check all the apply**

Name	Company	Phone Number	Reviewed LO/TO Procedure	LO/TO Authorized Person	NFPA 70e Authorized Person	Affected Employee	Affected Employee Trained
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐

Comments/Additional Details:

RECOGNIZE THE HAZARDOUS ENERGY SOURCE (check all that apply) and ASSESS THE RISK (Low-Moderate-High)

YES	NO	Type of Hazardous Energy	SELECT ↓	YES	NO	Type of Hazardous Energy	SELECT ↓
☐	☐	Electrical		☐	☐	Thermal	
☐	☐	Mechanical		☐	☐	Gravitational (Stored)	
☐	☐	Hydraulic		☐	☐	Pressure (Stored)	
☐	☐	Pneumatic		☐	☐	Hazardous Material	
☐	☐	Chemical		☐	☐	Other Hazard	

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CONTROL THE WORKING ENVIRONMENT

Written LO/TO Procedure	YES	NO	Written LO/TO Procedure Eception	YES	NO
Developed an Equipment LO/TO Procedure	☐	☐	Written LO/TO Procedure Eception	☐	☐
Identified all hazardous energy sources	☐	☐	Equipment has been removed from service	☐	☐
Equipment LO/TO Procedure Reviwed with the past 12 months	☐	☐	Locking devices and Tags in use	☐	☐
Identified all hazardous energy sources	☐	☐	Equipment reduced to zero energy state	☐	☐
Notified affected employees	☐	☐	Equipment has been isolated	☐	☐
Locking devices and Tags in use	☐	☐	Equipment isolation tested/verified	☐	☐

All No responses: **Use Stop Work Authority- Explain Control Work Environment:**

LO/TO POINTS ISOLATED BY AUTHORIZED PERSON(S)
Refrence Written LO/TO Procedure

Hazard	Action Required	Lock ID / #	Authorized Person Name	Date LOTO Applied	Date LO/TO Removed

EMERGENCY CONTACT LIST

Emergency Contact	Phone 1:	Phone 2:	Location:
Emegency (FIRE/EMS):			
Emegerncy (Facility):			
Work Care:	888.449.7787	-------	
Project Manager:			
Site Safety Officer:			
Client Contact:			
Other:			

*Include any Task Specific JSA's with this permit to work.

KEEP H&S FIRST IN ALL THINGS

I understand the nature of the work for this permit, and certify that this permit meets the requirements specified in the Arcadis LO/TO Standard.

Completed Permit to Work Must Be Retained in Project File for 12 Months

APPROVAL OF LO/TO WORK PERMIT- By ARCADIS LO/TO Authorized Person:

Name: _____ Office Location: _____

Title: _____ Date: _____

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Exhibit 4 – Lockout/Tagout Periodic Inspection Checklist

Lockout Tagout (LO/TO) Periodic Inspection Checklist ARCADIS

Periodic inspections of energy control procedure(s) are required at least annually to ensure that the requirements of the established energy control procedure and the LO/TO standard are being followed. This form must be attached to the Periodic Inspection Log. The Arcadis LO/TO TIP maybe used in place of this checklist.

All No responses require an update to the written LO/TO procedure.

		Yes/No	Details
1	Is all machinery or equipment capable of movement, required to be de-energized or disengaged and locked-out during cleaning, servicing, adjusting or setting up operations, whenever required?		
2	Where the power disconnecting means for equipment does not also disconnect the electrical control circuit:	--	--
2a	Are the appropriate electrical enclosures identified?		
2b	Is means provided to assure the control circuit can also be disconnected and locked-out?		
2c	Is the locking-out of control circuits in lieu of locking-out main power disconnects prohibited?		
3	Are all equipment control valve handles provided with a means for locking-out?		
4	Does the lock-out procedure require that stored energy (mechanical, hydraulic, air, etc.) be released or blocked before equipment is locked-out for repairs?		
5	Are appropriate employees provided with individual keyed personal safety locks?		
6	Are employees required to keep personal control of their key(s) while they have safety locks in use?		
7	Is it required that only the employee exposed to the hazard, place or remove the safety locks?		
8	Is it required that employees check the safety of the lock-out by attempting a startup after making sure no one is exposed?		
9	Are employees instructed to always push the control circuit stop button immediately after checking the safety of the lock-out?		
10	Is there a means provided to identify any or all employees who are working on locked-out equipment by their locks or accompanying tags?		
11	Are a sufficient number of accident preventive signs or tags and safety padlocks provided for any reasonably foreseeable repair emergency?		
12	When machine operations, configuration or size requires the operator to leave his or her control station to install tools or perform other operations, and that part of the machine could move if accidentally activated, is such element required to be separately locked or blocked out?		
13	In the event that equipment or lines cannot be shut down, locked-out and tagged, is a safe job procedure established and rigidly followed?		

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Exhibit 5 – Lockout/Tagout Exchange of Information Documentation

ARCADIS Design & Consultancy for natural and built assets

Lockout/Tagout Exchange of Information Documentation

The LO/TO standard requires that Arcadis exchange energy control procedures with outside employers who service and/or maintain equipment/machines owned by Arcadis that require LO/TO. Arcadis staff will use this form to notify all parties that they must comply with any identified restrictions and prohibitions, as outlined below. This form should be completed by an Arcadis Qualified LO/TO staff person in conjunction with the outside employer's LO/TO Authorized representative. This exchange of information must occur before service/maintenance activities begin on Arcadis-owned equipment. If Arcadis staff will also be working on this equipment or in surrounding areas, then attach this documentation form to the Equipment Specific LO/TO Procedure and the LO/TO Permit to Work.

1. **Identification of Outside Employer(s):**

   Company:_____
   Name:_____
   Address:_____
   _____
   Telephone #:_____

2. **Identify Location of Equipment:**_____

   Identify Equipment/Machine to be serviced:_____

   Hazardous energy control procedures for the equ[illegible]nt/m[illegible]thin[illegible]ave b[illegible]n excha[illegible]
   [illegible]ponse wo[illegible]Stop Work Authority)

3. **After comparin[illegible] the Ar[illegible]a[illegible] and O[illegible]sit[illegible] Em[illegible]oye[illegible] LO/T[illegible] programs/procedures, identify any specifi[illegible]estric[illegible]ons/pr[illegible]ibi[illegible]ns or [illegible]roce[illegible]l step[illegible] below:**

   _____
   _____

4. **[illegible]fec[illegible] Persons (listed below) shall review, understand and comply with the above-identified specific restrictions/prohibitions or procedural steps.**

(Printed Name)	(Signature)
_____	_____
_____	_____
_____	_____

5. **Acknowledged acceptance of the provisions of this exchange of information form:**

   Outside Employer Representative:_____ _____
   (LO/TO Qualified) (Signature) (Date)

   Arcadis Authorized LO/TO Staff:_____ _____
   (Signature) (Date)

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EXECUTIVE SUMMARY

The following is a requirements summary applicable to the Motor Vehicle Safety Program (MVSP):

- The MVSP applies to all Arcadis drivers operating Arcadis owned, leased, rented, or personal motor vehicles used for business purposes and all Arcadis owned, leased or rented motor vehicles used for non-business (personal) purposes.
- Arcadis expects 100 percent compliance with all applicable driving laws and regulations.
- Employees operating Arcadis owned, leased or rented vehicles for personal use must have written supervisor's approval.
- All Arcadis drivers with an assigned driving function for Arcadis may have their Motor Vehicle Record (MVR) reviewed by approved representatives of Corporate Human Resources, Health and Safety and/or Legal Departments.
- Newly hired drivers with an assigned driving function for Arcadis and a clean MVR must complete, at a minimum, on-line defensive driving training within 30 days of hire.
- Existing Arcadis drivers with an assigned driving function for Arcadis must participate, at a minimum, in on-line defensive driving training at intervals prescribed by Health and Safety.
- Weekly vehicle inspections are required for all Arcadis owned, leased, or rented vehicles used during the previous 7 days. Inspections will be documented.
- All Arcadis owned, leased, or rented motor vehicles will be properly maintained in accordance with manufacturer's recommendations. All defects affecting safe operation of the motor vehicle will be promptly repaired.
- Arcadis employees are prohibited from modifying Arcadis owned or leased vehicles unless the modification is approved in writing by Corporate Health and Safety and/or Corporate Procurement.
- Arcadis prohibits use of electronic devices, including electronic devices in hands free mode, while driving any vehicle for Arcadis.

1. POLICY

It is the policy of Arcadis to implement sound defensive driving training and education to employees. It is also Arcadis policy to provide administrative management that ensures vehicles are well maintained and driven by qualified employees.

2. PURPOSE AND SCOPE

2.1 Purpose

Arcadis is committed to providing a healthy and safe work environment for our employees, subcontractors, clients and visitors. To this end, Arcadis embraces this Health and Safety MVSP Standard.

This standard and accompanying requirements provides consistent practices with regards to defensive driving and vehicle administration for Arcadis vehicles.

2.2 Scope

Generally, this Standard applies to all employees operating motor vehicles for Arcadis.

2.2.1 Business Driving

This MVSP applies to the operation of any motor vehicle during the conduct of Arcadis business. It applies to every Arcadis Driver operating an Arcadis, rental, leased or personal vehicle used for company business.

2.2.2 Area Involved

This MVSP applies to the operation of motor vehicles for company business in any country in which Arcadis employees or temporary agency employees are working.

2.2.3 Exceptions

2.2.3.1 Operation of Commercial Motor Vehicles

Additional requirements apply to the operation of commercial motor vehicles (CMVs). Refer to the Arcadis Transportation Safety Program for Commercial Motor Vehicles (CMV Program) for additional information. When client requirements are more restrictive than this MVSP, the more restrictive requirement will apply for all work activities involving driving for that client.

2.2.3.2 Drivers without an Assigned Driving Function for Arcadis

Drivers without an assigned driving function for Arcadis are still subject to the requirements of Section 5.1 and all of Section 6.0 of this standard.

3. DEFINITIONS

Definitions relating this MVSP can be found in Exhibit 1.

4. RESPONSIBILITIES

The following have responsibilities under this standard:

4.1 **Corporate Health and Safety Department (Health and Safety)** – Has the responsibility for: revising and updating this standard, communicating MVSP requirements to employees. They also ensure this MVSP is being implemented effectively. Health and Safety has a primary focus of identifying defensive driving education and training resources. Health and Safety is also responsible for stewarding programs involving vehicle inspections and maintenance requirements. Health and Safety has the authority to request and evaluate motor vehicle reports (MVRs) on Arcadis drivers at any time.

4.2 **Health and Safety MVSP Specialist (MVSP Specialist) –** Is the primary contact for all issues related to implementation of this MVSP, including reporting of all accidents and incidents involving a motor vehicle. The MVSP Specialist will coordinate with other Corporate departments, as required, related to MVSP implementation requirements.

Contact the MVSP Specialist for all MVSP related reporting, questions or concerns.

4.3 **Corporate Human Resources Department (Human Resources)** – Has the responsibility to review applicable portions of this standard for the purposes of ensuring consistency with Human Resource's policies and procedures regarding motor vehicle operation. Human Resources have a primary focus of ensuring administrative procedures concerning vehicle use are followed by employees. Human Resources has the authority to request and evaluate MVRs on Arcadis drivers at any time.

4.4 **Corporate Legal Department (Legal) –** Has the responsibility to provide oversight of the requirements stipulated in this standard to ensure Arcadis risks are properly managed. Legal has the authority to request and evaluate MVRs on Arcadis drivers at any time.

4.5 **Corporate Purchasing (Purchasing)** – Has the responsibility to oversee leasing and maintenance management vendors and facilitate maintenance issues associated with Arcadis owned or leased vehicles. Purchasing will also work with Health and Safety on safety equipment needs for owned or leased vehicles.

4.6 Health and Safety Managers and Specialists – Are responsible for facilitating and educating staff on MVSP requirements. These individuals may also perform audits or conformance assessment to ensure compliance with the requirements of this standard.

4.7 Arcadis Managers and Supervisors (including Project and Task Managers) – These managers and supervisors provide stewardship concerning the requirements of this standards to lower tier managers and employees. In addition, they assure that appropriate time is provided to ensure implementation of MVSP requirements and facilitate maintenance request approvals.

4.8 Arcadis Employees – Each employee has the responsibility to adhere to this MVSP and to communicate Health and Safety concerns, issues and questions to their supervisor or to Health and Safety staff. In addition, all employees have the responsibly to use TRACK prior to any driving activity and will follow all applicable Arcadis, federal, state, provincial, and local jurisdiction regulatory; and client requirements when driving an Arcadis owned, leased, rented vehicle.

5. PROCEDURE

5.1 General Procedure and Requirements

Only Arcadis Drivers as defined in Exhibit 1 are permitted to drive Arcadis vehicles. Exceptions to this policy are limited only to individuals authorized by the Arcadis Driver or fleet administrator to perform short term driving and parking activities involving Arcadis vehicles such as maintenance employees and valets. Use of joint venture and temporary agency employees working with or for Arcadis to operate Arcadis vehicles requires pre- approval of the Business Line President and Legal.

Employees must report all moving violations that may affect their driving status for Arcadis.

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

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

- Receive a moving violation during non-business related driving in any type of motor vehicle that might affect their driving status with Arcadis.

If one of these issues occurs, the employee's supervisor will contact the MVSP Specialist. The MVSP Specialist (or his/her designate), in cooperation with Human Resources and Legal, as deemed necessary, will evaluate the employee's driving status (especially in instances of license suspension, revocation or restriction) and, as appropriate, corrective action recommendations will be made.

Employees who fail to report a driving violation to their supervisor that might affect their driving status for Arcadis purposes (a restricted driver) will face disciplinary action which may include termination if the conviction is discovered through routine MVR pulls, criminal background checks or other official documentation transmitted or made available to Arcadis. Arcadis will work to the extent practical with employees who report driving violations that might affect their driving status for Arcadis purposes if Arcadis operations management can accommodate a driving restriction for the driver or other suitable arrangement is made consistent with Human Resources and Legal policies.

All Arcadis Drivers driving an Arcadis motor vehicle or personal vehicle for Arcadis business will:

Arcadis prohibits use of cellular phones, including hands free mode, when driving vehicles for Arcadis.

- Wear seat belts at all times in any vehicle with seat belts (this includes taxis and shuttle buses equipped with seat belts);
- Have a valid unrestricted operator's license appropriate for the vehicle being driven;
- Operate and license the vehicle in accordance with applicable laws;
- Operate the vehicle consistent with client driving rules, speed limits, and requirements when operating the vehicle on project sites;
- Drive defensively as learned through training, education, and experience;
- Exercise caution when taking any prescription or over-the-counter medication that may cause drowsiness or an altered mental state;
- Not use controlled substances, illegal drugs, or be under the influence of alcohol while driving on Arcadis business;

- Not drive in a manner that could be deemed reckless or aggressive by other drivers;
- Not use radar/laser-type detectors;
- Not pick up hitchhikers;
- Not smoke in company vehicles; and
- For drivers with an assigned driving function for Arcadis, if permanently assigned an Arcadis motor vehicle will ensure the vehicle is maintained as directed by the Arcadis maintenance vendor.

Use of headlights at all times, even during daylight hours, is recommended. Additionally, Arcadis expects all drivers to use pull through parking or back into parking places consistent with their defensive driving training specified in this standard and as permitted by local laws.

5.2 MVR Review

5.2.1 New Hire MVR Review

Human Resources will perform a MVR review on potential new hires of positions that have an assigned driving function for Arcadis. The MVR review process for potential new hires follows an established review process that will result in a Pass, Conditional, or Restricted status. A MVR review resulting in Restricted status will prevent hiring of the candidate unless excepted as specified in Section 5.2.5. Human Resources will communicate the MVR review results to the new hire candidate and hiring manager prior to finalizing the new hire process.

MVSP Guide-005 provides details of the MVR review process.

5.2.2 Existing Employee MVR Review

Human Resources may perform a MVR review on existing employees with an assigned driving function for Arcadis at a frequency stipulated by Corporate. The MVR review process for existing employees follows an established review process that will either result in a Pass, Conditional, or Restricted status. Human Resources will communicate the MVR review results to the employee and their administrative supervisor when a Conditional or Restricted status is identified from the MVR review.

5.2.3 Post-Accident MVR Review

Any vehicle related accident classed as a preventable Motor Vehicle Accident (MVA) will require a MVR review for the employee involved in the MVA. Preventable VLEs are not generally subject to the MVR review process; however, Corporate reserves the right to perform a MVR review on any employee involved in a vehicle related accident regardless of accident classification. The MVSP Specialist will report the need to run a MVR to **Human Resources** upon determination of a preventable MVA and **Human Resources** will communicate the MVR results to the employee and their supervisor.

5.2.4 Commercial Motor Vehicle MVR Reviews

Detailed requirements concerning MVR review and evaluation for drivers participating in the Arcadis CMV Program is not addressed in this standard. MVR reviews related to CMV drivers are performed by Arcadis Director of Transportation Safety or his/her approved designate.

5.2.5 Appeals

MVR reviews that result in Restricted driving status for a potential new hire or existing employee may be appealed to the applicable Business Line President through the applicable Business Line H&S Director. The Business Line President may elect to maintain the restriction or overturn the restriction. An overturned restriction may be referred by the Business Line President to the Accident Review Committee for additional corrective action based on the circumstances of the restriction.

5.3 Defensive Driving Training, Evaluation, and Education Requirements

The Arcadis Learning Center provides instructions on how to enroll into defensive driving training courses or tutorials

5.3.1 New Hire Defensive Driving Training

All new hires (regardless of driving assignment) with an active driver's license will complete on-line defensive driving training prescribed by Health and Safety within 30 days of employment.

New hires with conditional driving status may be required to complete on-line defensive driving training prior to operating a vehicle for Arcadis.

5.3.2 Existing Employee Defensive Driving Training

On a frequency defined by Corporate Health and Safety, in cooperation with operations senior management, employees who have an assigned driving function for Arcadis shall complete an on-line defensive driving training course designated by Health and Safety or an equivalent course approved by Health and Safety.

Note: For existing employees hired before the implementation date of this policy, the supervisor will determine if the employee drives on average 5 or more days per month to warrant participation in this training.

In furtherance of Arcadis' goal of promoting safe driving, employees who do not have an assigned driving function for Arcadis are also eligible to voluntarily participate in the same on-line defensive driving training concurrent with prescribed timeframes for any assigned Arcadis driver training.

If a client requires classroom or hands-on defensive driver's training, the Arcadis Learning Center will arrange for the required classroom training. The Arcadis required on-line training will not be required for those driving employees who attend classroom training (hands-on or subject matter training) consistent with a Health and Safety recognized defensive driving system during the same calendar year.

All Arcadis drivers are expected to review and be familiar with the contents of the Operator's Manual(s) for the vehicles they will be operating. Additional training may be provided or required at the request of an employee's supervisor, Health and Safety, or as required by a client.

5.3.3 Inexperienced Drivers

New hires or existing employees having an assigned driving function for Arcadis and known to have only possessed a valid driver's license for less one year or experienced drivers that are unfamiliar with driving large vehicles may warrant additional evaluation and training in the operation of the vehicle(s) they are expected to drive while working for Arcadis. Supervisors are encouraged to review with their direct reports their license and driving history to ensure the driver is comfortable and

Supervisors should discuss with their direct reports about their abilities to operate large vehicles and address direct report concerns.

knowledgeable of expected vehicle operation. If determined by the supervisor that additional evaluation is warranted, a Commentary Drive (see Section 5.4) should be considered. The supervisor may schedule an additional TIP at a later date to ensure safe driving of larger vehicles is being performed.

Supervisors may opt to enroll drivers in additional defensive driving on-line training or hands-on defensive driver training if the driver expresses concerns about their ability to safely drive a vehicle.

5.3.4 Drivers Requiring Training or Evaluation due to Corrective Action from MVR Review

Any driver subject to Corrective Action arising from an MVR review will be trained or evaluated as prescribed in the MVR evaluation process (MVSP Guide-005).

5.3.5 Additional Defensive Driving Training and Education Requirements for Employees Involved in a Vehicle Loss Event

Corrective actions associated with an employee involved in a preventable or non-preventable VLE will be determined by the supervisor based on the severity and circumstances of the incident as determined by the Incident Reporting and Investigation H&S Standard (ARC HSMS010).

5.3.6 Additional Criteria for Temporary Agency Employees

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

- The temporary agency employee's MVR is clear of any violation for the prior three (3) years and lists no prior critical violations. Critical violations include such issues as:
    - Alcohol-related offenses
    - Driving while impaired or under the influence of alcohol or drugs
    - Homicide, negligent homicide, or manslaughter by vehicle
    - Fleeing or attempting to elude police officer
    - Hit and run
- If a temporary agency employee receives a convicted violation or has an accident while driving, regardless of fault or preventability, on Arcadis business, they are

immediately prohibited from driving Arcadis vehicles, rental vehicles or a personal vehicle for Arcadis business unless otherwise permitted by the applicable Business Line President or the ANA Director of Health and Safety.

5.4 Sources for On-Line and Video Based Defensive Driving Training

The on-line defensive driving training or equivalent training will be provided by, or based on, a nationally recognized defensive driving training company such as Smith System or other recognized provider as approved by Health and Safety and arranged through the Arcadis Learning Center. Video based defensive driving training modules will be arranged through the Arcadis Learning Center.

5.5 Commentary Drive Program

The Commentary Drive evaluates driver understanding of safe driving behaviors by having the driver verbalize their observations to the Commentary Drive observer when operating the vehicle. The observer will use a standard Commentary Drive Evaluation Form to document driver understanding of safe driving principles such as the Smith System “5 Keys”. The observer will also provide real time feedback on questionable driving behaviors. Commentary Drives are expected to last a minimum of 1 hour behind the wheel driving time.

MVSP Guide-001 provides criteria for observers used in Commentary Drives.

Employees performing observer functions for Commentary Drives must be current on Health and Safety defensive driving on-line training obligations as described in Section 5.3 above and meet additional criteria in MVSP-Guide 001.

5.6 Driving TIPs

The driving TIP may be used to evaluate driver performance and provide solutions related to questionable driving behaviors for routine driving evaluations under the Arcadis Behavior Based Safety (BBS) Program. Solutions generated using the TIP process will be consistent with the expectations of the Arcadis BBS Program.

5.7 Sources of Hands-On Defensive Driving Training

When used, hands-on defensive driving training will be provided by, or based on, a nationally recognized defensive driving training course such as Smith System or other provider approved by Health and Safety. The trainer

must be certified in the program upon which they are instructing and can be either internal or external to Arcadis. Arrangements for hands-on defensive driving courses are handled by the Arcadis Learning Center.

5.8 Additional Training and Education for Other Driving Conditions

Working together, supervisors, managers, and Health and Safety have the responsibility of determining additional training for employees driving under special conditions such as CMVs, towing trailers, riding and operating all-terrain vehicles or other non-routine driving conditions. Training approved by Health and Safety will be arranged through the Arcadis Learning Center.

5.9 Driving Distractions and Electronic Device Use While Operating a Motor Vehicle

Arcadis strictly prohibits employee use of personal or company-provided electronic devices (as defined in Exhibit 1) while the vehicle is on motion or stopped in traffic. This includes use of these devices in hands-on mode or hands-free mode while the employee is operating any motor vehicle for Arcadis purposes.

Electronic devices used for navigation must be secured in the vehicle with a mount designed for such purpose.

Guidance for vehicle controls and settings: If the driver needs to do more than push a button or flip a switch one time to complete the desired action, then the driver should not be performing the function while the vehicle is in operation or stopped in traffic. For example, the driver should not be repeatedly pushing the "seek" button on the radio to find a radio station they like or adjust the seat while simultaneously driving the vehicle.

To avoid distractions that could result in an accident, reading, grooming, eating and drinking should be avoided while operating a motor vehicle.

5.10 Additional Defensive Driving Procedures

Arcadis promotes additional defensive driving techniques to assist in the elimination or minimization of MVAs and VLEs. These techniques include:

- When a second Arcadis employee is available, and where it is safe to do so, all vehicle backing operations should use a spotter to assist with the backing operation.
- As a best practice, use of the cone program (or similar program) to promote awareness of hazards around parked vehicles.
- To assist drivers in their potential lack of familiarity with the location in which they are driving, one of the following should be utilized by drivers traveling to unfamiliar locations:
    - The use of GPS systems programmed prior to operating the vehicle, and/or
    - Pre-Trip Route Planning using Google® Maps or MapQuest®, and/or
    - Preparation of a Journey Management Plan (JMP) using the template provided in the Excel Standard HASP Template

MVSP Guide-007 provides best practices for spotting and cone placement

When the driver is the only occupant of the vehicle, use of a GPS device is preferred. Maps and JMPs should preferably be used by passengers in the vehicle to assist the driver in navigating to the desired destination.

5.11 Vehicle Inspections and Maintenance

All company owned or leased vehicles will be maintained in safe operating condition. To ensure vehicles are properly maintained, a daily pre-trip visual inspection must be informed prior to operating the vehicle. The pre-trip inspection should include, but is not limited to:

- Seat belts;
- Doors and door locks;
- Lights;
- Mirrors;
- Horn;
- Back up alarms, if equipped;
- Back up cameras, if equipped;
- Parking brake;
- Instrument panel;

- Steering;
- Windows;
- Windshield wipers;
- Tires; and
- Emergency equipment.

A more comprehensive weekly documented inspection (daily if required by the client, manager or supervisor or if vehicle is operated in harsh environments) is also required. Rental vehicles operated by Arcadis for more than one week also must also use the documented weekly inspection process. Inspections are required to be documented on the Weekly Vehicle Inspection Checklist or equivalent.

Documented vehicle inspections are required weekly and use of approved fuel cards is also required.

Deficiencies identified in inspections or at any other time will be managed through the Arcadis vehicle leasing company vendor or maintenance provider specified by Corporate Purchasing. Routine maintenance (gasoline, oil, etc.) will also be managed through these vendor(s) using approved fuel cards. Use of assigned fuel cards is critical to help ensure maintenance schedules are maintained for the vehicle. Records of vehicle inspections should be maintained at the office or project location where the vehicle is assigned.

Employees operating company owned or leased vehicles (including qualifying rental vehicles) required to be maintained under the CMV program will follow inspection and maintenance requirements specified in the CMV program. **Use of Weekly Vehicle Inspection checklist for CMV operation is <u>not permitted</u>.**

5.12 Safety Equipment for Arcadis Vehicles

All Arcadis owned or leased vehicles are expected to have, at a minimum, a 2.5 lb. A,B,C fire extinguisher (permanently mounted), first aid kit and an orange strobe or oscillating light. The amber warning light may be permanently affixed or removable; however, owned or leased vehicles obtained after April 4, 2016 must have permanently installed amber warning lights installed in or on the vehicle. Rental vehicles and Arcadis owned, leased, or rented vehicles will be subject to equivalent requirements, if used for field work unless otherwise excepted from a specific safety equipment requirement by the project specific HASP or Job

Arcadis Trucks:
- ✓ Fire Extinguisher
- ✓ First Aid Kit
- ✓ Amber Warning Light

Safety Analysis. Rental vehicles are not required to have fire extinguishers and amber warning light permanently mounted.

All Arcadis owned or leased vehicles obtained on or after June 1, 2012 will be required to be equipped with back up alarms. Arcadis owned or leased vehicles obtained prior to June 1, 2012 will be required to have a functioning back up alarm if used for project work with client mandated back up alarm requirement.

All Arcadis owned or leased pickup trucks with an open bed obtained on or after April 4, 2016 will be required to be equipped with a rear window protector.

Refer to MVSP Guide-010 for additional recommendations for safety and emergency equipment that may be required for specific project needs.

All Arcadis vehicles managed under the Arcadis approved vendor maintenance program have Emergency Roadside Assistance. Documentation, including the phone number, for the vendor providing assistance must be maintained in the glove box of the vehicle.

5.13 Securing Loads in Vehicles

All luggage, equipment and supplies loaded into a vehicle operated by Arcadis will be stowed in a manner that will prevent appreciable movement. Luggage, equipment and supplies placed in the passenger compartment of vehicles will be placed in a manner that will prevent rapid forward movement in the event of a hard stop or frontal collision. Objects will not be placed on the dashboard of vehicles unless they are secured in place by friction mats, suction cups, or similar securing device.

Securing straps, tiedowns (all types) and securing nets used to secure loads on trucks must be inspected prior to each use. Damaged, worn or frayed securing straps or tiedowns must not be used.

Chemicals transported in Arcadis vehicles must conform to the requirements of the Arcadis Transportation Safety Program for HazMat Shipping and Transportation.

Arcadis CMVs are subject to additional load securement requirements specified by the Arcadis Transportation Safety Program for CMVs.

5.14 Vehicle Modification

Arcadis employees are prohibited from modifying Arcadis owned or leased vehicles unless the modification is approved in writing by Corporate Health and Safety and/or Corporate Procurement.

5.15 Electronic Logging Devices (ELDs) and Telematics

Selected Arcadis vehicles are equipped with ELDs and/or telematic devices as designated by Corporate Health and Safety or Corporate Procurement. Arcadis employees are prohibited from tampering with devices or rending these devices in operable. ELD use is currently restricted to specific Arcadis CMV drivers.

5.16 Special Considerations for Rental Vehicles

Rental vehicles will be treated and driven in a manner equivalent to an Arcadis owned or leased vehicle. Additionally, Arcadis employees renting vehicles will plan and select a vehicle appropriate for the conditions anticipated when driving. Careful planning is required to preferentially use Arcadis owned or leased vehicles for off road use instead of using rental vehicles when reasonable, practical and permitted under contract (client or rental company) terms. Due to operating unfamiliarity typically encountered when renting vehicles, use of TRACK to identify and mitigate atypical or unfamiliar vehicle functionality or performance is required.

MVSP Guide-006 provides safety best practices information for rental vehicles. Arcadis drivers must be 21 years of age to rent vehicles.

6. VEHICLE USE AND INSURANCE

6.1 Non-Business Use of Company Vehicles

Non-business use during business hours and/or having non-business related passengers in an Arcadis Vehicle or Rental Vehicle during such business use is prohibited. In the event of an accident in these situations, the employee is personally liable for injuries and damages associated with such an accident and the employee, and not Arcadis, will be responsible for all rental charges. Operating an Arcadis Vehicle or Rental Vehicle for strictly personal use on weekends, evenings and holidays is prohibited, unless prior approval by the employee's supervisor is given, and the vehicle possession is necessary due to remote location and assignments, and the employee has all required personal automobile liability insurance. Supervisors should assess the requirement and may place any other appropriate limitations on such use.

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

6.2 Insurance

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

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

6.2.1 Vehicle Rental in the United States

As stated above, Arcadis has insurance for all Arcadis Vehicles. When renting for business in the United States, the rental should be arranged through World Travel, and there is no need to accept the insurance coverage offered by Arcadis preferred rental car vendors (currently Enterprise and National).

6.2.2 Vehicle Rental Outside of the United States

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

6.2.3 Personal Vehicles

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

indicates the amount of coverage as adequate proof of insurance coverage.

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

7. TRAINING

See section 5.3 of this standard for training requirements.

8. REFERENCES

Arcadis Transportation Safety Program for Commercial Motor Vehicles

The following MVSP Guides are located here:

MVSP Guide-001, Staff Approved for Conducting Commentary Drives

MVSP Guide-002, Guidelines for Conducting Commentary Drives

MVSP Guide-003, Automated Enforcement Conviction Evaluation Criteria

MVSP Guide-004, Criteria for Defining a Motor Vehicle Accident

MVSP Guide-005, Guide for MVR Corrective Actions

MVSP Guide-006, Rental Vehicle Safety Requirements and Best Practices

MVSP Guide-007, Spotter and Cone Program Best Practices

MVSP Guide-008, MVSP Restricted Driving Appeal Process

MVSP Guide-009, *Reserved*

MVSP Guide-010, Safety Requirements for Arcadis Vehicles

MVSP Guide-011, Reporting Requirements for all Vehicle Damage

Incident Reporting and Investigation H&S Standard (ARC HSMS010)

9. RECORDS

Records will be maintained as follows:

- MVRs pulled as required under this MVSP and associated notifications, approvals, releases, and findings information will be maintained by Human Resources.
- TIP results, incident reports and near miss reports related to MVSP activities will be maintained in the 4-Sight database.
- Commentary Drive documentation will be provided to the employee unless otherwise specified by the MVSP Specialist.
- Any training certificates or documentation arranged through the Arcadis Learning Center (hands-on defensive driving, defensive driving on-line, defensive driving videos, etc.) will be maintained by the Arcadis Learning Center.

10. APPROVALS AND HISTORY OF CHANGE

Approved By: Julie Santaniello, CSP - Corporate H&S, Manager of Technical Programs

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
26 March 2007	01		Original document
18 August 2007	02		Change in required on-line defensive drivers training
22 October 2007	03		Changing over to new template format and addition of the “Comments on My Driving?” program

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
21 January 2008	04		Change to new template; change to 2008 organization job titles; change to prohibit texting/emailing while driving
13 June 2008	05		Addition of Sections 5.10 and 5.11 on other defensive driving techniques and cone placement.
6 October 2008	06		Clarified who is required to complete online training in Section 5.3 and modified section on when hands-on defensive driving is required after an accident.
8 April 2009	07		Incorporated references to the CMV program and vehicle inspection requirements. Incorporated Vehicle Use Policy. Added fatigue management requirements. Deleted references to the Commentary Drive which is obsolete.
3 November 2009	08		Incorporated Smith System videos as a corrective action, Commentary Drive Program and revised Exhibit 2 and added new Exhibit 4.
1 November 2010	09		Deleted Comments on my driving section as program was discontinued.
25 May 2011	10		Revised content and restructured selected exhibits and standard sections. Most content duplicated in the Vehicle Use policy removed. Vehicle Use policy incorporated by reference
August 16, 2011	11		Replaced section 5.7, added new definitions and guide references, clarified fatigue management recommendations, modified terminology for BBS program, provided MVR report clarifications.

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
May 2, 2012	12		Comprehensive restructuring, Revisions to training and MVR processes, expanded rental vehicle safety, inclusion of additional MVSP guidance documents, roles and responsibilities clarification. Inclusion of vehicle safety equipment information. Formalization of the ARC process.
14 March 2013	13		Clarified MVR review and training for new hires. Clarified standard conflict with other corporate department policies. Restructuring of section 5.2. Removal of assigned driving function. Revision to headlight use. Section 4.2 MVSP Specialist e-mail link address updated
8 December 2013	14		Added definition for assigned driving function, Restructured MVR review requirements, newly licensed driver requirements, and add references to new MVSP Guides. Title changes and minor editing throughout.
29 January 2014	15	Sam Moyers	Addition of new section 5.13 addressing load securement to harmonize with other H&S standards and guidance. Addition of pre trip visual inspection information to harmonize with other H&S standards and guidance. Clarification of expectations in the cone and spotter program. Revised header and footer to current standard and modified revision history table.
4 February 2014	16	Sam Moyers	Section 5.1 was modified to clarify Arcadis parking expectations
22 September 2015	17	Sam Moyers	Revised appeal process and relinked revised MVSP Guide-005. Rebranding. Revised signature block

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
6 May 2016	18	Sam Moyers	Revised with new section 6 dealing with insurance issues. New section 5.3.6 dealing with temporary agency employees. Both were included from integrated **Human Resources** Vehicle Use Policy. Revised sections 5.3.5, 5.9 and 5.12 to clarify current policy. Added a definition for field work in Exhibit 1. Added additional references concerning cell phone prohibition.
27 March 2018	19	Sam Moyers/Julie Santaniello	Revised Executive Summary and Exhibit 1 concerning electronic devices, Revised sections 5.9, 5.10, and 5.13 to reflect current policies. New section 5.15 for ELDs and telematics. Added definition of “electronic device” in Exhibit 1. Minor editorial corrections throughout. Fixed broken links. Combined MVSP guides into one document.

EXHIBIT 1 - DEFINITIONS

Arcadis vehicle or Arcadis motor vehicle: Any motor vehicle owned or leased by Arcadis employee.

> Note: ATV/UTV/Snowmobile operation is addressed in Arcadis Speciality Vehicle H&S Standard ARC HSFS001

Arcadis driver or driver: Any Arcadis U.S. employee or temporary agency employee who drives an Arcadis vehicle, leased vehicle, rental vehicle, or personal vehicle for business reasons whether the use of the vehicle includes operation from the local office or for travel while away from the local office.

Arcadis employee: Any full-time, part-time, temporary, as needed employee, and interns employed by Arcadis U.S.

Assigned Driving Function for Arcadis: Any Arcadis driver who drives on average 5 or more days per month in the interest of Arcadis.

Business use of Arcadis owned, leased, rented, or personal motor vehicle: For the purposes of this standard, business use of an Arcadis, rental, leased or personal vehicle including but not limited to: attending meetings; driving to and from a client location; driving to dinner while out of town on business; and driving to an office supply store to pick up office supplies. Use of the vehicle for business would not include personal use as described below.

Corporate: As used in this standard and materials incorporated by reference, the term “Corporate” means Corporate Health and Safety, Corporate Human Resources, and/or Corporate Legal departments unless otherwise specified.

Electronic Device: Any portable electronic device not required for safe operation of a motor vehicle including, but not limited to, cell phones, computer tablets, laptops, watches (iWatch, etc.) and global positioning systems (GPSs).

Field Work: As used in this standard means any Arcadis work activity outside of an office environment.

Manager: The employee’s administrative supervisor or an Operations Manager.

Motor vehicle accident (MVA): Any incident on a reasonably anticipated route during the course of work where an Arcadis owned, leased, or rented motor vehicle is:

- On a public or established private roadway or parking area involving a third party motor vehicle, excluding load securement failures by a third party motor vehicle.
- On a public roadway involving damage to public or private property, excluding road debris damage.
- Involved in any type of pedestrian impact resulting in injury or property damage.

MVSP Guide-004 provides detailed MVA information and FAQs

- Involved in an Arcadis load securement failure or mechanical component failure on a public or established private roadway involving a third party motor vehicle or public property damage.

- On a public roadway involving damage or injury associated with another Arcadis operated vehicle, including load securement failures.

Personal use of Arcadis vehicle, leased vehicle or rented motor vehicle: For the purposes of this standard, personal use of an Arcadis vehicle, leased vehicle or rental vehicle include but are not limited to supervisor approved: driving to dinner with a non-business-related person(s) in the vehicle; driving for the purposes of personal entertainment or personal business; using an Arcadis vehicle or rental vehicle for staying over period of time not required for business (e.g., staying over a weekend to visit friends, etc.).

Potential New Hire or Candidate: For the purpose of this standard means an individual who has had a written offer made and accepted for employment with Arcadis.

Preventable MVA: A MVA where the Arcadis driver was as fault or was determined through the Arcadis LNL Investigation process failed to exercise reasonable care while driving an Arcadis vehicle. The classification of Preventable MVA is assigned by Corporate Health and Safety.

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

Supervisor: The employee's administrative supervisor (project supervisor if approved by the administrative supervisor).

Temporary agency employee: A temporary agency employee utilized by Arcadis for temporary work. Temporary Employee Agency agreements shall provide for standard automobile insurance and other terms consistent with this policy.

Vehicle loss event (VLE): Any incident involving a motor vehicle that does not meet the definition of a MVA. VLEs may be preventable or non-preventable based on findings of the Arcadis LNL Investigation process and is assigned by Corporate Health and Safety.

Hiring managers should review contracts for driving related issues involving temp agency employees

ARCADIS Infrastructure · Water · Environment · Buildings	ARCADIS HS Standard Name Personal Protective Equipment	Revision Number 06
Implementation Date 20 February 2009	ARCADIS HS Standard No. ARC HSGE015	Revision Date 23 June 2014

EXECUTIVE SUMMARY

Through the use of personal protective equipment (PPE), ARCADIS employees are protected from occupational hazards in the event that engineering and administrative controls are not sufficient or practical. PPE will be provided to ARCADIS full time and permanent part time employees who regularly conduct field work or visit project sites outside of office environments at no cost following training on the proper use and maintenance of PPE.

Project managers are responsible for assessing potential hazards on a worksite and determining the applicable PPE.

Project personnel are responsible for understanding and utilizing “Stop Work Authority” should a hazard present itself that was not previously identified or has been identified in concentrations that are higher than anticipated.

This minimum level of PPE (hard hat; safety glasses; class II high-visibility vest, shirt or coat; and protective footwear with safety toe cap) is expected to be worn on all project sites unless in a field trailer or vehicle, unless a specific exemption has been established within an approved HASP or modification to a task specific JSA or Permit to Work upon completion/review of the hazard analysis.

PPE selection will be based on an evaluation of the performance characteristics of the PPE relative to the following:

- The requirements and limitations of the tasks or work environment
- The task-specific conditions and duration of the work
- The hazards and potential hazards identified at the site

PPE may be categorized into levels A, B, C or D.

- Level A offers the highest skin and respiratory protection
- Level B offers a high degree of respiratory protection with lesser levels of skin protection
- Level C is used when the concentration and type of airborne substance is known, and the criteria for using an air purifying respirator are met
- Level D offers the least skin and respiratory protection

PPE training will include, at minimum:

- When and what PPE is necessary
- How to put on, adjust, wear and take off the PPE
- Limitations of the PPE
- Proper care, maintenance, useful life, and proper disposal of PPE

ARCADIS Infrastructure · Water · Environment · Buildings	ARCADIS HS Standard Name Personal Protective Equipment	Revision Number 06
Implementation Date 20 February 2009	ARCADIS HS Standard No. ARC HSGE015	Revision Date 23 June 2014

1. POLICY

It is the policy of ARCADIS to assess the workplace to identify and assess hazards in order to appropriately implement controls for those hazards. In addition, it is ARCADIS policy to supply personal protective equipment (PPE) for employees in a working environment where engineering and administrative controls are not feasible or effective in the control of hazards. ARCADIS will train and supply this PPE at no cost to the employee.

2. PURPOSE AND SCOPE

2.1 Purpose

The purpose of PPE is to shield or isolate individuals from the chemical, physical and biologic hazards that may be encountered in their work environment. A hazard analysis or assessment will be performed before a job task is begun to evaluate if PPE is necessary to protect an employee from identified hazards and determine the type of PPE required. This analysis will include the identification of hazards/suspected hazards and their routes of exposure.

Combinations of protection may be needed to provide the appropriate level of protection for any given work environment. The level of PPE may change during a job, so periodic task evaluation will be conducted to ensure that the most appropriate PPE is being used. Over-protection, as well as under-protection, can create additional hazards and should be avoided where possible.

Subcontractors and other non-ARCADIS employees must supply their own PPE. ARCADIS will not supply PPE to any non-ARCADIS employees unless specific arrangements and agreements are made with the other party.

This Health and Safety Standard (HSS) provides guidance on the proper selection, use, care and maintenance of PPE.

2.2 Scope

Whenever possible, engineering, substitution and administrative controls will be used to reduce or eliminate hazards. When such controls are not feasible, practical or adequate, PPE will be used to protect employees from exposure to hazards during ARCADIS-related work tasks.

3. DEFINITIONS

Definitions related to personal protective equipment can be found in Exhibit 1.

4. RESPONSIBILITIES

4.1 ARCADIS Management

ARCADIS Management is responsible for providing resources for the acquisition of PPE and for the conduct of hazard assessments.

4.2 Project Managers

Project Managers are responsible, as part of the project hazard assessment, for determining PPE necessary to complete the project. In addition, the Project Manager is responsible for determining client requirements with respect to PPE. Project Managers notify health and safety staff of biological, chemical and physical hazards present or potentially present on the site, as well as verifying that any specific state and/or local requirements for PPE have been identified. Project Managers are also responsible for ensuring that project staff has the appropriate and applicable training for PPE use prior to those staff beginning work.

4.3 Corporate Health and Safety

Corporate Health and Safety is responsible for keeping this standard up-to-date with current regulatory requirements and best practices and for assisting in determining the appropriate PPE for a particular task and work environment and for assisting in the identification of appropriate vendors of such PPE.

4.4 Health and Safety Staff

Project Health and Safety Staff including designated Writers and Reviewers of Project Health and Safety Plans (HASPs) are responsible for developing control processes and techniques on specific projects based on the physical, chemical and biological hazards expected to be encountered on project facilities.

It is the responsibility of the Site Safety Officer (SSO) to verify that any employee-owned PPE brought to the job site is adequate for the task, properly fitted to the employee, and has been properly maintained and is cleaned in accordance with this standard.

4.5 ARCADIS Staff

ARCADIS staff is responsible for completing PPE training as required by this policy and standard, and for following all hazard control processes designated by the Project Manager, Project Health and Safety Staff and the project HASP. Employees must choose appropriate, properly fitted PPE where required, and are responsible for inspecting their PPE for wear, damage and effectiveness. Employees that bring their own PPE to the job site must ensure that the equipment is adequate for the task (e.g., meets minimum ANSI requirements, AUS requirements and client requirements), and has been properly maintained in a sanitary and reliable condition in accordance with this standard.

If project personnel believe that a hazard is present that was not previously identified or is at levels that are higher than expected, they should stop work and notify project health and safety staff or the project manager immediately and not proceed until authorized.

Staff are expected to comply with minimum PPE requirements as established by ARCADIS policy and HASP requirements and/or task specific PPE requirements detailed in the task specific Job Safety Analysis (JSA) or Permit to Work.

5. PROCEDURE

5.1 Minimum PPE Requirements

All full time and permanent part time employees that regularly conduct field work or visit project sites outside of office environments will be issued a field bag that contains, at a minimum, the following PPE:

- An ARCADIS branded hardhat
- Two pair of safety glasses, one clear pair and one tinted pair, or one pair of prescription safety glasses with transitional lenses
- Hearing protection
- A minimum, Type 2 reflective vest in either orange, lime green or yellow

Office locations will stock extra bags with the equipment listed above for use by other staff that do not regularly go to field locations. Additional PPE and H&S equipment will be issued to staff based on the hazards they face on specific projects (i.e. respirators, goggles, chaps, etc.).

ARCADIS has established the following minimum PPE requirement for field activities that must be worn unless excepted by the HASP, JSA or Permit to Work:

- Type I Hardhat (Class G rating if there is potential danger of contact exposure to low voltage conductors)
- Safety Glasses (Z87.1)
- Class 2 reflective traffic vest, coat or shirt in either orange, lime green or yellow
- Protective Footwear, e.g. steel toe safety shoes (minimum I/50 Impact resistance for the toe area which is an impact resistance rating of at least 50-foot pounds; C/50 Compression resistance for the toe area which correlates to 1750 pounds of compression resistance).

This minimum level of PPE is expected to be worn on all project sites unless in a field trailer or vehicle, unless a specific exemption has been established within an approved HASP or modification to a task specific JSA or Permit to Work upon completion/review of the hazard analysis.

The goal in this section is to specify PPE for work that is not governed by a JSA or Permit to Work to avoid conflicts in PPE requirements. The PPE specified in a JSA/Permit to Work is automatically the PPE requirement for all work governed by the JSA/Permit to Work. As a result, it is critical to take the time during JSA/Permit development to consider and identify the proper PPE required for the activity. Please note that the template JSA

PPE information may not be the appropriate PPE for your project and should be adjusted accordingly.

Note: Project Teams must check and comply with state, local and/or client requirements for specific minimum PPE requirements and adjust the HASP, JSA or Permit to Work process accordingly.

Temporary full time/part time employees (temp staff) will be provided all of the above PPE; however, standard steel toed safety boots will only be provided to temp staff employees with the approval of the administrative supervisor and Project Manager. If the administrative supervisor or Project Manager elects to not provide protective footwear or other non-specialty required footwear to temp staff, the employee will be informed of the requirement to provide their own footwear meeting project health and safety requirements prior to hire.

No ARCADIS staff should arrive at a field or project site without this minimum PPE.

5.2 The PPE Program

The basic objectives of a PPE program are to protect the wearer from safety and health hazards; and to prevent injury to the wearer from incorrect use and/or malfunction of the PPE. This document serves as the overall ARCADIS PPE program and is used as guidance for the development of a project-specific PPE program which becomes part of a project-specific health and safety plan. A project-specific PPE program in combination with this HSS will address the following:

- PPE selection based upon site hazards (Hazard Identification/Assessment).
  - Identify the hazards/suspected hazards and their potential routes of exposure (e.g., skin, inhalation, ingestion or eye contact).
- The use and limitations of the equipment including limitations during temperature extremes and under certain medical conditions;
- The work mission duration;
- Maintenance, storage, decontamination and disposal of PPE;
- Training including proper fit and how to properly put on and take off PPE;
- PPE inspection procedures prior to, during, and after use; and
- Periodic evaluation of the effectiveness of the PPE program.

5.3 PPE Selection

The use of PPE can itself create significant worker hazards, such as heat stress, physical and psychological stress and impaired vision, mobility and communication. Over-protection, as well as under-protection and poor fit, can be hazardous and should be avoided where possible. Site or project-specific health and safety plans take into

consideration engineering, substitution, and administrative controls first as a means to eliminate/reduce the need for PPE. When it is not feasible or practical to eliminate the use of PPE, PPE must be properly fitted to each affected employee, and PPE selection will be based on an evaluation of the performance characteristics of the PPE relative to the following:

- The requirements and limitations of the tasks or work environment;
- The task-specific conditions and duration; and
- The hazards and potential hazards identified at the site.

The level of protection will be increased whenever it is shown that increased protection is necessary to reduce employee exposures to the hazards. It may be decreased when it is shown that this will not result in hazardous exposure to employees.

5.4 Levels of PPE Protection

For work on hazardous sites, a combination of PPE may be categorized into levels A, B, C, or D with level A offering the highest level of protection and D the lowest. Monitoring the effectiveness of PPE will be done throughout a project to ensure that the appropriate level of protection is being worn. These levels of protection are described below.

5.4.1 Level A Protection

Level A PPE offers the highest level of respiratory and skin protection and should be worn when:

- The hazardous substance has been identified and requires the highest level of protection of the skin, eyes, and respiratory system based on either:
  - The measured (or potential) high concentrations of atmospheric gases, vapors, or particulates; or
  - If site operations and work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates which are harmful to skin eyes, or the respiratory system.
- There is a known or suspected high degree of hazard to the skin and skin contact is possible.
- Conducting work in a confined, poorly ventilated area and the other criteria requiring Level A PPE have not been determined.

Level A equipment includes:

- NIOSH approved positive pressure, full-face piece self contained breathing apparatus (SCBA), or positive pressure supplied airline respirator with escape SCBA;
- Totally encapsulating chemical-protective suit (material based on the hazard);

- Chemical resistant outer **and** inner gloves (type and material based on the hazard);
- Chemical resistant boots with steel toe and shank;
- Disposable protective suit, gloves and boots (depending on suit construction, may be worn over the totally encapsulating suit);
- Coveralls (optional, as applicable);
- Long underwear (optional, as applicable); and
- Hard-hat - under suit (optional, as applicable).

5.4.2 Level B Protection

Level B PPE offers a high degree of respiratory protection with lesser levels of skin protection. Level B PPE should be worn when:

- The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection but less skin protection;
- The atmosphere contains less than 19.5 percent oxygen; or
- The presence of incompletely identified vapors or gases is indicated by direct reading organic vapor detection instruments, but the vapors and gases are not suspected of containing high levels of chemical harmful to the skin or capable of being absorbed through the skin. Level B is the minimum level of protection that should be worn when there is insufficient information to determine the hazards or potential hazards of the substance.

Level B PPE equipment includes:

- NIOSH approved positive pressure, full face piece self contained breathing apparatus 1(SCBA), or positive pressure supplied air respirator with escape SCBA;
- Hooded chemical resistant clothing (overalls and long sleeve jacket; coveralls; one or two piece chemical splash suit; disposable chemical resistant overalls) (materials based on the hazards);
- Chemical resistant outer **and** inner gloves (material based on the hazards);
- Chemical resistant boots with steel toe and shank;
- Coveralls (optional, as applicable);
- Outer chemical resistant boot covers (optional, as applicable);
- Hard hat (optional, as applicable); and

- Face shield (optional as applicable).

5.4.3 Level C Protection

Level C PPE is used when the concentration and type of airborne substance is known, and the criteria for using an air purifying respirator are met. It should be worn when:

- Atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin;
- The types of air contaminants have been identified, concentrations measured, and an air purifying respirator is available that can remove the contaminants; and
- All criteria for the use of an air purifying respirator are met.

Level C PPE equipment includes:

- NIOSH approved full face or half mask air purifying respirator (with appropriate cartridges based on the hazards);
- Hooded chemical resistant clothing (overalls and long sleeve jacket; coveralls; one or two piece chemical splash suit; disposable chemical resistant overalls) (materials based on the hazards);
- Chemical resistant outer **and** inner gloves (select appropriate materials based on the hazards);
- Chemical resistant boots with steel toe and shank;
- Coveralls (optional, as applicable);
- Outer chemical resistant boot covers (optional, as applicable);
- Hard hat (optional, as applicable);
- Escape mask (optional, as applicable); and
- Face shield (optional, as applicable).

5.4.4 Level D Protection

Level D PPE offers the least skin and respiratory protection and should be worn when the atmosphere contains no known hazards, and work functions preclude splashes, immersions or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

Level D PPE equipment may include any or all of the following depending on the hazards of the site:

- Chemical resistant boots with steel toe and shank (optional, as applicable);
- Coveralls (optional, as applicable);
- Gloves (optional, as applicable);
- Outer chemical resistant boots (disposable) (optional, as applicable);
- Safety glasses or chemical splash goggles (optional, as applicable);
- Hard hat (optional, as applicable);
- Escape mask (optional as applicable); and
- Face shield (optional as applicable).

5.5 Combinations of Protection

Combinations of protection are acceptable if the task hazard analysis and the site conditions warrant modification of PPE levels.

5.6 Equipment List

5.6.1 Eye/Face Protection

All employees engaged in or working in or adjacent to areas with eye-hazardous activities or operations, such as but not limited to flying objects and hazardous chemicals shall wear appropriate eye protection.

It is strongly encouraged that eye protection be worn when present on any project site, including construction sites

- Safety glasses with side shields are required for impact protection and shall meet ANSI Standard Z87.1 requirements.
- Chemical goggles (for protection against chemical splash).
- Face shields (for face protection from chemical splash and are not a substitute for primary eye protection).
- Full-face respirators can provide eye and face protection in lieu of safety glasses, goggles or face shields.
- Shaded eye protection meeting the minimum shade requirements established in 29 CFR 1910.133 (for employees exposed to sources of injurious light radiation [e.g., welding, cutting, lasers]).
- For prescription eye protection contact your supervisor to fill out an AOSafety order form available on the ARCADIS Health and Safety website (The Source). For temporary staff, standard prescription safety glasses will be provided with the

approval of the administrative supervisor and Project Manager. If the administrative supervisor or Project Manager elects to not provide standard prescription safety glasses to temp staff, the employee will be informed of the requirement to provide their own prescription safety meeting project health and safety requirements prior to hire.

5.6.2 Respiratory Protection

Respirators will be provided and used in accordance with the ARCADIS Respiratory Protection Policy/Standard ARC HSGE017 and 29 CFR 1910.134.

5.6.3 Hearing Protection

Hearing protection will be provided and used in accordance with the ARCADIS Hearing Conservation Policy/Standard ARC HSIH008 and 29CFR 1910.95.

5.6.4 Foot Protection

Basic foot protection is required for all ARCADIS job sites and industrial locations. Specialized footwear will be provided as required by the nature of the work. Special foot protection may include, but is not limited to, chemically resistant, thermally shielded, metatarsal guards, etc.

One pair of leather safety boots will be provided as necessary by ARCADIS. The employee purchasing the footwear is required to ensure that it meets any of the consensus standards as specified by OSHA 29 CFR 1910.136 which include:

- ASTM F2413-11 Standard Specification for Performance Requirements for Protective (Safety) Toe Cap Footwear

  Note: ASTM F2413-11 Standard Specification for Performance Requirements for Protective (Safety) Toe Cap Footwear contains performance requirements for footwear to protect workers' feet from the following hazards by providing:

  1. Impact resistance (I) for the toe area of footwear (75 foot-pounds);
  2. Compression resistance (C) for the toe area of the footwear (75/ 2,500 pounds);
  3. Metatarsal impact protection (Mt) that reduces the chance of injury to the metatarsal bones at the top of the foot (75 foot-pounds);
  4. Conductive properties (Cd) which reduce hazards that may result from static electricity buildup; and reduce the possibility of ignition of explosives and volatile chemicals (electrical resistance zero â€“ 500,000 ohms);
  5. Electric hazard protection (EH) to protect the wearer when accidental contact is made by stepping on live electrical wire (capable of withstanding the application of 18,000 volts at 60 hertz for one minute

with no current flow or leakage current in excess of one milliampere, under dry conditions);

6. Static dissipative properties (SD) to reduce hazards due to excessively low footwear electrical resistance that may exist where SD footwear is required (must have a lower limit of electrical resistance of 106 ohms and an upper limit of 108 ohms when tested at 50-volts); and
7. Puncture resistance (PR) (when viewed at a 90° angle, the test pin tip must not visually penetrate beyond the face of the material nearest the foot after an applied force of 270 pounds, no signs of de-lamination or cracking after 1.5 million flexes and no sign of corrosion, de-lamination or deterioration after being exposed to a five percent salt solution for 24-hours.)

- ASTM F-2412-2005, "Standard Test Methods for Foot Protection," and ASTM F-2413-2005, "Standard Specification for Performance Requirements for Protective Footwear"

- ANSI Z41-1999, "American National Standard for Personal Protection -- Protective Footwear"

Safety shoes worn by ARCADIS staff during field work must be equipped with protective (safety) toe cap that has a minimum I/50 Impact resistance rating for the toe area which is an impact resistance rating of at least 50-foot pounds and a C/50 Compression resistance rating for the toe area which correlates to 1750 pounds of compression resistance.

Puncture resistant soles or in-soles equipped in the safety boots are project driven based on the Hazard Assessment. Some clients may require puncture resistant soles or in-soles.

The maximum expenditure or reimbursement for approved safety shoe purchases will be $150. Reimbursement requests must be approved by the employee's supervisor.

It should be noted that some clients may prohibit the use of athletic-style safety shoes ("safety sneakers") due to the difficulties created by these styles in supervising proper use of protective footwear.

5.6.5 Head Protection

Hard hats meeting ANSI Z89.1 will be provided to protect employees from impact, penetration, falling objects and/or limited electrical shock and burn, as appropriate for work site hazards. A hard hat must be replaced when it becomes damaged, contaminated (and contamination cannot be removed) or it has been struck by an object of sufficient size to potentially compromise its integrity.

Hardhats must resist penetration by objects, be water resistant and slow burning, and have a chin strap if it is worn while working at elevation. It must be worn square on the head and not be pushed back, to the side or forward.

Baseball-style caps will interfere with the ability of a suspension to work properly during an impact; they should not be worn under protective headgear.

There are two types and three classes of head protection described in ANSI standard.

Other hazard situations to consider are:

- In areas of heavy vegetation or in any area where hunters may be present, it is recommended that some type of brightly colored head protection be worn. For example, a bright orange or yellow baseball cap or stocking cap.
- If cold exposure is an issue, hardhat liners are available (made specifically for the particular hardhat) or if a hardhat is not required, some type of insulated head protection such as a stocking cap should be worn.
- Because it can degrade headwear material and reduce the level of protection, insect repellent should not be applied to or inserted into headwear. The headwear manufacturer should be consulted for instructions on the use of insect repellents and other chemicals on its' products.

5.6.6 Hand Protection

Appropriate hand protection will be provided if employee's hands are exposed to hazards while on the job.

Such as:

- pinch points
- sharp/pointed tools or objects
- incorrect or inadequate tool use
- improper use
- rotating/energized/automated parts
- abrasive materials
- inadequate job planning
- lack of/inadequate protection
- changing weather conditions and extreme temperatures
- hazardous material
- Jewelry and loose clothing.

Once these hazards are identified, the appropriate glove or hand protection must be selected. When choosing gloves, keep in mind:

- Hazardous Chemicals/Substances to be Contacted
- Nature of Contact (total immersion, splash, etc.)
- Duration of Contact
- Area of Protection (hand only, forearm, arm)
- Equipment (rotating, sharp edges, etc.)
- Grip (dry, wet, oily)
- Thermal Protection
- Abrasion/Cut/Puncture Resistance
- Tear/Tensile Strength
- Ergonomics (size, heat stress, dexterity)
- Decontamination/Disposal

In selecting chemically protective gloves, the toxic properties of the chemical(s) will be determined. Information provided on the manufacturer's label or by chemical compatibility charts regarding breakthrough time, permeation rate and degradation should be considered during selection.

5.6.7 Body Protection

Protective clothing, gloves, boots, and other protective equipment will be provided as appropriate for the hazards associated with the tasks being performed.

Long pants are required for all field work unless approval is granted by corporate H&S. Additional protection such as cooling vests may be required. In environments with potential biological hazards such as ticks, plants or snakes, gloves and long sleeves should be worn along with head protection of some kind to protect the scalp. In areas of roadway work or other vehicle traffic high visibility Class II safety vests will be worn.

Chemically Protective Clothing (CPC) will be selected by evaluating the performance characteristics of the CPC against the requirements and limitations of the site and task-specific conditions. This selection should be performed by an employee with training and experience taking into consideration:

- Permeation, degradation, penetration of the CPC by the chemical and;
- Durability, flexibility, fit, temperature effects, ease of decontamination, compatibility with other necessary equipment (e.g., hardhats, SCBA, etc.); and duration of use that could affect the employees ability perform the task.

Where required, appropriate Fire Resistant (FR) protective clothing must be used where there is a potential for electrical arc flash hazards (refer to the ARCADIS Electrical Safety

Standard HSFS006 for additional information). Jobs that expose workers to fire dangers require the use of FR protective clothing.

5.6.8 Specialized Equipment

All other specialized safety equipment required for an assignment (e.g., work gloves, specialized protective clothing, hip boots, field rain gear, personal floatation devices) will be provided by ARCADIS as specified in the HASP.

5.6.9 Extreme Cold Environments

Supervisors are responsible for ensuring that staff is properly equipped to protect themselves while working in extreme cold environments. The following is suggested as appropriate PPE for cold conditions:

- Hats/hat liners and gloves
- Thermal clothing
- Hi-Visibility clothing
- Winter footwear

Use of specialized equipment will be charged to projects in accordance with established policy and rental rates.

5.7 Maintenance/Storage/Disposal

5.7.1 PPE Maintenance and Disposal

PPE must be inspected by the user before and after each use for defects, rips, tears and/or damaged parts. Damaged or compromised PPE will not be used and must be repaired before re-use or disposed. PPE must be disposed of according to the HASP and other project plans for the site. If non-disposable, PPE must be decontaminated and sanitized before being reused according to the HASP. Contaminated PPE which cannot be properly decontaminated by normal procedures must be disposed of accordingly.

Employees are responsible for using and maintaining PPE in a sanitary and reliable condition.

5.7.2 PPE Storage

All PPE must be stored to protect against dust, sunlight, extreme heat and cold, excessive moisture and damaging chemicals. Storage must be in accordance with the manufacturer's specifications and OSHA requirements.

5.7.3 Contaminated Boots

Single-use boots or boot covers which become contaminated on the job will be waste profiled, as necessary, and properly disposed. Work boots will be properly decontaminated upon exiting contaminated work zones (exclusion zones). Work boots that are damaged on the job must be replaced.

6. TRAINING

Training in the proper use of PPE will generally be provided in conjunction with HAZWOPER training or via coursework selected and approved by Corporate H&S. Training will be completed prior to the employee's use of PPE, when changes in the work place alter the use or type of PPE, and when inadequacies in the employee's knowledge or use of PPE are noted.

The training will include at a minimum:

- When and what PPE is necessary;
- How to put on, adjust, wear and take off the PPE;
- Limitations of the PPE; and
- Proper care, maintenance, useful life, and proper disposal of PPE.

Retraining will be conducted when the workplace changes making the earlier training obsolete, the type of PPE changes or when the employee demonstrates lack of use, improper use, or insufficient skill or understanding.

7. REFERENCES (regulation citation, technical links, publications, etc.)

29 CFR 1910.120 "Hazardous Waste Operations and Emergency Response"

29 CFR 1910 Subpart I "Personal Protective Equipment"

29 CFR 1910.136 Foot Protection

29 CFR 1910.6 Incorporation by reference

8. RECORDS - DATA RECORDING AND MANAGEMENT

Records of the PPE training are retained by the employee and in the ARCADIS training database. Medical clearance for respirator use is maintained by the employee and ARCADIS' medical vendor.

ARCADIS Infrastructure · Water · Environment · Buildings	ARCADIS HS Standard Name Personal Protective Equipment	Revision Number 06
Implementation Date 20 February 2009	ARCADIS HS Standard No. ARC HSGE015	Revision Date 23 June 2014

9. APPROVALS AND HISTORY OF CHANGE

Approved by: Tony Tremblay, CSP – Corporate H&S, Director of Technical Programs

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
20 February 2009	01	Miriam Koesterich/Mike Thomas	Original document
19 August 2011	02	Sue Byers/Mija Coppola	Updated footwear protection consensus standards, clarified contaminated work boot section and updated document format
2 February 2012	03	Tony Tremblay	Clarified temp staff PPE issues in sections 5.1 and 5.6.1
16 January 2013	04	Pat Vollertsen/Tony Tremblay	Added hand protection to section 5.1, added to employee responsibility in section 4.5, and added information on when eye protection should be worn in section 5.6
12 February 2013	05	Amanda Tine/Tony Tremblay	Added that PPE must be properly fitted. Added requirements for employees that bring their own PPE; Added Retraining information into Section 6
23 June 2014	06	Tony Tremblay	Identified minimum PPE requirements for ARCADIS field work in section 5.1 of HSS; Updated footwear protection consensus standard information in Section 5.6.4; and updated foot protection definition

ARCADIS Infrastructure · Water · Environment · Buildings	ARCADIS HS Procedure Name Personal Protective Equipment	Revision Number 06
Implementation Date 20 February 2009	ARCADIS HS Procedure No. ARC HSGE015	Revision Date 23 June 2014

Exhibit 1 – Definitions

Eye/Face Protection - Equipment designed to provide eye or face protection when exposed to hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation.

Foot Protection - Footwear designed to provide foot and toe protection when working in areas where there is a danger of foot injuries due to falling or rolling objects, or objects piercing the sole, and/or where an employee's feet are exposed to electrical hazards. These include such measures as safety toe cap and puncture resistant soles.

Hand and Body Protection - Equipment designed to provide protection to the hands and body during exposures to potential hazards such as potential for skin absorption of harmful substances, sharp objects, abrasive surfaces, punctures, temperature extremes and chemical contact.

Hazard Assessment - The process utilized to identify hazards in the workplace and to select the appropriate PPE to guard people against potential hazards.

Head Protection - Equipment designed to provide protection to the head during exposure to potential hazards such as falling objects, striking against objects or electrical hazards.

Hearing Protection - Equipment designed to provide protection to an individual's hearing during exposure to excessive noise levels and any 8hr work day with noise levels consistently 85dB or above.

Personal Protective Equipment (PPE) - Equipment designed to provide protection to the wearer from potential hazards to the eyes, face, hands, head, feet, ears, extremities and respiratory system.

Respiratory Protection - Equipment designed to provide protection to the wearer from potential inhalation hazards such as vapors, mists, particulates and gases.

Implementation Date 20 October 2017	Arcadis HS Standard Name Respirable Crystalline Silica	ARCADIS Design & Consultancy for natural and built assets
Revision Date 13 November 2017	Arcadis HS Standard No. ARC HSIH012	Revision Number 02

EXECUTIVE SUMMARY

It is the policy of Arcadis to prevent or minimize all occupational exposure to respirable crystalline silica, through the use of engineering and administrative controls, and personal protective equipment (PPE). Respirable crystalline silica particles are typically at least 100 times smaller than ordinary sand found on beaches or playgrounds, and is generated by high-energy operations including but not limited to cutting, sawing, grinding, drilling and crushing stone, rock, concrete, brick, block and mortar, or when abrasive blasting with sand. “Silica-containing dust” in this Health & Safety Standard (HSS) refers to “Respirable Crystalline Silica” unless otherwise specified.

The following personal exposure limits are established for silica-containing dust by inhalation:

- OSHA ACTION LEVEL
    - Time Weighted Average (TWA) – 25 micrograms per cubic meter of air (µg/m^3) silica in air averaged over an 8-hour period
- OSHA PERMISSIBLE EXPOSURE LEVELS (PELs)
    - TWA – 50 µg/m^3 silica in air averaged over an 8-hour period.
- ACGIH THRESHOLD LIMIT VALUES (TLVs)
    - TWA – 0.025 mg/m^3 silica-in-air averaged over an 8-hour period for the respirable crystalline silica fraction which are those particles that enter deep into the lung where gas exchange takes place.

The Action Level, PEL, and TLV apply to three forms of silica-containing dust: Quartz, Cristobalite, and Trydimite. Quartz is by far the most common form of silica-containing dust found at construction workplaces.

This HSS applies to all occupational exposures to silica-containing dust, except where employee exposure will remain below 25 µg/m^3 as an 8-hour TWA under any foreseeable conditions. Projects where exposure to silica-containing dust will occur will comply specified exposure control methods or alternative exposure control methods.

Initial silica awareness training is required for all employees who must comply with this HSS and/or are assigned to a work area where silica-containing dust is likely to be generated. A written Exposure Control Plan is required when exposure to silica-containing dust is or can reasonably be expected to exceed 25 µg/m^3 of silica-containing dust in air averaged over an 8-hour period. A Competent Person will implement the written plan and make frequent and regular inspection of job sites, material, and equipment.

Initial and Annual Medical Surveillance is required if:

- If employee personal exposures are reasonably expected to exceed the Action Level on at least 30 calendar days per year.
- If work is to be conducted where silica-containing dust concentrations are reasonably expected to exceed the PEL.
- All air monitoring and personal exposure monitoring records shall be kept for 30 years.

Implementation Date 20 October 2017	Arcadis HS Standard Name Respirable Crystalline Silica	ARCADIS Design & Consultancy for natural and built assets
Revision Date 13 November 2017	Arcadis HS Standard No. ARC HSIH012	Revision Number 02

1. POLICY

Arcadis understands the hazards of personal exposure to respirable crystalline silica (silica-containing dust), and will implement the appropriate controls to minimize or eliminate the hazards associated with silica-containing dust. These controls will focus first on engineering controls to mitigate silica-containing dust hazards where appropriate and practical. In most circumstances, dust suppression (wetting cutting surface) is effective in managing silica-containing dust. Work practices (administrative controls) may also be implemented as appropriate and practical. Wherever engineering and administrative controls are not sufficient to reduce employee exposure to or below the OSHA Permissible Exposure Limit (PEL), Arcadis will nonetheless use the controls to reduce employee exposure to the lowest feasible level and will supplement them with the use of respiratory protection that complies with the requirements of Section 5.5.

2. PURPOSE AND SCOPE

2.1 Purpose

This Health & Safety Standard (HSS) meets the Title 29 Code of Federal Regulations (CFR) Part 1926.1153 (Construction) requirements of the U.S. Occupational Safety and Health Administration (OSHA) regulation.

2.1.1 Exposure to Silica-Containing Dust

This HSS and associated standards provides information to protect Arcadis employees, subcontractors, and other affected personnel from exposures to silica-containing dust while conducting work on Arcadis projects.

The following personal exposure limits are established for silica-containing dust by inhalation:

- OSHA ACTION LEVEL
    - Time Weighted Average (TWA) – 25 micrograms per cubic meter of air (µg/m^3) silica in air averaged over an 8-hour period
- OSHA PERMISSIBLE EXPOSURE LEVELS (PELs)
    - TWA – 50 µg/m^3 silica in air averaged over an 8-hour period.
- ACGIH THRESHOLD LIMIT VALUES (TLVs)
    - TWA – 0.025 mg/m^3 silica-in-air averaged over an 8-hour period for the respirable crystalline silica fraction which are those particles that enter deep into the lung where gas exchange takes place.

The Action Level, PEL, and TLV apply to three forms of silica-containing dust: Quartz, Cristobalite, and Trydimite. Quartz is by far the most common form of silica-containing dust found at construction workplaces.

2.2 Scope

This HSS and the associated standards apply to all projects where silica-containing dust is generated in a manner in which Arcadis employees, subcontractors and other affected personnel are or could be exposed to silica-containing dust above the Action Level.

3. DEFINITIONS

Definitions related to this HSS can be found in Exhibit 1.

4. RESPONSIBILITIES

4.1 Project Manager, Associate Project Manager and Task Manager

Project Managers, Associate Project Managers and Task Managers (Project Team) are responsible, as part of the project hazard assessment, for determining if silica-containing dust may be generated at the project site. In addition, Project Teams are responsible for determining client requirements with respect to the control of silica-containing dust hazards. Project Teams will assign a Competent Person to oversee all activities that are likely to generate silica-containing dust. Project Teams are also responsible for ensuring that project staff have the appropriate and applicable training for silica-containing dust prior beginning work.

Project Teams are responsible for maintaining exposure monitoring records, if required, for a minimum of 30 years and submitting copies to Corporate Health and Safety, as required by the Industrial Hygiene H&S Standard (ARC HSIH009).

4.2 Project Personnel

Project personnel are responsible for reading and following all hazard control processes, as required by the project Health & Safety Plan (HASP). If unforeseen activities are required that may generate silica-containing dust, Project Personnel are expected to stop work and notify the Site Safety Officer and the Project Manager immediately, and not proceed with the associated task until authorized.

4.3 Competent Person

The Competent Person is an individual who is capable of identifying existing and foreseeable silica-containing dust hazards in the workplace and who has authorization to take prompt corrective measures to eliminate or minimize them. The competent person must have the knowledge and ability necessary to fulfill the responsibilities set forth in the Exposure Control Plan. The Competent Person is expected to make frequent and regular inspections of job sites, materials, and equipment to implement the written exposure control plan.

4.4 Corporate Health & Safety

Corporate Health and Safety is responsible for keeping this HSS up-to-date with current regulatory requirements and best practices. In addition, Corporate Health and Safety oversees the medical surveillance program for silica-containing dust, as applicable and provides a silica training program for presentation to appropriate staff.

5. PROCEDURE

5.1 Respirable Crystalline Silica

Exposure to silica-containing dust occurs when the following tools are used on concrete, brick, block, stone, mortar, and other materials that contain silica:

- Stationary masonry saws;
- Handheld power saws;
- Walk-behind saws;
- Drivable saws;
- Rig-mounted core saws or drills;
- Handheld and stand-mounted drills (including impact and rotary hammer drills);
- Dowel drilling rigs;
- Vehicle-mounted drilling rigs;
- Jackhammers and handheld powered chipping tools;
- Handheld grinders;
- Walk-behind milling machines and floor grinders;
- Drivable milling machines;
- Crushing machines; and
- Heavy equipment and utility vehicles when used to abrade or fracture silica-containing materials (such as hoe-ramming or rock ripping) or during demolition activities, and for tasks such as grading and excavating.

Exposures to silica-containing dust also occurs during tunneling operations and during abrasive blasting when sand or other blasting agents containing silica are used, or when abrasive blasting is performed on substrates that contain silica, such as concrete.

The health effects of silica-containing dust are based on the type of exposure encountered. Silicosis is a progressive lung disease resulting from prolonged and repeated exposure to silica-containing dusts. When inhaled, silica-containing dust passes into the lungs, and scavenger cells such as macrophages engulf it. Enzymes released by the scavenger cells cause the lung tissue to scar. The onset and degree of scarring is often dependent upon the duration and frequency of exposure.

- Chronic silicosis usually occurs after 10 or more years of exposure to silica-containing dust at relatively low concentrations, and is often first realized due to breathing difficulty during exercise. Sometimes the breathing difficulty progresses to shortness of breath even during rest. Some people have a cough that may produce

sputum. Breathing may worsen for years after the person stops working with silica-containing dust. The lung damage can lead to lower levels of oxygen in the blood and can also strain the right side of the heart. This strain can lead to a type of heart failure called cor pulmonale (also known as Pulmonary Hypertension), which can be fatal.

- Accelerated silicosis results from exposure to high concentrations of silica-containing dust and develops 5 to 10 years after the initial exposure.

- Acute silicosis occurs where exposure concentrations are the highest and can cause symptoms to develop within a few weeks to 4 or 5 years after the initial exposure.

5.2 Standard Applicability

This HSS applies to all occupational exposures to silica-containing dust, except where employee exposure will remain below 25 µg/m^3 as an 8-hour TWA under any foreseeable conditions.

Some tasks, identified by OSHA, can reasonably be anticipated to remain below 25 µg/m^3 as an 8-hour TWA that involved only minimal exposure to silica-containing dust. Such tasks include:

- Mixing concrete for post holes;

- Pouring concrete footers, slab foundation, and foundation walls; and

- Removing concrete formwork.

When tasks are performed in which exposure is anticipated to remain under 25 µg/m^3 as an 8-hour TWA, and isolated from tasks that generate significant exposures to silica-containing dust, this HSS does not apply. Some employees may perform construction-related tasks involving occasional, brief exposures (below 25 µg/m^3 as an 8-hour TWA) to silica-containing dust that are incidental to their primary work.

> **Example:** For employees using a hand-held drill to install a singular sub slab vapor point, if the duration of exposure is 15 minutes or less, the 8-hour TWA exposure can reasonably be anticipated to remain under the 25 µg/m^3 threshold (assuming no exposure for the remainder of the shift), and this HSS would not apply. If the duration of the exposure is greater than 15 minutes, active real-time air monitoring equipment must be utilized to determine applicability of this HSS.

5.3 Exposure Controls

Project Teams have two options to comply with this HSS when employee exposure is anticipated to be at or above 25 µg/m^3 as an 8-hour TWA under any foreseeable conditions:

1. Specified exposure control methods; or

2. Alternative exposure control methods.

5.3.1 Specified Exposure Control Methods

The specified exposure control option requires full compliance with OSHA's Table 1-Specified Exposure Control Method When Working With Materials Containing Crystalline Silica (Exhibit 2). When controls in Exhibit 2 are fully and properly implemented, Project Teams are not required to assess employees' exposure levels or keep employee exposure at or below the PELs.

When implementing the control measures specified in Exhibit 2, Project Teams shall ensure the following:

- For tasks performed indoors or in enclosed areas, provide a means of exhaust, as needed, to minimize the accumulation of visible airborne dust;
- For tasks performed using wet methods, apply water at flow rates sufficient to minimize release of visible dust;
- For measures implemented that include an enclosed cab or booth, ensure that the enclosed cab or booth:
    - Is maintained as free as practicable from settled dust;
    - Has door seals and closing mechanisms that work properly;
    - Has gaskets and seals that are in good condition and working properly;
    - Is under positive pressure maintained through continuous delivery of fresh air;
    - Has intake air that is filtered through a filter that is 95% efficient in the 0.3-10.0 µm range (e.g., MERV 16 or HEPA [MERV 17-20]); and
    - Has heating and cooling capabilities.
- Where an employee performs more than one task in Exhibit 2 during the course of a shift, and the total duration of all tasks combined is more than four hours, the required respiratory protection for each task is the respiratory protection specified for more than four hours per shift. If the total duration of all tasks in Exhibit 2 combined is less than four hours, the required respiratory protection for each task is the respiratory protection specified for less than four hours per shift.

5.3.2 Alternative Exposure Control Methods

For tasks not listed in Exhibit 2, or where engineering controls, administrative controls, and respiratory protection described in Exhibit 2 are not fully and properly implemented, alternative exposure control methods shall be implemented.

No employee will be exposed to an airborne concentration of silica-containing dust in excess of 50 µg/m^3, calculated as an 8-hour TWA. This is determined by assessing the exposure of each employee who is or may reasonably be expected to be exposed to silica-containing dust at or above the Action Level (25 µg/m^3 as an 8-hour TWA) in

accordance with either the performance option or the scheduled monitoring option (Section 5.4).

Project Teams who follow alternative exposure control methods must:

1. Determine the levels of silica-containing dust that employees are exposed to over an 8hr TWA in accordance with Section 5.4;
2. Limit employee exposures to a PEL of 50 µg/m^3 as an 8-hour TWA;
3. Use engineering and administrative controls, to the extent feasible, to limit employee exposures to the PEL, and supplement the controls with respiratory protection when necessary. If exposure controls are not sufficient in reducing worker exposure to at or below the PEL, the controls must still be implemented and supplemented with respiratory protection (Approved Protection Factor [APF] of 10 or greater).
4. Keep records of employee exposure to silica-containing dust in accordance with the Arcadis Industrial Hygiene HSS (ARC HSIH009).

5.4 Exposure Assessment

Project Teams following alternative exposure control methods must assess the 8-hour TWA exposure for each employee who is or may reasonably be expected to be exposed to silica-containing dust at or above the Action Level.

Personal exposure monitoring shall utilize standard industrial hygiene sampling techniques and recordkeeping as required in Arcadis Industrial Hygiene HSS (ARC HSIH009). Exposure assessments will be completed either using:

- Performance Option; or
- Scheduled Monitoring Option

5.4.1 Performance Option

The Project Team shall assess the 8-hour TWA exposure for each employee on the basis of any combination of air monitoring data or objective data sufficient to accurately characterize employee exposures to silica-containing dust.

Example: Objective data includes:

- Air monitoring data from industry-wide surveys, which includes well-documented procedures for measuring exposures and methods for controlling dust, could be used by Project Team to characterize employee exposures where employees perform tasks consistent with those described in the survey;
- Calculations based on the composition of a substance; area sampling results and exposure mapping profile approaches. Project Teams can use direct-reading instruments to measure real-time levels of respirable dust in the air. Only if Arcadis has information on the percentage of silica-containing dust in that respirable dust (for example, from the analysis of a bulk sample or

information from a safety data sheet), Project Teams can then calculate the level of silica-containing dust in air; and

- Historic air monitoring data collected by Arcadis. Historic air monitoring data collected by the Arcadis could be used to assess employee exposures if the Project Team can show that the data was collected during work operations and conditions that are consistent with the processes, types of material, control methods, work practices, and environmental conditions in the Project Team's current operations.

Project teams choosing the performance options must:

- Conduct the exposure assessments before work begins;
- Reassess exposures, whenever a change in production, process, control equipment, personnel, or work practices may reasonably be expected to result in new or higher exposures at or above the Action Level, or when the Project Team has any reason to believe that new or additional exposures at or above the Action Level have occurred;
- Be able to demonstrate that employee exposures have been accurately characterized; and
- Make sure that the exposure assessment reflects the exposures of employees on each shift, for each job classification, in each work area.

The Performance Option may be especially useful when measuring employee exposures is challenging, such as when tasks are conducted for short durations of time or performed under different weather conditions. Under the Performance Option, Project Teams can characterize employee exposure within a range to account for exposure variability. Project Teams can also use that this option to show that exposures exceed the PEL by a certain level, such as less than 10 times the PEL, after using all feasible controls. Project Teams would then provide respiratory protection (APF of 10 or greater) and medical surveillance for employees required to wear a respirator under this HSS for 30 or more days per year.

5.4.2 Scheduled Monitoring Option

The Project Team shall perform initial personal exposure monitoring with laboratory analysis to assess the 8-hour TWA exposure for each employee on the basis of one or more personal breathing zone air samples that reflect the exposures of employees on each shift, for each job classification, in each work area. Where several employees perform the same tasks on the same shift and in the same work area, the employer may sample a representative fraction of these employees in order to meet this requirement. In representative sampling, the employer shall sample the employee(s) who are expected to have the highest exposure to silica-containing dust.

If initial monitoring indicates that employee exposures are below the Action Level, the Project Team may discontinue monitoring for those employees whose exposures are represented by such monitoring.

When the most recent exposure monitoring indicates that employee exposures are at or above the Action Level but at or below the PEL, the project team shall repeat such monitoring within six months of the most recent monitoring.

Where the most recent exposure monitoring indicates that employee exposures are above the PEL, the Project Team shall repeat such monitoring within three months of the most recent monitoring.

Where the most recent (non-initial) exposure monitoring indicates that employee exposures are below the Action Level, the Project Team shall repeat such monitoring within 6 months of the most recent monitoring until two consecutive measurements, taken seven or more days apart, are below the Action Level, at which time the project team may discontinue monitoring for those employees whose exposures are represented by such monitoring.

The Project Team shall reassess exposures whenever a change in the production, process, control equipment, personnel, or work practices may reasonably be expected to result in new or additional exposures at or above the Action Level, or when the Project Team has any reason to believe that new or additional exposures at or above the Action Level have occurred.

Personal exposure monitoring data will be collected using the Scheduled Monitoring Sampling Form for Silica (Exhibit 3). Completed Scheduled Monitoring Sampling Forms for Silica should be submitted along with a copy of the sample chain of custody (COC), photos and analytical data to 4-Sight-Support@arcadis-us.com. Additional information on Scheduled Monitoring sampling protocol can be found in Exhibit 4.

5.4.3 Exposure Air Monitoring Notification

Project Teams must notify each affected employee of the results of the exposure assessment within 5 working days of completing it, in accordance with the Arcadis Industrial Hygiene HSS (ARC HSIH009). The 5-day period for notification starts when:

- The Project Team following the Performance Option finishes the exposure assessment; or
- The Project Team following the Scheduled Monitoring Approach receives the laboratory results.

Exposures can be characterized and reported as a range (for example, between the Action Level and the PEL), but must reflect exposures that would occur if the employee were not using a respirator.

When an exposure assessment reveals exposure above the PEL, the written notification must also describe the corrective action the Project Team is taking to reduce employee exposures to or below the PEL. Corrective actions must include engineering controls. However, if engineering controls are not feasible or the project team needs more than 5 days to identify the right engineering controls, respiratory protection is the corrective action that would be described in the written notification.

5.5 Respiratory Protection

Project Teams will provide employees with appropriate respirators where required by this HSS. Respirators will be used in accordance with the Arcadis Respiratory Protection HSS (ARC HSGE017). Project Teams who follow the specified exposure control methods listed in Exhibit 2 must provide respiratory protection where required. Project Teams who follow alternative exposure control methods must provide respiratory protection:

- Where exposures exceed the PEL during periods necessary to install or implement feasible engineering and work practice controls;
- Where exposures exceed the PEL during tasks, such as some maintenance and repair tasks, for which engineering and work practice controls are not feasible;
- During tasks in which the employer has implemented all feasible engineering and work practice controls but exposures remain above the PEL.

5.6 Abrasive Blasting

Provision 29 CFR 1910.94(a)(5)(ii)(b) of the General Industry Ventilation Standard requires that "abrasive-blasting respirators" shall be worn by all abrasive-blasting operators when using silica sand in manual blasting operations where the nozzle and blast are not physically separated from the operator in an exhaust ventilated enclosure.

The ventilation standard for Construction, 29 CFR 1926.57, also contains requirements for ventilation and PPE, including respirators when using silica-based abrasive blasting media.

5.7 Housekeeping

Cleaning methods such as dry sweeping, dry brushing, and use of compressed air can cause silica-containing dust to get into the air and be inhaled by employees. Therefore, the use of these cleaning methods is prohibited to prevent unnecessary exposures to employees. Other cleaning methods such as wet sweeping and HEPA filtered vacuums shall be used because such methods reduce employee exposures by preventing silica-containing dust from getting into the air. Compressed air maybe used as a cleaning method, if used in conjunction with a ventilation system that effectively captures the silica-containing dust created by compressed air.

Project Teams are not required to follow these housekeeping requirements when cleaning ordinary soil, large debris, and non-silica-containing materials, such as sawdust.

5.8 Written Exposure Control Plan

A written Exposure Control Plan (written plan), Exhibit 5 is required when exposure to silica-containing dust is or can reasonably be expected to exceed 25 µg/m^3 of silica-containing dust in air averaged over an 8-hour period. The written plan will be included in the site-specific HASP, which will be reviewed at least annually to evaluate the effectiveness of the written plan in accordance with the Arcadis Health and Safety Plan HSS (ARC HSFS010). The written plan shall be made readily available to each employee covered by this HSS.

The written exposure plan must include:

- A description of the tasks in the workplace that involve exposure to silica-containing dust;
- A description of the engineering controls, administrative controls, and respiratory protection used to limit employee exposure to silica-containing dust for each task;
- A description of the housekeeping measures used to limit employee exposure to silica-containing dust;
- A description of the procedures used to restrict access to work areas, when necessary, to minimize the number of employees exposed to silica-containing dust and their level of exposure, including exposures generated by other employers or sole proprietors;
- Designation of the Competent Person who is responsible for implementing the written plan and making frequent and regular inspection of job sites, material, and equipment; and
- A copy of or location of the safety data sheet (SDS) for crystalline silica products in accordance with the Arcadis Hazard Communication HSS (ARC HSGE007).

5.9 Medical Surveillance Program

Arcadis employees will complete an initial (baseline) medical examination for silica within 30 days after initial assignment (the day the employee starts working in a job/task in which he or she will be required by this HSS to wear a respirator for 30 or more days per year). Respirator use with past employers does not count toward the 30-day threshold. Periodic exams will be completed every three years from the employee's last examination or more frequently as determined by the Arcadis a third-party administrator (TPA) for the Arcadis medical surveillance program (currently WorkCare (1-800-455-6155)) occupational health physician.

Refer to the Arcadis Medical Surveillance Program HSS (ARC HSGE010) for additional information on the administration of the Medical Surveillance Program and instructions on requesting an exam.

The medical surveillance program for silica is intended to:

- Identify respirable crystalline silica-related diseases so that employees with those diseases can take actions to protect their health;
- Determine if an employee has any condition, such as a lung disease, that might make him or her more sensitive to silica exposure; and
- Determine the employee's fitness to use respirators.

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6. TRAINING

Silica awareness training is required for all employees who must comply with this HSS and/or are assigned to a work area suspected or known to contain silica-containing dust. Awareness training is available in the Arcadis Learning Center and will consist of:

- Operations that involve silica-containing dust exposure;
- Methods/observations that can be used to detect the presence or release of silica-containing dust;
- Physical and health hazards of silica-containing dust;
- Methods used to protect against the hazards of silica-containing dust including PPE and respiratory protection;
- A review of the applicable standard and where copies can be found; and
- An explanation of the medical surveillance program and an employee's right to access medical and exposure records.

6.1 Competent Person Training

The Silica Competent Person training covers all points described previously with the addition of a competency exam following the successful completion of the training. Retraining may be required as determined by Arcadis policy or management or by client or state-specific requirements.

7. REFERENCES

OSHA Silica Page

Arcadis Medical Surveillance H&S Standard – ARC HSGE010

Arcadis Respiratory Protection H&S Standard – ARC HSGE017

Arcadis Industrial Hygiene H&S Standard – ARC HSIH009

Arcadis Health and Safety Plan H&S Standard - ARC HSFS010

8. RECORDS - DATA RECORDING AND MANAGEMENT

Medical records will be maintained by Arcadis' medical surveillance TPA (WorkCare). Employees may obtain a copy of their complete medical record by contacting the medical surveillance TPA directly and a copy will be provided at no cost to the employee.

All records regarding occupational exposure measurements will be provided to employees by the project manager, Site H&S Officer or the Competent Person responsible for administering the exposure monitoring program, maintained in the applicable project team file and copies of such exposure monitoring records provided to both Corporate H&S (4-sight-support@arcadis-us.com) and Human Resources (HRSolutionsCenter.ANA@arcadis.com) for file retention. See the Arcadis Industrial Hygiene HSS (ARC HSIH009) for additional information.

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9. APPROVALS AND HISTORY OF CHANGE

Julie Santaniello, CSP - Corporate H&S, Manager of Technical Programs

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
22 September 2017	01	Greg Mason / Andrew McDonald/ Julie Santaniello	Original document
13 November 2017	02	Greg Mason / Andrew McDonald/ Julie Santaniello	Clarified when Engineering and Administrative controls are to be used in Section 1. Updated example in Section 5.2. Clarified using compressed air during housekeeping in Section 5.7.

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Exhibit 1 – Definitions

Action Level is the airborne concentration established by OSHA that triggers certain regulatory requirements (25 µg/m3 silica in air 8-hour time weighted average).

Affected Employee means all employees whose exposures were assessed, including employees whose exposures were represented by other employees' exposure measurements, and those whose exposure assessments were based on objective data.

Air Monitoring Data are any results of air monitoring (analyzed according to the procedures and requirements in 29 CFR 1926.1153 Appendix A methods of sample analysis) that the employer has done to meet the requirements of this HSS.

Crystalline Silica is a common mineral found in many naturally occurring and man-made materials used at construction sites. Materials like sand, concrete, brick, block, stone and mortar contain crystalline silica. Amorphous silica, such as silica gel, is not crystalline silica.

Competent person is an individual who is capable of identifying existing and foreseeable respirable crystalline silica hazards in the workplace and who has authorization to take prompt corrective measures to eliminate or minimize them.

Fully and properly implemented means that controls are in place, are properly operated and maintained, and employees understand how to use them. Several factors required for full and proper implementation of controls are listed in the discussion for each Exhibit 2 entry. The presence of large amounts of visible dust generally indicates that controls are not fully and properly implemented. A small amount of dust can be expected from equipment that is operating as intended by the manufacturer; however, a noticeable increase in dust generation during the task is a sign that the dust controls are not operating correctly. The difference between the small amounts of dust generated when control measures are working properly and the large amount of dust generated during tasks when control measures are not used or not operated effectively is easily observed. When this happens, prompt corrective actions are required.

High-Efficiency Particulate Air (HEPA) filter means a filter capable of trapping and retaining at least 99.97 percent of mono-dispersed particles of 0.3 micrometers in diameter.

Objective Data is information demonstrating that a particular product or material containing silica or a specific process, operation, or activity involving silica cannot release dust or fumes in concentrations at or above the Action Level even under the worst-case release conditions. Objective data can be obtained from an industry-wide study or from laboratory product test results from manufacturers of silica-containing products or materials. The data the used from an industry-wide survey must be obtained under workplace conditions closely resembling the processes, types of material, control methods, work practices and environmental conditions in the employer's current operations.

Permissible Exposure Limit (PEL) is an average airborne concentration regulatory limit established by OSHA above which requires control to protect people from adverse health effects (50 µg/m3 silica in air averaged over an 8-hour period).

Respirable Crystalline Silica means quartz, cristobalite, and/or tridymite contained in airborne particles that are determined to be respirable by a sampling device designed to meet the characteristics for respirable-particle-size-selective samplers specified in the International Organization for Standardization (ISO) 7708:1995: Air Quality – Particle Size Fraction Definitions for Health-Related Sampling https://www.iso.org/standard/14534.html.

Threshold Limit Value is a recommended average airborne concentration limit established by ACGIH. The TLVs are reviewed and updated as appropriate annually.

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

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Exhibit 2 - OSHA's Table 1- Specified Exposure Control Method When Working With Materials Containing Crystalline Silica

Construction Task or Equipment Operation		Engineering and Work Practice Control Methods	Required Respiratory Protection	
			≤ 4 hours/shift	>4 hours/shift
1	Stationary masonry saws	• Use saw equipped with integrated water delivery system that continuously feeds water to the blade. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None
2a	Handheld power saws (any blade diameter) when used outdoors	• Use saw equipped with integrated water delivery system that continuously feeds water to the blade. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask
2b	Handheld power saws (any blade diameter) when used indoors or in an enclosed area	• Use saw equipped with integrated water delivery system that continuously feeds water to the blade. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask
3	Handheld power saws for cutting fiber-cement board (with blade diameter of 8 inches or less) for tasks performed outdoors only	• Use saw equipped with commercially available dust collection system. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. • Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency.	None	None
4a	Walk-behind saws when used outdoors	• Use saw equipped with integrated water delivery system that continuously feeds water to the blade. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None
4b	Walk-behind saws when used indoors or in an enclosed area	• Use saw equipped with integrated water delivery system that continuously feeds water to the blade. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask
5	Drivable saws for tasks performed outdoors only	• Use saw equipped with integrated water delivery system that continuously feeds water to the blade. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None
6	Rig-mounted core saws or drills	• Use tool equipped with integrated water delivery system that supplies water to cutting surface. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None

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Construction Task or Equipment Operation		Engineering and Work Practice Control Methods	Required Respiratory Protection	
			≤ 4 hours/shift	>4 hours/shift
7	Handheld and stand-mounted drills (including impact and rotary hammer drills)	• Use drill equipped with commercially available shroud or cowling with dust collection system. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. • Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism. • Use a HEPA-filtered vacuum when cleaning holes.	None	None
8	Dowel drilling rigs for concrete for tasks performed outdoors only	• Use shroud around drill bit with a dust collection system. • Dust collector must have a filter with 99% or greater efficiency and a filter cleaning mechanism. • Use a HEPA-filtered vacuum when cleaning holes.	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask
9a	Vehicle-mounted drilling rigs for rock and concrete	• Use dust collection system with close capture hood or shroud around drill bit with a low-flow water spray to wet the dust at the discharge point from the dust collector.	None	None
9b	Vehicle-mounted drilling rigs for rock and concrete	• Operate from within an enclosed cab and use water for dust suppression on drill bit.	None	None
10a	Jackhammers and handheld powered chipping tools when used outdoors	• Use tool with water delivery system that supplies a continuous stream or spray of water at the point of impact.	None	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask
10b	Jackhammers and handheld powered chipping tools when used indoors or in an enclosed area	• Use tool with water delivery system that supplies a continuous stream or spray of water at the point of impact.	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask
10c	Jackhammers and handheld powered chipping tools when used outdoors	• Use tool equipped with commercially available shroud and dust collection system. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. • Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism.	None	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask
10d	Jackhammers and handheld powered chipping tools when used indoors or in an enclosed area	• Use tool equipped with commercially available shroud and dust collection system. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. • Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism.	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask
11	Handheld grinders for mortar removal (i.e., tuckpointing)	• Use grinder equipped with commercially available shroud and dust collection system. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust	N95 (or Greater Efficiency) Filtering Facepiece or	Powered Air-Purifying Respirator (PAPR) with

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Construction Task or Equipment Operation		Engineering and Work Practice Control Methods	Required Respiratory Protection	
			≤ 4 hours/shift	>4 hours/shift
11 **cont.**	Handheld grinders for mortar removal (i.e., tuckpointing)	emissions. • Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism.	Half Mask	P100 Filters
12a	Handheld grinders for uses other than mortar removal for tasks performed outdoors only	• Use grinder equipped with integrated water delivery system that continuously feeds water to the grinding surface. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None
12b	Handheld grinders for uses other than mortar removal when used outdoors	• Use grinder equipped with commercially available shroud and dust collection system. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. • Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism.	None	None
12c	Handheld grinders for uses other than mortar removal when used indoors or in an enclosed area	• Use grinder equipped with commercially available shroud and dust collection system. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. • Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism.	None	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask
13a	Walk-behind milling machines and floor grinders	• Use machine equipped with integrated water delivery system that continuously feeds water to the cutting surface. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None
13b	Walk-behind milling machines and floor grinders	• Use machine equipped with dust collection system recommended by the manufacturer. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. • Dust collector must provide the air flow recommended by the manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism. • When used indoors or in an enclosed area, use a HEPA-filtered vacuum to remove loose dust in between passes.	None	None
14	Small drivable milling machines (less than half-lane)	• Use a machine equipped with supplemental water sprays designed to suppress dust. • Water must be combined with a surfactant. • Operate and maintain machine to minimize dust emissions.	None	None

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Construction Task or Equipment Operation		Engineering and Work Practice Control Methods	Required Respiratory Protection	
			≤ 4 hours/shift	>4 hours/shift
15a	Large drivable milling machines (half-lane and larger) for cuts of any depth on asphalt only	• Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust. • Operate and maintain machine to minimize dust emissions.	None	None
15b	Large drivable milling machines (half-lane and larger) for cuts of four inches in depth or less on any substrate	• Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust. • Operate and maintain machine to minimize dust emissions.	None	None
15c	Large drivable milling machines (half-lane and larger) for cuts of four inches in depth or less on any substrate	• Use a machine equipped with supplemental water spray designed to suppress dust. • Water must be combined with a surfactant. • Operate and maintain machine to minimize dust emissions.	None	None
16	Crushing machines	• Use equipment designed to deliver water spray or mist for dust suppression at crusher and other points where dust is generated (e.g., hoppers, conveyers, sieves/sizing or vibrating components, and discharge points). • Operate and maintain machine in accordance with manufacturer's instructions to minimize dust emissions. • Use a ventilated booth that provides fresh, climate-controlled air to the operator, or a remote-control station.	None	None
17a	Heavy equipment and utility vehicles used to abrade or fracture silica-containing materials (e.g., hoe-ramming, rock ripping) or used during demolition activities involving silica-containing materials	• Operate equipment from within an enclosed cab.	None	None
17b	Heavy equipment and utility vehicles used to abrade or fracture silica-containing materials (e.g., hoe-ramming, rock ripping) or used during demolition activities involving silica-containing materials	• When employees outside of the cab are engaged in the task, apply water and/or dust suppressants as necessary to minimize dust emissions.	None	None
18a	Heavy equipment and utility vehicles for tasks such as grading and excavating but not including demolishing, abrading, or fracturing silica-containing materials	• Apply water and/or dust suppressants as necessary to minimize dust emissions.	None	None
18b	Heavy equipment and utility vehicles for tasks such as grading and excavating but not including demolishing, abrading, or fracturing silica-containing materials	• When the equipment operator is the only employee engaged in the task, operate equipment from within an enclosed cab.	None	None

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Exhibit 3 - Scheduled Monitoring Sampling Form for Silica

ARCADIS Design & Consultancy for natural and built assets

Scheduled Monitoring Sampling Form for Silica

Filter/Cassette #_____

Page 1 of 2

Project Number	Date	Project Name

Employee Name	Employee Number

Employee Business Line

Job Description

Type of Work Being Performed

Task	% Time Performing	Task	% Time Performing
☐ Abrasive Blasting	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%	☐ Mixing Concrete	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%
☐ Cutting	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%	☐ Mixing Mortar	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%
☐ Chipping	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%	☐ Patching	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%
☐ Drilling	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%	☐ Polishing	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%
☐ Excavating	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%	☐ Scabbing/ Scappling	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%
☐ Formwork Cleaning	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%	☐ Sc...	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%
☐ Grading	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%	☐ Scra...	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%
☐ Grindin...	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%	☐ Terra... Wor...	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%
☐ ...and Sweeping	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%	☐ ... Wo...	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%
☐ ...	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%		
☐ Ot...			☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%

Base Material Spec.		Silica Contained in Base Material
☐ Asphalt	☐ Gunite	☐ From bulk sample _____
☐ Block	☐ Mortar	☐ From estimate (SDS or list) _____
☐ Brick	☐ Soil	
☐ Concrete	☐ Terrazo	
☐ Cement	☐ Tile	
☐ Grout	☐ Other Material: _____	

Tool Being Used Attach Photo	PPE Utilized
Make:_____ Model: _____	☐ Dust Mask (DM) ☐ Half Face (HF) ☐ Full Face (FF) ☐ Protective Clothing (PC) ☐ Gloves (G)

Control Methods

☐ None (N)
☐ Dry (D)
☐ Natural Ventilation (NV)
  ☐Employee Downwind
  ☐Employee Upwind
  ☐Employee Crosswind
☐ General Mechanical (GM)
☐ Local Exhaust Ventilation - with HEPA vacuum (LE-HEPA)
☐ Local Exhaust Ventilation - with shop vac or other vacuum (LE-OTHER)
☐ Wet Method - Continuous Drip (WM-CD)
☐ Wet Method - Continuous Spray (WM-CS)
☐ Wet Method - Non-continuous Drip (WM-NCD) Frequency: _____
☐ Wet Method - Non-continuous Spray (WM-NCS) Frequency: _____

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ARCADIS Design & Consultancy for natural and built assets

Scheduled Monitoring Sampling Form for Silica

Filter/Cassette #_____

Project Numberr	Date	Project Name

Silica controls maintenance plan in effect? ☐ Yes ☐ No
Controls checked during sampling period? ☐ Yes ☐ No
Employee trained and familiar with operation of controls? ☐ Yes ☐ No

Weather Conditions

☐ Sunny ☐ Overcast ☐ Rain ☐ Snow

Environment	Air/Wind Currents	Temperature
☐ Outdoors ☐ Open Sided(Free Flow) ☐ Enclosed 1Side (Limited Flow) ☐ Enclosed All Sides (No Flow)	☐ None ☐ < 5mph ☐ 5-10 mph ☐ > 10 mph	☐ < 40°F (<40) ☐ 40°F < x < 90°F (40-90) ☐ > 90° F (>90)

Nearby Visible Dust Sources	midi
☐ None ☐ Other workers doing same task ☐ Partial from Other tasks and sources ☐ Continuous from Other tasks and source	☐ < 20% (<20 20% < x < % 0-40) % < x < % -60) 60 < x < % (-80)

Sampling Equipment	
☐ Respirable Silica (RS)	
Sampling Type	
☐ Personal (P) ☐ Area (A - Distance to Activity) ☐ Bulk (B)	
Pump Identification	**Analytical Method**
Make/Model	NIOSH 7500; OSHA ID-142

Filter	Pre-Calibration Date	Post- Calibration Date	Flow Rates Pre Rate
Cyclone Type			
	Sampling Times		Post Rate
Agent	Start / Stop	Time	
Respirable Silica			
	Start / Stop	Time	Average Flow rate

Average Flow Rate X	Total Sampling Time	Total Volume

Laboratory Results (ug/m3)			
Quartz	Cristobalite	Trydymite	RCS

Notations

Samplers Name (Print)

Samplers Signature

Exhibit 4 - Scheduled Monitoring Sampling Guidelines

Project Teams using the Scheduled Monitoring Option should collect and analyze samples using the procedures specified in one of the following analytical methods: OSHA ID-142 and/or NIOSH 7500. It is recommended that Project Teams use SKC PPI samplers in place of cyclone samplers. When collecting samples Project Teams should collect 1 field blank per 20 samples. For personal exposure monitoring sampling, devices should be placed in the breathing zone of the employee, often on the employee's lapel. Area samples should also be collected to help determine required exclusion zones, distance from the silica-containing dust source should be recorded on the Scheduled Monitoring Data Sampling Form for Silica (Exhibit 3).

Silica sampling kits can be rented from SGS Galson, which includes all the required equipment to complete the sampling:

- Gil-Air Pump with Charger
- Tubing and Clip
- Media for sample collection
    - Field blank – One field blank per 20 samples will be collected the Field blank will be carried to the sampling site, exposed to the sampling conditions during pump calibration, returned to the laboratory, treated as a sample, and carried through all steps of the analysis to evaluate possible effects attributable to shipping and field handling procedures.
- Instructions
- Calibrator (Rotameter)
- Packing Materials
- Test Report – Silica-containing dust (quartz, cristobalite & tridymite) with respirable dust

Personal exposure monitoring data will be collected using the Scheduled Monitoring Data Sampling Form for Silica (Exhibit 3). Completed Scheduled Monitoring Data Sampling Forms for Silica should be submitted along with a copy of the sample chain of custody (COC), photos and analytical data to 4-Sight-Support@arcadis-us.com.

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Exhibit 5 – Silica Exposure Control Plan

ARCADIS Design & Consultancy for natural and built assets

Silica Exposure Control Plan

Project Name: _____
Project Number: _____
Date: _____

Task Description:

1) *Arcadis Silica Competent Person:* _____
The above individual will ensure requirements stipulated in this plan are implemented and has the authority to take corrective measures and/or revise this plan to ensure employee, contractor and/or public exposure to silica dust remains below the respirable inhalation time weighted average action level of 25 µg/m3 over an 8-hour period.

2) *What material will the team be working with on this project?*
Select

3) *The following work activity will be performed on this project which have a potential for silica dust exposure:*
Select

The following controls will be utilized to mitigate exposure to silica dust hazards:
Based on the activities entered above, the following OSHA/Arcadis activity category is:
0

4) *The controls to be utilized include:*
#N/A

4a) *Respiratory Protection:*

	≤4 HRS	>4HRS		≤4 HRS	>4HRS
Indoors or Enclosed Area:	#N/A	#N/A	Outdoors:	#N/A	#N/A

#N/A
#N/A

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Additional Housekeeping Requirements:
Arcadis prohibits dry sweeping or dry brushing where such activity could contribute to employee exposure to respirable crystalline silica unless wet sweeping, HEPA-filtered vacuuming or other methods that minimize the likelihood of exposure are not feasible.

Arcadis prohibits use of compressed air to clean clothing or surfaces where such activity could contribute to employee exposure to respirable crystalline silica unless:
The compressed air is used in conjunction with a ventilation system that effectively captures the dust cloud created by the compressed air. No alternative method allowed.

5) Air Monitoring Requirements for Activities with an Assigned Respirator APF Listed in Section 4a.

- ☐ Real-time air monitoring for silica is not required for this project
- ☐ Real-time air monitoring will be conducted during work activities where employees contractors are exposed to or have the reasonable probability to be exposed to silica dust hazards. Silica air monitoring will include use of an aerosol monitor equipped with a cyclone-Oliver cyclone kit for respirable dust evaluation. Real-time air monitoring for silica will be performed in the employee breathing zone (personal monitoring) and also performed at the perimeter of the work area (exclusion zone boundary). Air samples for laboratory analysis will also be required unless exempt from collection by a CI

Aerosol monitor selected for use on this project: _____
Frequency of air sample collection for laboratory analysis: _____
Air samples will be submitted to the following laboratory: _____

6) Medical Surveillance

Employees performing work activities where exposure to silica dust is known to be or has a reasonable probability to be above the OSHA 8 Hr. TWA action level of 25 µg/m3 will participate in silica medical surveillance in conjunction with their annual HAZWOPER physical. New entrants into the silica medical surveillance program at times when the HAZWOPER physical is not due will coordinate the required surveillance with WorkCare and then maintain the surveillance with their HAZWOPER physical going forward.

7) Additional Instructions

Signatures:

_____ _____
Preparer Name Printed Date

_____
Preparer Signature

_____ _____
Competent Person Name Printed Date

_____
Competent Person Signature

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Implementation Date 10 January 2017	Arcadis HS Standard Name Short Service Employee	ARCADIS Design & Consultancy for natural and built assets
Revision Date 30 October 2017	Arcadis HS Policy No. ARC HSGE019	Revision Number 02

EXECUTIVE SUMMARY

Employees who are new to Arcadis are potentially at a greater risk for incidents. Arcadis has developed a short service employee (SSE) program, which will provide mentoring and coaching to ensure the health, safety, and security of SSEs.

This standard applies to all Arcadis U.S. (Arcadis) employees with less than one (1) year of employment at Arcadis. The goal is to introduce and mentor the Arcadis Health & Safety culture to each new hire. The SSE program comprises six (6) mandatory core elements to help introduce the Arcadis Health & Safety Culture to the SSE while fostering a strong relationship with their supervisor and project management.

The minimum requirements below apply to all employees with less than 1 year of employment at Arcadis.

- **New Hire Orientation Call**
- **New Hire Health & Safety Program Orientation**
- **New Hire / Short Service Employee Task Improvement Process (TIP)**
- **New Hire Health & Safety Culture Assessment**
- **Culture of Caring Review**
- **SSE Mentoring**

All Arcadis employees must comply with this Health and Safety Standard (HSS). Arcadis Client Teams will meet the requirements of this HSS in addition to following client specific requirements.

Implementation Date 10 January 2017	Arcadis HS Standard Name Short Service Employee	ARCADIS Design & Consultancy for natural and built assets
Revision Date 30 October 2017	Arcadis HS Policy No. ARC HSGE019	Revision Number 02

1. POLICY

This Health & Safety Standard (HSS) is applicable to Arcadis U.S. (Arcadis) with less than one (1) year of employment at Arcadis and client teams in which a short service employee (SSE) program is required.

2. PURPOSE AND SCOPE

2.1 Purpose

Employees who are new to Arcadis are potentially at a greater risk for incidents. SSEs will be appropriately mentored, coached, accompanied, and/or managed to ensure their health, safety, and security until they can safely work on their own.

2.2 Scope

This HSS supplements the requirements in the current version of the Arcadis Field Health and Safety Handbook. Additional client-specific requirements may apply requiring further program development. The Client Services Director must determine what additional client requirements apply and create a client-specific program.

3. DEFINITIONS

Short Service Employee (SSE): An employee with less than 1 year of employment at Arcadis.

Note: Employees who have been rehired by Arcadis, including Part Time as Needed (PTAN), or employees who have successfully completed the SSE program requirements and can demonstrate firsthand experience or knowledge of the task execution, specific hazards, and controls are not required to be designated as SSEs.

Client-specific SSE programs may have additional definitions.

4. RESPONSIBILITIES

4.1 Client Services Director

The Client Services Director (CSD) will determine whether a client team requires an SSE program, obtain the client requirements for the SSE program and oversee development of the client-specific SSE program within the client team. These client-specific SSE program requirements must be incorporated into each project HASP.

4.2 Arcadis Client H&S Team

The Arcadis Client H&S Team, if applicable, will review the client's SSE program and develop a plan that meets both Arcadis and client requirements. The team will then communicate the plan to Project Management for implementation.

4.3 Frontline Project Management

Frontline Project Management (Project Manager, Associate Project Manager, Phase Manager, Task Manger, or designee) is responsible for identification of each SSE assigned to the project and verify the SSE has the appropriate training prior to beginning any work performed outside of any office setting. Project Management will assign a mentor to the SSE and verify an on-site safety/task orientation is provided by a knowledgeable, experienced employee prior to the SSE's initial work assignment. In addition, Project Management will conduct periodic performance reviews.

Frontline Project Management shall ensure that an SSE will not conduct a new or unfamiliar task without being coached, mentored, and/or provided hands on training by an Assigned Mentor with relevant task experience.

4.4 SSE Supervisors

Supervisors of SSE are responsible for ensuring an SSE will be appropriately mentored, coached, accompanied, and/or managed to ensure their health, safety, and security until they can work on their own. Supervisors must ensure all applicable training is completed and the SSE is assigned a mentor prior to the SSE conducting a new or unfamiliar task outside of an office setting.

4.5 Assigned Mentors

The assigned mentor is an experienced Arcadis employee with the proper operations knowledge and skills who will display the appropriate safety leadership and work ethic. Mentors are responsible for teaching and coaching the SSE on the roles, responsibilities and safe work practices for all assigned tasks.

4.6 SSE Employees

SSE will complete all appropriate training prior to beginning work at the site and will participate in an on-site orientation upon arrival. The SSE will follow the instruction of and seek guidance from the assigned mentor. The SSE will initiate Stop Work Authority if he or she feels unsafe or does not understand the task, or when task conditions change.

4.7 Corporate Health & Safety Staff

Corporate Health & Safety (H&S) is responsible for assisting staff and project teams with the development and implementation of the required SSE program. In addition, Corporate H&S will provide access to the tools and training resources associated with the implementation of the SSE program. Corporate H&S shall review the program for effectiveness periodically and when program deficiencies are identified will implement a solution to resolve the deficiency.

5. PROCEDURE

5.1 Arcadis SSE Program Minimum Requirements

The minimum requirements below apply to all employees with less than 1 year of employment at Arcadis:

- **New Hire Orientation Call** - Completed by SSE within 7 days of hire.
- **New Hire Health & Safety Program Orientation** – Completed by SSE in the Learning Center within 14 days of hire.
- **New Hire / Short Service Employee Task Improvement Process (TIP)** – New Hire / Short Service Employee TIP must be completed with the SSE by the SSE Supervisor within 60 days of hire.
- **New Hire Health & Safety Culture Assessment** – Assigned in the Learning Center to SSE 60 days after hire. The New Hire Health & Safety Culture Assessment must be completed by SSE in the Learning Center within 90 days of hire.
- **Culture of Caring Review**– For tasks performed outside of any office setting, Project Management will provide coaching and mentoring on Arcadis H&S expectations during project work. This will include a detailed review of task specific hazards and controls and identification of an Assigned Mentor that can be contacted if SSE has questions regarding planned or unplanned work tasks. Project Management will complete the Culture of Caring form in the Health & Safety Plan.
- **SSE Mentoring** – SSEs will not perform a new or unfamiliar task outside of any office setting without being provided coaching, mentoring, and/or hands on training by an Assigned Mentor with relevant task experience. This can be documented by completion of a Tailgate Safety Meeting form, signoff of relevant JSA, or relevant TIP on the SSE.

  Note: The SSE Mentoring requirement does not apply if the SSE can demonstrate in review with Project Management, firsthand experience, task proficiency, or demonstrable knowledge of the task execution, specific hazards, and controls.

5.2 Arcadis Client Specific SSE Program

Arcadis Client Teams will meet the Arcadis SSE Program Minimum Requirements listed in Section 5.1 in addition to following client-specific guidelines.

6. TRAINING

All Arcadis staff will receive the New Hire H&S Orientation training within 14 days of hire. Other applicable training will be determined based on the job and responsibilities of the SSE (refer to the Business Line H&S Training Matrix on the Learning Center Resources page).

7. REFERENCES

Arcadis Field Health and Safety Handbook, current version.

8. RECORDS - DATA RECORDING AND MANAGEMENT

SSE progress will be documented in the Arcadis Learning Center, 4-Sight and/or applicable project files. Records will also be kept in accordance with the client contract.

Implementation Date 10 January 2017	Arcadis HS Standard Name Short Service Employee	ARCADIS Design & Consultancy for natural and built assets
Revision Date 30 October 2017	Arcadis HS Policy No. ARC HSGE019	Revision Number 02

9. APPROVALS AND HISTORY OF CHANGE

Approved by: Julie Santaniello, CSP – Corporate H&S, Manager of Technical Programs

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
10 January 2017	01	Sharon Lingle/Tony Tremblay/Julie Santaniello	Original document
30 October 2017	02	Alec MacAdam/Denis Balcer/ Lauren Hubbard/Tony Tremblay/Andrew McDonald/Julie Santaniello	Implementation of Arcadis U.S. wide SSE program for all employees with less than 1 year of employment at Arcadis.

EXECUTIVE SUMMARY

This Health and Safety Standard (HSS) describes the authority, obligation and responsibility to stop potentially unsafe work at the earliest stage possible. Every Arcadis and subcontractor employee is responsible for prevention of unsafe acts, behaviors or conditions, consequently preventing harm to people, the environment or property.

Every Arcadis and subcontractor employee has the authority and obligation to stop work that he or she considers to be unsafe. The Arcadis leadership team is committed to support anyone who exercises his or her 'Stop Work' authority. There will be no negative consequences as a result of 'Stop Work' actions.

This standard applies to all activities performed by Arcadis or on behalf of Arcadis. A stop work process will include the participation of all Arcadis, Arcadis subcontractors and other involved personnel as appropriate.

Senior Leaders shall establish the clear expectation for Arcadis employees and subcontractors to exercise 'Stop Work Authority'.

Project managers and field supervisors are responsible for confirming that 'Stop Work' requirements and obligations are understood thoroughly by Arcadis and subcontractor employees.

'Stop Work' involves:

- Initiating a 'Stop Work.'
- Notifying affected employees, other personnel (including client staff) and supervision.
- Assessing hazards and associated risks.
- Identifying and implementing controls.
- Resuming work once a hazard assessment and controls implementation (if applicable) are approved by a competent person and are satisfactory to all parties involved.

The "Stop Work" process will be included in employee induction, and in ongoing company communications and during Tailgate meetings

Records will be maintained to include Tailgate Meeting forms and Incident Investigation reports

1. POLICY

It is Arcadis policy that during the conduct of their work, Arcadis and subcontractor employees have the authority and responsibility to Stop Work immediately in any situation when the Health, Safety, Security and Environment hazards and associated risks associated with work being performed is not clearly understood, established or controlled. This standard presents the requirements to be observed if and when this situation occurs.

2. PURPOSE AND SCOPE

2.1 Purpose

This standard describes the authority, obligation and responsibility to stop potentially unsafe work at the earliest stage possible. Every Arcadis and subcontractor employee is responsible for prevention of unsafe acts, behaviors or conditions, consequently preventing harm to people, the environment or property.

Every Arcadis and subcontractor employee has the authority and obligation to stop work that he or she considers to be unsafe. The Arcadis leadership team is committed to support anyone who exercises his or her 'Stop Work' authority. There will be no negative consequences as a result of 'Stop Work' actions.

2.2 Scope

This standard applies to all activities performed by Arcadis or on behalf of Arcadis. A stop work process will include the participation of all Arcadis, Arcadis subcontractors and other involved personnel as appropriate.

3. DEFINITIONS

Definitions relating to this HSS can be found in Exhibit 1.

4. RESPONSIBILITIES

4.1 Senior Leaders (including Account Managers and company leadership)

In the scope of this HSS, senior leaders shall establish the clear expectation for Arcadis employees and subcontractors to exercise 'Stop Work Authority', create a culture where 'Stop Work' is exercised freely, resolve 'Stop Work' conflicts when they arise, and hold those accountable who do not to comply with established 'Stop Work' policies.

4.2 Project Managers and Field Supervisors

In the scope of this standard, project managers and field supervisors are responsible for confirming that 'Stop Work' requirements and obligations are understood thoroughly by Arcadis and subcontractor employees, creating a culture where 'Stop Work' is exercised freely, honoring and responding promptly to requests to stop work, working to resolve issues to the satisfaction of all involved parties before operations resume, recognizing proactive participation and verifying that all 'Stop Work' actions are properly reported with required follow-up, as necessary.

4.3 Arcadis and Subcontractor Employees

In the scope of this standard, Arcadis and subcontractor employees are responsible for understanding their authority and obligations under ‘Stop Work,’ initiating a ‘Stop Work’ intervention when warranted, supporting the intervention of others and properly reporting all ‘Stop Work’ actions as described in this standard. Arcadis and subcontractor employees are responsible for understanding the hazards of their activities, implementing the controls for the hazards and using ‘Stop Work’ authority if they don’t understand the hazards, their job tasks, or if they do not feel safe for any reason. In addition, employees will participate in determining and implementing the solutions for mitigating the unsafe issue.

5. PROCEDURE

5.1 General Requirements

Arcadis and subcontractor employees shall be made aware of their obligation to ‘Stop Work’ for issues that they consider to be unsafe.

Employees have the authority, obligation and responsibility to stop any task or operation where there are concerns or questions regarding the control of the hazards or risks associated with a task or operation that is being performed.

No work will resume until all ‘Stop Work’ concerns or questions have been adequately addressed and associated risks have been eliminated or mitigated to acceptable levels to the satisfaction of all parties involved.

All employees are made aware of the actions they shall take, including reporting, when stopping unsafe work.

All indications from personnel that the work is unsafe must be properly investigated as deemed appropriate for the situation. All instances of work being stopped for reasons of health and safety shall be recorded and appropriately investigated. This documentation may be completed using the Tailgate Meeting form or using the Arcadis Incident Investigation process.

Any form of retaliation or intimidation directed at any individual or company for exercising their authority as outlined in this standard will not be tolerated. Disregard for the requirements in this standard shall be addressed with disciplinary actions in accordance with Arcadis policy.

Before work begins, a responsible person shall be defined by the Project Manager for coordination of any ‘Stop Work’ activities, including hazard and risk assessment and mitigation actions following a ‘Stop Work’ intervention (refer to the Tailgate Meetings standard – ARC HSGE001).

5.2 Stop Work Process

In general terms, ‘Stop Work’ involves:

- Initiating a ‘Stop Work.’

- Notifying affected employees, other personnel (including client staff) and supervision.
- Assessing hazards and associated risks.
- Identifying and implementing controls.
- Resuming work once a hazard assessment and controls implementation (if applicable) are approved by a competent person and are satisfactory to all parties involved.

5.2.1 Initiate a ‘Stop Work’

When a person identifies a perceived or actual unsafe condition, act, error, omission, confusion or lack of understanding that could result in harm to persons, the environment or property, he or she shall immediately initiate a ‘Stop Work’ intervention.

This intervention shall:

- Be initiated in a positive manner.
- Result in a stop of associated work activities, if there is an immediate risk of injury or accident; removal of all person(s) (also persons not directly related to the Arcadis Work Team) from the area; as appropriate to the issue; stabilization of the situation and making the area as safe as possible, until more permanent solutions can be developed and implemented as appropriate to the situation.
- If there is no immediate risk, address the potentially unsafe issue with the person(s) potentially at risk and/or the person(s) causing the risk. This includes all affected employees of Arcadis, subcontractor, client and other parties.

5.2.2 Notifying the Affected Parties

All personnel affected by the ‘Stop Work’ situation shall be notified as soon as possible.

5.2.3 Assessing Hazards and Associated Risks

A competent person (e.g. task manager, field supervisor, task or job expert, H&S resource) shall guide the assessment for potential hazards and risks by involving the affected parties to determine the hazards and assess the associated risks, so that appropriate controls can be identified. This information will be documented on the Tailgate Meeting form or an incident investigation form in 4Sight.

5.2.4 Identifying Controls

To identify controls that eliminate risk or mitigate it to an acceptable level and to decide on an appropriate course of action, the following questions and others shall be considered:

- How can the risk be controlled or otherwise mitigated to an acceptable level and to the reasonable satisfaction of the parties involved?

- Is a competent person approving the hazard and risk assessment and the identified controls in order to prepare to re- start work?

All affected parties should be in agreement with the hazard and risk assessment and controls identification.

The results of the hazard and risk assessment and controls identification resulting from the 'Stop Work' shall be reported, documented and maintained on either Tailgate Meeting form or the incident investigation form as appropriate for the issue.

5.2.5 Qualifiers for Stopping/Resuming Work

The following should be considered when stopping or resuming work as the result of a 'Stop Work' intervention:

- If the 'Stop Work' intervention is based on a perceived (but not an actual) risk as determined from the hazard and risk assessment, the affected person(s), as appropriate, should:
    - Show appreciation to the initiator for his or her awareness and concern.
    - Proceed with work.
    - Share the learnings with the initiator and involved parties.
- If the 'Stop Work' intervention is based on an actual risk that cannot be immediately assessed and/or controlled on site by the present employees and available resources, work shall be suspended. If the identified controls that mitigate the risk in the 'Stop Work' situation are not within the original scope of work, the change will be managed appropriately, and the JSA and HASP should be reviewed to include a hazard and risk assessment and identify subsequent controls.
- If the work is in the scope of a permit, the permit issuer shall review/reissue the permit with the necessary changes or modifications.

Work can be resumed only once a competent person with the appropriate level of authority approves the hazard and risk assessment and the implemented controls and all parties are satisfied with the controls.

5.3 Stop Work ("If Not Me, Then Who?") Involving Parties Outside of Arcadis Control

The Arcadis H&S Vision and Policy and our culture of TRACK to 0 puts H&S first in all things. Yet, stopping work or intervening under the Arcadis "If Not Me, Then Who?" concepts when it involves parties outside of Arcadis control must be implemented in such a way to protect the health and safety of our staff members, but also to protect the company from any undue risk and liability. Consequently, a separate guidance document has been developed and included as Exhibit 2.

5.4 Reporting

All planned and unplanned ‘Stop Work’ interventions shall be documented on the Tailgate Meeting form, and/or in 4-Sight as a near miss report or incident investigation report, as appropriate to the issue.

Adequate descriptions shall be given of the act, behavior or condition that caused the ‘Stop Work’ intervention, its hazard and risk assessment and implemented risk mitigations.

Near miss and incident reports shall be reviewed by H&S personnel and reported to senior leaders to:

- Measure participation.
- Determine the quality of interventions and follow-up.
- Track common issues and identify trends and opportunities for improvement.
- Facilitate the sharing of learnings.
- Provide feedback from recognition programs.

The H&S team shall regularly communicate incident details reported by Business Line as well as details regarding common trends and learnings.

6. TRAINING

The “Stop Work” process will be included in H&S Orientation training, in ongoing company communications and reinforced during Tailgate meetings.

7. REFERENCES (regulation citation, technical links, publications, etc.)

Arcadis Health and Safety Plan standard – ARC HSFS010

Arcadis Incident Investigation Standard – ARC HSMS010

8. RECORDS - DATA RECORDING AND MANAGEMENT

Stop Work actions shall be documented in:

- Tailgate Meeting forms; and/or
- Incident Investigation reports

9. APPROVALS AND HISTORY OF CHANGE

Approved By:

Tony Tremblay, CSP – Corporate H&S, Director of Technical Programs

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
15 February 2010	01	Mike Thomas	Original document
17 April 2012	02	Camille Carollo/Tony Tremblay	Executive Summary added
16 January 2013	03	Pat Vollertsen/Tony Tremblay	Revised section 6.0 and Executive summary in regard to training
22 October 2015	04	Tony Tremblay/Julie Santaniello	Section 3 Definitions moved to Exhibit 1; Section 5.3 Stop Work (“If Not Me, Then Who?”) Involving Parties Outside of Arcadis Control added and existing section 5.3 renumbered to Section 5.4; text updated in Section 5.4; Document template updated; Exhibit 2 If Not Me, Then Who guidance document added

Exhibit 1

Planned 'Stop Work' is a 'Stop Work' situation previously identified in a Job Loss Analysis, HASP or other standard (e.g., 'Stop Work' trigger)

'Stop Work' is the stopping of all activities associated with a task, condition, situation, action or activity (issue) that anyone views as potentially unsafe. 'Stop Work' can be applied to the single issue, a group of issues, or an entire job project or site as applicable.

Exhibit 2 – If Not Me, Then Who? Guidance Document

ARCADIS Design & Consultancy for natural and built assets

IF NOT ME, THEN WHO?

- H&S SITUATIONS WHERE NO ARCADIS EMPLOYEES ARE INVOLVED OR WHEN ARCADIS DOES NOT HAVE HEALTH & SAFETY RESPONSIBILITY-

Effective: 1 March 2013

This document addresses the "If Not Me, Then Who?" concept in perceived or actual H&S situations (unsafe acts or behaviors, unsafe conditions, etc.) which do not involve our employees or partners and where we are not contractually or statutorily responsible for H&S[1].

For example, what does an Arcadis employee do, when Arcadis has no construction site responsibility but they see that a fence that was erected by a general contractor and is supposed to be protecting this site, has a gap that may allow an unauthorized person to enter the site where they could be injured?

The Arcadis H&S Vision and Policy, and our culture using TRACK to 0 concept put H&S first in all things. Yet we also have the need to protect ourselves from injury and the company from undue risk and liability:

1. Take a minute to think through the situation, related risks, and risks that would result from corrective action (TRACK).
2. Act immediately to safe lives if in your best judgment delay would cost lives or severe injuries (imminent danger).
3. If we see unsafe acts/behavior or conditions that are not imminent dangers: speak up and promptly notify the appropriate party. In a project: liaise with project manager about best person to address (consider H&S responsible person - contractor and client). In other situations, attempt to identify the person with H&S or overall responsibility for the activities.
4. Re-confirm the formal H&S responsibilities (law & contract) with H&S and legal department before doing anything else, or, if action could not be postponed for risk of losing lives/severe injuries, immediately after the action.
5. When having pointed out, or about to point out, areas of concern outside of our scope of responsibilities, accompany with a specific disclaimer[2].
6. Refrain from taking H&S responsibility through further action (actual corrections, audits, reviews or other)[3].

It is noted that the above example actually occurred involving an Arcadis employee. Instead of notifying the appropriate parties of the situation, our employee attempted to fix the contractor fence and got seriously injured in doing so. This resulted in lost time to our employee and a recordable injury against the company.

EXECUTIVE SUMMARY

This standard describes the requirements for implementing an incident- and injury-free workplace by providing guidance on tailgate safety meetings to be performed prior to all projects performed by Arcadis staff outside of an office-setting or environment.

This standard applies to all non-office related activities performed by Arcadis or on behalf of Arcadis. If the site and project is controlled by Arcadis, tailgate meetings will include the participation of all Arcadis staff, Arcadis subcontractors and other involved site personnel as appropriate.

The designated field supervisor will lead or designate an alternative leader to lead the tailgate meeting.

Project and Task Managers are responsible for ensuring that all appropriate hazard assessments have been completed, that all project requirements have been communicated to the field supervisor and other responsible parties.

Employees are responsible for actively participating in the tailgate meetings, acknowledging their presence at the tailgate meetings, and participating in hazard assessments for the activities in which they will be involved.

Tailgate meetings will be held, at a minimum, at the start of each work day, shift or task change.

The *Tailgate H&S Meeting Form* (Exhibit 1 or one of the Single Page versions located in the Standard Health & Safety Plan Template on the Health & Safety Plan page of the Source NA) will be used to document the conduct of the tailgate H&S meeting.

Tailgate Meeting forms are to be kept on-site and then in project files per Arcadis project recordkeeping requirements.

1. POLICY

It is Arcadis US policy that Arcadis staff will participate in tailgate meetings to be held at least once daily on Arcadis project sites that occur outside of an office environment to ensure that the health and safety issues of the day's activities are understood by all affected parties and that appropriate controls are in place.

2. PURPOSE AND SCOPE

2.1 Purpose

This standard describes the requirements for implementing an incident- and injury-free workplace by providing guidance on tailgate safety meetings to be performed prior to all projects performed by Arcadis staff outside of an office-setting or environment.

2.2 Scope

This standard applies to all non-office related activities performed by Arcadis or on behalf of Arcadis. If the site and project is controlled by Arcadis, tailgate meetings will include the participation of all Arcadis staff, Arcadis subcontractors and other involved site personnel as appropriate. If the site is controlled by another party (e.g., a construction site on which Arcadis is providing a resident engineer or owner's representative), then Arcadis staff should attend the tailgate meeting held by the controlling party, if one is held. If the tailgate meeting does not address Arcadis activities or is not deemed adequate, then the Arcadis staff will hold their own tailgate meeting following this standard.

If there is only one Arcadis staff on the site for the day, then the Project Manager (PM) and field staff will conduct the tailgate via phone as deemed appropriate.

It is also Arcadis U.S. policy that more than one tailgate meeting may be held as appropriate for the activities.

3. DEFINITIONS

Definitions applicable to this standard may be found in ARC HSMS000 – Health and Safety Management System.

4. RESPONSIBILITIES

4.1 Field Supervisor

In the scope of this practice, the designated field supervisor will lead or designate an alternative leader to lead the tailgate meeting. In addition, the field supervisor will verify that in the tailgate meeting, the following are clearly established, communicated and reinforced, and that the workforce understands them:

- A process for the transfer of control of work between work groups as appropriate and applicable
- Specific standards and policies that will be followed (e.g., Health and Safety Plan (HASP), Job Safety Analysis (JSA), H&S Standards, Field H&S Handbook, etc.)
- Assignment of other responsibilities based on the site activities and hazards to competent staff

4.2 Project and Task Managers

Project and Task Managers are responsible for ensuring that all appropriate hazard assessments have been completed, that all project requirements have been communicated to the field supervisor and other responsible parties, that competent personnel, based on the activities and hazards, have been assigned to the project, and

that all employees including Arcadis subcontractors and other site personnel know of their requirement and participation in tailgate meetings conducted for the project.

4.3 Health and Safety Staff and Project Site Safety Officers or Supervisors

Health and Safety Staff and Project Site Safety Officers or Supervisors shall assist with the completion of hazard identification and assessments as appropriate for the project. In addition, these staff will assist with determining the proper controls and provide information for the tailgate meetings that is relevant to the site activities and the hazards to be encountered by employees.

4.4 Employees

Employees are responsible for actively participating in the tailgate meetings, acknowledging their presence at the tailgate meetings, and participating in hazard assessments for the activities in which they will be involved. Employees are responsible for understanding the hazards of their activities, implementing the controls for the hazards and using Stop Work Authority if they don't understand the hazards, their job tasks, or if they do not feel safe.

5. PROCEDURE

5.1 Tailgate Meetings

Tailgate meetings will be held, at a minimum, at the start of each work day, shift or task change. It may be necessary to hold tailgate meetings at other times based on the site, activities, and personnel on the site. Tailgate meetings are usually conducted by the field supervisor, the site safety officer or both. At times, the Project Manager or Task Manager may lead the tailgate meeting.

Tailgate meetings may also be conducted by a subcontractor, other consultant or client.

Work crews that include a lone worker will hold a tailgate meeting by telephone with the Project or Task manager as appropriate. The lone worker or small workgroup will call in at the end of the day to complete the tailgate meeting form per this standard.

Tailgate meetings will review the planned work activities for the work period, discuss and resolve the risks and mitigations, discuss any health, safety, security and environment concerns and raise the consciousness of each worker before they start work. Utilizing the Tailgate Meeting form in Exhibit 1 or one of the Single Page versions located in the Standard Health & Safety Plan Template on the Health & Safety Plan page of the Source NA will ensure that relevant topics are addressed.

5.2 Tailgate Meeting Form

The *Tailgate H&S Meeting Form* (Exhibit 1 or one of the Single Page versions located in the Standard Health & Safety Plan Template on the Health & Safety Plan page of the Source NA) will be used to document the conduct of the tailgate H&S meeting. Copies of the completed form will be kept in the project files. It will be completed by the designated

leader of the meeting during the completion of the meeting and for post day activities review as indicated on the form.

5.3 Participation and Preparation

Effective tailgate meetings require participation. When selecting the location of the meetings, the meeting leader will ensure it is in a place free from distraction and that allows for interaction and participant comfort. This will help encourage participation.

6. TRAINING

No specific training or competence is required related to the conduct of the Tailgate Meeting.

7. REFERENCES (regulation citation, technical links, publications, etc.)

Arcadis Health and Safety Management System – ARC HSMS000

Arcadis Health and Safety Plan Standard – ARC HSFS010

8. RECORDS - DATA RECORDING AND MANAGEMENT

Tailgate Meeting forms to be kept on-site and then in project files per Arcadis project recordkeeping requirements.

9. APPROVALS AND HISTORY OF CHANGE

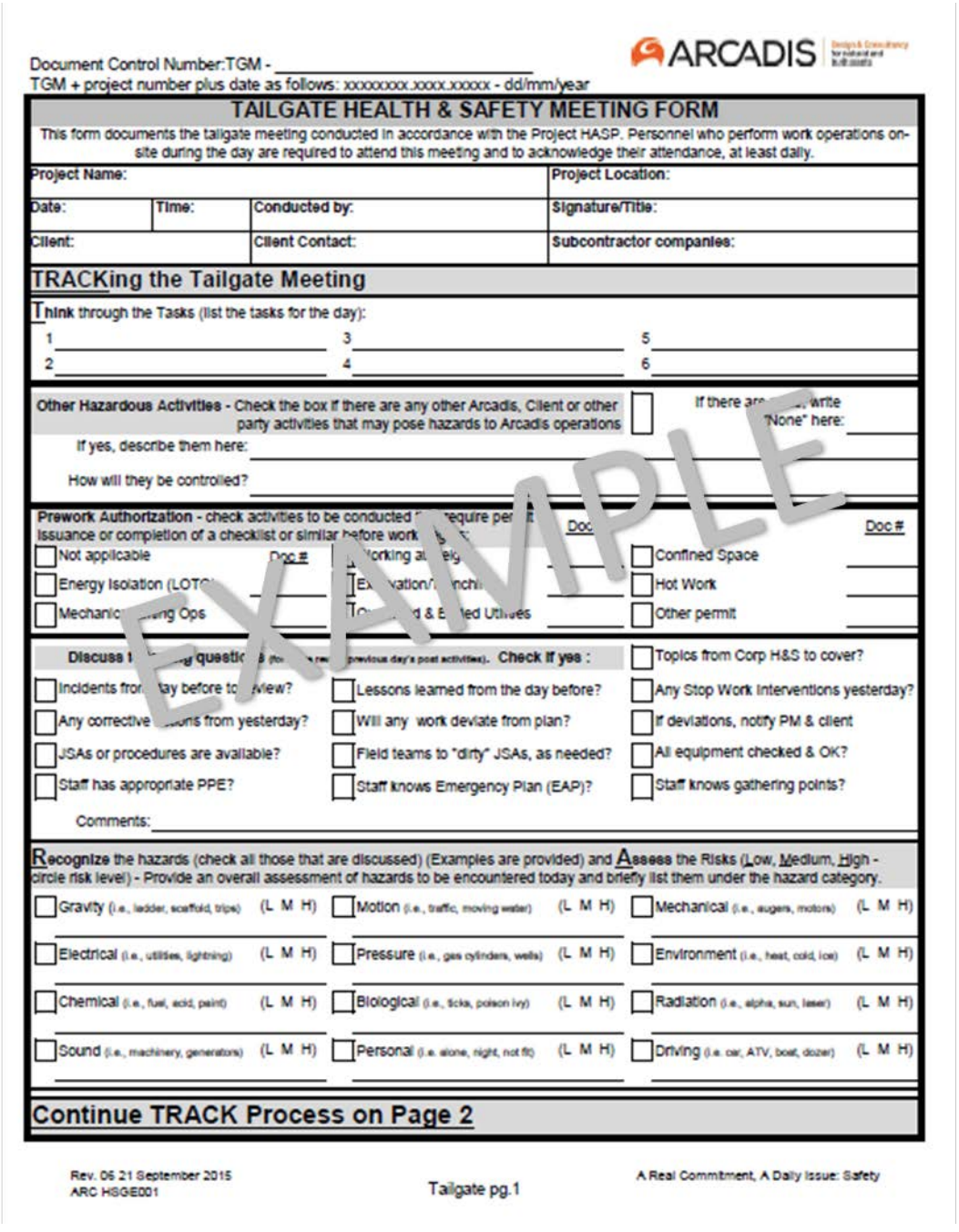
Approved By: Tony Tremblay, CSP – Corporate H&S, Director of Technical Programs

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
14 September 2009	01		Original document
1 February 2010	02		Made minor edits to text. Also, made modifications to Tailgate Meeting form. Changed JSA to JLA.
22 February 2010	03		Added tagline to the Tailgate meeting form

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
26 April 2013	04	Pat Vollertsen / Tony Tremblay	Added Executive Summary; changed JLA to JSA; updated Tailgate Meeting form to reflect new terminology; Added who else can lead a tailgate to section 5.1; Format Update
12 June 2015	05	Julie Santaniello	Updated contact phone numbers in Tailgate Meeting Form. Added text referencing additional acceptable single page Arcadis Tailgate Meeting Forms.
21 September 2015	06	Julie Santaniello	Updated HSS template and Tailgate Meeting Form brand. Added HSMS000 to references. Updated Exhibit 1 images.

Exhibit 1 – Tailgate Meeting Form



ARCADIS

Document Control Number:TGM - _____
TGM + project number plus date as follows: xxxxxxxx.xxxx.xxxxx - dd/mm/year

TAILGATE HEALTH & SAFETY MEETING FORM

This form documents the tailgate meeting conducted in accordance with the Project HASP. Personnel who perform work operations on-site during the day are required to attend this meeting and to acknowledge their attendance, at least daily.

Project Name:			Project Location:
Date:	Time:	Conducted by:	Signature/Title:
Client:		Client Contact:	Subcontractor companies:

TRACKing the Tailgate Meeting

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

1 _____ 3 _____ 5 _____
2 _____ 4 _____ 6 _____

Other Hazardous Activities - Check the box if there are any other Arcadis, Client or other party activities that may pose hazards to Arcadis operations ☐ If there are [illegible], write "None" here: _____

If yes, describe them here: _____

How will they be controlled? _____

Prework Authorization - check activities to be conducted [illegible] require permit issuance or completion of a checklist or similar before work [illegible]:

	Doc #		Doc #		Doc #
☐ Not applicable		☐ Working alone		☐ Confined Space	
☐ Energy Isolation (LOTO)		☐ Excavation/Trenching		☐ Hot Work	
☐ Mechanical Lifting Ops		☐ Overhead & Buried Utilities		☐ Other permit	

Discuss the following questions (for [illegible] previous day's post activities). **Check if yes :**

☐ Incidents from day before to review?	☐ Lessons learned from the day before?	☐ Any Stop Work Interventions yesterday?
☐ Any corrective actions from yesterday?	☐ Will any work deviate from plan?	☐ If deviations, notify PM & client
☐ JSAs or procedures are available?	☐ Field teams to "dirty" JSAs, as needed?	☐ All equipment checked & OK?
☐ Staff has appropriate PPE?	☐ Staff knows Emergency Plan (EAP)?	☐ Staff knows gathering points?

☐ Topics from Corp H&S to cover?

Comments: _____

Recognize the hazards (check all those that are discussed) (Examples are provided) and **A**ssess the Risks (Low, Medium, High - circle risk level) - Provide an overall assessment of hazards to be encountered today and briefly list them under the hazard category.

☐ Gravity (i.e., ladder, scaffold, trips) (L M H)	☐ Motion (i.e., traffic, moving water) (L M H)	☐ Mechanical (i.e., augers, motors) (L M H)	
☐ Electrical (i.e., utilities, lightning) (L M H)	☐ Pressure (i.e., gas cylinders, wells) (L M H)	☐ Environment (i.e., heat, cold, ice) (L M H)	
☐ Chemical (i.e., fuel, acid, paint) (L M H)	☐ Biological (i.e., ticks, poison ivy) (L M H)	☐ Radiation (i.e., alpha, sun, laser) (L M H)	
☐ Sound (i.e., machinery, generators) (L M H)	☐ Personal (i.e. alone, night, not fit) (L M H)	☐ Driving (i.e. car, ATV, boat, dozer) (L M H)	

Continue TRACK Process on Page 2

EXAMPLE

Rev. 06 21 September 2015
ARC HSGE001

Tailgate pg.1

A Real Commitment, A Daily Issue: Safety

TAILGATE HEALTH & SAFETY MEETING FORM - Pg. 2

Control the hazards (Check all and discuss those methods to control the hazards that will be implemented for the day): Review the HASP, applicable JSAs, and other control processes. Discuss and document any additional control processes.

- [x] **STOP WORK AUTHORITY** (Must be addressed in every Tailgate meeting - *(See statements below)*

☐ Elimination	☐ Substitution	☐ Isolation
☐ Engineering controls	☐ Administrative controls	☐ Monitoring
☐ General PPE Usage	☐ Hearing Conservation	☐ Respiratory Protection
☐ Personal Hygiene	☐ Exposure Guidelines	☐ Decon Procedures
☐ Emergency Action Plan (EAP)	☐ Fall Protection	☐ Work Zones/Site Control
☐ JSA to be developed/used ***(specify)***	☐ TIP conducted ***(specify job/JSA)***	☐ Traffic Control
		☐ Other ***(specify)***

Signature and Certification Section - Site Staff and Visitors

Name/Company/Signature	Initial & Sign in Time	Initial & Sign out Time	I have read and understand the HASP

Important Information and Procedure

All site staff should arrive fit for work. If not, they should report to the [illegible] any restrictions or concerns.

In the event of an injury, employees will call WorkCare at 1.800.455.6155 and then notify the field supervisor who will then notify the Project or Task Manager.

In the event of a motor vehicle accident, employees will notify the field supervisor who will then notify the Project or Task Manager.

In the event of a utility strike or other damage to property of a client or 3rd party, employees will immediately notify the field supervisor, who will then immediately notify the Project or Task Manager.

Visitor Name/Co - not involved in work

In	Out
In	Out
In	Out
In	Out

I will STOP the job any time anyone is concerned or uncertain about health & safety or if anyone identifies a hazard or additional mitigation not recorded in the site, project, job or task hazard assessment.

I will be alert to any changes in personnel, conditions at the work site or hazards not covered by the original hazard assessments.

If it is necessary to STOP THE JOB, I will perform TRACK, and then amend the hazard assessments or the HASP as needed.

I will not assist a subcontractor or other party with their work unless it is absolutely necessary and then only after I have done TRACK and I have thoroughly controlled the hazard.

Post Daily Activities Review - Review at end of day or before next day's work (Check those applicable and explain:)

- ☐ Lessons learned and best practices learned today: _____
- ☐ Incidents that occurred today: _____
- ☐ Any Stop Work Interventions today? _____
- ☐ Corrective/Preventive Actions needed for future work: _____
- ☐ Any other H&S Issues: _____

Keep H&S 1st in all things | **WorkCare - 1.800.455.6155**

Implementation Date	Arcadis HS Standard Name	ARCADIS Design & Consultancy for natural and built assets
13 December 2006	Utility Location and Clearance	
Revision Date	**Arcadis HS Standard No.**	**Revision Number**
17 March 2017	ARCHSFS019	16

EXECUTIVE SUMMARY

Damaging an underground or aboveground utility can result in serious injury and loss of life, disrupt essential services, and create significant liability to Arcadis, clients, and subcontractors. Therefore, it is Arcadis policy that the following steps be completed prior to beginning any subsurface intrusive work (i.e., any work or activity that breaks the plane of the ground surface):

- The presence of existing or known utilities will be investigated and cleared (to the extent feasible) by locating and marking before the start of any subsurface intrusive work and where appropriate, visually verifying through soft dig methods (referred to as potholing or daylighting) before the start of any subsurface intrusive activity.

- A minimum of **three (3) reliable lines** of evidence are required for an acceptable utility clearance. Each location of subsurface intrusive work must have at least 3 reliable lines of evidence. All lines of evidence used during the utility clearance procedure will be recorded on the Utility and Structures Checklist or equivalent client-provided checklist or permit. If a line of evidence is lost or not apparent, STOP WORK, and re-establish the line of evidence prior to resuming subsurface intrusive work.

- The lines of evidence used will be reasonable and appropriate for the conditions expected to be encountered (soil type, water table, etc.) and the type of utilities expected to be encountered (e.g., gas line versus an irrigation line).

- Contact the State One Call or equivalent service (Nationwide "811") as required by law. The State One Call or equivalent service (Nationwide "811") can only be used as a reliable line of evidence when working within the public right-of-way or easement.

- For point clearance (single intrusive point, used as 1 of the 3 required reliable lines of evidence), the borehole must be cleared to 110% of the diameter of the intrusive device (e.g., auger, drill head, etc.) or an additional 2 inches of overall diameter, whichever is greater.

- Utility clearance information will be documented on the Arcadis Utility and Structures Checklist (USC) or equivalent client-provided checklist or permit. The Utility Structures and Checklist is valid for 15 business days from the date of completion. A copy of the completed Utility and Structures Checklist will remain on-site during all subsurface intrusive work.

- Employees overseeing utility clearance activities will:

    - Be familiar with the contents of this standard and ARC HSFS-019 Supplement 2;
    - Have one year of field experience in the visual identification of utilities; and
    - If operating equipment, have training and six months of experience in the proper operation and results interpretation of any clearance equipment, including without limitation, magnetometers and ground penetrating radar.

- A utility strike is an unplanned contact of a utility during the course of work that results in damage requiring repairs, making a report to the utility owner, or requiring further assessment to evaluate the potential for damage. All utility strikes must be reported within 24 hours using the Utility Line Strike Investigation Form. **Do not enter the incident into 4-Sight until approved to do so by Corporate Legal. Refer to** ARC HSFS-019 Supplement 5**, Utility Strike Emergency Action Plan Guidelines.**

Report Utility Incident Now

Implementation Date 13 December 2006	Arcadis HS Standard Name Utility Location and Clearance	ARCADIS Design & Consultancy for natural and built assets
Revision Date 17 March 2017	Arcadis HS Standard No. ARCHSFS019	Revision Number 16

1. POLICY

It is the practice of Arcadis and its affiliated companies to implement appropriate, reasonable, and practical standards within acceptable and customary industry practices to promote the health and safety of its employees and avoid and mitigate exposure of risk in the performance of their work. In furtherance of this policy, Arcadis promotes and encourages compliance by all employees with this policy and standards relating to work in the vicinity of subsurface, submerged, or aboveground utilities.

2. PURPOSE AND SCOPE

2.1 Purpose

This standard directs general safety standards and best practices associated with the identification and management of subsurface, submerged, and aboveground utilities on project sites. Utility location standard operating procedures (SOP) for submerged utilities can found in ARC HSFS-019 Supplement 6.

2.2 Scope

This standard assigns responsibilities and expectations for proper utility clearance by both Arcadis employees and Arcadis subcontractors at project sites.

3. DEFINITIONS

Definitions relating to Utility Clearance can be found in Exhibit 1.

4. RESPONSIBILITIES

4.1 Project Manager Responsibilities

For every project site having the potential to come into contact with utilities, Project Managers must ensure that:

- The requirements of this standard are followed.
- Local regulations governing utility clearance are followed. This includes ensuring local and**/**or state laws defining activities or depth of intrusive work/excavation requiring utility clearance are reviewed as they vary by location. For further information, refer to One Call and State Law Directory.
- Efforts are made to work with the client, project site representatives, public utility companies, and subcontractors to identify the nature of any utilities and to determine control processes that need to be implemented by Arcadis and the subcontractors to prevent damage to these utilities and to properly manage the effects in the event there is utility damage.
- Utility clearance activities are only delegated to a Task Manager or other individual meeting the requirements of Section 4.2 below, as appropriate. However, even if the Project Manager delegates certain responsibilities, the Project Manager maintains primary responsibility for a complete utility clearance.

For additional information on Project Manager responsibilities and best practices, refer to ARC HSFS-019 Supplement 1.

- Project Managers or designee must review the Utility and Structures Checklist with staff and Arcadis subcontractors conducting subsurface intrusive work (including "Sub-of-Subs" when conducting subsurface intrusive work) prior to staff beginning subsurface intrusive work. The Project Manager or designee review must be documented on the Utility and Structures Checklist prior to starting subsurface intrusive work.

4.2 Field Personnel Responsibilities

Arcadis field personnel conducting work on a project site having the potential to come into contact with utilities have the responsibility to:

- Read, understand, and follow this standard and ARC HSFS-019 Supplement 2 and complete the appropriate checklists during the on-site utility and structures locate and clearance process.

- Complete a minimum of one year of utility clearance-related experience before accepting responsibility for any utility clearance tasks. This requires on-site training led by another Arcadis employee with detailed knowledge and experience in identifying utilities and structures.

- Complete training and have 6 months of experience in operating and interpreting the results of remote sensing technologies, including without limitation, magnetometers and ground penetrating radar, before operating such technologies. Field staff should understand the technologies being utilized by a private utility locate contractor and how they are operating in comparison with the site conditions. Refer to ARC HSFS-019 Supplement 3 for more information.

- Prior to beginning subsurface intrusive work, the Utility and Structures Checklist must be completed and signed by the staff member completing or overseeing the clearance. Confirm that the Utility and Structures Checklist was reviewed by the Project Manager or designee as discussed in Section 4.1 above. Review the Utility and Structures Checklist daily prior to starting subsurface intrusive activities to ensure all utilities are identified and markings are present. A copy of the completed Utility and Structures Checklist will remain on-site during all subsurface intrusive work (i.e., any work or activity that breaks the plan of the ground surface).

- Use their STOP WORK Authority to eliminate any reasonable concern if utilities cannot be reasonably located and contact the Project Manager to review the STOP WORK situation and confirm the direction of action before moving forward.

- Ensure that Arcadis subcontractors conduct their own reasonable independent utility clearance efforts as required by Arcadis' standard subcontract and are aware of any Arcadis clearance standards used on-site.

- Be on-site and provide oversight during utility locate activities and any active subsurface intrusive work or activities involving contractor under contract to Arcadis.

- If a utility is damaged and repaired during the course of the field event, field staff must provide oversight and document that the repair appears competent and complete to prevent further damage to the site when the damaged utility is re-activated.

4.3 Arcadis Subcontractor Responsibilities

According to Arcadis' standard subcontract, subcontractors have agreed to take responsibility for any damages resulting from a utility impact caused by their work. Therefore, Arcadis subcontractors are expected to take reasonable time and diligence to conduct their own independent utility clearance using reasonable standards and processes. Subcontractors have the responsibility to stop their work if utility concerns are identified and will report those concerns to the Arcadis employee overseeing their work activities. Arcadis staff should reinforce these responsibilities with subcontractors during job safety briefings.

In jurisdictions where the actual contractor performing the subsurface intrusive work is required to perform utility clearance notifications, the contractor will perform the clearance notification and will provide evidence of the notification to Arcadis (ticket or ticket number, etc.). Refer to ARC HSFS-019 Supplement 4 for Best Practices for State One Call procedures.

- If overhead utilities are present in areas where heavy equipment will be operated, ensure adequate clearance is provided. For heavy equipment that is extendable or telescoping (e.g., excavators, dump trucks, extendable lift trucks), evaluate whether the use of a spotter is necessary prior to operating heavy equipment when in proximity to the overhead utility.

- If a utility is damaged and repaired during the course of the field event, the field subcontractor must verify that the repair is competent and complete to prevent further damage to the site when the damaged utility is re-activated.

5. PROCEDURE

5.1 General

Protocols to be followed during utility and structures location and clearance activities are outlined in:

- Best Practices for Project Managers (or Their Delegates) Concerning Utility Clearance (ARC HSFS-019 Supplement 1).

- Best Practices for Field Personnel Concerning Utility Clearance (ARC HSFS-019 Supplement 2).

- Use and Limitations of Common Underground Locating Technologies and Clearance Methods (ARC HSFS-019 Supplement 3).

- Best Practices for State One Call Procedures (ARC HSFS-019 Supplement 4).
- Emergency Action Plan guidelines for Utility Strikes (HSFS-019 Supplement 5).
- Utility Location Standard Operating Procedure for Aquatic Work Activities (ARC HSFS-019 Supplement 6).

5.2 Lines of Evidence

When locating underground utilities, three (3) reliable "lines of evidence" must be established to help determine where a subsurface utility may be located. A line of evidence may be a site drawing that shows where a utility is located, it could be anecdotal information obtained from owners or employees, it could be established using any number of non-intrusive geophysical methods [e.g., ground penetrating radar (GPR), electromagnetic survey (EM), radio-frequency methods (RF), etc.], or it could involve probing for or exposing the utility by soft dig technologies (i.e., daylighting or potholing). Some lines of evidence will identify utility locations with a high degree of certainty (e.g., direct connect radio-frequency technique, daylighting or potholing, sonde tracing, etc.). Other lines of evidence will identify utilities will less certainty (e.g., anecdotal reports, design drawings, etc.).

Effective utility locate practices must use multiple lines of evidence until there is a high degree of certainty that the underground services have been adequately located. Three (3) reliable lines of evidence are required for an appropriate utility clearance as defined in this standard. All reliable lines of evidence used during the utility clearance procedure will be recorded on the Utility and Structures Checklist or equivalent client-provided checklist or permit. If three (3) reliable lines of evidence have not established certainty in the location of a utility, STOP WORK and do not proceed. Additional reliable lines of evidence must be utilized until the presence or absence of the underground utility can be established. During work activities, if a line of evidence is lost or not apparent (e.g., paint markings have faded), STOP WORK, and re-establish the line of evidence prior to resuming subsurface intrusive work.

Generally, the following lines of evidence may be used to meet this minimum utility clearance requirement:

1. Contacting the State One Call or equivalent service (Nationwide "811") is REQUIRED BY LAW regardless if it will be used as a line of evidence. Contacting the State One Call or equivalent service (Nationwide "811") is an acceptable reliable line of evidence when working within the public right of way or easement. Note that the State One Call can provide valuable information regarding locations and types of utilities entering the private property.

   Note: For work on private property or in areas not served by State One Call or equivalent service, consider using a reputable private utility locating company to locate and mark the utilities. **Use of a reputable private utility locator is encouraged for all projects with subsurface or submerged utilities.** When working with a private locater, it is best practice to pre-plan clearance areas, review required clearance equipment and the re-clearing/confirmation of any public utility mark outs (State One Call or equivalent service Nationwide "811").

2. Use detailed, scaled site utility plans, preferably in the form of an “as-built” or “record” drawing, to identify and/or confirm utility locations. Document request and/or receipt of utility drawings from the property owner/client on the Utilities and Structures Checklist.

3. Interview(s) with knowledgeable site or client personnel. The following questions should be asked during the interview and answers documented on the Utility and Structures Checklist:

   - Employees(s) Name and Affiliation(s) with the site;
   - Types of utilities, including utility composition and location of utilities on-site;
   - Depths of known utilities; and
   - Any other pertinent information regarding utilities on the site.

View the Utilities and Structures Checklist

4. Conduct a detailed visual site inspection of areas around all planned subsurface intrusive work points or areas to identify and/or confirm utility locations. For underground utilities, conduct an inspection for structures that tend to indicate the presence and general location of such utilities, including, but not limited to manholes, vaults, valve covers, valve markers, telephone pedestals, transformer housings, fire hydrants, spigots, sprinkler heads, air relief valves, backflow preventers, meters, downspouts going into the subsurface, power poles with wiring going into the subsurface and line markers. Saw cut lines and concrete/asphalt repairs often yield valuable information regarding utility locations.

   Always discuss the presence of utilities with the site owner, operator, and/or occupant to identify any potential utilities that might not be readily identified by non-intrusive clearing methods or may be:

   - At depths > 5 feet below ground surface; or
   - At very shallow depths (< 2 feet below ground surface), such as communication lines, electrical conduits/wiring, irrigation lines, etc.

If one of the above lines of evidence cannot be utilized or if using the above lines of evidence does not adequately identify utilities with reasonable certainty, one or more additional lines of evidence must be utilized. Commonly used lines of evidence are listed on the Utility and Structures Checklist.

A discussion of use and limitations associated with common utility location and clearance methods is provided in ARC HSFS-019 Supplement 3.

Standard operating procedures for utility location in submerged settings are presented in ARC HSFS-019 Supplement 6.

The lines of evidence will be recorded on the Utility and Structures Checklist or equivalent client-provided checklist or permit.

Note: If a line of evidence is lost, utility markings are removed/worn, or area of previous clearance is not confirmed, STOP WORK and re-establish the

line(s) of evidence prior to resuming subsurface intrusive work. Each location of subsurface intrusive work must have 3 reliable lines of evidence. All lines of evidence used during the utility clearance procedure will be recorded on the Utility and Structures Checklist of equivalent client-provided checklist or permit. If a line of evidence is lost or not apparent, STOP WORK, and re-establish the line of evidence prior to resuming subsurface intrusive work. The Utility Structures and Checklist is valid for 15 business days from the date of completion.

If and when any line of evidence reveals that planned subsurface work will be located inside the 30-inch Tolerance Zone of known/marked/located/observed utilities, the project team must Stop Work and contact Corporate H&S as early as possible for pre-approval.

5.3 Color Codes used for Utility Markings

The following colors are used for marking utilities. Some government agencies or large industrial facilities may use additional colors not provided below. Arcadis policy is to assume any paint marking or pin flag color not provided below is a subsurface utility marking until proven otherwise.

If utilities or subsurface anomalies are identified but the utility type or anomalies are not classified, it is recommend that a pink (Temporary Survey Marking) marking be used. Once the type of utility is established, the pink marks should be repainted/remarked to represent the correct type of utility.

COLOR	Utility Line
WHITE	Proposed Excavation
PINK	Temporary Survey Markings
RED	Electrical Power Lines, Cables, Conduit and Lighting Cables
YELLOW	Gas, Oil, Steam, Petroleum or Gaseous Materials
ORANGE	Communication, Alarm or Signal Lines, Cables or Conduit
BLUE	Potable Water
PURPLE	Reclaimed Water, Irrigation and Slurry Lines
GREEN	Sewer and Drain Lines

APWA and ANSI standard Z-53.1

5.4 Locating Technologies

There are several types of locating technologies that can be used to identify and locate utilities in the subsurface. Project teams need to work closely with private utility locators (PUL) in order to best match locating technology with site conditions. To provide the best results, all possible locating technologies should be available for use and implementation at the project location. Any potential interferences should also be discussed up front and then at the project site during utility location activities. Potential interferences could be soil moisture, soil type, standing water on concrete/asphalt, rebar, fencing, and metal

structures that are in the subsurface. Employees overseeing locating technology activities should have an understanding of device operation and limitations. For further information, refer to ARC HSFS-019 Supplement 3, Use and Limitations of Common Utility Location Technologies and Clearance Methods.

5.5 Clearance Methods

In some cases, proposed subsurface intrusive locations may be pre-cleared using other intrusive methods. Determine the clearance or soft dig method based on-site conditions and utilize the least invasive method possible. The number of subsurface intrusive locations and soil type should be taken into consideration. The following clearance methods are listed from least invasive to most:

1. Vacuum Extraction/Potholing (air or water-based),
2. Air knifing,
3. Hydroknifing,
4. Probing,
5. Hand augering,
6. Hand digging, and
7. Posthole digging.

Single-Point clearance must be 110% of the proposed subsurface intrusive area or the diameter plus 2 inches, whichever is greater. Three-Point clearance must be installed in a triangular pattern around the proposed borehole and in a configuration not to allow for utilities to enter the borehole. Three-Point clearance must be 110% of the proposed intrusive area or the diameter of the intrusive area plus 2 inches, whichever is greater. Each method of clearance should be documented on the Utility and Structure Checklist.

Manual clearing methods, such as shoveling, using pick axes, digging bars and other hand tools, should be avoided completely or only used when absolutely necessary and used with caution. Excessive downward force, prying or use in poor/obstructed visibility conditions is prohibited as these tools can damage utilities.

Surface cover (e.g., asphalt) removal methods within the 30-inch Tolerance Zone that pose excessive downward force, such as jackhammering, should be used with extreme caution. Methods that only cut the surface cover (coring or saw cutting) present less risk due to the absence of the downward force, which could cause collateral damage to shallow subsurface utilities. Note that utilities are often present at the concrete or pavement/soil interface or encased within the concrete or pavement and are easily damaged during concrete coring or pavement removal. Always work slowly, methodically and frequently STOP WORK to evaluate conditions during these work activities.

For borings and excavations, if the utility is known to be at depths where hand clearing is not feasible or creates additional safety concerns, no work will be performed within the 30-inch Tolerance Zone vertically or horizontally of the utility unless manual clearing is performed under the oversight of an Excavation Competent Person as defined in ARC HSCS005 Arcadis Excavation and Trenching.

5.5.1 Temporary Backfilling of Pre-Cleared Boreholes

In some cases, it may be necessary to temporarily backfill a pre-cleared location until the remaining subsurface activities are performed. At these locations where subsurface intrusive work does not immediately follow pre-clearance, it is important to properly backfill and mark the pre-cleared location in order to relocate the pre-cleared location. In general, wooden stakes, survey markers, whiskers, paint marking or other surficial markings alone are inadequate because these markings can be easily removed, damaged or otherwise lost leading to uncertainty regarding the pre-cleared location. Although the specific steps for backfilling a pre-cleared location will depend on site-specific conditions, use the following additional steps to prevent loss of the pre-cleared location:

- Backfill a pre-cleared location with clean sand or other granular material that is significantly different than the surrounding subsurface native material. Native soil should not be used to backfill a pre-cleared location that may require further subsurface work.
- Backfill the top 2 feet of a pre-cleared location with dyed sand or gravel to facilitate re-location.
- Use hammered wooden stakes or delineators to mark locations as an additional measure, if practical.
- In the event that the pre-cleared borehole is located on asphalt or concrete and an asphalt cold patch is required, use white paint to mark the intrusive location with a circle over the asphalt cold patch.
- In some instances, such as projects potentially affected by unexploded ordinance (UXO), the pre-cleared borehole may require that a PVC of matching diameter pipe be inserted into the pre-cleared borehole, filled with clean sand and affixed with a matching cap. Contact the project manager to identify any client-specific requirements.
- Always use a physical subsurface marker such as described above to identify the pre-cleared borehole location. Never rely solely on field measurements or GPS coordinates.
- If a utility or anomaly/obstruction is encountered during the pre-clearing process, backfill the hole with the native soil and mark the location with a pink-painted X and/or NO.

In the event that a previously pre-cleared location cannot be located, the location must be re-cleared prior to performing subsurface intrusive work.

5.6 Clearance for Working in Vicinity of Subsurface Utilities

Prior to the start of subsurface intrusive activities (i.e., excavations, vertical drilling, installing grounding rod, and soil sampling), all utilities must be located and measures must be instituted to avoid subsurface utility hazards. See exemptions for subsurface intrusive work in Exhibit 1 (Definitions). Do not conduct subsurface work within 30 inches of a line marking in all directions. If the centerline of the utility is marked, the diameter of

the utility or utility bank (Exhibit 1) must be incorporated into the 30-inch Tolerance Zone, see Figure 1 located in Exhibit 2 for further instructions.

If and when any line of evidence reveals that planned subsurface work will be located inside the 30-inch Tolerance Zone of known/marked/located/observed utilities, the project team must Stop Work and contact Corporate H&S as early as possible for pre-approval.

If subsurface work must take place within the 30-inch Tolerance Zone of the line marking, the utility must be exposed (potholed) by soft dig/clearance methods prior to starting subsurface intrusive activities (see Section 5.5 for options); **no mechanized equipment is permitted for the exposing of the utility**.

Once the utility has been exposed, if mechanized equipment is planned for use within the 30-inch Tolerance Zone of the utility, such activity must receive pre-approval by Corporate H&S, as necessary, to mitigate or accept the risk associated with the planned work. Additional excavation safety procedures may have to be developed as part of the approval to proceed. It should be noted that any disturbance within the 30 inches or disruption of the bedding materials could affect the integrity of the utility.

For horizontal borings, to avoid striking a utility, damage from vibration, damage by pressure of the advancing boring, do not drill within 30 inches in all directions (3-Dimensional cylinder) of a line marking. Make sure to factor the diameter of the line or utility bank when computing 30-inch Tolerance Zone. When crossing a utility during horizontal drilling, it is recommend that the utility be exposed 30 inches in a 360°-direction. When exposing utilities for horizontal borings, the utility must be exposed (potholed) by soft dig/clearance methods. This recommendation applies even if the operating contractor has technology that places the location to within a few inches. Make sure to factor the diameter of the utility when determining the 30-inch Tolerance Zone. If subsurface work must take place within the 30-inch Tolerance Zone of the line marking, the utility must be exposed (potholed) by soft dig/clearance methods prior to starting subsurface intrusive work (see Section 5.5 for options); **no mechanized equipment is permitted for the exposing of the utility**. Once the utility has been exposed, if mechanized equipment is planned for use within the 30-inch Tolerance Zone of the utility, such activity must receive pre-approval by Corporate H&S, as necessary, to mitigate or accept the risk associated with the planned work. Additional excavation safety procedures may have to be developed as part of the approval to proceed. It should be noted that any disturbance within the 30 inches or disruption of the bedding materials could affect the integrity of the utility.

Additional cautions for horizontal borings include gravity utilities, such as sewers and storm drains, as the depth of these utilities will change (sometimes significantly) as they run across the project site. Always obtain the utility depth at the location where the boring will actually cross the line by collecting sewer depth inverts from identified manholes and interpolating those depths to the area of the subsurface intrusive work.

During well installations and well abandonment via mechanical equipment, the 30-inch Tolerance Zone rule applies outward from the outside edge of the largest diameter auger or tool to be used for installation and abandonment (over drilling). In cases where wells have been previously installed and the 30-inch rule has not been followed, work proposed using mechanized equipment to work within the 30-inch Tolerance Zone will

require approval from Corporate H&S. For more information, see Exhibit 2 for further instructions.

5.6.1 Aboveground Activities causing Subsurface Disturbance in the Vicinity of Underground Utilities

Aboveground activities can cause damage to shallow underground utilities or structures. Plan the intended path/mobilization/operation of Heavy Equipment is cleared to ensure that shallow utilities are not damaged. If Heavy Equipment must cross over shallow utilities, the utilities will be protected. Other subsurface disturbances may lead to damage such as clearing trees/shrubs/vegetation as roots may be entangled with underground piping or structures. For more information, see Best Practices for Field Personnel Concerning Utility Clearance (ARC HSFS-019 Supplement 2).

5.7 Acceptable Clearance for Working in Vicinity of Overhead Power Lines and Other Overhead Lines and Structures

No work will be performed by Arcadis or our subcontractor near overhead power lines where any Unqualified Person or equipment is within the limits specified below unless the power line has been properly covered or de-energized by the owner or operator of the power line. Qualified Person approach distances are defined in Exhibit 5A and 5B of ARC HSFS0006 Electrical Safety Standard.

Power Line Voltage Phase to phase (kV)	Minimum Safe Clearance (feet)
50 or below	10
Above 50 to 200	15
Above 200 to 350	20
Above 350 to 500	25
Above 500 to 750	35
Above 750 to 1,000	45

ANSI standard B30.5-1994, 5-3.4.5

5.7.1 Reducing Vehicle and Mechanical Equipment Clearance Requirements

Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated so that a clearance of 10 feet (305 centimeters (cm)) is maintained. If the voltage is higher than 50 kilovolts (kV), the clearance shall be increased 4 inches (10 cm) for every 10 kV over that voltage. However, under any of the following conditions, the clearance may be reduced:

- If the vehicle is in transit with its structure lowered, the clearance may be reduced to 4 feet (122 cm). If the voltage is higher than 50 kV, the clearance shall be increased 4 inches (10 cm) for every 10 kV over that voltage.

- If insulating barriers are installed to prevent contact with the lines and if the barriers are rated for the voltage of the line being guarded and are not a part of or an attachment to the vehicle or its raised structure, the clearance may be reduced to a distance within the designed working dimensions of the insulating barrier.

- If the equipment is an aerial lift that is insulated for the voltage involved and if the work is performed by a qualified person, the clearance (between the uninsulated portion of the aerial lift and the power line) may be reduced to the distance given in OSHA 1910.333(c)(3)(ii)(C) Table S-5. Reference information from OSHA 1910.333 Table S-5 and NFPA 70E Table 130.4(C)(a) for alternating-current systems and 130.4(C)(b) for the distances associated with direct-current voltage systems is included as Exhibit 5 of ARC HSFS0006 Electrical Safety Standard.

Employees standing on the ground may not contact the vehicle or mechanical equipment or any of its attachments unless:

- The employee is using protective equipment rated for the voltage; or

- The equipment is located so that no uninsulated part of its structure (that portion of the structure that provides a conductive path to employees on the ground) can come closer to the line than permitted in this section of this standard.

If any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines is intentionally grounded, employees working on the ground near the point of grounding may not stand at the grounding location whenever there is a possibility of overhead line contact. Additional precautions, such as the use of barricades or insulation, shall be taken to protect employees from hazardous ground potentials, depending on earth resistivity and fault currents, which can develop within the first few feet or more outward from the grounding point.

When a machine is in contact with an overhead power line, do not allow anyone to come near or touch the machine. Stay away from the machine and summon outside assistance.

5.7.2 Acceptable Clearance for Working in Vicinity of Non-Electrical Overhead Utilities and Structures

Arcadis field personnel will identify non-electrical overhead utilities and structures and where possible, work is not be conducted within the 30-inch Tolerance Zone of these overhead utilities and structures. It is recommended that if work will be completed in the vicinity of non-electric overhead utilities, the overhead utilities should be labeled with warning signs, protective barricades, and/or flags. Non-electrical overhead utilities and structures may include, but is not limited to, pipe chases, water lines, ceilings in buildings, etc. Arcadis field personnel will notify its site workers

(employees, subcontractors, vendors, etc.) of known overhead utilities and structures during the tailgate safety meeting. See Exhibit 2 for additional details.

5.8 Reporting Utility Incidents

Arcadis field personnel involved with any subsurface, submerged, and aboveground utility strikes should immediately STOP WORK and contact the Project Manager to discuss the incident unless there are injuries, then call 911 or the available emergency services number for the area and then the Project Manager. The utility strike must be reported to Corporate Health and Safety and Legal Departments immediately and no later than 24 hours. Use the Utility Line Strike Investigation Form as part of the notification process.

Selected utility strike incidents may also utilize a conference call with operations management to review findings and lessons learned. The Business Line Health and Safety Director will make the determination concerning the need to have the incident review call and will arrange the call, if deemed necessary.

5.9 Relationship of this standard to the Project Specific HASP

With the exception of the Utility and Structures Checklist, this standard, including most supplements, are not designed to be printed off and attached to project HASPs. During project health and safety planning, this standard will be reviewed and applicable clearance technologies and methods will be documented on the Utility and Structures Checklist.

Additionally, emergency action standards specific to utility strikes should be addressed. ARC HSFS-019 Supplement 5 provides general guidelines for emergency response to utility strikes. Applicable information may be attached to the Utility and Structures Checklist to facilitate communication of response expectations.

5.10 Required Contract Terms and Conditions

Arcadis' standard client and subcontractor contracts contain required terms and conditions defining responsibility for utility clearance and the allocation of risk associated with an impacted utility. These terms and conditions have prescribed language concerning subsurface work that is presented in Arcadis client contracts and Arcadis' subcontractor contracts, which can be found on the Legal Source site. If such provisions cannot be agreed upon, the reasons are documented and other risk-management actions should be identified, such as limits of liability, add additional physical investigations, additional lines of evidence or utility location, assignment of risk to subcontractors, etc. In addition, any changes to these terms and conditions require approval by Legal Services.

6. TRAINING

Employees responsible for coordinating or conducting utility clearance activities will be familiar with the requirements of this standard. Arcadis in-house 8-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) refresher may provide awareness-level training regarding this utility location and clearance standard.

Implementation Date 13 December 2006	Arcadis HS Standard Name Utility Location and Clearance	ARCADIS Design & Consultancy for natural and built assets
Revision Date 17 March 2017	Arcadis HS Standard No. ARCHSFS019	Revision Number 16

7. REFERENCES (regulation citation, technical links, publications, etc.)

- Utility and Structures Checklist
- Utility Line Strike Investigation Form
- ARC HSFS-019 Supplement 1, Best Practices for Project Managers (or Their Delegates) Concerning Utility Clearance
- ARC HSFS-019 Supplement 2, Best Practices for Field Personnel Concerning Utility Clearance
- ARC HSFS-019 Supplement 3, Use and Limitations Associated with Location Technologies and Common Utility Clearance Methods
- ARC HSFS-019 Supplement 4, Best Practices for State One Call Procedures and Notifications
- ARC HSFS-019 Supplement 5, Emergency Action Plan guidelines for Utility Strikes
- ARC HSFS-019 Supplement 6, Utility Location SOP for Aquatic Work Activities
- Figure 1 – 30-Inch Tolerance Zone
- ARC HSCS005 Excavation and Trenching
- ARC HSFS0006 Electrical Safety Standard
- One Call and State Law Directory

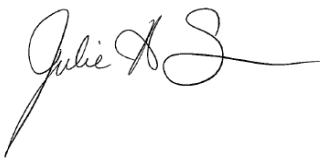
8. RECORDS - DATA RECORDING AND MANAGEMENT

8.1 Utility Clearance Records

All records (maps, checklists and documentation of communications) used to determine the location of utilities should be retained and kept in the project file.

9. APPROVALS AND HISTORY OF CHANGE

Approved By: Julie Santaniello, CSP – Corporate H&S, Manager of Technical Programs



Implementation Date 13 December 2006	Arcadis HS Standard Name Utility Location and Clearance	ARCADIS Design & Consultancy for natural and built assets
Revision Date 17 March 2017	Arcadis HS Standard No. ARCHSFS019	Revision Number 16

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
13 December 2006	01	Mike Thomas/Pat Vollertsen	Original document
26 March 2007	02	Mike Thomas/Pat Vollertsen	Put in new company format
15 May 2007	03	Mike Thomas/Pat Vollertsen	Added nation-wide 811 number
6 September 2007	04	Mike Thomas/Pat Vollertsen	Changing over to new template format
22 February 2008	05	Mija Coppola	Changing over to new template format
13 January 2009	06	Mija Coppola	Define lines of evidence
4 October 2010	07	Sam Moyers/Mija Coppola	Reformatting and addition of utility clearance information
13 February 2012	08	Sam Moyers/Mija Coppola	Modified link information for utility strike reporting, clarified local/state requirements in section 4.1 and 4.3
28 January 2013	09	Tony Tremblay	Utility and Structures Checklist revised; hyperlink updated
12 February 2013	10	Amanda Tine/Tony Tremblay	Clarified clearance boundaries for Unqualified staff in Section 5.7 and added information about vehicles and equipment being used near power lines in Section 5.7.1

Implementation Date 13 December 2006	Arcadis HS Standard Name Utility Location and Clearance	ARCADIS Design & Consultancy for natural and built assets
Revision Date 17 March 2017	Arcadis HS Standard No. ARCHSFS019	Revision Number 16

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
15 March 2013	11	Kurt Merkle, Rebecca Lindeman / Tony Tremblay	Added additional text to standard for recent lessons learned, added section 5.4 (Locating Technologies) and 5.5 (Clearance Methodologies), added additional details to section 5.6 when working in close proximity to subsurface utilities, and added Supplement 6 - Utility Location SOP for Aquatic Work Activities.
07 July 2013	12	Andrew McDonald/ Tony Tremblay	Removed HSFS-019 Supplement 1, Utility Definitions. Added hyperlink for One Call and State Law Directory. Segregated evidence of sewer or storm drains in USC list. Removed Sam Moyers and added Andrew McDonald as author.
26 September 2014	13	Andrew McDonald/Tony Tremblay	Added Exhibit 1. Definitions and 30 inch tolerance zone. Clarified use of 811 or state one call as a reliable line of evidence. Added best practice to cover backfilling of pre-cleared boreholes. Updated USC list to cover soft dig termination depths and PM review.
23 February 2015	14	Tony Tremblay	Page number correction

Implementation Date 13 December 2006	Arcadis HS Standard Name Utility Location and Clearance	ARCADIS Design & Consultancy for natural and built assets
Revision Date 17 March 2017	Arcadis HS Standard No. ARCHSFS019	Revision Number 16

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
10 May 2016	15	Denis Balcer/Sharon Lingle/Alec MacAdam/Andrew McDonald/Tony Tremblay/Julie Santaniello	ES and Section 4.2 - define subsurface intrusive work; clarify employees providing oversight of utility contractors, Arcadis requirements of operating and interpreting results of utility clearance equipment, and utility clearance before all subsurface intrusive work. Sections 1 and 5.8- changed submarine to submerged. Section 4.1 – added contacting public utility companies to help clear utilities. Section 4.2 – Clarified requirement to complete one year of utility clearance-related experience. Section 4.2 and 4.3 - Added discussion on aboveground activities causing subsurface disturbances. Added responsibility to clear overhead utilities when heavy equipment will be used and to evaluate use of a spotter. Added that repairs to damaged utilities need to be verified as competent and complete. Section 5.2 – Clarified reliable lines of evidence for each subsurface intrusive work point and degrees of certainty. Added all work within 30-inch Tolerance Zone needs Corp H&S preapproval. Section 5.6 and Exhibit 1- Clarify subsurface intrusive work and activity and exemptions for subsurface intrusive work. Section 5.6.1 – Add requirement to evaluate aboveground activities that may lead to subsurface disturbances that may cause damage to shallow underground utilities or structures.

Implementation Date 13 December 2006	Arcadis HS Standard Name Utility Location and Clearance	ARCADIS Design & Consultancy for natural and built assets
Revision Date 17 March 2017	Arcadis HS Standard No. ARCHSFS019	Revision Number 16

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
10 May 2016	15	Denis Balcer/Sharon Lingle/Alec MacAdam/Andrew McDonald/Tony Tremblay/Julie Santaniello	Section 5.7.2 – added non-electric overhead utilities and structures other than power lines need to be identified and marked if working in that area. Section 9 – Changed reviewer from Tony Tremblay to Julie Santaniello. Exhibit 1 – added definitions of Utility Strike, Daylighting, Potholing, Subsurface Intrusive Work, Subsurface Intrusive Activities, and Utility Bank. Standard and Supplements placed on new Arcadis headers. Updated Supplement revision numbers to be consistent with standard. Supplement 2 revised. Utility Clearance and Structures Checklist and Utility Strike Investigation Form revised.
17 March 2017	16	Alec MacAdam/Julie Santaniello	Hyperlink updates; minor formatting; Utility Clearance and Structures Checklist revised.

Implementation Date 13 December 2006	Arcadis HS Procedure Name Utility Location and Clearance	ARCADIS Design & Consultancy for natural and built assets
Revision Date 17 March 2017	Arcadis HS Procedure No. ARCHSFS019	Revision Number 16

EXHIBIT 1 – DEFINITIONS

Aboveground Utilities - For the purpose of this procedure, aboveground utilities include, but are not limited to: any aboveground line, pipe, conduit, system, or facility used for producing, storing, conveying, transmitting or distributing communication or telecommunications signals, electricity, gas, liquid, petroleum and petroleum products, coal slurry, hazardous liquids or gases, water under pressure, steam, sanitary sewage, storm water, or other materials, liquids, or gases.

Daylighting – exposing underground utilities or structures through soft dig technology/clearance prior to completing subsurface intrusive activities.

Excavation - Any man-made cut, cavity, trench, or depression, in an earth surface formed by earth removal into which a person can bodily enter.

Overhead Utilities and Structures – Overhead water lines, overhead pipe chases, ceilings in buildings.

Potholing – exposing underground utilities or structures through soft dig technology/clearance prior to completing subsurface intrusive activities.

Subsurface Intrusive Activities – For the purposes of this procedure, subsurface intrusive activities include, but are not limited to: excavations, vertical drilling, installing grounding rod, soil sampling, etc,

Subsurface Intrusive Work – Is any work or activity that breaks the plane of the ground surface. Exemptions include soil sampling using a non-conductive sampling tool to a depth of 6 inches below ground surface (bgs), placement of survey flagging to a depth of 6 inches bgs, and placement of non-conductive survey stake(s) to a depth of 6 inches bgs).

Subsurface Utilities - For the purposes of this procedure, subsurface utilities include, but are not limited to: any underground line, pipe, conduit, system, or facility used for producing, storing, conveying, transmitting or distributing communication or telecommunications signals, electricity, gas, liquid, petroleum and petroleum products, coal slurry, hazardous liquids or gases, water under pressure, steam, storm water, or sanitary sewage; underground storage tanks; tunnels and cisterns; and septic tanks and lines.

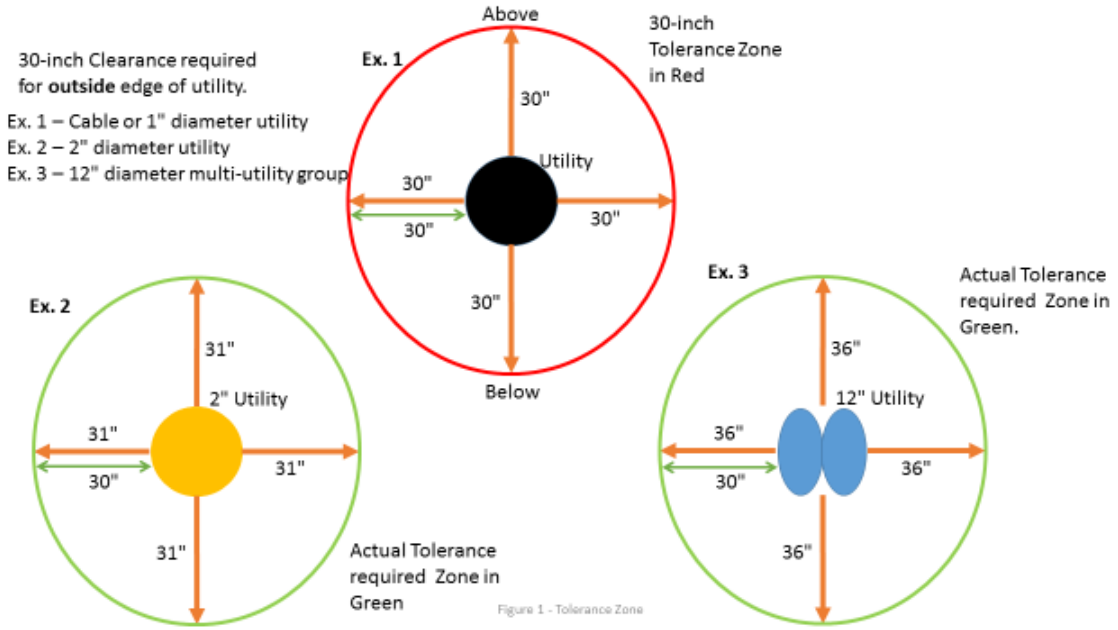
Tolerance Zone – The area within 30 inches in all directions from the outside diameter of a located/marked utility in which special care is to be taken. If the centerline of the utility is marked, the diameter of the utility or utility bank/trench must be incorporated into the 30 inches. This area must be hand cleared with non-mechanized equipment. Once the utility has been exposed, if mechanized equipment is planned for use within the 30-inch Tolerance Zone of the utility, such activity must receive pre-approval by Corporate H&S, to mitigate or accept the risk associated with the planned work. See Figure 1 – 30-inch Tolerance Zone.

Utility Bank – a structure containing two or more conduits. A conduit is a single enclosure containing one or more facilities.

Utility Strike – An unplanned contact of a utility (i.e., overhead and structures, aboveground, underground or submerged) during the course of work that results in damage requiring repairs, making a report to the utility owner or requiring further assessment to evaluate the potential for damage

Implementation Date 13 December 2006	Arcadis HS Procedure Name Utility Location and Clearance	ARCADIS Design & Consultancy for natural and built assets
Revision Date 17 March 2017	Arcadis HS Procedure No. ARCHSFS019	Revision Number 16

EXHIBIT 2 – FIGURE 1 – TOLERANCE ZONE



Implementation Date 15 October 2015	Arcadis HS Standard Name Water Operations Safety Standard	ARCADIS Design & Consultancy for natural and built assets
Revision Date 05 January 2018	Arcadis HS Standard No. ARC HSFS002	Revision Number 02

EXECUTIVE SUMMARY

This Health and Safety Standard (HSS) sets forth minimum requirements for Arcadis personnel to safely conduct work activities while near, over, on, or in a body of water. ARC HSF002 does not cover Operation of a boat / vessel or diving activities which will be covered in the Field Health and Safety Handbook or working on Ice Sheets. Arcadis recognizes the risk for drowning or serious injury during water based operations and the following tools and components of this HSS can be effectively used to eliminate or reduce these hazards.

This HSS provides practices and policies that Arcadis personnel shall follow to identify, assess, and control risks associated with work activities while near, over, on, or in a body of water.

Activities that involve working near (within 6ft), over, on, or in a body of water, may require that the Project Team complete a Water Risk Assessment Form (WRAF). The WRAF will be used to assess the risks, identify safety critical equipment requirements, training requirements, and identify methods for prompt, safe rescue and notification methods.

Where the risk of drowning exists, Arcadis employee(s) must wear a U.S. Coast Guard (USCG)-approved life jacket or life preserver, commonly referred to as a personal flotation device (PFD). A U.S. Coast Guard-approved inherently buoyant Type I PFD will be worn when ARCDIS employee(s) are working near, over, or on an open ocean, rough seas, or remote water, where rescue may be slow coming. A USCG-approved inherently buoyant Type II or Type III PFD will be worn by Arcadis employee(s) when working near, over, on or in calm, inland waters, or where there is a good chance for fast rescue. The use of Type V & non-inherently buoyant PFDs is not approved and must not be considered for use unless approved by Corporate Health and Safety. The use of PFDs classified for recreational use are prohibited for use on Arcadis controlled projects.

When the water temperature is below 60°F (Cold Water) additional PPE and rescue requirements must implemented and documented on the WRAF, Section 5.6.

When the risk of drowning exists, ring buoys (life rings) with at least 90 feet of line must be provided and must be staged within 200 feet of working personnel. When water conditions allow, a rescue skiff will be made immediately available to assist in rescue.

Prior to each day or shift when work is being performed on water in a boat / vessel a Float Plan must be prepared using the U.S. Coast Guard smartphone app for boating safety by the Arcadis staff and/or boat operator/captain, and must be submitted to the Arcadis PM, TM or their designee and the SSO.

The information contained in this HSS covers Federal requirements. Some State specific requirements may apply, such as Michigan's, requirement for a collar on the Type I PFD that is able to flip an employee face up should they be unconscious in the water. Employees must review and understand state and/or local, and client requirements that may be more stringent than this HSS. In those instances, Arcadis employee(s) must comply with the more stringent requirement(s).

Implementation Date 15 October 2015	Arcadis HS Standard Name Water Operations Safety Standard	ARCADIS Design & Consultancy for natural and built assets
Revision Date 05 January 2018	Arcadis HS Standard No. ARC HSFS002	Revision Number 02

1. POLICY

It is Arcadis' policy that Arcadis employees working near, over, on, or in a body of water where the risk of drowning exists, shall at a minimum follow this standard.

2. PURPOSE AND SCOPE

2.1 Purpose

This standard sets forth the accepted practice for evaluation of work near, over, on, or in a body of water where the risk of drowning exists and mitigation of associated risks.

2.2 Scope

This standard identifies the general safety requirements for working near, over, on, or in a body of water where the risk of drowning exists including the required use of Personal Flotation Devices (PFDs), completion of the Water Risk Assessment Form (WRAF), Float Plan, cold water and emergency rescue planning.

3. DEFINITIONS

See Definitions in Exhibit 1.

4. RESPONSIBILITIES

4.1 Corporate Health & Safety

Corporate Health &Safety (H&S) will review and update this standard on a routine basis. In addition, Corporate H&S are responsible to provide technical assistance regarding the WRAF, Float Plan, selection of appropriate PFD:

4.2 Project Managers and Task Mangers

Project Managers (PM) and Task Managers (TM) are responsible for knowing, understanding and following applicable Arcadis HSS requirements and for ensuring work on their projects is conducted in accordance with policies/procedures established in this HSS.

4.3 Site Safety Officer (SSO)

Site Safety Officer (SSO) is responsible for knowing, understanding and following applicable Arcadis HSS requirements and for ensuring work on their projects is conducted in accordance with policies/procedures established in this HSS. Additionally, the SSO is responsible for:

- Reviewing and signing of the WRAF;
- Training employees for onsite conditions which include risks, controls, work tasks, emergency procedures, and use of emergency equipment;
- Donning and doffing of PFDs and inspection of the PFDs will be covered during this training;

4.4 Arcadis Employees

Employees are required to follow the procedures and practices outline in this Health & Safety Standard (HSS). In addition, employees are required to use PPE provided to them as required by HASPs, JSA, and/or client requirements.

In addition, employees have the responsibility to:

- Complete training and/or have the experience in order to identify existing or predictable risks in surroundings and/or working conditions associated with near, over, on, or in a body of water;
- Understand safety requirements that must be implemented to protect themselves and others during work near, over, on or in water bodies; and
- Properly use emergency rescue equipment and PPE as specified by this HSS, HASP, and JSA.

4.5 Arcadis Subcontractors

Subcontractors working on behalf of Arcadis are responsible for establishing, implementing and managing their own water safety program, which includes identification and elimination or control of fall risks in compliance with Occupational Safety and Health Administration (OSHA) and USCG requirements.

5. PROCEDURE

5.1 General Safety Requirements

This standard establishes requirements to minimize the potential for accidental drowning associated with work near, over, on or in water bodies.

Several factors are relevant to determining whether a risk of drowning exists. These include the type (i.e., a pool, a river, and a canal), depth, presence or absence of a current, height above the water surface, and the use of fall protection.

Employees involved with work near, over, on, or in a body of water must:

- Complete a WRAF (Exhibit 2). The project Site Safety Officer (SSO) must review and sign off on the completed WRAF;
- Participate daily tailgate safety meetings to review the task specific risks and controls identified in the JSA;
- If working alone or at night near, over, on, or in a body of water without use of a boat / vessel, the employee will notify the Arcadis PM, TM or their designee and the SSO of the following prior to initiating work:
    - Start location
    - End location

- Estimated time work will start and estimated time of arrival at end location
- Emergency Action Plan discussion
- The discussion will be documented on the WRAF

- If working at night near, over, on, or in a body of water without use of a boat / vessel, Arcadis staff will use the buddy system at all times.
- If working in a boat / vessel, a Float Plan must be prepared (refer to Section 5.5.1) and
- If working in water within 3,000ft of a dam, dam overflow, water intake, or similar structure, Arcadis will notify the structure owner and discuss the appropriate safety requirements and work restrictions and document the requirements on the WRAF.

All employees, including office personnel that are involved with daily operations that involve water based work, must be familiar with emergency action procedures, daily operations and project safety requirements. When any project team member or subcontractor feels unsafe they have the authority to Stop Work at any time.

5.1.1 Personal Flotation Device

Arcadis employees working near, over, on, or in a body of water, where the risk of drowning exists, must wear a USCG-approved life jacket or life preserver, commonly referred to as a PFD. An inherently buoyant Type I PFD will be worn when employees are working in or near an open ocean, rough seas, or remote water where rescue may be slow coming. An inherently buoyant Type II or Type III PFD will be worn by employees when working around or on calm, inland waters, or where there is a good chance for fast rescue. The use of Type V and non-inherently buoyant PFDs is not approved unless approved by Corporate H&S. The use of PFDs classified for recreational use are prohibited for use on Arcadis projects.

Additional information on selection, use, wear, and care can be found in the USCG's PFD Selection, Use, and Wear & Care Guide.

Note: Some state specific requirements may apply, such as Michigan's requirement for a collar on the Type I PFD that is able to flip an employee face up should they be unconscious in the water. Be sure to review and understand local, state, federal, and client requirements that may be more stringent than this HSS. In those instances, Arcadis staff must comply with the more stringent requirement(s).

5.2 Water Risk Assessment Form

Activities that involve working near, over, on, or in a body of water, may require that the Project Team complete a WRAF, Exhibit 2.

The completion of a WRAF is required when working near (within 6ft) or above any body of water (ponds, lakes, streams, rivers, bays, oceans), including but not limited to the following areas or activities:

- Entering a body of water (e.g. ecological surveys);
- Working in a harbor, on boat docks, or bulkhead;
- Deployment of a boat / vessel for work activities;
- Working on a boat / vessel or barge;
- Working on a boat / vessel near a Dam;
- Working on a body of water performing Vibracoring / intrusive operations of sediments;
- Working near sludge impoundments, unprotected aeration ponds, retention / detention ponds; and/or
- Working on ice.

The completion of the WRAF may not be feasible when project teams are completing first time mobile surveys on foot. As such the project team is not required to complete the WRAF, but is required to complete a risk assessment and document controls in the HASP. The correct type of PFD, if required, must be documented in the HASP and JSA. Upon completion of initial mobile survey on foot an WRAF should be prepared for all future work.

The final WRAF must include relevant JSAs and be reviewed and signed by SSO prior to work beginning. The WRAF must be shared with all personnel performing the work, and must also be available for review in the appropriate work area.

A client required permit may be used as long as it meets or exceeds the Arcadis WRAF.

The WRAF must be reviewed and updated at a minimum every 3 months, or when site conditions or work activities change (e.g., air/water temperature conditions; night vs day work; seasonal conditions).

5.3 Working Near (Within 6ft) or Over a Body of Water

Where feasible, Arcadis will first attempt to eliminate or minimize the potential risk of drowning. The risk assessment and controls will be detailed in the WRAF.

Where the risk of drowning exists, employees shall be provided with USCG-approved PFD. Refer to Section 5.1.1 for additional information regarding PFD use and care. When continuous fall protection is used (without exception) to prevent employees from falling into the water, this has effectively removed the drowning risk, and PFDs are not needed.

If an employee cannot fall into the water as a result of use of fall protection and there is no risk of drowning, then a PFD is not required. The exception is that PFDs must be worn by employees when safety nets constitute the fall protection system. Employees who exit the

basket of an aerial lift to a location that is over or near water and the risk of drowning exists as a result of a fall, or who do not maintain 100% fall protection, must wear a PFD.

Employees walking or working on unguarded piers or docks (e.g., open edge to water where drowning risk exists) must wear USCG-approved PFD. Fall protection will be used if there is a possibility that persons could fall 6 or more feet to a lower level, deck, tethered boat / vessel, dock/pier or water. Where feasible, guardrail systems meeting OSHA requirements should be used to address the fall risk.

Example: Where an employee is working on a steep slope and could fall into water in which a drowning risk exists, then a PFD is required. A guard rail system that prevents employees from reaching the water and eliminates the risk of drowning would negate the need for a PFD. The same is true when working on a barge or floating platform with a railing system that meets OSHA requirements.

When the risk of drowning exists, ring buoys (life rings) with at least 90 feet of line must be provided and must be staged within 200 feet of working personnel. When water conditions allow, a rescue skiff will be made immediately available to assist in rescue.

5.4 Working In Water Bodies

Employees may perform work in a body of water under two scenarios; wading or snorkeling/diving. Each activity presents a unique set of risks. Wading requirements are addressed in this HSS. Refer to the Field H&S Handbook for requirements pertaining to snorkeling and diving activities. Additionally, prior to engaging in snorkeling or diving work these activities must undergo review and approval by the Arcadis Diving Control Board (DCB).

Wading activities require similar controls as working near or over water including the use of a PFD when the risk of drowning exists. Staff should also use the buddy system when wading. Additional rescue/self-extraction aids (ring buoy, probing rod, and tether to stable object on shore) should be used when necessary based on site conditions.

Some general wading guidance:

- Monitor weather conditions in the work area and upstream from the work area to avoid rapidly changing water levels;
- Use a wading stick or staff, when feasible and cross the current facing upstream;
- Where feasible and permitted by work activity and local regulations, use waders that have felt soles to keep your feet from slipping off of slippery rocks;
- If using waders, use a wader belt to help prevent water from getting down into your waders;
- Carry a whistle in case you need to call for help;
- Shuffle your feet and take one step at a time; and

- If water penetrates the waders, immediately initiate the emergency action plan and evacuate the water.

- A risk assessment must be completed to insure the use of non safety toe waders is acceptable. This will be documented in the HASP & JSA.

5.5 Working On Water Bodies

When working in a boat / vessel on water, including the open ocean, rough seas, remote waters, or any location where rescue may be slow coming, employees will be required to wear a USCG-approved inherently buoyant Type I PFD. A USCG-approved inherently buoyant Type II or Type III PFD will be worn by employees when working on calm, inland waters, or where there is a good chance for fast rescue. Refer to Section 5.1.1 for additional information regarding PFD use and care.

A Float Plan is required when working in a boat / vessel on water. Refer to Section 5.5.1 for additional information.

5.5.1 Float Plan

Prior to each day or shift when work is being performed on water in a boat / vessel a Float Plan must be prepared using the U.S. Coast Guard smartphone app for boating safety by the Arcadis staff and/or boat operator/captain, and must be submitted to the Arcadis PM, TM or their designee and the SSO. All optional information must be submitted. Additionally, an electronic copy will remain with the worker(s).

Changes to the float plan will be relayed to the Arcadis PM, TM or their designee and the SSO as soon as the boat / vessel operator/captain becomes aware of the changes. When cell phone service is not available, use of a marine radio is required. The project team will communicate their arrival back to port at the completion of operations or end of shift. If the project team fails to check in at the designated time, the onshore contact will use the contact numbers/method to communicate with the boat / vessel members. If the Arcadis PM, TM or their designee and the SSO fail to reach the boat / vessel, the PM, TM or their designee and/or the SSO will initiate the emergency action plan and contact the following based on operating area:

- 911 (First responders), plant emergency series, or other emergency services.

- United States Coast Guard District in which the work is taking place, if area is not covered by 911 or other emergency services.

- Corporate Health and Safety

It is recommended that motorized boats / vessels have a self-contained mounted global positioning system (GPS) system or some other sufficient way of tracking boats / vessels (i.e. all boats / vessels can be viewed from the shoreline or launch point with a dedicated person on shore).

5.6 Cold Water

Work that will be performed where cold water conditions exist (water temperature is below 60°F) will require additional planning and personal protective equipment.

PFD Type	Air Temperature	Water Temperature	Time of Rescue*
II or III	> 60°F	> 60°F	< 15 Minutes
I	> 60°F	≤ 60°F	< 5 Minutes
Anti-Exposure / Work Suit (CLO ≥0.40)	≤ 60°F	≤ 60°F	< 30 Minutes
Rescue / Immersion suit (CLO ≥0.96)	≤ 60°F	≤ 60°F	< 1 Hour

*Time of Rescue – Total time to secure victim in a dry location and treat for possible hypothermia

According to the USCG, each anti-exposure work suit and survival / immersion suit must:

- Be fitted with Type I retro reflective material;
- Have a lifejacket light securely attached to the front shoulder area of the immersion suit;
- Have a whistle firmly secured by a cord to the immersion suit; and
- Survival suits construction and performance requirements are outlined within 46 CFR Part 160.171 – Immersion Suits

5.7 Emergency Rescue Equipment & Planning and Implementation

When the risk of drowning exists, ring buoys (life rings) with at least 90 feet of line must be provided and must be staged within 200 feet of working personnel. When water conditions allow, a rescue skiff will be made immediately available to assist in rescue.

The emergency rescue skiff or boat will be equipped with 2 paddles or 2 oars; a ring buoy (with 90ft of line); additional PFD's; and a reach extension device (ball pointed boat hook). Where water current exists, the skiff or boat must be motorized or occupied at all times. It is recommended that the rescue skiffs engine be running to expedite rescue. A safety line may be connected between the boat and a structural member capable of maintaining the position of the boat. All occupants of boats must wear a PFD.

Employees working near, over, on, or in a body of water when the risk of drowning exists will be required to follow the PFD requirements at a minimum as set forth in Section 5.1.1. All PFDs and emergency rescue equipment must be inspected prior to use and be in good working condition. Any equipment that is found to be in poor condition will be deemed out of service. Employees must be trained in the proper use and care of PFDs and emergency equipment.

Emergency Rescue Teams will ensure that all safety, rescue, and emergency equipment is in place prior to commencement of work. Thorough onsite orientation and training on use of the equipment will be provided to employees involved in the work by the SSO. Where applicable, local Emergency Medical Service should be notified and given pertinent information regarding the water based activities. It should be documented on the WRAF if self-rescue is feasible or if outside rescue support is needed.

If the Arcadis PM, TM or their designee and the SSO fail to reach the boat / vessel, as required in the Communication Plan, the PM, TM or their designee and/or the SSO will initiate the emergency action plan and contact the following based on operating area:

- 911 (First responders) or plant emergency series
- United States Coast Guard District in which the work is taking place (If area is not covered by 911 or other emergency series)
- Corporate Health and Safety

6. TRAINING

6.1 Water Awareness Training

All employees that are involved with daily operations that involve water based work, are required to review this HSS and complete project specific training.

6.2 Project Specific Training

Each project SSO will be responsible for training employees for onsite conditions which include risks, controls, work tasks, emergency procedures, and use of emergency equipment. Donning and doffing and inspection of the PFDs and anti-exposure work suit will be covered during this training. The donning and doffing and inspection of survival / immersion suit will be provided by a qualified vendor.

7. REFERENCES (regulation citation, technical links, publications, etc.)

29 CFR 1926.106 – Working over or near water: https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=10669&p_table=STANDARDS

US Army Corps of Engineers EM 385-1-1 2014

CFR Subpart 160.001 – Life Preservers, General http://www.gpo.gov/fdsys/pkg/CFR-2003-title46-vol6/pdf/CFR-2003-title46-vol6-sec160-001-2.pdf

United State Coast Guard – PFD Selection, Use, Wear & Care https://www.uscg.mil/hq/cg5/cg5214/pfdselection.asp

Implementation Date 15 October 2015	Arcadis HS Standard Name Water Operations Safety Standard	ARCADIS Design & Consultancy for natural and built assets
Revision Date 05 January 2018	Arcadis HS Standard No. ARC HSFS002	Revision Number 02

8. RECORDS – DATA RECORDING AND MANAGEMENT

All records regarding will be maintained in the project files. Employee training will be documented on the daily Tailgate Form.

9. APPROVALS AND HISTORY OF CHANGE

Approved By: Julie Santaniello, CSP – Corporate H&S, Manager of Technical Programs

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
15 October 2015	01	Kurt Merkle/Andrew McDonald/Julie Santaniello/Tony Tremblay	Original document
05 January 2018	02	Andrew McDonald/Julie Santaniello	Provided clarification on Cold Water PFD requirements and working near water (within 6ft). Updated WRAF feasibility text in Section 5.2. Updated approver from Tony Tremblay to Julie Santaniello. Updated WARF Exhibit 2.

Implementation Date 15 October 2015	Arcadis HS Procedure Name Water Operations Safety Standard	ARCADIS Design & Consultancy for natural and built assets
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Exhibit 1 – Definitions

Aerial Lift - A piece of equipment, extendible and/or articulating, designed to position personnel and/or materials in elevated locations.

ANSI - American National Standards Institute.

Boat – See Vessel.

Buoyancy - The tendency of a body to float or sink in water or any other fluid. Most people will naturally float in water, especially if they fill their lungs with air. Most require only about 11 pounds (50 Newton's) of extra buoyancy to keep their head out of water. That is why a PFD with just 15.5 pounds (70 Newton's) of buoyancy can provide adequate flotation for an adult -- even a very large person. PFDs with 22 to 34 pounds (100 to 155 Newton's) can provide superior performance.

In technical terms, buoyancy is determined by Archimedes' Principle:
Anybody partially or completely submerged in a fluid is buoyed up by a force equal to the weight of the fluid displaced by the body.

That means someone immersed in water is "buoyed" upward by a force equal to the weight of the volume of water that their body takes up (displaces). Gravity pulls a person's body downward by a force equal to their weight. The difference between these forces is a person's net buoyancy. A PFD is very light weight, but displaces enough water to make the PFD and the person wearing it very buoyant.

It also follows that the people hardest to float are those with compact, dense bodies. These tend to be people with athletic body builds, with a lot of bone and muscle mass, and not much fat. Fat is not as dense as muscle and bone, so people who are overweight can actually be easier to float than someone who is much smaller and leaner. Heavy people do not need a higher buoyancy PFD because of their weight.

Cold Water Conditions – A body of water that is 60°F or colder which requires the use of a Work or Survival Suit.

Controlled Access Zones (CAZ's) - An area where a recognized risk exists requiring demarcation by a competent person through the use of signs, wires, tapes, ropes, chains, or other devices. All protective elements of the CAZ shall be implemented prior to beginning work.

Dry Suit – Traps air as an insulation layer between the body and the suit, insulating the user from the cold water. Most dry suits utilize seals at the wrist, neck, and ankles, unless incorporating gloves and boots. These seals are made from waterproof material, insulated or non-insulated.

Floating Work Platform - Platform or barge capable of safely supporting workers, equipment, and materials necessary to perform work.

Hypothermia - Hypothermia is a physical condition that occurs when the body's core temperature falls below a normal 98.6° F (37° C) to 95° F (35° C) or cooler.

Inflatable - A device which depends on flexible air chambers which can be filled with air or other gas (usually carbon dioxide) for flotation.

Inherently Buoyant - A device which relies on buoyant material for flotation. Buoyant materials used in Personal Flotation Devices include -
Kapok - A natural silky fiber produced from the seed of the kapok (ceiba) tree which floats because of air trapped in the fibers' hollow cells.
Plastic Foams - Materials consisting of closed plastic cells which trap air and provide flotation. Flexible plastic foams used for buoyancy include Polyvinyl Chloride (PVC), Polyethylene (PE), and Neoprene. Rigid foams used in ring lifebuoys are often polyurethane.

Lanyard – ANSI approved line designed for supporting one person, with one end fastened to a safety belt or full body harness, and the other end secured to a safety line or structural member. Lanyards shall not exceed 6' in length, and preferably include a "deceleration device" to attenuate fall impact.

Newton - The metric (SI) system measure of force. A one pound force equals about 4.4 Newton's.

OSHA - Occupational Safety & Health Administration.

Personal Flotation Device – Type I, II, III, V
TYPE I PFDS / OFF-SHORE LIFE JACKETS: Best for all waters, Open Ocean, rough seas, or remote water, where rescue may be slow coming. Abandon-ship lifejacket for commercial boat / vessels and all boat / vessels carrying passengers for hire:

- Inherently Buoyant Type I PFDs - SOLAS Service
- Inherently Buoyant Type I PFDs - U.S. Service
- Inflatable Type I PFDs - SOLAS and Domestic
- Hybrid Type I PFDs - US Services

TYPE II PFDS / NEAR-SHORE BUOYANT VESTS: For general boating activities. Good for calm, inland waters, or where there is a good chance for fast rescue:

- Inherently Buoyant Type II PFDs
- Inflatable Type II PFDs
- Hybrid Type II PFDs

TYPE III PFDS / FLOTATION AIDS: For general boating or the specialized activity that is marked on the device such as water skiing, hunting, fishing, canoeing, kayaking and others. Good for calm, inland waters, or where there is a good chance for fast rescue. Designed so that wearing it will complement your boating activities:

- Inherently Buoyant Type III PFDs
- Inflatable Type III PFDs
- Hybrid Type III PFDs

TYPE V PFDS / SPECIAL USE DEVICES: Only for special uses or conditions.
See label for limits of use:

- Hybrid Inflatable PFDs

- Canoe/Kayak Vest
- Boardsailing Vests
- Deck Suits
- Work Vests for Commercial boat / vessels
- Commercial Whitewater Vests
- Man-Overboard Rescue Devices
- Law Enforcement Flotation Devices

Positioning Device - Body belt or harness system limiting free fall to 2 feet or less.

Safety Body Belt/Full Body Harness – ANSI approved body device designed for fall protection, which by reason of its attachment to a lanyard and safety line or structure will limit a fall to 6' or less. A full body harness is the preferred device for fall protection in aerial lift devices. However, safety body belts may be used as “positioning devices” in aerial lift equipment, where employees stand with both feet on the floor of the bucket or platform; and are an acceptable alternative to harnesses only in this application. Because aerial lifts have passive fall protection systems (bucket or rail system), the intent of the belt is to keep the occupant(s) in the device upon impact, not to attenuate a fall from it.

Serviceable condition- A PFD is considered to be in serviceable condition only if the following conditions are met:

1. No PFD may exhibit deterioration that could diminish the performance of the PFD including:
   - Metal or plastic hardware used to secure the PFD on the wearer that is broken, deformed, or weakened by corrosion;
   - Webbings or straps used to secure the PFD on the wearer that are ripped, torn, or which have become separated from an attachment point on the PFD; or
   - Any other rotted or deteriorated structural component that fails when tugged.
2. In addition to meeting the requirements of paragraph 1 of this definition, no inherently buoyant PFD, including the inherently buoyant components of a hybrid inflatable PFD, may exhibit:
   - Rips, tears, or open seams in fabric or coatings that are large enough to allow the loss of buoyant material;
   - Buoyant material that has become hardened, non-resilient, permanently compressed, waterlogged, oil-soaked, or which shows evidence of fungus or mildew; or loss of buoyant material or buoyant material that is not securely held in position.
3. In addition to meeting the requirements of paragraph 1 of this definition, an inflatable PFD, including the inflatable components of a hybrid inflatable PFD, must be equipped with:
   - Except as provided in paragraph 4 of this section, a properly armed inflation mechanism, complete with a full inflation medium cartridge and all status indicators showing that the inflation mechanism is properly armed;
   - Inflatable chambers that are all capable of holding air;

- Oral inflation tubes that are not blocked, detached, or broken;
- A manual inflation lanyard or lever that is not inaccessible, broken, or missing; and
- Inflator status indicators that are not broken or otherwise non-functional.

4. The inflation system of an inflatable PFD need not be armed when the PFD is worn inflated and otherwise meets the requirements of paragraphs 1 and 3 of this definition.

Vessel – A boat, ship or any watercraft that is used to travel or carry employees on a water body and maybe powered.

Wet Suit – Allows some water in, but restrict water movement into and out of the suit. Your body heats up the water that becomes, more or less, trapped in the suit. If the openings of the suite become restricted, the warmed water stays inside the suit longer, reducing heat loss. If a wet suit is damaged or torn, the level of protection is reduced.

Exhibit 2: Water Risk Assessment Form

ARCADIS Design & Consultancy for natural and built assets

Water Risk Assessment Form

Project Name:	Project Location:
Project Number:	Date / Time:
Project Manager:	Evaluation Completed By:
Expiration Date: (At a minimum the WRAF must be reviewed and update every 3 months)	

1. Description of Water Operations

Scope of work:

Type or Water Body (Stream, Pond, River, Ocean, etc.):

Depth range of Water Body: _____ to _____ | Typical Working Hours: _____ to _____

Water Body Flow Rate or Current (List unit of measurement):

Water Body Temperature Range (List unit of measurement):

Geographic Limits of Work Area including Start/End Locations:

Surrounding Topography or Site Conditions:

2. Identification & Control of Water Hazards [1,2]

(Circle Answer that Applies)

1) Will work be conducted at a height of 6' or greater with unprotected edges? If YES, completion of the Elevated Work Permit is required. See Section 5.3 of Water Operations HSS	YES	NO
2) Will work be conducted when water temperature is at or below 60°F? If Yes, below select type of cold water work PPE to be used : (See Section 5.6 of Water Operations HSS)	YES	NO
	Type I PFD	
	Anti-Exposure / Work Suit	
	Rescue / Immersion Suit	
2) Does the Water Operations listed in Section 1. present a risk of drowning? If YES, select type of Inherently Buoyant PFD to be used: (See Section 5.1.1 of Water Operations HSS)	YES	NO
Worn when employees are working in or near an open ocean, rough seas, or remote water where rescue may be slow coming. See Section 2.	Type I	
Worn by employees when working around or on calm, inland waters, or where there is a good chance for fast rescue	Type II	
Worn by employees when working around or on calm, inland waters, or where there is a good chance for fast rescue	Type III	
4) Does the work require the use of a boat / vessel ? If YES, an electronic Float Plan must be completed and submitted prior to starting work. (See Section 5.5.1 of Water Operations HSS)	YES	NO
5) Will work on boat/vessel be conducted within 3,000ft of a Dam, Spillway, Similar Feature? If YES, completion of a communication plan is required. (See Section 5.7 of Water Operations HSS)	YES	NO

EXAMPLE

Implementation Date 15 October 2015	Arcadis HS Procedure Name Water Operations Safety Standard	ARCADIS Design & Consultancy for natural and built assets
Revision Date 05 January 2018	Arcadis HS Procedure No. ARC HSFS002	Revision Number 02

ARCADIS Design & Consultancy for natural and built assets

2. Identification & Control of Water Hazards [1,2]

(Circle Answer that Applies)

6) Will staff be working alone (Lone Worker)? If YES, the use of the buddy system is required and completion of a communication plan is required. (See Section 5.1 of Water Operations HSS)	YES	NO
7) Will work be conducted at night with out the use of a boat / vessel? If YES, completion of a communication plan is required. (See Section 5.1 of Water Operations HSS)	YES	NO

2) If YES is selected for any questions 3, 4, 5, and 6 must be reviewed and completed.

3.Communcition Plan

(List Minimum Requirements as required in Section 5.1 of the Water Operations Safety HSS)

1) If working in water within 3,000ft of a dam, dam overflow, water intake, or similar structure, Arcadis will notify the structure owner and discuss the appropriate safety requirements and work restrictions and document the requirements here.

4. [illegible]

(List the Rescue Requirements as required in Section 5.5.1 & 5.7 of the Water Operations HSS)

5.Restrictions

Minimum restrictions are listed below

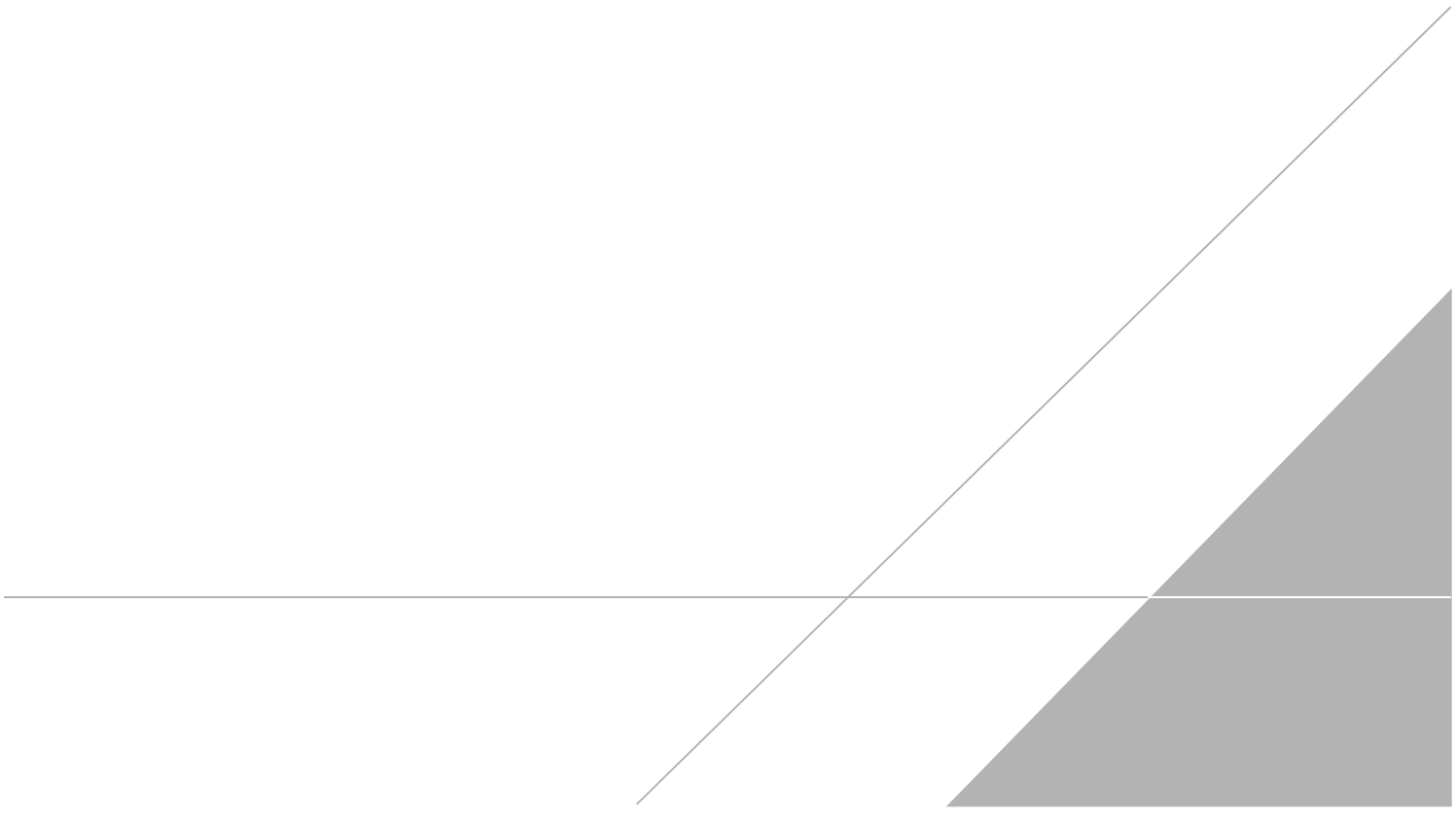
1) The use of Type V and non-inherently buoyant PFDs is not approved unless approved by Corporate H&S.
2) The use of PFDs classified for recreational use are prohibited for use on Arcadis projects.
3) Snorkeling or diving work is prohibited unless reviewed and approval by the Arcadis Diving Control Board (DCB)

6.Site Safety Officer (SSO) Review and Signature

The signatory has reviewed this WRAF and has reviewed the Water Operations HSS. The WRAF must be shared with all personnel performing the work, and must also be available for review in the appropriate work area. After activation of the Emergency Response Plan contact Arcadis Corporate Health and Safety

Name (Print):	Date:
Signature:	Time:

JSAs



Job Safety Analysis

General

JSA ID	9387	**Status**	(3) Completed
Job Name	Infrastructure-Manlift/Bucket Operations	**Created Date**	5/23/2013
Task Description	Manlift/Bucket Operations	**Completed Date**	05/28/2013
Template	True	**Auto Closed**	False

Client / Project

Client	Arcadis AGMI
Project Number	000000100000
Project Name	GENERAL OVERHEAD
PIC	
Project Manager	

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Hubbard, Lauren M	6/13/2013	5/23/2013	Tremblay, Tony	☑
HASP Reviewer	Tremblay, Tony	6/6/2013	5/27/2013	Ebert, Joachim	☑
Quality Reviewer	Llewellyn, Timothy M.	6/11/2013	6/11/2013	Polinsky, Heather L	☑

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Manlift/Bucket Truck Setup	1	Impact with facility equipment or facilities from improper access route selection	Ensure right manlift/bucket truck for the task to be performed, know height, width, weight and lift and coordinate route with facility prior to manlift/bucket truck arrival. Use spotters to watch for impact hazards, especially for overhead wires.	Employee Field Health and Safety Handbook Section III.BB
		2	Tipping from improper outrigger placement	Place manlift/bucket truck in location where all outriggers can be fully deployed.	
		3	Tipping from setup on soft or uneven ground	Evaluate setup area and ensure ground is suitable for placement, use pads, wood blocking or other suitable support device to displace weight if needed	
		4	Pinch point hazards (cuts, pinch, crush) from moveable parts including outriggers, boom, vehicle movement.	Be aware and keep hands clear of rigging. Watch for pinch points and keep body away. Leather gloves and steel toe boots required.	
		5	Struck by vehicle/traffic	When inside roadway clearzone, be aware of traffic conditions. Wear high visibility clothing and Class II (minimum) traffic vest. Ensure traffic control devices are in place according to traffic control plan.	
2	Inspection and Maintenance	1	Hoisting failure from lack of or improper maintenance	All aspects of inspection and maintenance to be performed under the oversight of a competent person. Manlift/bucket truck shall not be used if any identified defect is observed that has the potential to affect safe operations.	

3	Operation of Manlift/Bucket Truck	1	Shock and Electrocution from Arc Flash.	At no time shall shall manlift, bucket, or person enter the Arc Flash Limited Approach Boundary of overhead power lines or transformers over 600 V. Limited approach boundary includes: - Nominal Voltage 50 V to 72.5 kV requires 10' 0" clearance - Nominal Voltage 72.6 kV to 121 kV requires 10' 8" clearance - Nominal Voltage 122 kV to 145 kV requires 11' 0" clearance - Nominal Voltage 146 kV to 169 kV requires 11' 8" clearance - Nominal Voltage 170 kV to 242 kV requires 13' 0" clearance - Nominal Voltage 243 kV to 362 kV requires 15' 4" clearance - Nominal Voltage 363 kV to 550 kV requires 19' 0" clearance - Nominal Voltage 551 kV to 800 kV requires 23'9" clearance	
		2	Fall from manlift/bucket truck	Anyone on or in manlift/bucket truck should have approved safety harness and fall protection system in place. After putting on harness, spotter to confirm harness is installed correctly. Only personnel who have taken fall protection training shall be in manlift/bucket truck.	
		3	Struck by object	While in manlift/bucket truck, or when within work zone of the manlift/bucket truck, wear hard hat and eye protection at all times. Look up for possible overhead hazard, stay aware of surrounds. Secure any loose rigging or equipment. Use spotter on the ground.	
		4	Cuts and Scrapes	Wear protective gloves, long sleeve shirt and pants. Watch for sharp surfaces and avoid contact. Avoid reaching into location where visibility is impaired.	
		5	Muscle strain from awkward body position	Avoid awkward body position and strain while working from manlift/bucket truck. Adjust manlift/bucket truck to proper working angle and location.	
		6	Tipping of manlift/bucket truck	Operator shall ensure all loads do not exceed load limit (including wind load) and boom angle does not exceed angle limit during operation.	
		7	Environmental Conditions - Severe Weather	Check daily weather forecast before beginning work and monitor changes in weather. In the event of lighting, heavy winds, hail, heavy rain, suspend work and return to vehicle until conditions improve.	
		8	Personal Safety	At no time enter or operate bucket truck without spotter on ground. Always be aware of your surrounds. Coordinate work schedule and location with PM or his designee. have cell phone available both on the ground and in manlift/bucket truck.	
		9	Slips,Trips and Falls	Wear proper footwear with good tread and ankle support. Plan route when walking on sloped surface or when entering manlift/bucket. use hand holds on vehicle when entering manlift/bucket.	

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Dermal Protection	long sleeve shirt/pants		Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	work gloves (specify type)	Leather	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs	As needed	Required
Miscellaneous PPE	other	Safety Harness	Required
	traffic vest--Class II or III		Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Miscellaneous	fall protection (specify type)	Full body harness with shock absorbing lanyard	Required
	fire extinguisher		Required
	first aid kit		Required
Traffic Control	traffic cones		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Tremblay, Tony HASP Reviewer Approve 5/27/2013	
Employee: **Role** **Review Type** **Completed Date**	Llewellyn, Timothy M. Quality Reviewer NA 6/11/2013	Taylor Rental notes that manlifts lead the injury incidents they have. People underestimate the danger and fail to level the equipment resulting in toppling at full extension

Job Safety Analysis

General

JSA ID	22	**Status**	(3) Completed
Job Name	General Industry-Site clearing (tree/brush/vegetation) removal	**Created Date**	1/29/2009
Task Description	Site clearing	**Completed Date**	01/29/2009
Template	True	**Auto Closed**	False

Client / Project

Client	Arcadis AGMI
Project Number	000000100000
Project Name	GENERAL OVERHEAD
PIC	
Project Manager	

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Coppola, Mija A	3/6/2012	1/29/2009	Ebert, Joachim	☐
HASP Reviewer	Coppola, Mija A	1/31/2009	1/29/2009	Ebert, Joachim	☐

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Prepping equipment for clearing activities	1	Improperly maintained tools and equipment increase risk for injury to workers using tools/equipment	Maintain tools and equipment according to manufacturer recommendations, including proper oiling and inspection of tool/equipment. Ensure cutting blades are sharp.	
		2	Cuts to hands, fingers, forearms from sharpening tool/equipment blades	Wear protective gloves suitable for the tool/device being sharpened, use proper sharpening techniques and do not hurry through the sharpening process.	
		3	Falls from accessing or egressing from large equipment like tractors or bulldozers	Always use 3 points of contact when access/egressing large heavy equipment. Never attempt to access/egress form moving equipment, wear footwear with good anti-slip tread and ankle support, keep mud off of stepping surfaces. Promptly affix seatbelt when sitting in seat.	
		4	Exposure to fuel during refueling activities	Wear protective gloves during refueling activities, avoid breathing fuel vapors by standing up wind when practical, promptly wash exposed skin or clothing.	
2	Clearing large brush/trees with heavy equipment	1	Struck by vegetation under tension during clearing	Stand at least 100 ft from clearing activity. Keep unnecessary workers away from clearing activity in all directions.	
		2	Trip fall hazards on uneven ground surfaces	Plan route and avoid walking over down trees and into vegetation where ground surface cannot be seen. Wear footwear with good tread and ankle support, don't carry tools in a manner that can obstruct vision of ground.	
		3	Slip or trip on muddy or sloped surfaces	Plan route, wear footwear as above, keep hands out of pockets to balance and brace falls.	
		4	Contact with poisonous or physically damaging plants	Identify and avoid contact, if brush containing poisonous plants being burned, do not stand down wind and do not inhale smoke. Wear long pants and long sleeve shirt, in heavy briar infested areas requiring walking, wear briar chaps.	
		5	Contact with poisonous or biting insects	Watch for and avoid hazardous insects, keep cab doors closed, if equipped, to reduce exposure potential.	
		6	Struck by falling trees or large brush	Keep clear of planned fall direction, assume tree can fall in any direction and keep clear in all fall directions	

3	Clearing large brush/trees with hand tools/chainsaws	1	Cuts to arms, legs, hands from cutting tools or chainsaw	Wear protective gloves. When using chainsaw, use chainsaw chaps and helmet equipped with face shield. When using manual tools, cut away from body, maintain large distance between workers using hand tools or chainsaw. When using chainsaws, don't reach over running saw, don't saw over head height, don't use saw in low visibility situations, and don't use chainsaws on ladders or use one handed.	
		2	Physical stresses from repetitive motion or excessive push/pulling during clearing	Use job or task rotation or frequent rest breaks. Don't use excessive force pulling or pushing on vegetation.	
		3	Scrapes, cuts to skin from vegetation	Wear protective gloves, long pants and long sleeve shirt. Wear briar chaps in thorny vegetation.	
		4	Noise form chainsaws	Wear hearing protection, keep unnecessary workers away form sawing activity	
		5	Exposure to ticks.	Assess locations for possible tick habitat. When possible, walk over thin, low grasses, dirt or rock paths. Avoid tall grasses, weeds and beds of fallen leaves (likely nest areas). Wear permethrin spray, heavily applied, on clothing (where permitted) and DEET (30% or higher) on exposed skin. Wear light colored clothing to make ticks more visible. Check for ticks on clothing and skin frequently. Tape pant legs to boots if working in potential tick habitat for extended periods. In areas with very high potential for exposure or known infestations, wear disposable coveralls.	
		6	Contact with poison ivy, poison oak or sumac may result in severe skin irritation.	Learn to identify how urushiol-containing plants appear during all seasons. Avoid contact with skin or clothing. Give plants a wide berth as younger plants in the area may be more difficult to recognize and the vines extending from recognized areas also contain urushiol. Consider applying a barrier cream to exposed skin. In areas where the plants are prevalent or in cases where individuals have known allergic responses to urushiol (ie. poison ivy), wear chemically protective disposable coveralls.	
4	Clearing small brush/tall grass with mowers/bush hogs	1	Struck by flying debris from mowing activity	Keep unnecessary workers 100 ft from mowing activities	
		2	Foot hazards from slipping into cutting blades using walk behind mowers	Do not remove and promptly repair guards that reduce potential for foot entry into blade housing of mowers. Plan mowing to reduce situations that increase risk of foot slippage towards mower housing, wear steel toe boots with good tread.	
		3	Noise from mowing activities	Wear hearing protection	
5	Using wood chippers	1	Struck by debris being chipped or chips emanating from the chipper	Stand clear of material being drawn into the chipper, stand to the side of the chipper table during vegetation entry. Maintain swinging baffles that prevent throwback of material.	
		2	Cuts/amputation of hands/arm inserting brush into chipper	Only use chippers with a 36 inch or more feed throw from the cutting knives. Never place hands, feet on top of the feed table of the chipper. Wear protective gloves.	
		3	Noise from chipping activity.	Wear hearting protection	
		4	Injury caused from unplanned movement of chipper.	Chock tires of chipper when operating.	

6	Using herbicides	1	Worker exposure to herbicide during mixing or application.	Follow manufacturer mixing and application instructions, review product MSDS for additional hazards or PPE requirements. Wear impermeable gloves and clothing during mixing and application, promptly wash any skin exposed to herbicide. Wear safety goggles and face shield during mixing and application.	
		2	Fatigue and physical stresses form carrying hand applicator for prolonged period of time.	Use job or task rotation to reduce fatigue. For applicators carried by hand, switch hands periodically, opt for backpack versions of applicators when possible.	

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Dermal Protection	coveralls	when using herbicides	Required
	long sleeve shirt/pants		Required
Eye Protection	faceshield	when using herbicides	Required
	safety glasses		Required
	safety goggles	when using herbicides	Required
Foot Protection	steel-toe boots	or equivalent	Required
Hand Protection	work gloves (specify type)	leather	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Required
Miscellaneous PPE	other	chainsaw chaps if using chainsaw	Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Coppola, Mija A HASP Reviewer Approve 1/29/2009	

Job Safety Analysis

General

JSA ID	2113	**Status**	(3) Completed
Job Name	Infrastructure-Other	**Created Date**	4/7/2010
Task Description	Construction Inspection	**Completed Date**	07/15/2011
Template	True	**Auto Closed**	False

Client / Project

Client	Arcadis AGMI
Project Number	000000100000
Project Name	GENERAL OVERHEAD
PIC	
Project Manager	

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Moyers, Samuel H	12/27/2011	7/15/2011	Tremblay, Tony	☑
HASP Reviewer	Casaletta, Robert J.	7/29/2011	7/15/2011	Kundert, Brian J	☐
Quality Reviewer	Palmer, Peter	8/4/2011	8/4/2011	Suarez, Gustavo	☐

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Accessing/egressing work location	1	Slips, trips and falls on boats, barges, construction lay down areas and steel fabrication areas	Do not hurry through task, plan routes and focus on walking task. Keep hands free.	ARC HSGE001 Tailgate Meeting
		2	Falls from ladders, scaffolds, or on stairs	Maintain 3 points of contact climbing/descending ladders, Expect boat movement when accessing barge ladders and plan movement when crossing to ladder. Use handrails on stairs, or scaffold stairs, inspect route and plan route on scaffolds.	
		3	Impacts to head, arms, legs and body from suspended or protruding construction equipment, pitching boat.	Plan route and select routes along aisle ways with adequate width. No shortcutting over or under equipment. Always maintain awareness of crane blocking and low overhangs. Stay seated during boat operations. Wear hard hat at all times, even on or in boat.	
		4	Struck by construction equipment	For vehicle and exposed worker, follow STAR Plan for project. For worker, plan routes and communicate with equipment operators.	
		5	Lack of safety briefing may result in injury	Participate in contractor safety briefings to ensure H&S requirements are met during inspection activities and awareness of planned work activities. Use TRACK for all inspection activities.	
2	Performing inspections and observations	1	Cuts and scrapes to hands while inspecting steel and concrete.	Wear protective leather gloves or equivalent gloves. Do not place hands in areas of impaired visibility.	
		2	Falls from height while inspecting steel.	100 percent tie off fall protection is required (double legged lanyard). Plan routes prior to climbing and do not hurry through task. No shortcutting or over reaching when moving at height.	
		3	Impalement or cuts, scrapes from sitting on improvised or non standard seating.	Inspect area prior to sitting for splinters, protruding nails, or similar hazard. Seating should be prefabricated and designed for that purpose or craft made by carpenter.	
		4	Struck by equipment and suspended loads	Maintain awareness of surroundings during inspections, and look up frequently for crane activity overhead. Avoid distractions such as talking on cell phones or radios during inspection work.	

3	Escorting visitors and visitor safety	1	Visitor not knowledgeable of site hazards	Escorts to provide all visitors with safety briefing even if briefing is provided by contractor or USACE. Emphasize the need to wear required PPE at all times.	ARC HSGE001 Tailgate Meeting
		2	Visitor slip trip and fall by not focusing on walking task or unfamiliarity with boat characteristics.	TRACK visitor behaviors and coach/mentor visitors if questionable behaviors are observed. Verify visitor has correct footwear for site.	

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots	with ankle support and good tread	Required
Hand Protection	work gloves (specify type)	leather or other suitable material	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs	NR 30 or better	Required
Miscellaneous PPE	personal flotation device	Type III or V per SSO	Required
	traffic vest--Class II or III	II or III per SSO, see also STAR Plan	Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
	walkie talkie	per SSO or contractor requirement	Required
Miscellaneous	fall protection (specify type)	requires double legged lanyard for harnesses	Required
	fire extinguisher	ABC in vehicle	Required
	first aid kit	in vehicle	Required
Personal	insect repellent		Recommended
	sunscreen		Recommended

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Casaletta, Robert J. HASP Reviewer Revise 4/14/2010	Add to Job Step 1 : Potential hazard- Personal injury Critical Action- Conduct a Tailgate meeting to review planned work activities for the work period. Cpmplete Tailgate meeting form to document the meeting. HSP Reference ARC HSGE001 Tailgate Meeting.
Employee: **Role** **Review Type** **Completed Date**	Casaletta, Robert J. HASP Reviewer Approve 7/15/2011	
Employee: **Role** **Review Type** **Completed Date**	Palmer, Peter Quality Reviewer NA 8/4/2011	Good point on the potential hazard associated with distractions due to talking on cell phone or radios during inspections.

Job Safety Analysis

General

JSA ID	36	**Status**	(3) Completed
Job Name	Construction-Cranes/rigging	**Created Date**	2/2/2009
Task Description	Cranes/rigging	**Completed Date**	07/27/2012
Template	True	**Auto Closed**	False

Client / Project

Client	Arcadis AGMI
Project Number	000000100000
Project Name	GENERAL OVERHEAD
PIC	
Project Manager	

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Coppola, Mija A	8/10/2012	7/27/2012	Ebert, Joachim	☐
HASP Reviewer	Hubbard, Lauren M	8/10/2012	7/27/2012	Tremblay, Tony	☑
Quality Reviewer	Malone, Donald R	8/6/2012	8/6/2012	Purvis, John M	☐

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Crane/Boomtruck setup	1	Impact with facility equipment or facilities from improper access route selection	Lift plan specific to the task to be developed by Competent Person. Ensure right crane/boom truck for the task to be performed, know height, width, weight of crane and coordinate route with facility prior to crane/boom truck arrival. Use spotters to watch for impact hazards, especially for overhead piping or wires	Handbook section IV F
		2	Tipping from improper outrigger placement	Place crane/boom truck in location where all outriggers can be fully deployed	
		3	Tipping from set up on soft or uneven ground	Evaluate set up area and ensure ground suitable for placement, use pads, wood blocking or other suitable support device to displace weight if needed.	
		4	Crush hazards from test lifts	Test lifts are required, ensure unnecessary workers keep clear of the test lift location activity, be aware and keep feet clear of suspended load if inspecting rigging	
		5	Hand hazards (cuts, pinch, crush) from test lifts	Be aware and keep hands clear of rigging when load being lifting for test. Watch for pinch points of secured devices and keep fingers clear, leather gloves required.	
2	Inspections and Maintenance (crane or boom truck)	1	Hoisting failure from lack of or improper maintenance.	All aspects of inspection and maintenance to be performed under the oversight of a competent person, Crane or boom truck shall not be used if any identified defect is observed that has the potential to affect safe operation.	
		2	Cuts and scrapes to hands	Wear protective gloves, watch for sharp surfaces and avoid contact. Avoid reaching into location where visibility is impaired.	
		3	Struck by hazards from crane components	Wear hard hat and eye protection at all times, if raising up from a kneeling position, look up for possible overheard hazard, Stay aware of surroundings on crane or boom truck. Secure any loose rigging that could be affected by wind causing it to swing freely.	
		4	Tipping due to absence of boom angle indicators and load charts	Competent person shall ensure all manufacturer supplied angle indicators and load charts are present, readable by the operator and unobstructed at all times. No crane or boom truck shall be use if these device/information are not present	

2	Inspections and Maintenance (crane or boom truck)	5	Muscle strain from awkward body positions	Avoid awkward body testing and bending when servicing crane/boot truck engine compartment(s)	
3	Inspections and attachment of rigging	1	Load securing failure from improperly inspected or maintained components	Competent person to inspect and approve of all rigging components to be used for the lift daily or more often as required by site conditions. Competent person shall provide oversight of rigger activities to ensure good load securement and load is evenly balanced and contained.	
		2	Cuts, scrapes, puncture wounds to hands and arms from wire cable	Wear leather gloves for all rigging attachment activities, watch for and avoid pinch points.	
		3	Muscle strain from moving heavy chain or cable	Avoid moving bulky or heavy coiled cable or chain, use buddy system or other automated methods to move long strands of cable or chains or if moving blocking.	
		4	Pinch hazard to hands from connecting devices	Keep hands clear, wear leather gloves. Do not hurry through task	
		5	Struck by hazards from blocking	Be aware of hazard and stay clear when crane/boom truck in operation, ensure blocking is secured when not in use	
4	Hoisting	1	Load failure from impact with other equipment or objects	All site workers will be educated in the Emergency Stop Hand Signal. Standard hand signals will be reviewed prior to hoisting activities for all workers involved in the lift. Lifts to be performed in a smooth methodical manner. All loads to be adequately contained and/or secure to prevent being knocked off and falling to ground.	
		2	Worker struck by hazard from spinning or swinging load	Tagline required for all loads lifted over knee height to prevent sudden spinning or swinging, number of taglines required to be specified by Competent Person based on size of load lifted. Hard hat required for all activities.	
		3	Crush hazard to feet during load placement	Steel toe boot required, stay clear of loads be lowered into place, if close proximity required, be aware of hazard and ensure visibility of surface and feet are not obscured.	
		4	Tipping of crane/boom truck form excessive load or boom angle	Operator shall ensure all loads do not exceed load limits or the boom angle is not exceeded at any time during the lift.	

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	work gloves (specify type)	leather	Required
Head Protection	hard hat		Required
Miscellaneous PPE	traffic vest--Class II or III		Required

Supplies

Type	Supply	Description	Required
Communication Devices	walkie talkie		Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Hubbard, Lauren M HASP Reviewer Approve 7/27/2012	Great job!
Employee: **Role** **Review Type** **Completed Date**	Malone, Donald R Quality Reviewer NA 8/6/2012	Did not note where JSA indicated placing crane on level ground, only on even (not soft) ground. Minor sublty but important to ensure crane does not tilt under load. Consider during next re-write.

Job Safety Analysis

General

JSA ID	8121	**Status**	(3) Completed
Job Name	General Industry-Driving - passenger vehicles	**Created Date**	8/24/2012
Task Description	Driving a car, van, or truck on public roadways.	**Completed Date**	05/30/2013
Template	True	**Auto Closed**	False

Client / Project

Client	Arcadis AGMI
Project Number	000001410000
Project Name	HEALTH & SAFETY
PIC	
Project Manager	

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Moyers, Samuel H	12/18/2012	5/30/2013	Tremblay, Tony	☑
HASP Reviewer	Santaniello, Julie A.	6/13/2013	5/30/2013	Balcer, Denis M	☑
Quality Reviewer	Lujan, Teresa M.	6/17/2013	6/17/2013	Metzger, Kenneth	☐

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Pre-Trip Inspection	1	Failing to perform pre-trip inspections may cause mechanical failure, accident or injury	Perform walk around of vehicle with particular attention to tire inflation and condition. Check lights, wipers, seatbelts for proper operating condition. Properly adjust seat and mirrors prior to vehicle operation. Use or review vehicle inspection checklist as required under the MVSP.	ARC HSGE024 Motor Vehicle Safety Standard (MVSP)
		2	Scrapes, cuts, burns to hand if inspecting engine fluids and/or tires. Eye splash hazard if inspecting engine fluids. Pinch or crush hazards when opening or closing hood, trunk or tailgate.	Wear protective gloves and safety glasses as described below when checking under hood or tires. Use TRACK and keep hands clear when opening/closing hood, trunk, or tailgate to avoid crush or pinch hazard.	
		3	Improperly secured cargo may dislodge creating injury, property damage or road hazard.	Ensure all cargo is properly secured to prevent movement while the vehicle is in opertation. This includes cargo in the cab of the vehicle.	
2	Driving a motor vehicle on public streets	1	Failing to observe traffic flow ahead increases risk of hard braking resulting in potential impact of vehicle ahead, being struck by another vehicle from behind and decreases decision making time.	Use Smith System Key #1, "Aim High in Steering". **Look ahead (15 seconds if possible) to observe traffic flow and traffic signals.** Adjust speed accordingly to keep vehicle moving and avoid frequent braking. Select lane of least traffic and adjust speed based on observed signal timing when possible. Avoid following directly behind large vehicles that obscure view ahead.	Smith System "5-Keys" is a registered trademark of Smith System Driver Improvement Institute, Inc.
		2	Failing to observe vehicles, pedestrians, bicyclists and other relevant objects in vicinity of your vehicle increases risk of side swipes, rear ending, and third party injury.	Use Smith System Key #2, "Get the Big Picture". **Maintain 360 degrees of awareness around vehicle.** Check a mirror every 6-8 seconds, maintain space around the vehicle, choose a lane that avoids being boxed in. Look for pedestrian activity ahead in crosswalks or sidewalks. Watch for construction zone approach signs and act early by executing lane changes and reducing speed.	

2	Driving a motor vehicle on public streets	3	Failing to keep your eyes moving increases risk of not seeing relevant vehicles, pedestrians and objects in your vicinity that may impair your ability to make timely and appropriate driving decisions and also increases risk of accident.	Use Smith System Key #3, "Keep Your Eyes Moving". **Move your eyes every 2 seconds and avoid staring while evaluating relevant objects.** Scan major and minor intersections prior to entering them. Check mirrors.	
		4	Failing to maintain space around and in front of your vehicle increases risk of striking another vehicle or being struck by another vehicle. Insufficient space shortens time for effective driving decision making resulting in increased accident risk.	Use Smith System #4, "Leave Yourself an Out". **Use 4 second rule when following a vehicle.** Avoid driving in vehicle clusters by adjusting speed and using lanes that permit maximum space and visibility. When stopped, keep one car length space in front of vehicle ahead or white line.	
		5	Failing to communicate with other drivers and pedestrians increases risk of striking vehicles, pedestrians, or being struck by other vehicles, especially from the rear.	Use Smith System Key #5, "Make Sure They See You". **Brake early and gradually when stopping to reduce potential of being rear ended.** Keep foot on brake while stopped. Use turn signals and horn effectively. Establish eye contact with other drivers and pedestrians to extent practical. Use vehicle positioning that promotes being seen.	
		6	Distractions within the vehicle takes focus off driving, increases risk of accident decreases time for making effective driving decisions.	**Cell phone use (any type or configuration) is prohibited while the vehicle is in motion.** Familiarize yourself with vehicle layout and controls (radio, temperature controls, etc.) prior to operating unfamiliar vehicles. Set controls prior to operating vehicle. Use GPS in unfamiliar areas to avoid use of paper maps/directions while driving. Set GPS prior to vehicle operation. Pull over and stop to modify GPS functions. Avoid consuming food or drink while driving.	
3	Parking	1	Parking vehicle in areas of clustered parked vehicles or near facility entrance may impair visibility to oncoming traffic in lot and increase exposure to pedestrian traffic.	**Use pull through parking or back into parking space when permitted or practical.** When practical and safe to do so, park away from other vehicles and avoid parking near the facility entrance or loading docks. If available, use a spotter to aid in backing activity. Back no further than necessary and back slowly. Get out and look (GOAL) if uncertain of immediate surroundings. Tap horn prior to backing.	

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses	While checking engine or tires	Required
Hand Protection	work gloves (specify type)	Leather or equivalent checking engine or tires	Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
	other	Vehicle kit (applies to company trucks)	Required
Miscellaneous	fire extinguisher	Applies to company trucks	Required
	first aid kit	Applies to company trucks	Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Santaniello, Julie A. HASP Reviewer Revise 9/6/2012	Revise per suggested mark-ups
Employee: **Role** **Review Type** **Completed Date**	Santaniello, Julie A. HASP Reviewer Approve 5/30/2013	
Employee: **Role** **Review Type** **Completed Date**	Lujan, Teresa M. Quality Reviewer NA 6/17/2013	Very good write up. The reminder of the 5 Key Smith Driving rules are essential in everyday driving. The practice of these has and will make you a better driver and keep you safe.

Job Safety Analysis

General

JSA ID	2796	**Status**	(3) Completed
Job Name	Construction-Oversight - excavation and construction	**Created Date**	6/14/2010
Task Description	Excavation/Trenching Oversight (Outdoors)	**Completed Date**	06/17/2010
Template	True	**Auto Closed**	False

Client / Project

Client	Arcadis AGMI
Project Number	000000100000
Project Name	GENERAL OVERHEAD
PIC	
Project Manager	

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Stewart, Ian D	5/21/2012	6/14/2010	Baxter, Jonathan P.	☐
HASP Reviewer	Tremblay, Tony	6/28/2010	6/17/2010	Ebert, Joachim	☑
Quality Reviewer	Crandall, James M.	6/25/2010	6/25/2010	Johnson, Gary W	☐

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Utility Clearance	1	Contact with utilities can cause injury, property damage, and cause releases of hazardous substances to the environment.	Establish a minimum of three lines of evidence, and obtain additional lines of evidence as needed for site specific conditions. Maintain utility markings, perform detailed site inspections, and keep open and constant communication between operators, onsite staff, and project management. Always Use Stop Work Authority if there is a question or concern about the location of a utility.	ARCHSFS019 - Utility Clearance HS Standard
		2	Slip trip and falls while performing site clearance activities	Focus on task at hand and do not hurry through task. Avoid reading maps/drawings while walking, stop walking when looking up for overhead utilities.	
2	Excavation/Trenching and Backfilling Oversight	1	Slips trips and falls from poor housekeeping around trench or excavation.	Maintain work area and minimize clutter near excavation. Place excavated material properly and at least 2 feet away from the edge of excavation. Remove potential hazards when possible. Mark hazards when it cannot be removed. Create and maintain awareness of hazard. Maintain barriers, fall hazard warning signage and traffic controls properly. Do not cross over caution tape, safety fencing etc. Follow Project specific STAR Plan	FHSHB IV(D)
		2	Excavation or trench collapse trapping workers or creating falls.	Excavation/Trench greater than five (5) feet deep in which subcontractor, employees or others will be entering must be properly sloped, benched, shored or have a trench box in place. Sloping, benching, shoring or use of trench box is not required IF an excavation is less than five (5) feet in depth and examination of the ground by a competent person provides no indication of a potential cave-in. Ensure a Competent Person is on site to inspect and oversee excavation/ trenching activities. Where feasible, stay six (6) feet from edge of excavation/trench. A safe means of egress, such as a stairway, ladder, or ramp, shall be located so that no more than twenty-five (25) feet of lateral travel is necessary for site workers conducting activities in trenches exceeding four (4) feet in depth.	

2	Excavation/Trenching and Backfilling Oversight	3	Potential high level of dust, fumes, vapors or particulates creating visibility or inhalation/contact hazards could result in exposure above occupational exposure limit or create an IDLH atmosphere.	Visually monitor air for dust, and wet excavated soil as needed to control dust. Monitor for chemical vapors if hazard exists. The atmosphere must be tested in excavations greater than four (4) feet in depth where oxygen deficiency or toxic or flammable gases are likely to be present, before workers will be permitted to enter. Ensure downwind and perimeter monitoring also performed, if atmospheric hazards exists.	
		4	Excessive noise from excavating equipment or pumps.	Make sure all authorized personnel including subcontractors are wearing hearing protection (ear plugs/muffs) when working around noisy equipment. Increase distance from noise hazard when practical.	
		5	Potential Leaks of Petroleum Fluids and Lubricants from excavating equipment and support equipment.	Make sure all authorized personnel including subcontractors perform equipment inspections looking for leaks, cracked hoses, and loose fittings. Promptly and properly repair all leaks.	
		6	Open Excavation, Unauthorized Entry, or Property Damage	Make sure all authorized personnel including subcontractors mark open excavation with demarcation tape, orange fencing, orange cones, etc. to prevent unauthorized / accidental entry. Make sure controls are adequate for traffic protection after dark or when the site is unstaffed. Backfill excavation area as soon as possible and fence off any excavation not backfilled at the end of the work day.	
		7	Contact with potentially impacted groundwater and soil.	Conduct task in a calm, cautious manner. Wear appropriate PPE. Ensure equipment is in working conditions before start of work every day. Stop work immediately and report to the site manager, if any life threatening conditions exist.	
		8	Working Around Heavy Machinery	Where feasible, maintain distance from excavation equipment in excess of the swing radius. Maintain eye contact with operators at all time. Ensure equipment is in good working condition before work begins. Wear appropriate PPE, including safety vest. Do not wear loose clothing and pull back long hair. Be aware of and avoid standing in red zones (equipment operator "blind-spots"). No personnel are permitted to stand underneath suspended loads.	
3	Stockpile Maintenance and Sampling	1	Falls climbing on or during covering of stockpile.	Avoid climbing on stockpiles when possible, keep hands free, do not hurry trough tasks such as pulling plastic sheeting up onto or over piles.	
		2	Overexertion placing plastic sheeting, weight, and straw bales.	Use proper lifting techniques, avoid twisting of body, and forceful pulling/pushing. Do not hurry through task.	
		3	Cuts, scrapes, impalement from debris in stockpiles.	Have excavation contractor remove/isolate large chunks of concrete, exposed rebar etc. from stockpile to extent practical. Inspect areas prior to kneeling or placing hands when sampling upon stockpile.	

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Dermal Protection	long sleeve shirt/pants		Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	When sampling groundwater	Required
	work gloves (specify type)	Leather when hand hazard exists; nitrile for soil/	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs	When working near heavy equipment	Required
Miscellaneous PPE	traffic vest--Class II or III		Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone	Remote area, check reception	Required
Decontamination	Decon supplies (specify type)		Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
	flashlight		Required
Personal	eye wash (specify type)		Required
	insect repellent		Recommended
Traffic Control	Other	Cones/tape to delineate trenches prior to backfill	Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Tremblay, Tony HASP Reviewer Approve 6/17/2010	
Employee: **Role** **Review Type** **Completed Date**	Crandall, James M. Quality Reviewer NA 6/25/2010	No additional comments. Very well done.

Job Safety Analysis

General

JSA ID	2291	**Status**	(3) Completed
Job Name	Construction-Excavation and trenching	**Created Date**	4/26/2010
Task Description	Soil Excavation	**Completed Date**	04/27/2010
Template	True	**Auto Closed**	False

Client / Project

Client	Arcadis AGMI
Project Number	000000100000
Project Name	GENERAL OVERHEAD
PIC	
Project Manager	

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Moyers, Samuel H	6/29/2012	4/26/2010	Tremblay, Tony	☑
HASP Reviewer	Hubbard, Lauren M	5/10/2010	4/27/2010	Tremblay, Tony	☑

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Site preparation	1	Improper utility clearance may result in utility/equipment damage or injury.	Perform utility clearance with a minimum of 3 lines of evidence. Document utility clearance for reference including any ticket numbers or phone numbers of utilities.	
		2	Clearing vegetation may result in impact hazards.	Stand at least 25 ft from clearing operations using manual or mechanized methods. Larger vegetation like trees may be under stress and may break and wood parts my fly in any direction.	
		3	Slip trip and fall hazards from walkover activities (vegetation, uneven surfaces, etc and applies to all job steps in this JSA)	Plan route and focus on the task at hand (walking). Do not walk while looking at utility maps/drawings or talking on cell phones.	
2	Excavation and backfilling	1	Struck by equipment during excavation.	Stay at least 10 feet beyond the reach of excavation equipment unless establishing communication with operator. Wear PPE required by this JSA for increased visibility. Keep unneccessary workers away from the excavation area.	
		2	Equipment/worker falls into excavations from edge collapse	Stand at least 6 ft from edge of excavation. Competent person to oversee sloping, benching, bracing excavation to ensure stability.	
		3	Worker entrapment/suffocation/chemical overexposure/engulfment in excavation	Entry into excavations are prohibited unless approved by a Competent Person. Keep spoil piles at least 2 ft from excavation edge. Ensure proper slope/bench/shielding is in place prior to entry. Air monitor for toxic vapors and oxygen deficiency. Ensure proper means of access and egress.	
		4	Chemical exposure to site contaminants.	Wear protective clothing specified in this JSA, avoid skin contact with soil materials or any liquids in the excavation. Use air monitoring to ensure TLVs are not exceeded. Wash hands and face prior to eating, drinking or consuming tobacco.	
		5	Noise from excavation equipment	Keep distance from equipment to reduce noise levels. If levels cannot be controlled wear hearing protection appropriate for the hazard.	
3	Excavation equipment decontamination	1	Slips and falls on wet surfaces.	Wear footwear appropriate for wet environments. Reduce amount of pressure washing required by removing soils using dry methods to extent practical	

3	Excavation equipment decontamination	2	Flying particles from cleaning activities.	Wear eye and skin protection during decontamination activities. Use face shield if overspray or flying debris is a persistent problem. Avoid cleaning (pressure washing) in direction of other nearby workers, keep unneccessary workers clear of decontamination activity.	

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Dermal Protection	chemical protective suit (specify type)	Tyvek per SSO	Required
Eye Protection	faceshield	During decontamination (per SSO)	Required
	safety glasses		Required
Foot Protection	rubber boots	Wet environments (per SSO)	Required
	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile when handling impacted soils	Required
	work gloves (specify type)	leather or equivalent (per SSO)	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Required
Miscellaneous PPE	traffic vest--Class II or III	Class II	Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
	walkie talkie		Required
Miscellaneous	auxilary lighting	Light plant for night work	Required
	fire extinguisher	ABC 10 pound minimum	Required
	first aid kit		Required
Personal	eye wash (specify type)	Bottle	Required
	insect repellent		Recommended
	sunscreen		Recommended

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Hubbard, Lauren M HASP Reviewer Approve 4/27/2010	

Job Safety Analysis

General

JSA ID	156	**Status**	(3) Completed
Job Name	General Industry-Fence installation	**Created Date**	4/29/2009
Task Description	Fence installation	**Completed Date**	08/18/2009
Template	True	**Auto Closed**	False

Client / Project

Client	Arcadis AGMI
Project Number	000000100000
Project Name	GENERAL OVERHEAD
PIC	
Project Manager	

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Coppola, Mija A	8/18/2009	8/18/2009	Ebert, Joachim	☐
HASP Reviewer	Coppola, Mija A	9/1/2009	8/18/2009	Ebert, Joachim	☐

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Survey Area on Proposed Installation of Fencing and Posts	1	Tripping can occur from uneven walking/working surfaces	Identify and control any trip hazards. Setup work area with least interference to public and surrounding activities.	Employee Field H&S Handbook; Utility Clearance HS Standard ARCHSFS019; HS Standard ARCHSFS017
		2	Underground utilities can be hit when doing intrusive work	Follow Utility Clearance HS Standard	
		3	Staff can be hit by vehicular traffic, and pedestrians can enter work area	Wear Class II traffic vest when working proximal to vehicular traffic. Use traffic cones to keep pedestrians away.	
2	Fence Post Installation	1	Injury can occur when using hand and power tools	Always inspect hand tools prior to starting task. Wear leather work gloves. Use GFCIs for any power tools. Do not use in wet work areas.	
		2	Rotating parts on gas powered augers can cause bodily injury, and this equipment can be unstable to operate.	A two person operated machine is preferred for better stability. Keep all unnecessary staff clear of augering. Do not wear loose clothing or jewelry	
		3	Fuel spills can occur with refueling equipment	Use approved gas cans for all refueling of equipment. Allow ample time for motor to cool before refueling.	
		4	Sharp edges can cause cuts, and equipment has pinch point hazards	Always secure the equipment when transporting them in vehicles with ratchet straps. Use heavy work gloves while handling and team lift when moving equipment.	
		5	Mixing and pouring concrete can generate dust	Wear safety glasses or goggles.	
3	Chain Link Fence Installation	1	Fence handling can cause lacerations from sharp edges, or injury from pinch points and puncture hazards	Wear leather work gloves	
		2	Muscle strain can occur from heavy lifting	Team lift chain link sections of fencing or use powered equipment to move them.	
		3	Injury can occur when using hand and power tools	Always inspect hand tools prior to starting task. Wear leather work gloves. Use GFCIs for any power tools. Do not use in wet work areas.	
		4	Muscle strain can occur when tightening fencing	Use fencing puller to tighten up fencing.	

3	Chain Link Fence Installation	5	Staff can trip over equipment or uneven working surfaces, or get clothing caught in the chain link fencing.	Do not lay out piping for post on ground where it can create a trip hazard for workers and pedestrians. Keep site in order, and do not wear loose clothing. Keep shoe laces tied tightly.	
4	Silt Fence Installation - Manual	1	Muscle strains can occur from heavy lifting of materials, or when pounding stakes.	Team lift rolls of silts fence off trucks or trailers. Take breaks when using slide hammer (fence post driver) to drive stakes into ground. Muscles can cramp easily from use of this tool. Stretch muscles as necessary. Keep back straight while lifting hammer as well.	
		2	Hands can be cut from splinters on stakes	Wear leather work gloves.	
		3	Excessive noise can be generated when pounding in stakes.	Use hearing protection as necessary.	
		4	Hand injury can occur when pounding stakes, or surrounding staff can be hit.	Make sure surrounding is clear, and keep in communication with staff. Use the right tool for the job, and wear leather work gloves. When using hammer, keep hands clear of post top. If hands are needed to hold stake to get it started, use heavy type work gloves.	
5	Silt Fence Installation - Powered Equipment	1	Powered equipment can pull in or strike body parts causing injury	Do not stand in front of powered equipment as it sets the silt fence in the ground. Stand where operator can see you and where you can see the line of silt fence being installed. Stay in communication with the equipment operator.	
		2	Fuel spills can occur with refueling equipment	Use approved gas cans for all refueling of equipment. Allow ample time for motor to cool before refueling.	
		3	Use of powered and pressurized tools can cause flying parts or hand injuries.	If using air stapler to connect silt fence to stakes, make sure to keep hands clear during use of stapler. During travel to next stake, keep air stapler pointed away from body and toward the ground.	
6	Snow Fence Installation	1	Plastic snow fence can have sharp edges due to thin material which can cause scrapes or lacerations	Use heavy work type gloves while handling fencing.	
		2	Excessive noise can be generated when pounding in stakes.	Use hearing protection as necessary.	
		3	Hand injury can occur when pounding stakes, or surrounding staff can be hit.	Make sure surrounding is clear, and keep in communication with staff. Use the right tool for the job, and wear leather work gloves. When using hammer, keep hands clear of post top. If hands are needed to hold stake to get it started, use heavy type work gloves.	

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Foot Protection	boots	steel toe	Required
Hand Protection	work gloves (specify type)	leather work gloves	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Recommended
Miscellaneous PPE	traffic vest--Class II or III	when working proximal to traffic	Recommended

Supplies

Type	Supply	Description	Required
Miscellaneous	first aid kit		Required
Personal	eye wash (specify type)		Required
Traffic Control	traffic cones		Required

Review Comments

Reviewer		Comments
Employee:	Coppola, Mija A	
Role	HASP Reviewer	
Review Type	Approve	
Completed Date	8/18/2009	

Job Safety Analysis

General

JSA ID	881	**Status**	(3) Completed
Job Name	Environment-Air Monitoring	**Created Date**	9/21/2009
Task Description	ORS FTIR Field Monitoring	**Completed Date**	09/23/2009
Template	True	**Auto Closed**	False

Client / Project

Client	Arcadis AGMI
Project Number	000000100000
Project Name	GENERAL OVERHEAD
PIC	
Project Manager	

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Chase, Michael J.	5/22/2012	9/21/2009	Modrak, Mark T.	☐
Developer	Thornton, Todd A.	5/22/2012	9/21/2009	Hemmerling, Tracy	☐
HASP Reviewer	Thornton, Todd A.	10/5/2009	9/21/2009	Hemmerling, Tracy	☐
Reviewer	Modrak, Mark T.	10/5/2009	9/23/2009	Jozewicz, Wojciech	☐

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Mobilization/Demobilization	1	Heavy lifting	Utilize appropriate lifting techniques. Team lift object heavier than 50 lbs. Utilize material handling equipment whenever possible.	
		2	Abrasions	Use work gloves when handling equipment and supplies.	
		3	Motor vehicle accident	Use Smith System defensive driving techniques.	
2	Tailgate Safety Meeting	1	Unaware of job site hazards, conditions and critical safety actions.	Conduct a tailgate safety briefing each day prior to the start of work and if job site and/or conditions change during the day. Review appropriate sections of the Field Safety & Health Handbook. Ensure that all employees are fully aware of all hazards and are wearing all necessary PPE. Ensure all employees are aware of the locations of emergency equipment and contacts.	ARCHSGE001
3	General Environmental Conditions	1	Heat Stress	a. Dress appropriately for the weather. b. Take frequent breaks as necessary to cool off. c. Stay hydrated by drinking plenty of water. d. Stay out of direct sunlight when possible.	
		2	Severe weather	a. Monitor the weather forecast for each day's activities. b. Take immediate shelter in a protected structure or field vehicle in the event of lightning, hail, high winds, or flooding.	
		3	Bites/Stings - Insects/Spiders/Snakes	a. Wear insect repellant during outdoor activities. b. Avoid disturbing area that may be a habitat for insects, spiders, or snakes. Use caution when moving rocks, equipment, or other items that may be providing shelter for these animals. c. Wear sturdy boots to protect from snake bites.	
		4	Heavy equipment operation in vicinity	a. Establish clearly marked work areas using barrier tape, cones, or other highly visible material. b. Wear safety vests when working in areas within 200 ft of heavy equipment operation. c. Notify the site contact of the work area.	
		5	Uneven terrain	a. Survey the working area prior to set up. Mark any holes, pits, or other hazardous terrain. b. Wear sturdy safety shoes.	

4	Equipment/Site Set Up	1	Materials handling/heavy lifting	Utilize appropriate lifting techniques. Team lift objects over 50 lbs. Utilize materials handling equipment whenever possible.	
		2	Falls from height	Utilize personal fall arrest equipment when exposed to unprotected falls greater than 4 feet in height.	
		3	Electricity- shock or electrocution	a. Inspect all extension cords prior to use. Mark all damaged cords and take them out of service. b. Protect cords in use from traffic or other damage. c. Ensure cords are appropriate for the load.	
5	Monitoring/Data Collection	1	Laser exposure to eyes	a. Ensure personnel stay out of laser path. b. Utilize radiation protective glasses when adjusting laser path.	
		2	Heat stress/Sunburn	Utilize a canopy over the monitoring area. Work in shaded areas when possible. Use sunscreen. Drink plenty of water and take breaks as necessary.	
		3	Cryogen exposure	a. Wear proper cryogen PPE whenever handling cryogens (safety glasses, face shield, cryogen gloves, safety shoes). b. Store cryogens in a secured location to prevent spills.	

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Dermal Protection	coveralls	Fire resistant (on refinery site)	Required
	long sleeve shirt/pants		Recommended
Eye Protection	faceshield	For cryogens	Required
	safety glasses	For cryogens	Required
Foot Protection	steel-toe boots		Required
Hand Protection	insulated gloves	Cryogen gloves	Required
	work gloves (specify type)	leather or cotton	Required
Miscellaneous PPE	traffic vest--Class II or III		Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Miscellaneous	first aid kit		Required
	Other	Cones/Traffic control	Required
Personal	insect repellent		Required
	sunscreen		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Modrak, Mark T. Reviewer Approve 9/23/2009	
Employee: **Role** **Review Type** **Completed Date**	Thornton, Todd A. HASP Reviewer Approve 9/21/2009	

Job Safety Analysis

General

JSA ID	344	**Status**	(3) Completed
Job Name	Construction-Heavy equipment operation	**Created Date**	5/29/2009
Task Description	Heavy equipment operation	**Completed Date**	06/15/2009
Template	True	**Auto Closed**	False

Client / Project

Client	Arcadis AGMI
Project Number	000000100000
Project Name	GENERAL OVERHEAD
PIC	
Project Manager	

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Coppola, Mija A	5/21/2012	5/29/2009	Ebert, Joachim	☐
HASP Reviewer	Moyers, Samuel H	6/12/2009	6/15/2009	Tremblay, Tony	☑

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Loading and Unloading Equipment from transport vehicles.	1	Stake or impact hazards from moving equipment	Stand clear of equipment loading or unloading form transport vehicles	FHSHB Section IV (E); ARCHSF019, FHSHB Section III(MM)
		2	Equipment damage from improper removal or placement on vehicle	Ensure any ramps used are rated for weight and properly placed and secure prior to moving equipment across, ensure trailers being loaded or unloaded are properly secured against movement.	
		3	Overhead utility contact for equipment with booms or extensions	Plan position of transport vehicle to maintain safe distance (>20 ft) from all overhead lines and structures, Use spotters since operator focus may be on vehicle alignment with ramps or other ground level distractions.	
		4	Ascending/Descending equipment cab.	Do not hurry through task, wear footwear with good tread and ankle support, maintain 3 points of contact while accessing or egress equipment, no jumping off trailers or truck beds.	
2	Pre-operation inspection	1	Pinch hazards to hands	Wear gloves appropriate for hazard while maintaining dexterity. Keep hand in field of vision and watch for and keep hands clear of obvious hazards like door or cover closures. Do not hurry during the removal or placement of covers or equipment components.	
		2	Head injury from striking equipment covers or components	Wear hard hat, stay focused on surroundings, avoid standing or raising up suddenly especially if door cover is overhead.	
		3	Exposure to engine fluids or lubricants	Wear protective gloves, ensure MSDS is available for engine fluids and lubricants, promptly wash exposed skin, contact WorkCare immediately for any situation where diesel is injected under the skin.	
		4	Awkward body positions and twisting	Plan inspection activity and do not hurry through task, stretch before crawling or squatting. Avoid overreaching.	
		5	Entanglement in equipment components.	Do not circumvent protective guards or shields, ensure equipment is not operational (LOTO if necessary) when accessing engine compartment if intrusion required.	

3	Equipment operation	1	Strike or impact hazards with other workers, equipment or structures.	Keep eyes moving and watch for unanticipated worker movement. Keep workers 15 ft from any extendable area of the equipment, Maintain 360 degrees of awareness and ensure adequate communication method with other workers. All workers to know emergency STOP hand signals. Verify that all back up alarms are functional.	
		2	Utility contact (subsurface or above ground)	Follow utility clearance procedure prior to any intrusive work with equipment. Immediately stop work if any unusual or unanticipated condition encountered.	
		3	Rollovers on slopes or from improper usage	Follow equipment manufacturer instructions for use on slopes or load capacities, wear seatbelt at all times, Ensure all outriggers, if equipped are properly deployed on stable surface.	
		4	Noise from engine or work activity	Wear hearing protection as required, keep equipment well maintained.	
		5	Slips and falls from accessing or egress from equipment	Maintain 3 points of contact when access or egress equipment, keep any ladder or steps on equipment clean and dry to extent practical, ensure equipment doors, if present, are in good working order.	
		6	Exposure to tools and metal edges and damaged metal resulting in cuts lacerations to hands during maintenance	Wear protective gloves that allow for good dexterity. Mitigate sharp surfaces to extent practical.	
		7	Pinch/crush hazards to hands from doors or covers	Wear gloves appropriate for hazard while maintaining dexterity. Watch for and keep hands clear of obvious hazards like door or cover closures. Do not hurry during the removal or placement of covers or equipment components.	
		8	Contact stress to knees and hands	Use padding or knee pads if kneeling on hard surfaces for an extended period of time. Avoid placing weight on hands for extended periods of time.	
4	Maintenance	1	Awkward body positions and twisting	Plan inspection activity and do not hurry through task, stretch before crawling or squatting. Avoid overreaching.	
		2	Excessive force turning bolts or lifting heavy components.	Use automated methods to loosen tight bolts, do not use excessive force or torque when using hand tools. Do not use "cheater bars".	
		3	Contact with engine fluids or lubricants	Wear protective gloves, ensure MSDS is available for engine fluids and lubricants, promptly wash exposed skin, contact WorkCare immediately for any situation where diesel is injected under the skin.	
		4	Flying debris during decontamination or cleaning activities.	Wear adequate eye and face protection when removing soils or solid media form tracks, buckets, or other component of equipment by using a pressure washer.	
		5	Entanglement in equipment components.	Do not circumvent protective guards or shields, ensure equipment is not operational (LOTO if necessary) when accessing engine compartment if intrusion required.	
		6	Exposure of hands and arms to hot engine components	Take the time to allow the engine to cool, wear protective gloves and forearm protection.	
		7	Struck by moving equipment or boom extensions	Keep at least 15 ft from any extendable area of the equipment, if entering within 15 ft, establish and maintain contact with equipment operator, wear high visibility clothing or work vest.	
5	Working in proximity to heavy equipment	1	Equipment damage from moving equipment	Keep other equipment not required for work outside of heavy equipment work area. Flag or mark equipment with high visibility markings, cones, etc.	
		2	Noise hazards from equipment operation	Wear hearing protection and increase distance if work activity permits.	

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	work gloves (specify type)		Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs	as needed	Recommended
Miscellaneous PPE	traffic vest--Class II or III		Required

Supplies

Type	Supply	Description	Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
Personal	eye wash (specify type)		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Moyers, Samuel H HASP Reviewer Approve 6/15/2009	

Job Safety Analysis

General

JSA ID	213	**Status**	(3) Completed
Job Name	General Industry-Water work-with boat	**Created Date**	5/11/2009
Task Description	Boat operations	**Completed Date**	06/08/2009
Template	True	**Auto Closed**	True

Client / Project

Client	Arcadis AGMI
Project Number	000000100000
Project Name	GENERAL OVERHEAD
PIC	
Project Manager	

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Coppola, Mija A	3/20/2012	5/11/2009	Ebert, Joachim	☐
HASP Reviewer	Moyers, Samuel H	5/25/2009		Tremblay, Tony	☑

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Mobilizing to Job site	1	MVAs can occur if watercraft trailer is not hitched and towed correctly.	Follow JSA on commercial motor vehicles.	JSA Commercial Motor vehicles. Field H&S Handbook-Section III-V ARC HSFS018-Trailer usage
2	Launching watercraft/prepare for operating boat	1	Staff can fall in the water during launch or pinch fingers/body parts	Move all objects away from the operating area of the watercraft launch. All parties should be visible and able to communicate with operator of vehicle backing the trailer.	
		2	Missing equipment or equipment failure can leave boaters stranded on the water.	Make sure boating safety checklist is completed before operating the boat.	
		3	Fuel can leak or spill when fueling equipment.	Do not overfill the tank. Have absorbent pads available in case of spill.	
3	Loading and Unloading watercraft	1	Loss of Equipment in water	Avoid directly carrying anything onboard. Have someone hand them to you one by one. Distribute equipment evenly in vessel.	
		2	Muscle strains can occur when lifting supplies into watercraft	Use proper lifting techniques or team lift.	
		3	Obstacles and wet boat can cause slip/trip/fall hazard	Ensure path is clear, use additional caution in areas that may be slick. Access watercraft from sides rather than ends.	
		4	Unbalanced cargo and personnel can make boat unstable.	Evenly distribute cargo and personnel to assure balance in boat. Always load boat from side to side. Secure all cargo on the watercraft.	
4	Operating watercraft	1	Personnel can fall into the water	All personnel must wear a personal floatation device and remain seated during boat operation. Steering changes must be made slowly. Avoid wakes of other watercraft traffic. Larger watercrafts have the right of way. Maintain a controllable speed.	Field H&S Handbook Section III-X Boating safety; ARC HSFS002-Boating operations
		2	Equipment can be lost in the water	Secure all equipment when the boat is being operated.	
		3	Other watercraft can be struck during boat operation	Assign someone as a spotter. Look constantly for others around you.	
		4	The boat can be damaged when hitting floating objects/debris in the water.	Always be looking for objects in the water. Use a good safe operating speed. Be extra cautious after rain events because more debris in the water is likely.	

4	Operating watercraft	5	Severe weather can impact boating operation	Check for severe weather alerts, and TRACK the weather throughout the day. Boating should cease if high winds are expected, or lightning storms.	
5	Docking watercraft	1	Body parts can be pinched between the boat and dock.	When tying watercraft up, do not put fingers between watercraft and dock/unloading site to avoid pinching hands or fingers. Use leather gloves.	
		2	Wet and uneven surfaces on dock and watercraft can cause slipping/tripping	Make sure watercraft is secure to watercraft dock. Watch footing getting on and off watercraft. Clean out all equipment and supplies in watercraft. Use good housekeeping.	

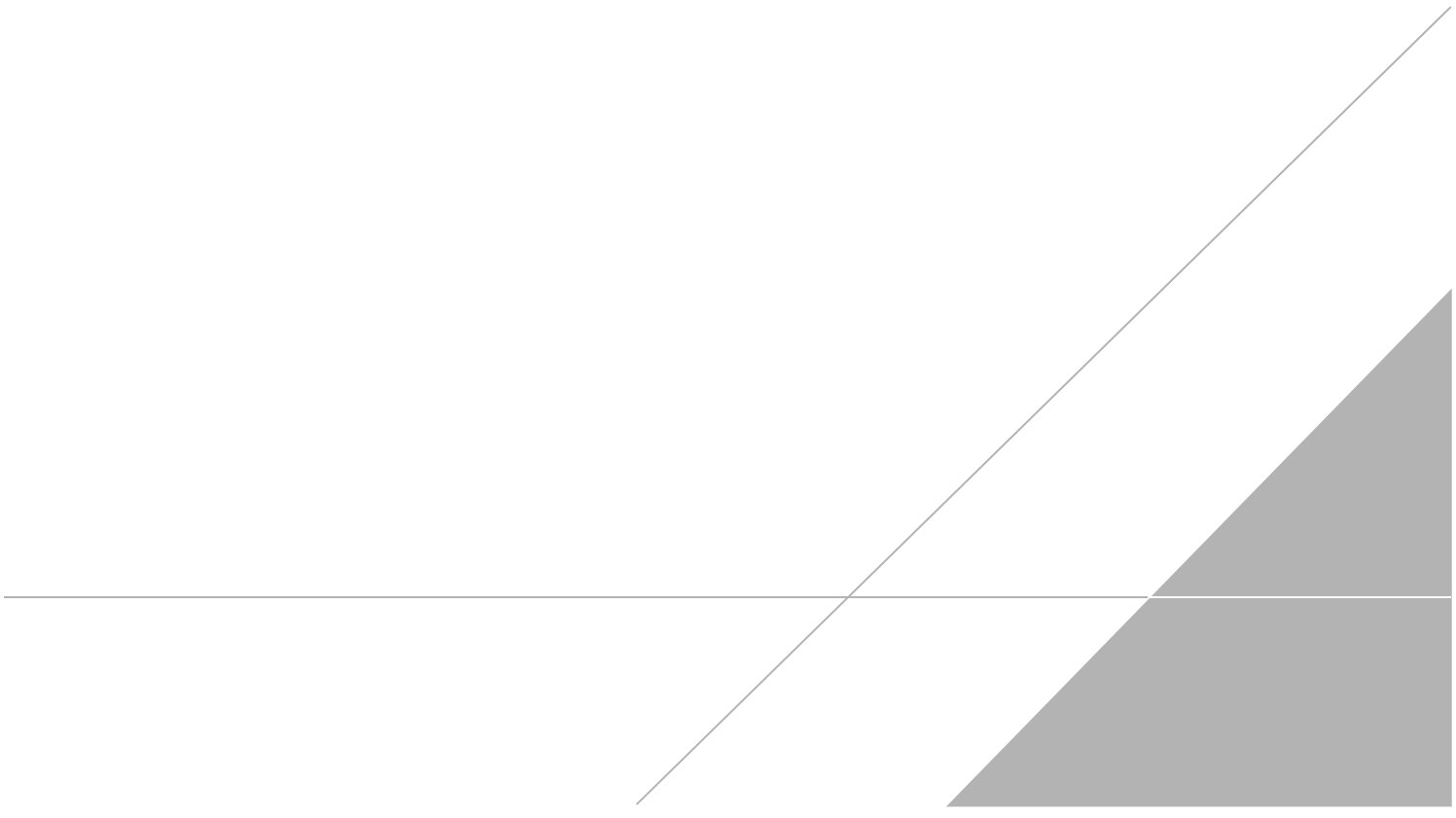
PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Foot Protection	boots		Required
Hand Protection	work gloves (specify type)	leather	Required
Miscellaneous PPE	personal flotation device		Required

Supplies

Type	Supply	Description	Required
Communication Devices	walkie talkie		Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
Personal	sunscreen		Required

Permits



Elevated Work Permit

ARCADIS

ELEVATED WORK PERMIT

Project Name:		**Project Location:**	
Permit Developed By:		**Date:**	
Project Start Date:		**Project Completion Date:**	
Client:		**Client Contact:**	
Subcontractor Companies			

TRACKing the Elevated Work Permit

THINK THROUGH THE TASK

Job Task: (Summary of what elevated work is proposed)

WORKFORCE INVOLVED IN ELEVATED WORK		Check all the apply						
Name	**Company**	Elevated Work Qualified	Competent Person	Experienced	Can Work Alone	Short Service Employee	Training Required	Supervision Required
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐

Comments/Additional Details:

RECOGNIZE THE HAZARDS (check those that apply) and ASSESS THE RISK (Low - Moderate - High)

YES	NO		SELECT ↓	YES	NO		SELECT ↓
☐	☐	FRAGILE ROOF OR SURFACES		☐	☐	POSSIBLE FALL FROM A HEIGHT BELOW 6' (1.83M)	
☐	☐	MATERIALS OR TOOLS AT HEIGHTS		☐	☐	POSSIBLE FALL FROM A HEIGHT OF 6' (1.83M) OR MORE	
☐	☐	LIFTING, PUSHING OR PULLING		☐	☐	POSSIBLE FALL FROM A LADDER	
☐	☐	WORK NEAR ELECTRICAL LINES		☐	☐	POSSIBLE FALL FROM A WORK PLATFORM	
☐	☐	MANUAL HANDLING MATERIALS		☐	☐	POSSIBLE FALL INTO A HAZARDOUS SUBSTANC	
☐	☐	GROUND LEVEL OBSTRUCTION		☐	☐	POSSIBLE FALL INTO EXCAVATION	
☐	☐	MOVING MATERIALS		☐	☐	POSSIBLE FALL INTO WATER	
☐	☐	OVERHEAD OBSTRUCTIONS		☐	☐	RESTRICTED SPACE	
☐	☐	FALLING OBJECTS		☐	☐	VEHICLES OR TRAFFIC	
☐	☐	SLIPS, TRIPS, FALLS		☐	☐	WEATHER OR TEMPERATURE	
☐	☐	WORKING ALONE		☐	☐	FALLING OBJECTS	
☐	☐	UNGUARDED EDGES		☐	☐	LACK OF SPACE	
☐	☐	UNEVEN FLOOR SURFACES		☐	☐	WORKING ABOVE A HAZARD	

Elevated Work Permit

CONTROL THE WORKING ENVIRONMENT

	YES	NO		YES	NO
GENERAL INDUSTRY PROJECT	☐	☐	CONSTRUCTION INDUSTRY PROJECT	☐	☐
CONES/BARRIERS	☐	☐	ISOLATE EQUIPMENT	☐	☐
EMERGENCY RESCUE PROCEDURES IN PLACE	☐	☐	THREE FEET OF LADDER ARE ABOVE STEPPING-OFF POINT	☐	☐
EQUIPMENT MAINTAINED	☐	☐	LADDER PLACED AT 4:1 ANGLE	☐	☐
FIRST AID PROVISION	☐	☐	WEATHER	☐	☐
RESCUE AT HEIGHTS AVAILABLE WITHIN FIVE MINUTES	☐	☐	LADDER SECCURED AT TOP AND ON LEVEL FIRM BASE TO SUPPORT LOAD	☐	☐
SAFE WORKING AREA	☐	☐	WORK EQUIPMENT INSPECTED	☐	☐

Note: General Industry requires fall protection at heights of 4 feet and greater, whearas Construction Industry requires protection at 6 feet and higher.

CONTROL THE HAZARDS: TYPE OF FALL PROTECTION SYSTEM TO BE USED

	YES	NO		YES	NO
GUARDRAILS	☐	☐	FENCES	☐	☐
PFAS	☐	☐	BARRICADES	☐	☐
SAFETY NET	☐	☐	CAGE LADDER SYSTEM	☐	☐
POSITIONING DEVICE SYSTEM	☐	☐	RIGID RAIL	☐	☐
COVERS	☐	☐	WIRE RAIL SYSTEM	☐	☐
CONTROLLED ACCESS ZONE	☐	☐	WARNING LINE SYSTEM	☐	☐

EQUIPMENT REQUIRED

Personal Fall Arrest System	YES	NO	**Guardrail System**	YES	NO
6' (1.83M) FALL-LIMITING LANYARD WITH SHOCK ABSORBER	☐	☐	MID-RAIL PLACED WITH NO GAP OF 19" (48cm)	☐	☐
ANCHORAGE POINTS DESIGNED	☐	☐	GUARD RAILS (DOUBLE ABOVE 6 [1.83m])	☐	☐
FALL ARREST (INSPECTED)	☐	☐	GUARD RAILS (TOP RAIL A MINIMUM OF 39" [1m] ABOVE PLATFORM)	☐	☐
HARNESS (INSPECTED)	☐	☐	TOE BOARDS	☐	☐
Positioning/ Restraint System	**YES**	**NO**	**Scaffolding**	**YES**	**NO**
DOUBLE LANYARD FOR 100% TIE-OFF	☐	☐	TAGGED	☐	☐
FALL RESTRAINT (INSPECTED)	☐	☐	FIXED SCAFFOLDING ERECTED BY CP	☐	☐
Other Equipment	**YES**	**NO**			
LADDERS	☐	☐			
AERIAL LIFT/ MAN LIFT/ SCISSOR LIFT	☐	☐			
RAMPS/STAIRWAYS/STEPS	☐	☐			

KEY ITEMS CHECKLIST

Fall Protection Program	YES	NO	N/A
Has a Competent Person been designated?	☐	☐	☐
Have employees received training (site specific as needed) by a Competent Person?	☐	☐	☐
Is a Qualified Person available for assistance if needed?	☐	☐	☐
Fall Protection Systems	**YES**	**NO**	**N/A**
Are midrails being used with guardrail systems?	☐	☐	☐
Are toeboards being used with guardrail systems?	☐	☐	☐
Will guardrails withstand a 200-pound force from an outward or downward direction?	☐	☐	☐
Are openings on safety nets no greater than 6-inch squares?	☐	☐	☐
Does warning line have a minimum tensile strength of 500 pounds (2,220 N)?	☐	☐	☐
Is warning line capable of supporting, without breaking, loads applied to the stanchions?	☐	☐	☐

Elevated Work Permit

Are positioning devices used for fall protection?	☐	☐	☐
Are covers appropriately marked or adequately fastened?	☐	☐	☐
If a fall protection plan is in use, has it been developed by a Qualified Person?	☐	☐	☐
Personal Fall Arrest System	**YES**	**NO**	**N/A**
Are only full body harnesses being used?	☐	☐	☐
Are lanyards with a deceleration device being used?	☐	☐	☐
Are only double-locking safety-type snap hooks being used?	☐	☐	☐
Are anchorage points capable of supporting 5,000 pounds (22.2 kilonewtons)?	☐	☐	☐
Are horizontal lifelines engineered by a Qualified Person?	☐	☐	☐
Are horizontal lifelines designed to support 5,000 pounds for each employee attached?	☐	☐	☐
Is no more than one employee being attached to a single vertical lifeline?	☐	☐	☐
Are personal fall arrest systems being adequately inspected before each use?	☐	☐	☐
Self-Retracting Lifelines	**YES**	**NO**	**N/A**
Do they automatically limit free fall distances to 2 feet?	☐	☐	☐
Are they capable of sustaining a tensile load of 3,000 pounds (13.3 kilonewtons)***?***	☐	☐	☐
Are self-retracting systems being inspected before and after each use?	☐	☐	☐
Rescue Plan	**YES**	**NO**	**N/A**
Has an effective rescue plan been developed?	☐	☐	☐
Have personnel been trained in the rescue plan?	☐	☐	☐

EMERGENCY CONTACT LIST

Emergency Contact:	**Phone 1:**	**Phone 2:**	**Location:**
Local Police:			
Local Ambulance:			
Local Fire Dept.			
Project Manager:			
Site Manager:			
Client Contact:			
Site Safety Officer:			
H&S Manager:			
Work Care	800-455-6155		

***Include any Task Specific JLA's with this permit.**

KEEP H&S FIRST IN ALL THINGS

I understand the nature of the work for this permit, and certify that this permit meets the requirements specified in the ARCADIS Elevated Work and Fall Protection Standard.

APPROVAL OF ELEVATED WORK PERMIT- By ARCADIS Competent Person:

Name: _____

Title: _____

Office Location: _____

Date: _____

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Lifting Operations Permit (Critical Lift Plan)

Project Name:	**Date:**
Project Location:	**Project Manager:**

Weight of Load Estimated or Known (Circle One) _____	Method by Which Weight was determined:_____	Center of Gravity was Estimated or Calculated (circle one):_____

Crane (if the answer to any of the following questions is NO, lifting operations shall not proceed)	**Yes**	**No**	**N/A**
1. Was a pre-lifting operations meeting held?	☐	☐	☐
2. Is the yearly crane/hoist inspection current and documented?	☐	☐	☐
3. Has the daily visual inspection been completed? (copy attached to permit)	☐	☐	☐
4. Are safety devices (e.g., two-block) installed and tested?	☐	☐	☐
5. Has qualified person assessed and accounted for wind and other environmental conditions?	☐	☐	☐
6. Is wind speed below manufacturer specified limit or 30 miles per hour (26.1 knots; 48.3 km/hour) – whichever is more conservative? If wind speed exceeds manufacturers limit or 30 mph, lifting operations shall not proceed	☐	☐	☐
7. Have precautions been established to keep other personnel out of the lift area?	☐	☐	☐
8. Was the need to protect the swing area and lift/landing zones been considered?	☐	☐	☐
9. Has the ground stability been assessed and is the ground stability adequate for the lift?	☐	☐	☐
Load (if the answer to any of the following questions is NO, lifting operations shall not proceed)	**Yes**	**No**	**N/A**
10. Has the need for taglines been evaluated and addressed?	☐	☐	☐
11. Is the load to be lifted stable? (no liquid or other material that could shift load)	☐	☐	☐
12. Have the lifting lugs and pad eyes been inspected?	☐	☐	☐
13. Have we identified/ accounted for the characteristics, weight, dimensions, center of gravity, and whether the item to be moved contains any hazardous or toxic materials?	☐	☐	☐
Critical Lift Assessment (if the answer to any of the following questions is YES, a Critical Lift Plan must be completed	**Yes**	**No**	**N/A**
14. Could loss of control of the item being lifted result in a declaration of an emergency?	☐	☐	☐
15. Could mishandling or dropping of the load result in irreplaceable damage or delays that involve a negative impact of facility or project site?	☐	☐	☐
16. Does the total load to be lifted exceed 75% of the rated capacity of the crane? (no lift is allowed if it exceeds 90% of the load chart for given crane configuration)	☐	☐	☐
17. Does the load require exceptional care in handling because of size, weight, shape, close tolerance or high susceptibility to damage?	☐	☐	☐
18. Is this a lift where the load cannot be reasonably estimated?	☐	☐	☐
19. Does this lift require multiple cranes for the lift, or the use of two or more cranes or lifting devices to lift one load simultaneously?	☐	☐	☐
20. Will this lift be performed while the operator of the lifting equipment cannot see the load? If yes, answer the following questions: Insufficient communication between the signal person, hoist operator and/or lift leader? Detail the type of communication (circle one): RADIO RELAYED HAND SIGNAL or OTHER	☐ ☐	☐ ☐	☐ ☐

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21. Are people being lifted?	☐	☐	☐
22. Will the load be lifted over the top of live process equipment/piping (e.g., gasoline, crude oil, natural gas, etc)?	☐	☐	☐
23. Could the crane come within 20 feet of an energized power line? (all power lines must be considered to be energized without proper verification) (if the answer is YES, contact the Electrical Service Provider to determine the actual electric line voltage and implement encroachment prevention measures (refer to section 5.2.1 of HSS)	☐	☐	☐

Pre-Lift Notes:	**Post Lift Notes:**

Critical Lift Details

Crane Make:	**Model #:**

Total Weight of Required Rigging:	
Total Weight of the Lift to be made:	
Additional Weight to be added to the load:	
Total Weight of the Lift:	
Allowable Load (from the load chart):	
Ratio Calculation: Total Lift Weight divided by the Crane Lift Weight Capacity x 100 (if value exceeds 90%, **STOP WORK**)	
Maximum Operating Boom Radius:	
Planned Operating Boom Radius:	

Rigging Diagram (attach separate page if needed)**:**	**Crane Setup Diagram** (attach separate page if needed)**:**

Emergency and Rescue Plan

Detail Emergency Planning and Notification Procedures (attach separate page if needed):

Critical Lift Plan Signatures

I certify that the weight of the lift is less than 90% of the allowable load (from the load chart) at the planned boom radius:

Lift Leader Name:	Lift Leader Signature:	Date:
Rigger Name:	Rigger Signature:	Date:
Crane/Hoist Operator Name:	Crane/Hoist Operator Signature:	Date:

Signal Person Name:	Signal Person Signature:	**Date:**

**** Must attach hoisting equipment and sling/rigging equipment inspection checklists and Hoisting/Lifting JSA****

Equipment Lockout / Tagout (LO/TO) Permit to Work

Equipment:		**Project Number:**	
Project Name:		**Project Location:**	
Name of Authorized Person in Control of LO/TO Process:		**Name of Authorized Person applying Equip Isolation Device:**	
Name of Authorized Person that verified Hazardous Energy Source is controlled:		**Name of NFPA 70e Authorized Person (If Required):**	
Start Date for LO/TO Procedure:		**Estimated Date of Completion for LO/TO Procedure:**	
Estimated Start Time for LO/TO Procedure:		**Estimated Completion Time for LO/TO Procedure:**	

TRACKing the LO/TO Work Permit

THINK THROUGH THE TASK

Job Task: (Brief summary of what hazardous energy control work is proposed)

WORKFORCE INVOLVED/AFFECTED BY LO/TO WORK — **Check all the apply**

Name	Company	Phone Number	Reviwed LO/TO Procedure	LO/TO Authorized Person	NFPA 70e Authorized Person	Affected Employee	Affected Employee Trained
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐

Comments/Additional Details:

RECOGNIZE THE HAZARDOUS ENERGY SOURCE (check all that apply) and ASSESS THE RISK (Low-Moderate-High)

YES	NO	Type of Hazardous Energy	SELECT ↓	YES	NO	Type of Hazardous Energy	SELECT ↓
☐	☐	Electrical		☐	☐	Thermal	
☐	☐	Mechanical		☐	☐	Gravitational (Stored)	
☐	☐	Hydraulic		☐	☐	Pressure (Stored)	
☐	☐	Pneumatic		☐	☐	Hazardous Material	
☐	☐	Chemical		☐	☐	Other Hazard	

CONTROL THE WORKING ENVIRONMENT

Written LO/TO Procedure	YES	NO	Written LO/TO Procedure Eception	YES	NO
Developed an Equipment LO/TO Procedure	☐	☐	Written LO/TO Procedure Eception	☐	☐
Identified all hazardous energy sources	☐	☐	Equipment has been removed from service	☐	☐
Equipment LO/TO Procedure Reviwed with the past 12 months	☐	☐	Locking devices and Tags in use	☐	☐
Identified all hazardous energy sources	☐	☐	Equipment reduced to zero energy state	☐	☐
Notified affected employees	☐	☐	Equipment has been isolated	☐	☐
Locking devices and Tags in use	☐	☐	Equipment isolation tested/verified	☐	☐

All No responses; Use Stop Work Authority- Explain Control Work Environment:

LO/TO POINTS ISOLATED BY AUTHORIZED PERSON(S)
Refrence Written LO/TO Procedure

Hazard	Action Required	Lock ID / #	Authorized Person Name	Date LOTO Applied	Date LO/TO Removed

EMERGENCY CONTACT LIST

Emergency Contact:	Phone 1:	Phone 2:	Location:
Emegency (FIRE/EMS):			
Emegernсy (Facility):			
Work Care:	888.449.7787	-------	
Project Manager:			
Site Safety Officer:			
Client Contact:			
Other:			

***Include any Task Specific JSA's with this permit to work.**

KEEP H&S FIRST IN ALL THINGS

I understand the nature of the work for this permit, and certify that this permit meets the requirements specified in the Arcadis LO/TO Standard.

Completed Permit to Work Must Be Retained in Project File for 12 Months

APPROVAL OF LO/TO WORK PERMIT- By ARCADIS LO/TO Authorized Person:

Name: _____ Office Location: _____

Title: _____ Date: _____

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Permit-Required Confined Space Entry Permit

Permit No. _____
(e.g., PRCS - Project Number - Date - #{sequential for day})

Project Name:	Date / Time:
Project Number:	Project Location:
Permit Prepared By:	Project Manager:

Location and Description of Confined Space:

Rescue Contact and Phone Number:

Note: If relying on local emergency services for emergency rescue, detail how we have coordinated advance notice if local emergency service will be unable to respond for a period of time (because they are responding to another emergency, attending department-wide training, etc.):

Entry Objectives:

Equipment / Materials Required for Entry:

Time of Entry:	Expiration of Entry:

Respirator Required for Entry: (Explain)

Required Protective Clothing for Entry:

Air Monitoring Interval: (Circle Selection) Continuous | Every 15min* | Every 30min* | Every Hour*

* If continuous monitoring isn't feasible detail reasoning for air monitoring interval selected:

Pre-Entry Air Monitoring

(enter pre-entry readings below, subsequent readings record in attachment or log published in the project HASP)

Monitoring For	Monitoring Equipment	Calibration Info: Date / Time	Calibration Info: By	Pre-Entry Reading	Values outisde defined Aceptable Range = **Hazardous Atmosphere**[1]
% Oxygen					19.5 – 23.5%
% of LEL					<10% LEL
Hydrogen Sulfide-H_2S					<1 ppm TLV-TWA
					<5 ppm TLV-STEL
Carbon Monoxide-CO					<25 ppm
Combustible Dust (LFL)					< LFL (Dust that dosn't not obscure vision at a distance of 5ft)
Other:					

[1] Refer to the Confined Space Standard for details on acceptable ranges based on entry classification.
TLV-STEL - Short-term exposure limit: Employee can work in the area up to 15 minutes
TLV-TWA - 8 hr. Time Weighted Avg (PEL/TLV): Employee can work in area 8 hrs (longer with appropriate respiratory protection)

Pre-Entry Atmospheric Testing Conducted By

Print Name:	Date:
Signature:	Time:

Pre-Entry Checklist				
Checklist	**YES**	**NO**	**N/A**	**Comment**
Competent Person completed confined space evaluation?	☐	☐	☐	
Are all lines to and from confined space blanked, capped, or isolated?	☐	☐	☐	
Are lines purged, flused and vented?	☐	☐	☐	
Electrical service locked out (entrant with key)?	☐	☐	☐	
Are mechanical devices / systems restrained and locked out?	☐	☐	☐	
If mechanical ventilation is needed, is it in place and functioning?	☐	☐	☐	
If relying upon natural ventilation only, is air monitoring in place?	☐	☐	☐	
Is explosion-proof electrical equipment in use?	☐	☐	☐	
If required, are we using non-sparking tools?	☐	☐	☐	
Are ladders secured at top?	☐	☐	☐	
Are the permanent ladder rungs in safe condition?	☐	☐	☐	
Is the ground fault circuit interrupter checked and functioning?	☐	☐	☐	
Are all ignition sources identified and isolated?	☐	☐	☐	
Are warning signs posted?	☐	☐	☐	
Is required PPE being used?	☐	☐	☐	
Are respirators and air supply equipment in proper condition?	☐	☐	☐	
Are safety harnesses and lifelines in proper condition?	☐	☐	☐	
Is a full-body harness with back "D" ring being used ?	☐	☐	☐	
Is the retrieval system (hoist, etc.) functioning properly?	☐	☐	☐	
Is emergency equipment ready for use?	☐	☐	☐	Fire extinguisher, first aid/CPR supplies, etc.
Are rescue provisions in place?	☐	☐	☐	
Has rescue plan (entry or non-entry) been practiced in last 12 moths?	☐	☐	☐	
Communication device for entrance and attendants?	☐	☐	☐	Explain here:

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Pre-Entry Checklist				
Checklist	**YES**	**NO**	**N/A**	**Comment**
Is air monitoring equipment calibrated and functioning properly?	☐	☐	☐	Calibrated according to manufacturer requirements and daily verification with certified calibration gas
Is pre-entry atmospheric testing completed and within range?	☐	☐	☐	
Is a trained attendant on standby?	☐	☐	☐	
If high hazard work is conducted, are other permits (welding, etc.) in place?	☐	☐	☐	Explain here:
If entry rescue is planned, are SCBAs on site and ready as needed?	☐	☐	☐	
Is the area secured to eliminate unauthorized entry?	☐	☐	☐	
Are entry personnel trained for confined space entry?	☐	☐	☐	
Is this confined space entry permit completed, signed and posted?	☐	☐	☐	

Confined Space Rescue (Non-Entry or Entry Rescue Assistance)		
PRCS Rescue Type: (Circle Selcetion)	Non-Entry Rescue or Entry Rescue	If Entry Rescue is selected, identify names, qualifications and verification of rescue capabilities for type of confined space entry planned by contracted service (Arcadis staff are not permitted to perform entry rescue)
Entry Rescuer Name:		Qualifications:
Has Selected Rescue Type & Capabilities been Confirmed and Practied? (<12months)		Yes / No
Provide details on Non-Entry Rescue or Entry Rescue Assistance here:		

Permit Required Confined Space Entrants and Attendants	
Total Number of Entrants: (Arcadis + Other Authorized Entrants)	Total Number of Attendants: (Arcadis + Other Authorized Attendants)

Arcadis Entrant Signature(s)

I have been properly instructed on safe entry into this Permit Required Confined Space and understand my duties including STOP WORK Authority and the Emergency Evacuation Procedures

Entrant 1 - Print Name: Entrant 1 Signature:	Date:	Time:
Entrant 2 - Print Name: Entrant 2 Signature:	Date:	Time:
Entrant 3 - Print Name: Entrant 3 Signature:	Date:	Time:

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Arcadis Entrant Signature(s)		
I have been properly instructed on safe entry into this Permit Required Confined Space and understand my duties including STOP WORK Authority and the Emergency Evacuation Procedures		
Entrant 4 - Print Name: Entrant 4 Signature:	Date:	Time:
Entrant 5 - Print Name: Entrant 5 Signature:	Date:	Time:
Entrant 6- Print Name: Entrant 6 Signature:	Date:	Time:

Attendant Signature	
I have reviewed the Arcadis Confined Space Standard, the completed confined space evaluation form and this entry permit and I understand my responsibilities as an Attendant	
Print Name:	Date:
Signature:	Time:
Print Name:	Date:
Signature:	Time:

Other Authorized Entrants (Contractor, Client, Regulator) Entering Permit Required Confined Space	
Multi-employer work site activities coordinated?	Yes / No / NA
Confirmed that workers working outside confined space won't introduce hazards into Permit Required Confined Space?	Yes / No / NA
I have been properly instructed on safe entry into this Permit Required Confined Space and understand my duties including STOP WORK Authority and the Emergency Evacuation Procedures	
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date

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Entry Supervisor Authorizing Confined Space Entry Permit

Entry Supervisor has reviewed the work authorized by this permit, the information contained here-in and has reviewed the confined space evaluation form. Written instructions and safety procedures have been received and are understood. Entry cannot be approved if any questions are answered with a "No". This permit is not valid unless all appropriate items are completed

Entry Supervisor Name (Print):	Date:
Entry Supervisor Signature:	Time:

Construction Work ONLY

Entry Supervisor Suspending Permit Required Confined Space Entry Permit

Detail the situation that warranted the temporary suspension of the Construction Work Permit Required Confined Space Entry Permit:

OSHA Construction Confined Space standard allows for the suspension of a permit, instead of cancellation, in the event of changes from the entry conditions listed on the permit or an unexpected event requiring evacuation of the space. The space must be returned to the entry conditions listed on the permit before re-entry.

Entry Supervisor Name (Print):	Date Permit Suspended
Entry Supervisor Signature:	Time Permit Suspended

Detail how the space was returned to entry conditions listed on this permit before re-entry is allowed:

Entry Supervisor Name (Print):	Date Permit Reinstated
Entry Supervisor Signature:	Time Permit Reinstated

Entry Supervisor Canceling Confined Space Entry Permit

Entry Supervisor Name (Print):	Date:
Entry Supervisor Signature:	Time:

Submit a copy of the Completed / Cancelled Confined Space Entry Permit to Corporate H&S @ 4-Sight-Support@arcadis-us.com. Addtionaly this Completed / Cancelled Confined Space Entry Permit is to be reatined in project files.

Documenting Problems Encountered During Permit Required Confined Space Entry

Describe problem/incident:

Detail corrective actions implemented:

Detail confined space program / standard revisions required:

Submit a copy of the Completed / Cancelled Confined Space Entry Permit to Corporate H&S @ 4-Sight-Support@arcadis-us.com. Addtionaly this Completed / Cancelled Confined Space Entry Permit is to be reatined in project files.

ARCADIS Design & Consultancy for natural and built assets

Permit Required Confined Space Entry
Air Monitoring Documentation

Permit No. _____
(e.g., PRCS - Project Number - Date - #{sequential for day})

Project Name:	Date:
Project Number:	Location:
Air Monitoring Conducted By:	Project Manager:

Air Monitoring

Time	Monitoring Equipment	% Oxygen	% of LEL	Hydrogen Sulfide-H_2S	Carbon Monoxide-CO	Combustible Dust (LFL)	Other / Comment
Values beyond defined Aceptable Range = Hazardous Atmosphere		19.5–23.5%	<10% LEL	<1 ppm TWA <5 ppm STEL	<25 ppm	< LFL (Dust that dosn't not obscure vision at a distance of 5ft)	

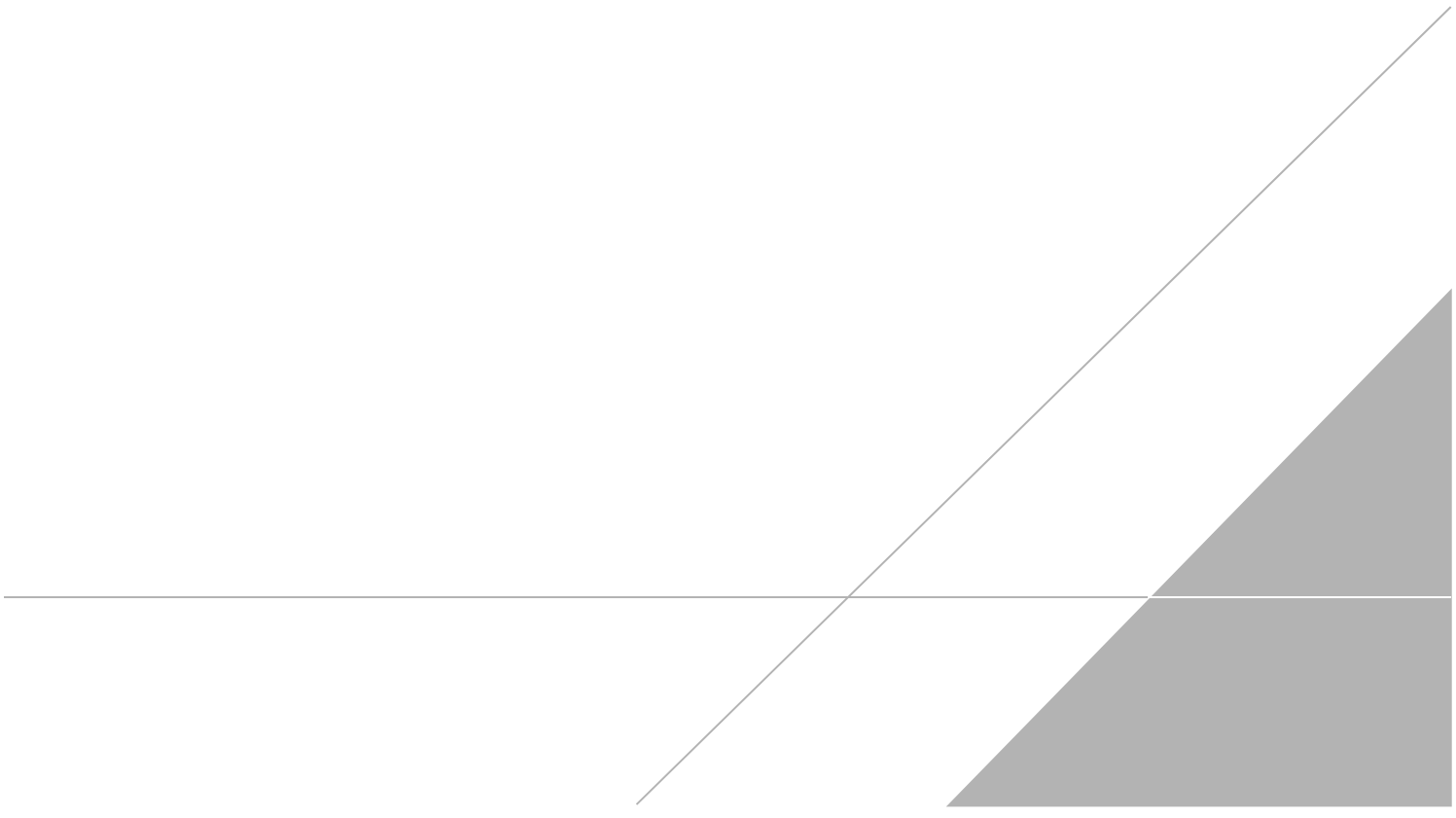
Competent person shall use a meter calibrated to manufacturer specifications and validated using calibration grade gas daily. Calibration and validation must be documented and attached to this form.

Print Name:	Date:
Signature:	

APPENDIX C

HAZARD COMMUNICATION/GLOBALLY HARMONIZED SYSTEM

Hazard Com GHS



Hazard Communication (HAZCOM)/Global Harmonization System (GHS)

☐ HAZCOM/GHS for this project is managed by the client or general contractor

List the chemicals anticipated to be used by Arcadis on this project per HAZCOM/GHS requirements.
(Modify quantities as needed)

	Preservatives	Qty
X	Not applicable	
	Hydrochloric acid	<500 ml
	Nitric acid	<500 ml
	Sulfuric acid	<500 ml
	Sodium hydroxide	<500 ml
	Zinc acetate	<500 ml
	Ascorbic acid	<500 ml
	Acetic acid	<500 ml
	Isopropyl alcohol	< 4 gal.
	Formalin (<10%)	< 4 gal.
	Methanol	<500 ml
	Sodium bisulfate	<500 ml

	Decontamination	Qty
	Not applicable	
X	Alconox	≤ 5 lbs
X	Liquinox	≤ 1 gal
	Acetone	≤ 1 gal
	Methanol	≤ 1 gal
	Hexane	≤ 1 gal
	Isopropyl alcohol	≤ 4 gal
	Nitric acid	≤ 1 L
	Other:	

	Calibration	Qty.
X	Not applicable	
	Isobutylene/air	1 cyl
	Methane/air	1 cyl
	Pentane/air	1 cyl
	Hydrogen/air	1 cyl
	Propane/air	1 cyl
	Hydrogen sulfide/air	1 cyl
	Carbon monoxide/air	1 cyl
	pH standards (4,7,10)	≤ 1 gal
	Conductivity standards	≤ 1 gal
	Other:	

	Fuels	Qty.
	Not applicable	
X	Gasoline	≤ 5 gal
X	Diesel	≤ 5 gal
	Kerosene	≤ 5 gal
	Propane	1 cyl
	Other:	
X	Motor Oil	

	Kits	
X	Not applicable	
	Hach (specify):	
	DTECH (specify):	
	Other:	

		Qty.
		1 kit
		1 kit
		1 kit

	Remediation	Qty.
	Not applicable	
X	2-Cycle Engine Oil	
X	Hydraulic Fluid	

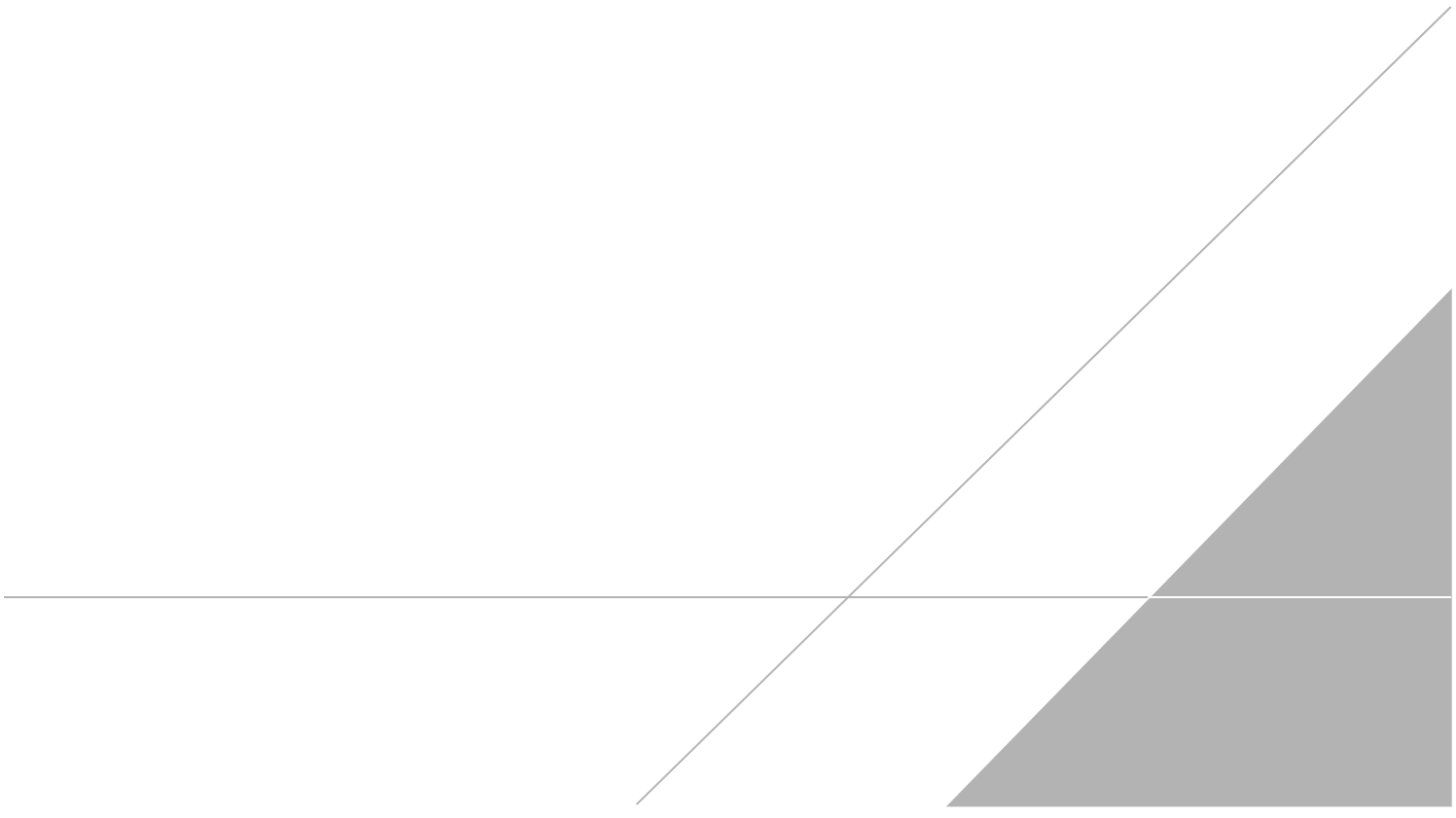
	Other:	Qty.
	Not applicable	
X	Spray paint	≤ 6 cans
	WD-40	≤ 1 can
	Pipe cement	≤ 1 can
	Pipe primer	≤ 1 can
	Mineral spirits	≤ 1 gal

	DOT(1):	Qty.
	MOT eligible soils	
	MOT eligible water	
	MOT eligible solids	
	MOT eligible liquids	

(1) Attach applicable Materials of Trade (MOT) generic shipping determination. SDS not generally applicable to this category.

NA

SDS



STIHL HP (HIGH PERFORMANCE) 2-CYCLE ENGINE OIL

Packaged for Stihl Incorporated, 536 Viking Drive, Virginia Beach, VA 23452

Safety Data Sheet

Conforms to HCS 2012 (29 CFR 1910.1200)

Section 1. Identification

Product identifier

Product Name: **STIHL HP (High Performance) 2-Cycle Engine Oil**

Other names: F3E

Part/Product Number(s): 0781-319-8008, 0781-319-8009, 0781-319-8010, **0781-319-8014**, **0781-319-8015**, **0781-319-8016**, **0781-319-8044**, **0781-319-8045**, **0781-319-8049**, 0781-319-8051, **7010-871-0208**, **7010-871-0177**

Material Use: 2-cycle engine fuel additive

Uses advised against: Not for use in non-2-cycle engines

Manufacturer: Omni Specialty Packaging, LLC
10399 Hwy 1 South
Shreveport, LA 71115
1-318-524-1100

Issuing date: May 21, 2015

Revision date: June 2, 2015

Revision number: 001

Company contact: OMNI EHS Department; E-Mail: sds@osp.cc; Contact phone: 318-524-1100
(Monday-Friday, 8:00 AM – 4:00 PM, CST)

In case of emergency: CHEMTREC: Within USA and Canada: 1 (800) 524-9300 (24/7)
CHEMTREC Outside USA and Canada: +1 703-527-3887 (24/7)

Section 2. Hazards Identification

OSHA/HCS Status: This product is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or Mixture: Not classified

GHS Label Elements

Hazard pictograms:

Signal word: None

Appearance: Blue **Physical State:** Liquid **Odor:** Petroleum distillates

Hazard statement: None

Precautionary statements

General: Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand.

Prevention: Not applicable

Response: Not applicable

Storage: Not applicable

Disposal: Not applicable

Hazards not otherwise classified (HNOC): Defatting to the skin.

Other information: Product diluted with gasoline must be handled with the same precautions used for gasoline. Before mixing, the Safety Data Sheet for gasoline should be consulted for any precautionary measures necessary.

Section 3. Composition/Information on Ingredients

Petroleum mineral oil lubricant base stock with proprietary performance additives mixture.

Substance/mixture: Mixture

Components Name	CAS number	Weight %*
Lubricant Base Oil (Petroleum) Highly refined mineral oils (C15-C50)	Various	85 – 95
2-Cycle Engine Oil Additives Mixture	Proprietary	5 – 15

This product does not contain known hazardous materials at the ≥ 1% level or known carcinogens at the ≥ 0.1% level as defined by 29 CFR 1910.1200.

* The exact percentage of composition has been withheld as a trade secret.

Section 4. First Aid Measures

Description of necessary first aid measures

General Advice: No specific first aid measures are required. Get medical attention if irritation develops and persists.

Eye contact: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Check for and remove any contact lenses. Get medical attention if irritation develops and persists.

Skin contact: Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation or allergic reaction develops and persists.

Inhalation: In case of inhalation of decomposition products in a fire, symptoms may be delayed. If inhaled, remove to fresh air. The exposed person may need to be kept under medical surveillance for 48 hours. Get medical attention if symptoms occur.

Ingestion: Do NOT induce vomiting. Drink plenty of water. If symptoms persist, call a physician.

Protection of first-aiders: No action shall be taken involving any personal risk or without suitable training. Remove all sources of ignition. Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination. Wear personal protective clothing (see section 8).

Most important symptoms and effects, both acute and delayed

See Section 11 for more detailed information on health effects and symptoms.

Most Important Symptoms and Effects: Personnel with pre-existing skin disorders should avoid contact with this product. Under normal use conditions, no adverse effects to health are known.

Eye contact: Not expected to cause prolonged or significant eye irritation.

Skin contact: Contact with skin is not expected to cause prolonged or significant irritation. Contact with skin is not expected to cause an allergic skin response. Not expected to be harmful to internal organs if absorbed through the skin.

Inhalation: Not expected to be harmful if inhaled. Contains petroleum-based mineral oil. May cause respiratory irritation or other pulmonary effects following prolonged or repeated inhalation of oil mist at airborne levels above the recommended oil mist exposure limit. Symptoms of respiratory irritation may include coughing and difficult breathing.

Ingestion: Not expected to be harmful if swallowed.

Note to physician: Treat symptomatically.

Section 5. Fire-Fighting Measures

Uniform Fire Code: Class IIIB

Flash Point: 222°C (432°F)

Extinguishing Media

Suitable Media: In case of fire, use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Use water fog, alcohol resistant foam, dry chemical, carbon dioxide (CO2) extinguisher or spray.

Unsuitable Media: CAUTION: Use of water spray when fighting fire may be inefficient.

Specific Hazards Arising from the Chemical: Keep product and empty container away from heat and sources of ignition as product will burn. Contact with strong oxidizers may cause fire. In the event of fire, cool tanks with water spray. Fire residues and contaminated fire extinguishing water must be contained, prevented from being discharged to any waterway, sewer or drain and disposed of in accordance with local regulations.

Hazardous Combustion Products: Combustion products may include the following: Carbon dioxide (CO2) Carbon monoxide (CO), and Nitrogen oxides.

Protection of Fire Fighters: Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

Section 6. Accidental Release Measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel: No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Do not touch or walk through spilled material. Put on appropriate personal protective equipment. Floors may be slippery; use care to avoid falling.

For emergency responders: If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. Ensure adequate ventilation. Keep people away from and upwind of spill/leak. Pay attention to flashback. Take precautionary measures against static discharges. All equipment used when handling the product must be grounded. See also the information in "For non-emergency personnel".

Environmental precautions: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). See Section 12 for ecological information.

Methods and materials for containment and cleaning up

Small Spills: Stop leak if without risk. Move containers from spill area. Absorb with an inert material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large Spills: Stop leak if without risk. Move containers from spill area. Prevent entry into sewers, water courses, basements or confined areas. Contain and collect spillage with non- combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations. Dispose of via a licensed waste disposal contractor.

NOTE: If RQ (Reportable Quantity) is exceeded or if spills enter a body of water, report immediately to the USEPA's National Response Center at (800) 424-8802. Check with your local and state regulators regarding their reporting requirements.

Section 7. Handling and Storage

Precautions for safe handling

Protective measures: Eye protection and face shield should be used if material is used under conditions that increase the chances of splattering. Put on appropriate personal protective equipment (see Section 8). Keep out of reach of children.

NOTE: Product diluted with gasoline must be handled with the same precautions used for gasoline. Before mixing, the Safety Data Sheet for gasoline should be consulted for any precautionary measures necessary.

Advice on general occupational hygiene: Do not get in eyes, on skin or on clothing. Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Wash thoroughly after handling. Remove contaminated clothing and protective equipment before entering eating areas.
See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, Including any incompatibilities: Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials, strong oxidizing agents (see Section 10) and food and drink. Keep away from heat, sparks, flame and other sources of ignition (i.e., pilot lights, electric motors and static electricity). Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Use appropriate containment to avoid environmental contamination. Avoid contaminating soil or releases into sewage or drainage systems and bodies of water.

Section 8. Exposure Controls/Personal Protection

Control parameters

Occupational Exposure Limits

Chemical name	ACGIH		OSHA		NIOSH	
	TLV	STEL	PEL	STEL	TWA	Ceiling
Lubricant Base Oil (Petroleum) Highly refined mineral oils (C15-C50)	5 mg/m3 (mist)	10 mg/m3 (mist)	5 mg/m3 (mist)	–	–	–

Appropriate engineering controls: Good general ventilation should be sufficient to control worker exposure to airborne contaminants. Emergency shower and eyewash station.

Environmental exposure controls: Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures: Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/Face Protection: Wear safety glasses with side shields. A face shield may be necessary under some conditions.

Skin and Body Protection

Hand protection: Wear protective gloves if prolonged or repeated contact is likely. Wear chemical resistant gloves. Recommended: Nitrile gloves. Consult your supervisor or Standard Operating Procedure (SOP) for special handling instructions.

Body protection: No protective equipment is needed under normal use conditions. For non-routine tasks, personal protection equipment for the body should be selected based on the

task being performed and the risks involved.

Other skin protection: Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved.

Respiratory protection: No respiratory protection is normally required. If user operation generates an oil mist, determine if airborne concentrations are below the occupational exposure limit for mineral oil mist. If not, wear an approved respirator that provides adequate protection from measured concentrations of this material. The correct choice of respiratory protection depends upon the chemicals being handled, the conditions of work and use, and the condition of the respiratory equipment. For air-purifying respirators use a particulate cartridge. Use a positive pressure air-supplying respirator in circumstances where air-purifying respirators may not provide adequate protection.

Section 9. Physical and Chemical Properties

Appearance	(Typical or Target)
Physical State:	Liquid
Color:	Blue
Odor:	Petroleum distillates
Odor threshold:	Not available
pH:	Not applicable
Boiling Point:	Not available
Flash Point (Closed cup):	222°C (432°F) (Typical or Target)
Pour Point:	-25°C (-13°F) (Typical or Target)
Evaporation rate (Butyl acetate = 1):	Not available
Flammability (solid, gas):	Not applicable. Based on - Physical state
Flammable) Limit in Air	Not available
Vapor pressure:	Not available
Vapor density (Air = 1):	>1
Relative density:	0.8820 - 0.8990 g/l at 15°C (Typical or Target)
Solubility:	In soluble in water
Partition coefficient (n-Octanol/water):	Not available
Auto-ignition temperature:	Not available
Decomposition temperature:	Not available
Viscosity – Kinematic (cSt (mm2/s)@ 40°C):	85 to 100
Viscosity – Kinematic (cSt (mm2/s) @ 100°C):	10.3 to 12
VOC %:	<0.026%

Section 10. Stability and Reactivity

Reactivity:	Not reactive under normal storage conditions
Chemical stability:	Stable under normal storage conditions
Possibility of hazardous reactions:	None under normal processing.
Hazardous polymerization:	Hazardous polymerization does not occur.
Conditions to avoid:	Heat, flames and sparks.
Incompatible materials:	Oxidizing agents, Halogens, Halogenated compounds
Hazardous decomposition products:	May include: Fumes, Oil vapors, Smoke, Carbon Oxides (including carbon monoxide and carbon dioxide), Aldehydes, Nitrogen oxides, and incomplete combustion products.

Section 11. Toxicological Information

Information on toxicological effects

Basis for Assessment: Information given is based on product data, a knowledge of the components and the toxicity of similar products.

Likely Routs of Exposure: Exposure may occur via skin absorption, skin or eye contact, inhalation, ingestion.

Substance/Mixture

Acute Toxicity	Oral LD50	Dermal LD50	Inhalation LC50
Lubricant Base Oil (Petroleum) Highly refined mineral oils (C15-C50) Mixture - Typical	>2000 mg/Kg (rat)	>2000 mg/Kg (rabbit)	>2.18 mg/L (rat) 4h (mist)

Aspiration hazard: Not expected to be an aspiration hazard.

Skin Corrosion/Irritation: No known significant effects or critical hazards.

Serious Eye Damage/Irritation: No known significant effects or critical hazards.

Skin Sensitization: No known significant effects or critical hazards.

Respiratory Sensitization: No known significant effects or critical hazards.

Specific Target Organ Toxicity (Single Exposure) - STOT-SE: No known significant effects or critical hazards.

Specific Target Organ Toxicity (Repeated Exposure) – STOT-RE: No known significant effects or critical hazards.

Carcinogenicity: No known significant effects or critical hazards.

Germ Cell Mutagenicity: No known significant effects or critical hazards.

Reproductive Toxicity No known significant effects or critical hazards.

Information on Toxicity Effects of Compounds

Lubricant Base Mineral Oil (Petroleum)

Mineral oils are known to cause cancer because of carcinogenic components (e.g. Benzene). The lubricant base mineral oils in this product have been highly refined by a variety of processes including severe solvent extraction, severe hydro cracking or severe hydro treating to reduce aromatics and improve performance characteristics. The oils in the is product meets the IP-346 criteria of less than 3 percent PHA's and are not considered to be a carcinogen by the International Agency for Research on Cancer.

None of the oils in this product requires a cancer warning under the OSHA Hazard Communication Standard (29 CFR 1910.1200). These oils have not been listed in the National Toxicology Program (NTP) Annual Report nor have they been classified by the International Agency for Research on Cancer (IRAC) as: carcinogenic to humans (Group 1), probably carcinogenic to humans (Group 2A), or possibly carcinogenic to humans (Group 2B). These oils have not been classified by the American Conference of Governmental Industrial Hygienists (ACGIH) as: confirmed human carcinogen (A1), suspected human carcinogen (A2), or confirmed animal carcinogen with unknown relevance to humans (A3).

2-Cycle engine oils mix with gasoline:

2-cycle engine oils diluted with gasoline must be handled with the same precautions used for gasoline. Before mixing, the Safety Data Sheet for gasoline should be consulted for any precautionary measures necessary.

Section 12. Ecological Information

The information is based on data available for the material, the components of the material, and similar materials.

Ecotoxicity: No testing has been performed by the manufacturer. Ecotoxicity hazard is based on an evaluation of data for the components or a similar material. Not expected to be harmful to aquatic organisms.

Mobility: Base oil component – Low solubility and floats and is expected to migrate from water to land. Expected to partition to sediment and wastewater solids.

Soil/water partition coefficient (K_{OC}): Not available.

Persistence and degradation

Biodegradation: The material is not expected to be readily biodegradable. The biodegradability of this material is based on an evaluation of data for the components or a similar material.

Bioaccumulative potential

Bioaccumulation: This product is not expected to bioaccumulate through food chain in the environment.

Other adverse effects: No known significant effects or critical hazards.

Other ecological information: Spills may form a film on water surfaces causing physical damage to organisms. Oxygen transfer could also be impaired.

Section 13. Disposal Considerations

Disposal recommendations based on material supplied.

Waste treatment methods: This material, as supplied, is not a hazardous waste according to Federal regulations (40 CFR 261). Consult the appropriate state, regional, or local regulations for additional requirements. The generation of waste should be avoided or minimized wherever possible.

Product waste: Significant quantities of waste product residues should not be disposed of via the sanitary sewer but processed in a suitable effluent treatment plant. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Incineration or landfill should only be considered when recycling is not feasible. Oil collection services are available for used oil recycling.

Contaminated packaging: Empty containers or liners may retain some product residues and could pose a potential fire and explosion hazard. Do not cut, puncture, or weld containers.

Other information: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport Information

General information: Petroleum Lubricating oil - Not regulated.

	DOT Classification	IMDG	IATA
Stihl HP 2-Cycle	Not Regulated	Not Regulated	Not Regulated

Special precautions for user: Transport within user's premises: Always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Section 15. Regulatory Information

United States Regulations

United States Inventory (TSCA 8b): All components are listed or exempted.

SARA 302/304: No products were found.

SARA 311/312:

Immediate (Acute) Health Effects:	No
Delayed (Chronic) Health Effects:	No
Fire Hazard:	No
Sudden Release of Pressure Hazard:	No
Reactivity Hazard:	No

SARA 313:
The following components of this material are found on the EPCRA 313 list:
None

Supplier notification: This product does not contain any hazardous ingredients at or above regulated thresholds.

CWA (Clean Water Act): This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

CERCLA: This material, as supplied, does not contain any substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302).

State Regulations

Massachusetts:	None of the components are at or above regulated thresholds.
New Jersey:	None of the components are at or above regulated thresholds.
Pennsylvania:	None of the components are at or above regulated thresholds.
California Proposition 65:	WARNING: This product contains a chemical known to the State of California to cause cancer. Ethylbenzene - <0.1

Canada

WHMIS Hazard Class: Not classified.

International Chemical Inventories:

All components comply with the following chemical inventory requirements: DSL (Canada)

Section 16. Other Information

NFPA Rating:	**Health Hazard – 1**	**Flammability – 1**	**Instability/Reactivity – 0**
HMIS Rating:	**Health Hazard – 1**	**Flammability – 1**	**Physical Hazards – 0**

(NFPA & HMIS Hazard Rating Key: 0 - Minimum Hazard; 1 - Slight Hazard; 2 - Moderate Hazard; 3 - High Hazard; 4 - Extreme Hazard; * - Chronic Hazard Indicator, & PPE - Personal Protective Equipment Index A to L. These values are obtained using the guidelines or published evaluations prepared by the National Fire Protection Association (NFPA) or the National Paint and Coating Association (for HMIS or Hazardous Material Identification System).

Key to abbreviations:

OSHA = Occupational Safety and Health Administration
ACGIH= American Conference of Industrial Hygienists
ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
CAS = Chemical Abstracts Service Registry Number
cSt = Centistroke (mm2/s)
GHS = Global Harmonized System of Classification and Labeling Of Chemicals.
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
OEL = Occupational Exposure Limit
SDS = Safety Data Sheet
STEL = Short term exposure Limit
UN = United Nations
UN Number = United Nations Number, a four digit number assigned by the United Nations Committee of Experts on the Transportation of Dangerous Goods

Prepared By: **OMNI Specialty Packaging EH&S Department**

Revision Date: **June 2, 2015**

Status: **Final**

Revision Note: **Revision 001 of OSHA GHS SDS format.**

Consumer Product Improvement Act of 2008, General Conformity Certification

For Consumer Product Packages: This product has been evaluated and is certified to be labeled and packaged in compliance with the applicable provisions of the Federal Hazardous Substance Act as stated in 16 CFR 1500 and enforced by the Consumer Product Safety Commission. Where applicable the products that require Child Resistant Closures are packaged in accordance with the Poison Prevention Packaging Act as stated in 16 CFR 1700 and enforced by the Consumer Product Safety Commission. All closures have been tested in accordance with the latest protocols. No testing is required to certify compliance with the provisions. The date of the manufacturing is stamped on the product container.

Disclaimer

All reasonably practicable steps have been taken to ensure the information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text. This information is furnished upon condition that the person receiving it shall make their own determination of the suitability of the material for their particular purpose.

End of Safety Data Sheet

Safety Data Sheet

Material Name: Hess 10W30 Motor Oil

SDS No. 8957
US GHS

Synonyms: Valvoline Product Code 52670413

* * * Section 1 - Product and Company Identification * * *

Manufacturer Information

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

Phone: 732-750-6000 Corporate EHS
Emergency # 800-424-9300 CHEMTREC
www.hess.com (Environment, Health, Safety Internet Website)

* * * Section 2 - Hazards Identification * * *

GHS Classification:

Skin Corrosion/Irritation – Category 2
Specific Target Organ Toxicity – Category 3 (narcosis)
Carcinogenicity - Category 1B

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

WARNING

Hazard Statements

Causes skin irritation.
May cause cancer.
May cause drowsiness or dizziness.

Precautionary Statements

Prevention

Wash hands and forearms thoroughly after handling.
Wear protective gloves/protective clothing/eye protection.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Avoid breathing fume/mist/vapors/spray.
Use only outdoors or in a well-ventilated area.

Response

If on skin: Wash with plenty of soap and water. Take off contaminated clothing and wash it before reuse. If skin irritation occurs: Get medical advice/attention.
If exposed or concerned: Get medical advice/attention.
If inhaled: Remove person to fresh air and keep in a position comfortable for breathing. Call poison center or doctor if you feel unwell.

Safety Data Sheet

Material Name: Hess 10W30 Motor Oil

Storage

Store locked up.
Store in a well-ventilated place.
Keep container tightly closed.

Disposal

Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 3 - Composition / Information on Ingredients * * *

CAS #	Component	Percent
64742-65-0	Petroleum distillates, solvent dewaxed heavy paraffinic	83-93

Petroleum-based lubricating oil with detergent/dispersant engine oil package with zinc compounds.

* * * Section 4 - First Aid Measures * * *

First Aid: Eyes

If symptoms develop, move individual away from exposure and into fresh air. Flush eyes gently with water while holding eyelids apart. If symptoms persist or there is visual difficulty, seek medical attention.

First Aid: Skin

Remove contaminated clothing. Wash exposed area with soap and water. If symptoms persist, seek medical attention. Launder clothing before reuse.

First Aid: Ingestion

Seek medical attention. If individual is drowsy or unconscious, do not give anything by mouth; place individual on the left side with the head down. Contact a physician, medical facility, or poison control center for advice about whether to induce vomiting. If possible, do not leave individual unattended.

First Aid: Inhalation

Remove person to fresh air. If person is not breathing provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

First Aid: Notes to Physician

Acute aspiration of large amounts of oil-laden material may produce a serious aspiration hazard. Patients who aspirate these oils should be followed for the development of long-term sequelae. Repeated aspiration of mineral oil can produce chronic inflammation of the lungs (i.e. lipoid pneumonia) that may progress to pulmonary fibrosis. Symptoms are often subtle and radiological changes appear worse than clinical abnormalities. Occasionally, persistent cough, irritation of the upper respiratory tract, shortness of breath with exertion, fever, and bloody sputum occur. Inhalation exposure to oil mists below current workplace exposure limits is unlikely to cause pulmonary abnormalities. Preexisting disorders of the following organs (or organ systems) may be aggravated by exposure to this material: skin.

* * * Section 5 - Fire Fighting Measures * * *

General Fire Hazards

See Section 9 for Flammability Properties.
Never use welding or cutting torch on or near drum (even empty) because product (even just residue) can ignite explosively. No special fire hazards are known to be associated with this product. Dense smoke may be generated while burning.

Safety Data Sheet

Material Name: Hess 10W30 Motor Oil

Hazardous Combustion Products

May form: carbon dioxide and carbon monoxide, oxides of sulfur, nitrogen and phosphorous, various hydrocarbons.

Extinguishing Media

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or gaseous extinguishing agent.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Unsuitable Extinguishing Media

None

Fire Fighting Equipment/Instructions

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment. Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

* * * Section 6 - Accidental Release Measures * * *

Recovery and Neutralization

Carefully contain and stop the source of the spill, if safe to do so.

Materials and Methods for Clean-Up

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal. Caution, flammable vapors may accumulate in closed containers.

SMALL SPILL: Absorb liquid on vermiculite, floor absorbent or other absorbent material. Persons not wearing proper personal protective equipment should be excluded from area of spill.

LARGE SPILL: Prevent run-off to sewers, streams, or other bodies of water. If run-off occurs, notify authorities as required, that a spill has occurred. Persons not wearing proper personal protective equipment should be excluded from area of spill until clean-up has been completed.

Emergency Measures

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Personal Precautions and Protective Equipment

Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

Safety Data Sheet

Material Name: Hess 10W30 Motor Oil

Environmental Precautions

Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Prevention of Secondary Hazards

None

* * * Section 7 - Handling and Storage * * *

Handling Procedures

Handle as a combustible liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents.

Storage Procedures

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks."

Incompatibilities

Avoid contact with: acids, halogens, strong oxidizing agents.

* * * Section 8 - Exposure Controls / Personal Protection * * *

Component Exposure Limits

ACGIH, OSHA, and NIOSH have not developed exposure limits for any of this product's components.

Engineering Measures

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

Personal Protective Equipment: Respiratory

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

Safety Data Sheet

Material Name: Hess 10W30 Motor Oil

Personal Protective Equipment: Hands

Not normally required. However, wear resistant gloves such as nitrile rubber to prevent irritation which may result from prolonged or repeated skin contact with product.

Personal Protective Equipment: Eyes

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

Personal Protective Equipment: Skin and Body

To prevent repeated or prolonged skin contact, wear impervious clothing and boots. Wear normal work clothing covering arms and legs.

Hygiene Measures

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

* * * Section 9 - Physical & Chemical Properties * * *

Appearance:	Dry, clear and bright	**Odor:**	None
Physical State:	Liquid	**pH:**	ND
Vapor Pressure:	ND	**Vapor Density:**	ND
Boiling Point:	>425 °F (218.3°C) @ 760.00 mmHg	**Melting Point:**	ND
Solubility (H2O):	Negligible	**Specific Gravity:**	0.881 @ 60°F (16°C)
Evaporation Rate:	Slower than ethyl ether	**VOC:**	ND
Viscosity:	<= 3300.0 cps @ -20°C; 10.0 - 11.0 cst @ 100°C	**Octanol/H2O Coeff.:**	ND
Flash Point:	430 °F (221.1 °C)	**Flash Point Method:**	COC
Upper Flammability Limit (UFL):	ND	**Lower Flammability Limit (LFL):**	ND
Burning Rate:	ND	**Auto Ignition:**	ND

* * * Section 10 - Chemical Stability & Reactivity Information * * *

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

None

Incompatible Products

Avoid contact with: acids, halogens, strong oxidizing agents.

Hazardous Decomposition Products

May form: aldehydes, carbon dioxide and carbon monoxide, hydrogen sulfide, oxides of sulfur, nitrogen and phosphorus, toxic fumes, various hydrocarbons.

Safety Data Sheet

Material Name: Hess 10W30 Motor Oil

* * * Section 11 - Toxicological Information * * *

Acute Toxicity

A: General Product Information

Harmful if large amounts are swallowed.

B: Component Analysis - LD50/LC50

Petroleum distillates, solvent dewaxed heavy paraffinic (64742-65-0)

Inhalation LC50 Rat >4.7 mg/L 4 h; Oral LD50 Rat >5000 mg/kg; Dermal LD50 Rabbit >5000 mg/kg

Potential Health Effects: Skin Corrosion Property/Stimulativeness

May cause mild skin irritation. Prolonged or repeated contact may dry the skin. Symptoms include redness, burning, drying and cracking of the skin, and skin burns. Additional symptoms of skin contact include: acne. Passage of this material into the body through the skin is possible, but it is unlikely that this would result in harmful effects during safe handling and use.

Potential Health Effects: Eye Critical Damage/ Stimulativeness

May cause mild eye irritation. Symptoms include stinging, tearing, and redness.

Potential Health Effects: Ingestion

Swallowing small amounts of this material during normal handling is not likely to cause harmful effects. Swallowing large amounts may be harmful.

Potential Health Effects: Inhalation

It is possible to breathe this material under certain conditions of handling and use (for example, during heating, spraying, or stirring). Breathing small amounts of this material during normal handling is not likely to cause harmful effects. Breathing large amounts may be harmful. Symptoms usually occur at air concentrations higher than the recommended exposure limits.

Respiratory Organs Sensitization/Skin Sensitization

This product is not reported to have any skin sensitization effects.

Generative Cell Mutagenicity

This product is not reported to have any mutagenic effects.

Carcinogenicity

A: General Product Information

May cause cancer.

Used motor oil has been shown to cause skin cancer in laboratory animal continually exposed by repeated applications.

B: Component Carcinogenicity

None of this product's components are listed by ACGIH, IARC, OSHA, NIOSH, or NTP.

Reproductive Toxicity

This product is not reported to have any reproductive toxicity effects.

Specified Target Organ General Toxicity: Single Exposure

This product is not reported to have any specific target organ general toxicity single exposure effects.

Specified Target Organ General Toxicity: Repeated Exposure

This product is not reported to have any specific target organ general toxicity repeat exposure effects.

Aspiration Respiratory Organs Hazard

Acute aspiration of large amounts of oil-laden material may produce a serious aspiration hazard.

Safety Data Sheet

Material Name: Hess 10W30 Motor Oil

* * * Section 12 - Ecological Information * * *

Ecotoxicity

A: General Product Information

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations.

B: Component Analysis - Ecotoxicity - Aquatic Toxicity

Petroleum distillates, solvent dewaxed heavy paraffinic (64742-65-0)

Test & Species	Conditions
96 Hr LC50 Oncorhynchus mykiss	>5000 mg/L
48 Hr EC50 Daphnia magna	>1000 mg/L

Persistence/Degradability

No information available.

Bioaccumulation

No information available.

Mobility in Soil

No information available.

* * * Section 13 - Disposal Considerations * * *

Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment recommendations.

Disposal of Contaminated Containers or Packaging

Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 14 - Transportation Information * * *

DOT Information

Shipping Name: Not Regulated

* * * Section 15 - Regulatory Information * * *

Regulatory Information

Component Analysis

None of this products components are listed under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65), or CERCLA (40 CFR 302.4).

SARA Section 311/312 – Hazard Classes

Acute Health	Chronic Health	Fire	Sudden Release of Pressure	Reactive
X	X	--	--	--

SARA SECTION 313 - SUPPLIER NOTIFICATION

ZINC C1-C14 ALKYLDITHIOPHOSPHATE (CAS No. 68649-42-3)

State Regulations

Safety Data Sheet

Material Name: Hess 10W30 Motor Oil

Component Analysis - State

None of this product's components are listed on the state lists from CA, MA, MN, NJ, PA, or RI.

Component Analysis - WHMIS IDL

No components are listed in the WHMIS IDL.

Additional Regulatory Information

Component Analysis - Inventory

Component	CAS #	TSCA	CAN	EEC
Petroleum distillates, solvent dewaxed heavy paraffinic	64742-65-0	Yes	DSL	EINECS

* * * Section 16 - Other Information * * *

NFPA® Hazard Rating

Health	1
Fire	1
Reactivity	0

HMIS® Hazard Rating

Health	1*	Slight
Fire	1	Slight
Physical	0	Minimal
		*Chronic

Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act; ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration., NJTSR = New Jersey Trade Secret Registry.

Literature References

None

Other Information

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

End of Sheet

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

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1 Identification of the substance/mixture and of the company/undertaking

· **1.1 Product identifier**

· **Trade name: ALCONOX**

· **1.2 Relevant identified uses of the substance or mixture and uses advised against**
No further relevant information available.

· **Application of the substance / the mixture:** Cleaning material/ Detergent

· **1.3 Details of the supplier of the Safety Data Sheet**

· **Manufacturer/Supplier:**
Alconox, Inc.
30 Glenn St., Suite 309
White Plains, NY 10603
Phone: 914-948-4040

· **Further information obtainable from:** Product Safety Department

· **1.4 Emergency telephone number:**
ChemTel Inc.
(800)255-3924, +1 (813)248-0585

2 Hazards identification

· **2.1 Classification of the substance or mixture**

· **Classification according to Regulation (EC) No 1272/2008**


GHS05 corrosion

Eye Dam. 1; H318: Causes serious eye damage.


GHS07

Skin Irrit. 2; H315: Causes skin irritation.

· **Classification according to Directive 67/548/EEC or Directive 1999/45/EC**


Xi; Irritant

R38-41: Irritating to skin. Risk of serious damage to eyes.

· **Information concerning particular hazards for human and environment:**
The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

· **Classification system:**
The classification is according to the latest editions of the EU-lists, and extended by company and literature data.
The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

· **2.2 Label elements**

· **Labelling according to Regulation (EC) No 1272/2008**
The product is classified and labelled according to the CLP regulation.

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· **Hazard pictograms**

GHS05

· **Signal word:** Danger

· **Hazard-determining components of labelling:**
sodium dodecylbenzene sulfonate
· **Hazard statements**
H315: Causes skin irritation.
H318: Causes serious eye damage.
· **Precautionary statements**
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P264: Wash thoroughly after handling.
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310: Immediately call a POISON CENTER or doctor/physician.
P321: Specific treatment (see on this label).
P362: Take off contaminated clothing and wash before reuse.
P332+P313: If skin irritation occurs: Get medical advice/attention.
P302+P352: IF ON SKIN: Wash with plenty of soap and water.
· **Hazard description:**
· **WHMIS-symbols:**
D2B - Toxic material causing other toxic effects

· **NFPA ratings (scale 0 - 4)**

Health = 1
Fire = 0
Reactivity = 0

· **HMIS-ratings (scale 0 - 4)**

Health = 1
Fire = 0
Reactivity = 0

· **HMIS Long Term Health Hazard Substances**
None of the ingredients is listed.

· **2.3 Other hazards**
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.

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3 Composition/information on ingredients

· **3.2 Mixtures**
· **Description:** Mixture of substances listed below with nonhazardous additions.

· **Dangerous components:**		
CAS: 68081-81-2	sodium dodecylbenzene sulfonate Xn R22; Xi R36 Acute Tox. 4, H302; Eye Irrit. 2, H319	10-25%
CAS: 497-19-8 EINECS: 207-838-8 Index number: 011-005-00-2	Sodium Carbonate Xi R36 Eye Irrit. 2, H319	2,5-10%
CAS: 7722-88-5 EINECS: 231-767-1	tetrasodium pyrophosphate substance with a Community workplace exposure limit	2,5-10%
CAS: 151-21-3 EINECS: 205-788-1	sodium dodecyl sulphate Xn R21/22; Xi R36/38 Acute Tox. 4, H302; Acute Tox. 4, H312; Skin Irrit. 2, H315; Eye Irrit. 2, H319	2,5-10%

· **Additional information:** For the wording of the listed risk phrases refer to section 16.

4 First aid measures

· **4.1 Description of first aid measures**
· **After inhalation:** Supply fresh air; consult doctor in case of complaints.
· **After skin contact:**
Immediately wash with water and soap and rinse thoroughly.
If skin irritation continues, consult a doctor.
· **After eye contact:**
Remove contact lenses if worn.
Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.
· **After swallowing:**
Rinse out mouth and then drink plenty of water.
Do not induce vomiting; call for medical help immediately.
· **4.2 Most important symptoms and effects, both acute and delayed**
No further relevant information available.
· **4.3 Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

5 Firefighting measures

· **5.1 Extinguishing media**
· **Suitable extinguishing agents:**
CO_2, powder or water spray. Fight larger fires with water spray or alcohol resistant foam.

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· **5.2 Special hazards arising from the substance or mixture:** No further relevant information available.
· **5.3 Advice for firefighters**
· **Protective equipment:**
Wear self-contained respiratory protective device.
Wear fully protective suit.
· **Additional information:** No further relevant information available.

6 Accidental release measures

· **6.1 Personal precautions, protective equipment and emergency procedures**
Product forms slippery surface when combined with water.
· **6.2 Environmental precautions:** Do not allow to enter sewers/ surface or ground water.
· **6.3 Methods and material for containment and cleaning up:**
Pick up mechanically.
Clean the affected area carefully; suitable cleaners are:
Warm water
· **6.4 Reference to other sections**
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

· **7.1 Precautions for safe handling**
Prevent formation of dust.
Keep receptacles tightly sealed.
· **Information about fire - and explosion protection:** No special measures required.

· **7.2 Conditions for safe storage, including any incompatibilities**
· **Storage:**
· **Requirements to be met by storerooms and receptacles:** No special requirements.
· **Information about storage in one common storage facility:** Not required.
· **Further information about storage conditions:** Protect from humidity and water.
· **7.3 Specific end use(s):** No further relevant information available.

8 Exposure controls/personal protection

· **Additional information about design of technical facilities:** No further data; see item 7.

· **8.1 Control parameters**

· **Ingredients with limit values that require monitoring at the workplace:**	
7722-88-5 tetrasodium pyrophosphate	
REL (USA)	5 mg/m³
TLV (USA)	TLV withdrawn
EV (Canada)	5 mg/m³

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· **Additional information:** The lists valid during the making were used as basis.

· **8.2 Exposure controls**
· **Personal protective equipment:**
· **General protective and hygienic measures:**
Keep away from foodstuffs, beverages and feed.
Immediately remove all soiled and contaminated clothing.
Wash hands before breaks and at the end of work.
Avoid contact with the skin.
Avoid contact with the eyes and skin.
· **Respiratory protection:**
Not required under normal conditions of use.
In case of brief exposure or low pollution use respiratory filter device. In case of intensive or longer exposure use self-contained respiratory protective device.
· **Protection of hands:**


Protective gloves

The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.
Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation.
· **Material of gloves**
Butyl rubber, BR
Nitrile rubber, NBR
Natural rubber, NR
Neoprene gloves
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material cannot be calculated in advance and has therefore to be checked prior to the application.
· **Penetration time of glove material**
The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.
· **Eye protection:**


Safety glasses

· **Body protection:** Protective work clothing

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9 Physical and chemical properties

· **9.1 Information on basic physical and chemical properties**	
· **General Information**	
· **Appearance:**	
Form:	Powder
Colour:	White
· **Odour:**	Odourless
· **Odour threshold:**	Not determined.
· **pH-value (10 g/l) at 20 °C:**	9,5 (- NA for Powder form)
· **Change in condition**	
Melting point/Melting range:	Not Determined.
Boiling point/Boiling range:	Undetermined.
· **Flash point:**	Not applicable.
· **Flammability (solid, gaseous):**	Not determined.
· **Ignition temperature:**	
Decomposition temperature:	Not determined.
· **Self-igniting:**	Product is not self-igniting.
· **Danger of explosion:**	Product does not present an explosion hazard.
· **Explosion limits:**	
Lower:	Not determined.
Upper:	Not determined.
· **Vapour pressure:**	Not applicable.
· **Density at 20 °C:**	1,1 g/cm³
· **Relative density**	Not determined.
· **Vapour density**	Not applicable.
· **Evaporation rate**	Not applicable.
· **Solubility in / Miscibility with water:**	Soluble.
· **Partition coefficient (n-octanol/water):**	Not determined.
· **Viscosity:**	
Dynamic:	Not applicable.
Kinematic:	Not applicable.
· **Solvent content:**	
Organic solvents:	0,0 %
Solids content:	100 %
· **9.2 Other information**	No further relevant information available.

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10 Stability and reactivity

· **10.1 Reactivity**
· **10.2 Chemical stability**
· **Thermal decomposition / conditions to be avoided:**
No decomposition if used according to specifications.
· **10.3 Possibility of hazardous reactions**
Reacts with acids.
Reacts with strong alkali.
Reacts with strong oxidizing agents.
· **10.4 Conditions to avoid:** No further relevant information available.
· **10.5 Incompatible materials:** No further relevant information available.
· **10.6 Hazardous decomposition products:**
Carbon monoxide and carbon dioxide
Phosphorus compounds
Sulphur oxides (SOx)

11 Toxicological information

· **11.1 Information on toxicological effects**
· **Acute toxicity:**
· **Primary irritant effect:**
· **On the skin:** Irritant to skin and mucous membranes.
· **On the eye:** Strong irritant with the danger of severe eye injury.
· **Sensitization:** No sensitizing effects known.
· **Additional toxicological information:**
The product shows the following dangers according to the calculation method of the General EU Classification Guidelines for Preparations as issued in the latest version:
Irritant
Swallowing will lead to a strong caustic effect on mouth and throat and to the danger of perforation of esophagus and stomach.

12 Ecological information

· **12.1 Toxicity**
· **Aquatic toxicity:** No further relevant information available.
· **12.2 Persistence and degradability:** No further relevant information available.
· **12.3 Bioaccumulative potential:** Not worth-mentioning accumulating in organisms
· **12.4 Mobility in soil:** No further relevant information available.
· **Additional ecological information:**
· **General notes:**
Water hazard class 2 (German Regulation) (Self-assessment): hazardous for water.
Do not allow product to reach ground water, water course or sewage system.
Danger to drinking water if even small quantities leak into the ground.
· **12.5 Results of PBT and vPvB assessment**
· **PBT:** Not applicable.

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· **vPvB:** Not applicable.
· **12.6 Other adverse effects:** No further relevant information available.

13 Disposal considerations

· **13.1 Waste treatment methods**
· **Recommendation**
Smaller quantities can be disposed of with household waste.
Small amounts may be diluted with plenty of water and washed away. Dispose of bigger amounts in accordance with Local Authority requirements.
The surfactant used in this product complies with the biodegradability criteria as laid down in Regulation (EC) No. 648/2004 on detergents. Data to support this assertion are held at the disposal of the competent authorities of the Member States and will be made available to them, at their direct request or at the request of a detergent manufacturer.

· **Uncleaned packaging:**
· **Recommendation:** Disposal must be made according to official regulations.
· **Recommended cleansing agents:** Water, if necessary together with cleansing agents.

14 Transport information

· **14.1 UN-Number**	
· **DOT, ADR, IMDG, IATA, ICAO**	Not Regulated
· **14.2 UN proper shipping name**	
· **DOT, ADR, IMDG, IATA, ICAO**	Not Regulated
· **14.3 Transport hazard class(es)**	
· **DOT, ADR, IMDG, IATA, ICAO**	
· **Class**	Not Regulated
· **14.4 Packing group**	
· **DOT, ADR, IMDG, IATA, ICAO**	Not Regulated
· **14.5 Environmental hazards:**	
· **Marine pollutant:**	No
· **14.6 Special precautions for user**	Not applicable.
· **14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	Not applicable.
· **UN "Model Regulation":**	Not Regulated

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15 Regulatory information

· **15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**
· **United States (USA)**
· **SARA**

· **Section 355 (extremely hazardous substances):**
None of the ingredients is listed.
· **Section 313 (Specific toxic chemical listings):**
None of the ingredients is listed.
· **TSCA (Toxic Substances Control Act):**
All ingredients are listed.

· **Proposition 65 (California):**

· **Chemicals known to cause cancer:**
None of the ingredients is listed.
· **Chemicals known to cause reproductive toxicity for females:**
None of the ingredients is listed.
· **Chemicals known to cause reproductive toxicity for males:**
None of the ingredients is listed.
· **Chemicals known to cause developmental toxicity:**
None of the ingredients is listed.

· **Carcinogenic Categories**

· **EPA (Environmental Protection Agency)**
None of the ingredients is listed.
· **IARC (International Agency for Research on Cancer)**
None of the ingredients is listed.
· **TLV (Threshold Limit Value established by ACGIH)**
None of the ingredients is listed.
· **NIOSH-Ca (National Institute for Occupational Safety and Health)**
None of the ingredients is listed.
· **OSHA-Ca (Occupational Safety & Health Administration)**
None of the ingredients is listed.

(Contd. on page 10)

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Printing date: 31.12.2013 **Revision:** 31.12.2013

Trade name: ALCONOX

(Contd. of page 9)

· **Canada**

· **Canadian Domestic Substances List (DSL)**	
All ingredients are listed.	
· **Canadian Ingredient Disclosure list (limit 0.1%)**	
None of the ingredients is listed.	
· **Canadian Ingredient Disclosure list (limit 1%)**	
497-19-8	Sodium Carbonate
7722-88-5	tetrasodium pyrophosphate
151-21-3	sodium dodecyl sulphate

· **15.2 Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Relevant phrases**
H302: Harmful if swallowed.
H312: Harmful in contact with skin.
H315: Causes skin irritation.
H319: Causes serious eye irritation.
R21/22: Harmful in contact with skin and if swallowed.
R22: Harmful if swallowed.
R36: Irritating to eyes.
R36/38: Irritating to eyes and skin.

· **Abbreviations and acronyms:**
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road) IMDG: International Maritime Code for Dangerous Goods DOT: US Department of Transportation
IATA: International Air Transport Association
GHS: Globally Harmonized System of Classification and Labelling of Chemicals
ACGIH: American Conference of Governmental Industrial Hygienists
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)

1. IDENTIFICATION

Product Identifier	Diesel Fuel
Synonyms:	Diesel Fuel, Motor Vehicle Diesel Fuel, Dyed Diesel, * DieselOne®, * DieselOne® w/Platinum Plus DFX, Low Sulfur Diesel (LSD), Ultra Low Sulfur Diesel (ULSD)
Intended use of the product:	Fuel
Contact:	Global Companies LLC Water Mill Center 800 South St. Waltham, MA 02454-9161 www.globalp.com
Contact Information:	EMERGENCY TELEPHONE NUMBER (24 hrs): CHEMTREC (800) 424-9300 COMPANY CONTACT (business hours): 800-542-0778

2. HAZARD IDENTIFICATION

According to OSHA 29 CFR 1910.1200 HCS

Classification of the Substance or Mixture

Classification (GHS-US):

Flam. Liquid	Category 3	H226
Skin Corrosion/Irritation	Category 2	H315
Aspiration Hazard	Category 1	H304
STOT SE	Category 3	H336
Carcinogenicity	Category 2	H350
Aquatic Chronic	Category 2	H411
Serious Eye Damage/ Irritation	Category 2B	H319

Labeling Elements

Signal Word (GHS-US):	**Danger**
Hazard Statements (GHS-US):	H226 – Flammable liquid and vapor. H315 – Causes Skin irritation. H304 – May be fatal if swallowed and enters airways. H336 – May cause drowsiness or dizziness. H350 – May cause cancer. H411 – Toxic to aquatic life with long lasting effects. H319 – May cause eye damage/irritation.
Precautionary Statements (GHS-US):	P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking. P233 - Keep container tightly closed. P240 – Ground/bond container and receiving equipment.

P241 – Use explosion-proof electrical/ventilating/lighting equipment pursuant to applicable electrical code.
P242 – Use only non-sparking tools.
P243 – Take precautionary measures against static discharge.
P261 – Avoid breathing dust/fume/gas/mist/vapors/spray.
P264 – Wash skin thoroughly after handling.
P271 – Use only outdoors or in a well-ventilated area.
P273 – Avoid release to the environment.
P280 - Wear protective gloves/protective clothing/eye protection/face protection.
P303+361+353 - If on skin (or hair): Take off immediately all contaminated clothing. Rinse with water/shower.
P308+311 - If exposed or concerned: Get medical advice/attention.
P301+310 - If swallowed: Immediately call a poison center/doctor/…
P331 - Do NOT induce vomiting.
P370+P378 – In case of fire use firefighting foam or other appropriate media for Class B fires to extinguish.
P403+235 - Store in a well-ventilated place. Keep cool.
P405 - Store locked up.
P501 – Dispose of contents/container in accordance with local/regional/national/international regulation.

Other information:

NFPA 704
Health: 1
Fire: 2
Reactivity: 0

3. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Composition Information
Mixture

Name	Product Identifier (CAS#)	% (w/w)	Classification
Diesel Fuel	68476-34-6	100	Flam Liq. 3, H226; Skin Irrit. 2, H315; Aspiration 1, H304; STOT SE 3, H336; Carc.2. H350; Aquatic chronic 2, H411
Naphthalene	91-20-3	<0.1	Carc. 2, H351; Acute Tox. 4, H302; Aquatic Acute 1, H400; Aquatic Chronic 1, H410

Additional Formulation Information:
Diesel Fuel consists of C9+ hydrocarbons resulting from distillation of crude oil.

Low Sulfur Diesel Fuel typically contains less than 500 ppm of sulfur

Ultra Low Sulfur Diesel Fuel typically contains less than 15 ppm of sulfur

4. FIRST AID MEASURES

Route	Measures
Inhalation	Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.
Ingestion	Aspiration Hazard: DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Ingestion may cause gastrointestinal disturbances including irritation, nausea, vomiting, and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory failure, and death.
Eye Contact	In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention. In case of contact lenses, remove immediately.
Skin Contact	Remove contaminated clothing and shoes. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops. Thermal burns require immediate medical attention depending on the severity and of the area of the body burned.

Most Important Symptoms
Contact with eyes and face may cause irritation. Long-term exposure may cause dermatitis (itching, irritation, pain and swelling).

Inhalation may cause irritation and significant or long term exposure could cause respiratory insufficiency and pulmonary edema.

Ingestion may cause aspiration, gastrointestinal disturbance, and CNS effects.

Immediate Medical Attention and Special Treatment
For contact with skin or eyes, immediately wash or flush contaminated eyes with gently flowing water. If possible, irrigate each eye continuously with 0.9% saline (NS). If ingested, rinse mouth. Do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs).

If inhaled, administer oxygen or establish a patent airway if breathing is labored. Suction if necessary. Monitor closely, anticipate seizures. Consider orotracheal or nostracheal intubation of airway control if patient is unconscious or is in severe respiratory distress.

Discard any clothing or shoes contaminated as they may be flammable.

5. FIRE-FIGHTING MEASURES

Extinguishing Media
Foam, carbon dioxide, dry chemical are most suitable

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, C02, water spray, firefighting foam, or Halon. Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other firefighting equipment.

LARGE FIRES: Foam, carbon dioxide, dry chemical. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Specific Hazards / Products of Combustion
Moderate fire hazard when exposed to heat or flame with a very low flash point. Product is flammable and easily ignited when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

Combustion may produce smoke, carbon monoxide and other products of incomplete combustion.

Special Precautions and Protective Equipment for Firefighters
Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water.

For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied firefighting foam.

Fighting Equipment/Instructions
Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH- approved pressure-demand self-contained breathing apparatus with full face piece and protective clothing.

Refer to Section 9 for fire properties of this chemical including flash point, auto ignition temperature, and explosive limits.

6. ACCIDENTAL RELEASE MEASURES

ACTIVATE FACILITY SPCC, SPILL CONTINGENCY or EMERGENCY PLAN.

Personal Precautions
Due to high vapor density, flammable / toxic vapors may be present in low lying areas, dikes, pits, drains, or trenches. Vapors may accumulate in low lying areas and reach ignitable concentrations. Ventilate the area. Use of non-sparking tools and intrinsically safe equipment is recommended. Potential for flammable atmosphere should be monitored using a combustible gas indicator positioned downwind of the spill area. Refer to Sections 2 and 7 for further hazard warnings and handling instructions.

Use appropriate personal protective equipment to prevent eye/skin contact and absorption. Use NIOSH approved respiratory protection, if warranted, to prevent exposures above permissible limits. Refer to Section 8. Contaminated clothing should not be near sources of ignition.

Emergency Measures
As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions. Consider wind direction. Secure all ignition sources (flame, spark, hot work, hot metal, etc.) from area. Evaluate the direction of product travel, diking sewers, etc. to confirm spill areas. Do not touch or walk-through spilled material. For large spills, isolate initial action distance downwind 1,000 ft. (300 m).

Environmental Precautions
Stop the spill to prevent environmental release if it can be done safely. Product is toxic to aquatic life. Take action to isolate environmental receptors including drains, storm sewers and natural water bodies. Keep on impervious surface if at all possible. Use water sparingly to prevent product from spreading. Foam and absorbents may be used to reduce / prevent airborne release.

Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Follow federal, state or local requirements for reporting environmental release where necessary. Refer to Section 15 for further information.

Containment and Clean-Up Methods
Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of firefighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with dry earth, sand or other non-combustible, inert oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container with clean, non-sparking tools for reclamation or disposal. Response and cleanup crews must be properly trained and must utilize proper protective equipment. Refer to Section 8 for appropriate protective equipment.

7. HANDLING AND STORAGE

USE ONLY AS A FUEL.
DO NOT SIPHON BY MOUTH.

Handling Precautions
Handle as a flammable liquid. Keep away from heat, sparks, and open flame. No smoking. Electrical equipment should be approved for classified area. Bond and ground containers during product transfer pursuant to NFPA 70 and API RP 2003 to

reduce the possibility of static-initiated fire or explosion. Follow precautions to prevent static initiated fire.

Use good personal hygiene practices. Use only with protective equipment specified in Section 8. Avoid repeated and/or prolonged skin exposure. Use only outdoors or in well ventilated areas. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves. Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API RP 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents."

Storage

Large quantities of diesel fuel are stored in tanks or portable containers at an ambient storage temperature. Separate from incompatible chemicals (Refer to Section 10) by distance or secondary containment. Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers that are clearly labeled. Label all secondary containers that this material is transferred into with the chemical name and associated hazard(s). Empty product containers or vessels may contain flammable vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Storage tanks should have a venting system. If stored in small containers, the area should be well ventilated, away from ignition sources and protected from potential damage or vehicular traffic. Post “No Smoking” signs in product storage areas. This storage area should comply with NFPA 30 “Flammable and Combustible Liquid Code” or applicable building code. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 “Cleaning Mobile Tanks in Flammable and Combustible Liquid Service” and API RP 2015 “Safe Entry and Cleaning of Petroleum Storage Tanks”.

Incompatibles

Keep away from strong oxidizers, ignition sources and heat.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Limits

Component	CAS #	List	Value
Diesel Fuel	68476-34-6	ACGIH TLV-TWA	100 mg/m3*
Naphthalene	91-20-3	ACGIH TLV-TWA OSHA PEL ACGIH STEL	10 ppm 10 ppm 15 ppm

*Critical effects; Skin; A3; CNS impairment.

Engineering Controls

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Intrinsically safe equipment and non-sparking tools shall be used in circumstances where concentrations may exceed lower flammable limits. Grounding and bonding shall be used to prevent accumulation and discharge of static electricity. Emergency shower and eyewash should be provided in proximity to handling areas in the event of exposure to decontaminate.

Personal Protective Equipment

Exposure	Equipment
Eye / Face	Wear appropriate chemical protective glasses or goggles or face shields to prevent skin and eye contact especially caused from splashing.
Skin	Wear appropriate personal protective clothing to prevent skin contact. Gloves constructed of nitrile, neoprene or PVC are recommended when handling this material. Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure.

Exposure	Equipment
Respiratory	A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection and limitations. Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.
Thermal	Product is stored at ambient temperature. No thermal protection is required except for emergency operations involving actual or potential for fire. Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

9. PHYSICAL AND CHEMICAL PROPERTIES

Property	Value	
Appearance	Clear or straw-colored liquid. May be dyed red for distribution.	
Odor	Mild characteristic petroleum distillate odor.	
Odor Threshold	<1 ppm	
pH	Not available	
Melting Point	-22 to -0.4 ˚F (-30 to -18 ˚C)	
Boiling Point Range	320 to 690 ˚F (160 to 366 ˚C)	
Flash Point	> 125.6 ˚F (52 ˚C) PMCC	
Evaporation Rate	Slow, varies with conditions	
Flammability	Flammable liquid	
Flammable Limits	0.6 % - 6.5%	
Vapor Pressure	0.009 psia @ 70 ˚F	
Vapor Density	> 1	(air=1)
Specific Gravity	0.83-0.86 @ 60 ˚F (16 ˚C)	(water=1)
Solubility	Insoluble in water; miscible with other petroleum solvents.	
Partition Coefficient (N-octanol/water)	Log Kow range of 3.3 to >.6.0	
Autoignition Temperature	494 ˚F (257 ˚C)	
Decomposition Temperature	When heated it emits acrid smoke and irritating vapors.	
Viscosity	>3 cSt	
Percent Volatiles	100	

10. STABILITY AND REACTIVITY

Stability
This is a stable material that is flammable liquid (OSHA/GHS hazard category 3). Stable during transport.

Reactivity
Material is not self-reacting. Flammable concentrations may be present in air. Compound can react with oxidizing materials.

Possibility of Hazardous Reactions
Hazardous polymerization will not occur.

Incompatibility
Keep away from strong oxidizers such as nitric and sulfuric acids.

Conditions to Avoid
Avoid high temperatures, open flames, sparks, static electricity, welding, smoking and other ignition sources.

Hazardous Decomposition Products
Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

11. TOXICOLOGICAL INFORMATION

Acute Toxicity:
Acute Toxicity (Inhalation LC50)
Diesel Fuel (68476-34-6)
LC50 Inhalation Rat >6 mg/l/4h

Acute Toxicity (Dermal LD50)
Diesel Fuel (68476-34-6)
LD50 Dermal Rabbit >5000 mg/kg

Acute Toxicity (Oral LD50)
Diesel Fuel (68476-34-6)
LD50 Oral Rabbit >5000 mg/kg

Skin Corrosion/Irritation: Prolonged and repeated contact may cause skin irritation leading to dermatitis. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

Serious Eye Damage/Irritation: Causes serious eye irritation.

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: OSHA: NO, IARC: Group 3, NTP: NO, ACGIH: NOIC:A3, NIOSH: NO

IARC: Group 3 – Not classifiable as to their carcinogenicity to humans

ACGIH: A3 – Confirmed animal carcinogen with unknown relevance to humans.

Studies have shown that similar products produce skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.

IARC classifies whole diesel fuel exhaust particulates (byproduct of combustion of this material) carcinogenic to humans (Group 1) and NIOSH regards diesel fuel exhaust particulate as a potential occupational carcinogen.

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Repeated Exposure): Not classified

Specific Target Organ Toxicity (Single Exposure): Inhalation exposure may cause drowsiness or dizziness by inhalation exposure.

Aspiration Hazard: The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Potential Health Effects: Vapor irritating to skin, eyes, nose, and throat. Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

WARNING: The burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of

combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

12. ECOLOGICAL INFORMATION

Toxicity:
This material is expected to be toxic to aquatic organisms and may cause long-term adverse effects in the aquatic environment.

Data for Component: Diesel Fuel (68476-34-6)

Material is toxic to aquatic organisms based on an acute basis (LC50/EC50 >1 but ≤ 10 mg/L in the most sensitive species tested).

Material is a long-term aquatic hazard based on a chronic basis (LC50/EC50 >1 but ≤ 10 mg/L in the most sensitive species tested).

Persistence and Degradation: This material is not expected to be readily biodegradable.

Bioaccumulative Potential: Not available

Mobility in Soil: Not available

Other Adverse Effects: None known

Other Information: Avoid release to the environment.

13. DISPOSAL CONSIDERATIONS

Consult federal, state and local waste regulations to determine appropriate disposal options. May be considered a hazardous waste if disposed. Direct solid waste (landfill) or incineration at a solid waste facility is not permissible. Do not discharge to sanitary or storm sewer. Personnel handling waste containers should follow precautions provided in this document.

Shipping containers must be DOT authorized packages. Follow licensure and regulations for transport of hazardous material and hazardous waste as applicable.

14. TRANSPORT INFORMATION

US DOT

UN Identification Number	NA 1993 / UN 1202
Proper Shipping Name	Diesel Fuel
Hazard Class and Packing Group	3, PGIII
Shipping Label	Combustible liquid
Placard / Bulk Package	Combustible liquid, 1993
Emergency Response Guidebook Guide Number	128

IATA Information

UN Identification Number	UN 1202
Proper Shipping Name	Combustible-Liquid, N.O.S. (Fuel, Diesel)
Hazard Class and Packing Group	3, PGIII
ICAO Label	3
Packing Instructions Cargo	310
Max Quantity Per Package Cargo	220L
Packing Instructions Passenger	309Y
Max Quantity per Package	60L

ICAO

UN Identification Number	UN 1202
Shipping Name / Description	Combustible-Liquid, N.O.S. (Fuel, Diesel)
Hazard Class and Packing Group	3, PG III
IMDG Label	3

IMDG

UN Identification Number	UN 1202
Shipping Name / Description	Combustible-Liquid, N.O.S. (Fuel, Diesel)
Hazard Class and Packing Group	3, PGIII
IMDG Label	3
EmS Number	F-E-S-E
Marine Pollutant	Yes

15. REGULATORY INFORMATION

U.S. Federal, State, and Local Regulatory Information

Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other federal, state, or local regulations; consult those regulations applicable to your facility/operation.

OSHA Hazard Communication Standard

This product is 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

Immediate (Acute) Health Hazard	Yes
Delayed (Chronic) Health Hazard	Yes
Fire Hazard	Yes
Reactive Hazard	No
Sudden Release of Pressure Hazard	No

Clean Water Act (Oil Spills)

Any spill or release of this product to “navigable waters” (Essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) or, if not practical, the U.S. Coast Guard with follow up to the National Response Center, as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA Section 103 and SARA Section 304 (Release to the Environment)

The CERCLA definition of hazardous substances contains a “petroleum exclusion” clause which exempts this material. This product does not contain any chemicals subject to the reporting requirements of CERCLA Section 103 or SARA 304.

SARA Section 313- Supplier Notification

This product does not contain any chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372.

EPA Notification (Oil Spills)

If the there is a discharge of more than 1,000-gallons of oil into or upon navigable waters of the United States, or if it is the second spill event of 42 gallons or more of oil into water within a twelve (12) month period, a written report must be submitted to the Regional Administrator of the EPA within sixty days of the event.

Pennsylvania Right to Know Hazardous Substance list:

The following product components are cited in the Pennsylvania Special Hazardous Substance List, and are present at levels which require reporting.

Component	CAS	Amount
Diesel Fuel	68476-34-6	100%

New Jersey Right to Know Hazardous Substance list:

The following product components are cited in the New Jersey Right to Know Hazardous Substance List, and are present at levels which require reporting.

Component	CAS	Amount
Diesel Fuel	68476-34-6	100%

California Proposition 65 WARNING: This product contains chemicals known to the State of California to cause Cancer or Reproductive Toxicity.

Component	CAS	Amount
Naphthalene	91-20-3	<0.1%

U.S. Toxic Substances Control Act
All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30.

CEPA - Domestic Substances List (DSL)
All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

Canadian Regulatory Information (WHMIS)
Class B3 – Combustible Liquid
Class D2A – Materials causing other toxic effects. (Very Toxic)

16. OTHER INFORMATION

Version	4
Issue Date	May 20, 2016
Prior Issue Date	May 3, 2015

Description of Revisions
Revised to meet Globally Harmonized System for chemical hazard communication requirements pursuant to OSHA regulatory revisions 77 FR 17884, March 26, 2012.

Abbreviations

˚F	Degrees Fahrenheit (temperature)
<	Less than
=	Equal to
>	Greater than
AP	Approximately
C	Centigrade (temperature)
kg	Kilogram
L	Liter
mg	Milligrams
mL	Milliliter
mm^2	Square millimeters
mmHg	Millimeters of mercury (pressure)
N/A	Not applicable
N/D	Not determined
ppm	Parts per million
sec	Second
ug	Micrograms

Acronyms

ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
AL	Action Level
ANSI	American National Standards Institute
API	American Petroleum Institute
CAS	Chemical Abstract Service
CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act
DOT	U.S. Department of Transportation
EC50	Ecological concentration 50%
EPA	U.S. Environmental Protection Agency
ERPG	Emergency Response Planning Guideline
GHS	Global Harmonized System
HMIS	Hazardous Materials Information System
IARC	International Agency for Research On Cancer
IATA	International Air Transport Association
IMDG	International Maritime Dangerous Goods
Koc	Soil Organic Carbon
LC50	Lethal concentration 50%
LD50	Lethal dose 50%
MSHA	Mine Safety and Health Administration
NFPA	National Fire Protection Association
NIOSH	National Institute of Occupational Safety and Health
NOIC	Notice of Intended Change

NTP	National Toxicology Program
OPA	Oil Pollution Act of 1990
OSHA	U.S. Occupational Safety & Health Administration
PEL	Permissible Exposure Limit (OSHA)
RCRA	Resource Conservation and Recovery Act Reauthorization Act of 1986 Title III
REL	Recommended Exposure Limit (NIOSH)
RVP	Reid Vapor Pressure
SARA	Superfund Amendments and
SCBA	Self Contained Breathing Apparatus
SPCC	Spill Prevention, Control, and Countermeasures
STEL	Short Term Exposure Limit (generally 15 minutes)
TLV	Threshold Limit Value (ACGIH)
TSCA	Toxic Substances Control Act
TWA	Time Weighted Average (8 hr.)
UN	United Nations
UNECE	United Nations Economic Commission for Europe
WEEL	Workplace Environmental Exposure Level (AIHA)
WHMIS	Canadian Workplace Hazardous Materials Information System

Disclaimer of Expressed and Implied Warranties

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

** End of Safety Data Sheet **

Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950
US GHS

Synonyms: Hess Conventional (Oxygenated and Non-oxygenated) Gasoline; Reformulated Gasoline (RFG); Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB); Unleaded Motor or Automotive Gasoline

* * * Section 1 - Product and Company Identification * * *

Manufacturer Information

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

Phone: 732-750-6000 Corporate EHS
Emergency # 800-424-9300 CHEMTREC
www.hess.com (Environment, Health, Safety Internet Website)

* * * Section 2 - Hazards Identification * * *

GHS Classification:

Flammable Liquid - Category 2
Skin Corrosion/Irritation - Category 2
Germ Cell Mutagenicity - Category 1B
Carcinogenicity - Category 1B
Toxic to Reproduction - Category 1A
Specific Target Organ Toxicity (Single Exposure) - Category 3 (respiratory irritation, narcosis)
Specific Target Organ Toxicity (Repeat Exposure) - Category 1 (liver, kidneys, bladder, blood, bone marrow, nervous system)
Aspiration Hazard - Category 1
Hazardous to the Aquatic Environment – Acute Hazard - Category 3

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

DANGER

Hazard Statements

Highly flammable liquid and vapour.
Causes skin irritation.
May cause genetic defects.
May cause cancer.
May damage fertility or the unborn child.
May cause respiratory irritation.
May cause drowsiness or dizziness.
Causes damage to organs (liver, kidneys, bladder, blood, bone marrow, nervous system) through prolonged or repeated exposure.
May be fatal if swallowed and enters airways.
Harmful to aquatic life.

Precautionary Statements

Prevention

Keep away from heat/sparks/open flames/hot surfaces. No smoking
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ventilating/lighting/equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Wear protective gloves/protective clothing/eye protection/face protection.
Wash hands and forearms thoroughly after handling.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Do not breathe mist/vapours/spray.
Use only outdoors or in well-ventilated area.
Do not eat, drink or smoke when using this product.
Avoid release to the environment.

Response

In case of fire: Use water spray, fog, dry chemical fire extinguishers or hand held fire extinguisher.
IF ON SKIN (or hair): Wash with plenty of soap and water. Remove/Take off immediately all contaminated clothing and wash before reuse. If skin irritation occurs, get medical advice/attention.
IF exposed or concerned: Get medical advice/attention.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a poison center or doctor/physician if you feel unwell.
Get medical advice/attention if you feel unwell.
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Do not induce vomiting.

Storage

Store in a well-ventilated place.
Keep cool. Keep container tightly closed.
Store locked up.

Disposal

Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 3 - Composition / Information on Ingredients * * *

CAS #	Component	Percent
86290-81-5	Gasoline, motor fuel	100
108-88-3	Toluene	1-25
106-97-8	Butane	<10
1330-20-7	Xylenes (o-, m-, p- isomers)	1-15
95-63-6	Benzene, 1,2,4-trimethyl-	<6
64-17-5	Ethyl alcohol	0-10
100-41-4	Ethylbenzene	<3
71-43-2	Benzene	0.1-4.9

110-54-3	Hexane	0.5-4

A complex blend of petroleum-derived normal and branched-chain alkane, cycloalkane, alkene, and aromatic hydrocarbons. May contain antioxidant and multifunctional additives. Non-oxygenated Conventional Gasoline and RBOB do not have oxygenates (Ethanol). Oxygenated Conventional and Reformulated Gasoline will have oxygenates for octane enhancement or as legally required.

* * * Section 4 - First Aid Measures * * *

First Aid: Eyes

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

First Aid: Skin

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or with waterless hand cleanser. Obtain medical attention if irritation or redness develops.

First Aid: Ingestion

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

First Aid: Inhalation

Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

* * * Section 5 - Fire Fighting Measures * * *

General Fire Hazards

See Section 9 for Flammability Properties.

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

Hazardous Combustion Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

Extinguishing Media

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or gaseous extinguishing agent.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Firefighting foam suitable for polar solvents is recommended for fuel with greater than 10% oxygenate concentration.

Unsuitable Extinguishing Media

None

Fire Fighting Equipment/Instructions

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment. Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

* * * Section 6 - Accidental Release Measures * * *

Recovery and Neutralization

Carefully contain and stop the source of the spill, if safe to do so.

Materials and Methods for Clean-Up

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal. Caution, flammable vapors may accumulate in closed containers.

Emergency Measures

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Personal Precautions and Protective Equipment

Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

Environmental Precautions

Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Prevention of Secondary Hazards

None

* * * Section 7 - Handling and Storage * * *

Handling Procedures

USE ONLY AS A MOTOR FUEL.
DO NOT SIPHON BY MOUTH

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents."

Storage Procedures

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

Incompatibilities

Keep away from strong oxidizers.

* * * Section 8 - Exposure Controls / Personal Protection * * *

Component Exposure Limits

Gasoline, motor fuel (86290-81-5)

ACGIH: 300 ppm TWA
500 ppm STEL

Toluene (108-88-3)

ACGIH: 20 ppm TWA
OSHA: 200 ppm TWA; 375 mg/m3 TWA
150 ppm STEL; 560 mg/m3 STEL
NIOSH: 100 ppm TWA; 375 mg/m3 TWA
150 ppm STEL; 560 mg/m3 STEL

Butane (106-97-8)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases: Alkane C1-4)
OSHA: 800 ppm TWA; 1900 mg/m3 TWA
NIOSH: 800 ppm TWA; 1900 mg/m3 TWA

Xylenes (o-, m-, p- isomers) (1330-20-7)

ACGIH: 100 ppm TWA
150 ppm STEL
OSHA: 100 ppm TWA; 435 mg/m3 TWA
150 ppm STEL; 655 mg/m3 STEL

Benzene, 1,2,4-trimethyl- (95-63-6)

NIOSH: 25 ppm TWA; 125 mg/m3 TWA

Ethyl alcohol (64-17-5)

ACGIH: 1000 ppm STEL
OSHA: 1000 ppm TWA; 1900 mg/m3 TWA
NIOSH: 1000 ppm TWA; 1900 mg/m3 TWA

Ethylbenzene (100-41-4)

ACGIH: 20 ppm TWA
OSHA: 100 ppm TWA; 435 mg/m3 TWA
125 ppm STEL; 545 mg/m3 STEL
NIOSH: 100 ppm TWA; 435 mg/m3 TWA
125 ppm STEL; 545 mg/m3 STEL

Benzene (71-43-2)

ACGIH: 0.5 ppm TWA
2.5 ppm STEL
Skin - potential significant contribution to overall exposure by the cutaneous route
OSHA: 5 ppm STEL (Cancer hazard, Flammable, See 29 CFR 1910.1028, 15 min); 0.5 ppm Action Level; 1 ppm TWA
NIOSH: 0.1 ppm TWA
1 ppm STEL

Hexane (110-54-3)

ACGIH: 50 ppm TWA
Skin - potential significant contribution to overall exposure by the cutaneous route
OSHA: 500 ppm TWA; 1800 mg/m3 TWA
NIOSH: 50 ppm TWA; 180 mg/m3 TWA

Engineering Measures

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

Personal Protective Equipment: Respiratory

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

Personal Protective Equipment: Hands

Gloves constructed of nitrile, neoprene, or PVC are recommended.

PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment: Eyes

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

Personal Protective Equipment: Skin and Body

Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

* * * Section 9 - Physical & Chemical Properties * * *

Appearance:	Translucent, straw-colored or light yellow	**Odor:**	Strong, characteristic aromatic hydrocarbon odor. Sweet-ether like
Physical State:	Liquid	**pH:**	ND
Vapor Pressure:	6.4 - 15 RVP @ 100 °F (38 °C) (275-475 mm Hg @ 68 °F (20 °C)	**Vapor Density:**	AP 3-4
Boiling Point:	85-437 °F (39-200 °C)	**Melting Point:**	ND
Solubility (H2O):	Negligible to Slight	**Specific Gravity:**	0.70-0.78
Evaporation Rate:	10-11	**VOC:**	ND
Percent Volatile:	100%	**Octanol/H2O Coeff.:**	ND
Flash Point:	-45 °F (-43 °C)	**Flash Point Method:**	PMCC
Upper Flammability Limit (UFL):	7.6%	**Lower Flammability Limit (LFL):**	1.4%
Burning Rate:	ND	**Auto Ignition:**	>530°F (>280°C)

* * * Section 10 - Chemical Stability & Reactivity Information * * *

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources.

Incompatible Products

Keep away from strong oxidizers.

Hazardous Decomposition Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

* * * Section 11 - Toxicological Information * * *

Acute Toxicity

A: General Product Information

Harmful if swallowed.

B: Component Analysis - LD50/LC50

Gasoline, motor fuel (86290-81-5)

Inhalation LC50 Rat >5.2 mg/L 4 h; Oral LD50 Rat 14000 mg/kg; Dermal LD50 Rabbit >2000 mg/kg

Toluene (108-88-3)

Inhalation LC50 Rat 12.5 mg/L 4 h; Inhalation LC50 Rat >26700 ppm 1 h; Oral LD50 Rat 636 mg/kg; Dermal LD50 Rabbit 8390 mg/kg; Dermal LD50 Rat 12124 mg/kg

Butane (106-97-8)

Inhalation LC50 Rat 658 mg/L 4 h

Xylenes (o-, m-, p- isomers) (1330-20-7)
Inhalation LC50 Rat 5000 ppm 4 h; Inhalation LC50 Rat 47635 mg/L 4 h; Oral LD50 Rat 4300 mg/kg; Dermal LD50 Rabbit >1700 mg/kg

Benzene, 1,2,4-trimethyl- (95-63-6)
Inhalation LC50 Rat 18 g/m3 4 h; Oral LD50 Rat 3400 mg/kg; Dermal LD50 Rabbit >3160 mg/kg

Ethyl alcohol (64-17-5)
Oral LD50 Rat 7060 mg/kg; Inhalation LC50 Rat 124.7 mg/L 4 h

Ethylbenzene (100-41-4)
Inhalation LC50 Rat 17.2 mg/L 4 h; Oral LD50 Rat 3500 mg/kg; Dermal LD50 Rabbit 15354 mg/kg

Benzene (71-43-2)
Inhalation LC50 Rat 13050-14380 ppm 4 h; Oral LD50 Rat 1800 mg/kg

Hexane (110-54-3)
Inhalation LC50 Rat 48000 ppm 4 h; Oral LD50 Rat 25 g/kg; Dermal LD50 Rabbit 3000 mg/kg

Potential Health Effects: Skin Corrosion Property/Stimulativeness

Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

Potential Health Effects: Eye Critical Damage/ Stimulativeness

Moderate irritant. Contact with liquid or vapor may cause irritation.

Potential Health Effects: Ingestion

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

Potential Health Effects: Inhalation

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

Respiratory Organs Sensitization/Skin Sensitization

This product is not reported to have any skin sensitization effects.

Generative Cell Mutagenicity

This product may cause genetic defects.

Carcinogenicity

A: General Product Information

May cause cancer.

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

B: Component Carcinogenicity

Gasoline, motor fuel (86290-81-5)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans

Toluene (108-88-3)

ACGIH: A4 - Not Classifiable as a Human Carcinogen
IARC: Monograph 71 [1999]; Monograph 47 [1989] (Group 3 (not classifiable))

Xylenes (o-, m-, p- isomers) (1330-20-7)

ACGIH: A4 - Not Classifiable as a Human Carcinogen
IARC: Monograph 71 [1999]; Monograph 47 [1989] (Group 3 (not classifiable))

Ethyl alcohol (64-17-5)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans
IARC: Monograph 100E [in preparation] (in alcoholic beverages); Monograph 96 [2010] (in alcoholic beverages) (Group 1 (carcinogenic to humans))

Ethylbenzene (100-41-4)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans
IARC: Monograph 77 [2000] (Group 2B (possibly carcinogenic to humans))

Benzene (71-43-2)

ACGIH: A1 - Confirmed Human Carcinogen
OSHA: 5 ppm STEL (Cancer hazard, Flammable, See 29 CFR 1910.1028, 15 min); 0.5 ppm Action Level; 1 ppm TWA
NIOSH: potential occupational carcinogen
NTP: Known Human Carcinogen (Select Carcinogen)
IARC: Monograph 100F [in preparation]; Supplement 7 [1987]; Monograph 29 [1982] (Group 1 (carcinogenic to humans))

Reproductive Toxicity

This product is suspected of damaging fertility or the unborn child.

Specified Target Organ General Toxicity: Single Exposure

This product may cause drowsiness or dizziness.

Specified Target Organ General Toxicity: Repeated Exposure

This product causes damage to organs through prolonged or repeated exposure.

Aspiration Respiratory Organs Hazard

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

* * * Section 12 - Ecological Information * * *

Ecotoxicity

A: General Product Information

Very toxic to aquatic life with long lasting effects. Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations.

B: Component Analysis - Ecotoxicity - Aquatic Toxicity

Gasoline, motor fuel (86290-81-5)

Test & Species		Conditions
96 Hr LC50 Alburnus alburnus	119 mg/L [static]	
96 Hr LC50 Cyprinodon variegatus	82 mg/L [static]	
72 Hr EC50 Pseudokirchneriella subcapitata	56 mg/L	
24 Hr EC50 Daphnia magna	170 mg/L	

Toluene (108-88-3)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	15.22-19.05 mg/L [flow-through]	1 day old
96 Hr LC50 Pimephales promelas	12.6 mg/L [static]	
96 Hr LC50 Oncorhynchus mykiss	5.89-7.81 mg/L [flow-through]	
96 Hr LC50 Oncorhynchus mykiss	14.1-17.16 mg/L [static]	
96 Hr LC50 Oncorhynchus mykiss	5.8 mg/L [semi-static]	
96 Hr LC50 Lepomis macrochirus	11.0-15.0 mg/L [static]	
96 Hr LC50 Oryzias latipes	54 mg/L [static]	
96 Hr LC50 Poecilia reticulata	28.2 mg/L [semi-static]	
96 Hr LC50 Poecilia reticulata	50.87-70.34 mg/L [static]	
96 Hr EC50 Pseudokirchneriella subcapitata	>433 mg/L	
72 Hr EC50 Pseudokirchneriella subcapitata	12.5 mg/L [static]	
48 Hr EC50 Daphnia magna	5.46 - 9.83 mg/L [Static]	
48 Hr EC50 Daphnia magna	11.5 mg/L	

Xylenes (o-, m-, p- isomers) (1330-20-7)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	13.4 mg/L [flow-through]	

96 Hr LC50 Oncorhynchus mykiss	2.661-4.093 mg/L [static]
96 Hr LC50 Oncorhynchus mykiss	13.5-17.3 mg/L
96 Hr LC50 Lepomis macrochirus	13.1-16.5 mg/L [flow-through]
96 Hr LC50 Lepomis macrochirus	19 mg/L
96 Hr LC50 Lepomis macrochirus	7.711-9.591 mg/L [static]
96 Hr LC50 Pimephales promelas	23.53-29.97 mg/L [static]
96 Hr LC50 Cyprinus carpio	780 mg/L [semi-static]
96 Hr LC50 Cyprinus carpio	>780 mg/L
96 Hr LC50 Poecilia reticulata	30.26-40.75 mg/L [static]
48 Hr EC50 water flea	3.82 mg/L
48 Hr LC50 Gammarus lacustris	0.6 mg/L

Benzene, 1,2,4-trimethyl- (95-63-6)

Test & Species	Conditions
96 Hr LC50 Pimephales promelas	7.19-8.28 mg/L [flow-through]
48 Hr EC50 Daphnia magna	6.14 mg/L

Ethyl alcohol (64-17-5)

Test & Species	Conditions
96 Hr LC50 Oncorhynchus mykiss	12.0 - 16.0 mL/L [static]
96 Hr LC50 Pimephales promelas	>100 mg/L [static]
96 Hr LC50 Pimephales promelas	13400 - 15100 mg/L [flow-through]
48 Hr LC50 Daphnia magna	9268 - 14221 mg/L
24 Hr EC50 Daphnia magna	10800 mg/L
48 Hr EC50 Daphnia magna	2 mg/L [Static]

Ethylbenzene (100-41-4)

Test & Species	Conditions
96 Hr LC50 Oncorhynchus mykiss	11.0-18.0 mg/L [static]
96 Hr LC50 Oncorhynchus mykiss	4.2 mg/L [semi-static]
96 Hr LC50 Pimephales promelas	7.55-11 mg/L [flow-through]
96 Hr LC50 Lepomis macrochirus	32 mg/L [static]
96 Hr LC50 Pimephales promelas	9.1-15.6 mg/L [static]
96 Hr LC50 Poecilia reticulata	9.6 mg/L [static]
72 Hr EC50 Pseudokirchneriella subcapitata	4.6 mg/L
96 Hr EC50 Pseudokirchneriella subcapitata	>438 mg/L
72 Hr EC50 Pseudokirchneriella subcapitata	2.6 - 11.3 mg/L [static]

96 Hr EC50 Pseudokirchneriella subcapitata	1.7 - 7.6 mg/L [static]
48 Hr EC50 Daphnia magna	1.8 - 2.4 mg/L

Benzene (71-43-2)

Test & Species	Conditions
96 Hr LC50 Pimephales promelas	10.7-14.7 mg/L [flow-through]
96 Hr LC50 Oncorhynchus mykiss	5.3 mg/L [flow-through]
96 Hr LC50 Lepomis macrochirus	22.49 mg/L [static]
96 Hr LC50 Poecilia reticulata	28.6 mg/L [static]
96 Hr LC50 Pimephales promelas	22330-41160 µg/L [static]
96 Hr LC50 Lepomis macrochirus	70000-142000 µg/L [static]
72 Hr EC50 Pseudokirchneriella subcapitata	29 mg/L
48 Hr EC50 Daphnia magna	8.76 - 15.6 mg/L [Static]
48 Hr EC50 Daphnia magna	10 mg/L

Hexane (110-54-3)

Test & Species	Conditions
96 Hr LC50 Pimephales promelas	2.1-2.98 mg/L [flow-through]
24 Hr EC50 Daphnia magna	>1000 mg/L

Persistence/Degradability

No information available.

Bioaccumulation

No information available.

Mobility in Soil

No information available.

* * * Section 13 - Disposal Considerations * * *

Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment recommendations.

Disposal of Contaminated Containers or Packaging

Dispose of contents/container in accordance with local/regional/national/international regulations.

Safety Data Sheet

Material Name: Gasoline All Grades **SDS No. 9950**

* * * Section 14 - Transportation Information * * *

Component Marine Pollutants

This material contains one or more of the following chemicals required by US DOT to be identified as marine pollutants.

Component	CAS #	
Gasoline, motor fuel	86290-81-5	DOT regulated marine pollutant

DOT Information

Shipping Name: Gasoline
UN #: 1203 **Hazard Class:** 3 **Packing Group:** II
Placard:

* * * Section 15 - Regulatory Information * * *

Regulatory Information

A: Component Analysis

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4).

Toluene (108-88-3)
SARA 313: 1.0 % de minimis concentration
CERCLA: 1000 lb final RQ; 454 kg final RQ

Xylenes (o-, m-, p- isomers) (1330-20-7)
SARA 313: 1.0 % de minimis concentration
CERCLA: 100 lb final RQ; 45.4 kg final RQ

Benzene, 1,2,4-trimethyl- (95-63-6)
SARA 313: 1.0 % de minimis concentration

Ethylbenzene (100-41-4)
SARA 313: 0.1 % de minimis concentration
CERCLA: 1000 lb final RQ; 454 kg final RQ

Benzene (71-43-2)
SARA 313: 0.1 % de minimis concentration
CERCLA: 10 lb final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule); 4.54 kg final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule)

Hexane (110-54-3)

SARA 313: 1.0 % de minimis concentration
CERCLA: 5000 lb final RQ; 2270 kg final RQ

SARA Section 311/312 – Hazard Classes

Acute Health	Chronic Health	Fire	Sudden Release of Pressure	Reactive
X	X	X	--	--

Component Marine Pollutants

This material contains one or more of the following chemicals required by US DOT to be identified as marine pollutants.

Component	CAS #	
Gasoline, motor fuel	86290-81-5	DOT regulated marine pollutant

State Regulations

Component Analysis - State

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA	RI
Gasoline, motor fuel	86290-81-5	No	No	No	No	Yes	No
Toluene	108-88-3	Yes	Yes	Yes	Yes	Yes	No
Butane	106-97-8	Yes	Yes	Yes	Yes	Yes	No
Xylenes (o-, m-, p- isomers)	1330-20-7	Yes	Yes	Yes	Yes	Yes	No
Benzene, 1,2,4-trimethyl-	95-63-6	No	Yes	Yes	Yes	Yes	No
Ethyl alcohol	64-17-5	Yes	Yes	Yes	Yes	Yes	No
Ethylbenzene	100-41-4	Yes	Yes	Yes	Yes	Yes	No
Benzene	71-43-2	Yes	Yes	Yes	Yes	Yes	No
Hexane	110-54-3	No	Yes	Yes	Yes	Yes	No

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.
WARNING! This product contains a chemical known to the state of California to cause reproductive/developmental effects.

Safety Data Sheet

Material Name: Gasoline All Grades **SDS No. 9950**

Component Analysis - WHMIS IDL

The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

Component	CAS #	Minimum Concentration
Toluene	108-88-3	1 %
Butane	106-97-8	1 %
Benzene, 1,2,4-trimethyl-	95-63-6	0.1 %
Ethyl alcohol	64-17-5	0.1 %
Ethylbenzene	100-41-4	0.1 %
Benzene	71-43-2	0.1 %
Hexane	110-54-3	1 %

Additional Regulatory Information

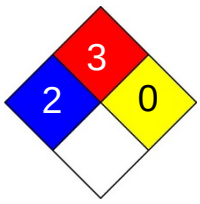
Component Analysis - Inventory

Component	CAS #	TSCA	CAN	EEC
Gasoline, motor fuel	86290-81-5	No	DSL	EINECS
Toluene	108-88-3	Yes	DSL	EINECS
Butane	106-97-8	Yes	DSL	EINECS
Xylenes (o-, m-, p- isomers)	1330-20-7	Yes	DSL	EINECS
Benzene, 1,2,4-trimethyl-	95-63-6	Yes	DSL	EINECS
Ethyl alcohol	64-17-5	Yes	DSL	EINECS
Ethylbenzene	100-41-4	Yes	DSL	EINECS
Benzene	71-43-2	Yes	DSL	EINECS
Hexane	110-54-3	Yes	DSL	EINECS

* * * Section 16 - Other Information * * *

NFPA® Hazard Rating

Health	2
Fire	3
Reactivity	0



HMIS® Hazard Rating

Health	2	Moderate
Fire	3	Serious
Physical	0	Minimal
		*Chronic

Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act; ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration., NJTSR = New Jersey Trade Secret Registry.

Literature References

None

Safety Data Sheet

Material Name: Gasoline All Grades **SDS No. 9950**

Other Information

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

End of Sheet

SAFETY DATA SHEET

CITGO A/W Hydraulic Oil 32

Section 1. Identification

GHS product identifier : CITGO A/W Hydraulic Oil 32

Synonyms : Hydraulic Fluid

Material uses : Lubricating oil

Code : 633491001

Supplier's details : CITGO Petroleum Corporation
P.O. Box 4689
Houston, TX 77210
sdsvend@citgo.com

Emergency telephone number (with hours of operation) : Technical Contact: (800) 248-4684
Medical Emergency: (832) 486-4700
CHEMTREC Emergency: (800) 424-9300
(United States Only)

Section 2. Hazards identification

OSHA/HCS status : While this material is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200), this SDS contains valuable information critical to the safe handling and proper use of the product. This SDS should be retained and available for employees and other users of this product.

Classification of the substance or mixture : Not classified.

GHS label elements

Signal word : Warning

Hazard statements : Injection of pressurized hydrocarbons can cause severe permanent tissue damage. Initial symptoms may be minor.

Precautionary statements

General : Avoid contact with eyes, skin and clothing. Thoroughly wash exposed areas and clothing with soap and water. IF IN EYES: Rinse cautiously with water for several minutes. IF SWALLOWED: Do not induce vomiting. If you feel unwell, seek medical attention and show the label when possible. Keep out of reach of children.

Prevention : Not applicable.

Response : Not applicable.

Storage : Not applicable.

Disposal : Not applicable.

Hazards not otherwise classified : Injection of petroleum hydrocarbons requires immediate medical attention.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Other means of identification : Hydraulic Fluid

CAS number/other identifiers

CAS number : Not applicable.

Section 3. Composition/information on ingredients

Ingredient name	%	CAS number
Distillates (petroleum), hydrotreated heavy paraffinic	≥90	64742-54-7
Residual oils (petroleum), solvent-dewaxed	≤5	64742-62-7

Any concentration shown as a range is to protect confidentiality or is due to process variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical attention if symptoms occur.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur.

Ingestion : Wash out mouth with water. Remove victim to fresh air and keep at rest in a position comfortable for breathing. Do not induce vomiting unless directed to do so by medical personnel. Get medical attention if symptoms occur.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : Injection of pressurized hydrocarbons can cause severe permanent tissue damage. Initial symptoms may be minor.

Ingestion : No known significant effects or critical hazards.

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : In the event of injection in underlying tissue, immediate treatment should include extensive incision, debridement and saline irrigation. Inadequate treatment can result in ischemia and gangrene. Early symptoms may be minimal.

Specific treatments : Treat symptomatically and supportively.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Section 5. Fire-fighting measures

Specific hazards arising from the chemical : In a fire or if heated, a pressure increase will occur and the container may burst.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8).

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 7. Handling and storage

Bulk Storage Conditions: Maintain all storage tanks in accordance with applicable regulations. Use necessary controls to monitor tank inventories. Inspect all storage tanks on a periodic basis. Test tanks and associated piping for tightness. Maintain the automatic leak detection devices to assure proper working condition.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Distillates (petroleum), hydrotreated heavy paraffinic	**ACGIH TLV (United States, 3/2016).** TWA: 5 mg/m³ 8 hours. Form: Inhalable fraction **OSHA PEL (United States, 6/2016).** TWA: 5 mg/m³ 8 hours. **NIOSH REL (United States, 10/2013).** TWA: 5 mg/m³ 10 hours. Form: Mist STEL: 10 mg/m³ 15 minutes. Form: Mist
Residual oils (petroleum), solvent-dewaxed	**ACGIH TLV (United States, 6/2013).** TWA: 5 mg/m³ 8 hours. Form: Inhalable fraction **NIOSH REL (United States, 4/2013).** TWA: 5 mg/m³ 10 hours. Form: Mist STEL: 10 mg/m³ 15 minutes. Form: Mist **OSHA PEL (United States, 2/2013).** TWA: 5 mg/m³ 8 hours.

Appropriate engineering controls : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, vapor controls, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety glasses equipped with side shields are recommended as minimum protection in industrial settings. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles. Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If inhalation hazards exist, a full-face respirator may be required instead.

Skin protection

Hand protection : Chemical-resistant gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Avoid skin contact with liquid. Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Leather boots are not protective for liquid contact.

Section 8. Exposure controls/personal protection

Respiratory protection : Avoid inhalation of gases, vapors, mists or dusts. Use a properly fitted, air-purifying or supplied-air respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid.

Color : Light amber [Light]

Odor : Mild petroleum odor [Slight]

pH : Not applicable.

Boiling point : Not available.

Flash point : Open cup: 214°C (417.2°F) [Cleveland.]

Lower and upper explosive (flammable) limits : Not available.

Vapor pressure : Not available.

Vapor density : Not available.

Relative density : Not available.

Density lbs/gal : 7.14 lbs/gal

Density gm/cm³ : 0.86 g/cm³

Gravity, °API : 33.6

Flow time (ISO 2431) : Not available.

Viscosity : Dynamic (room temperature): Not applicable.
Kinematic (room temperature): Not applicable.
Kinematic (40°C (104°F)): 0.32 cm^2/s (32 cSt)

Viscosity SUS : 155 SUS @100 F

Section 10. Stability and reactivity

Reactivity : Not expected to be Explosive, Self-Reactive, Self-Heating, or an Organic Peroxide under US GHS Definition(s).

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Incompatible materials : No specific data.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Distillates (petroleum), hydrotreated heavy paraffinic	LD50 Oral	Rat	>5000 mg/kg	-

Conclusion/Summary :

Section 11. Toxicological information

Distillates (petroleum), hydrotreated heavy paraffinic: Mineral oil mists derived from highly refined oils are reported to have low acute and sub-acute toxicities in animals. Effects from single and short-term repeated exposures to high concentrations of mineral oil mists well above applicable workplace exposure levels include lung inflammatory reaction, lipoid granuloma formation and lipoid pneumonia. In acute and sub-acute studies involving exposures to lower concentrations of mineral oil mists at or near current work place exposure levels produced no significant toxicological effects.

Irritation/Corrosion

Not available.

Skin : No additional information.

Eyes : No additional information.

Respiratory : No additional information.

Sensitization

Not available.

Skin : No additional information.

Respiratory : No additional information.

Mutagenicity

Not available.

Conclusion/Summary : No additional information.

Carcinogenicity

Not available.

Conclusion/Summary : No additional information.

Reproductive toxicity

Not available.

Conclusion/Summary : No additional information.

Teratogenicity

Not available.

Conclusion/Summary : No additional information.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : Injection of pressurized hydrocarbons can cause severe permanent tissue damage. Initial symptoms may be minor.

Ingestion : No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Section 11. Toxicological information

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Section 12. Ecological information

Toxicity

Not available.

Conclusion/Summary : Not available.

Persistence and degradability

Conclusion/Summary : Not available.

Bioaccumulative potential

Not available.

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Avoid

Section 13. Disposal considerations

dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT Classification	IMDG	IATA
UN number	Not regulated.	Not regulated.	Not regulated.
UN proper shipping name	-	-	-
Transport hazard class(es)	-	-	-
Packing group	-	-	-
Environmental hazards	No.	No.	No.

Oil: The product(s) represented by this SDS is (are) regulated as “oil” under 49 CFR Part 130. Shipments by rail or highway in packaging having a capacity of 3500 gallons or more or in a quantity greater 42,000 gallons are subject to these requirements. In addition, mixtures containing 10% or more of this product may be subject to these requirements.

Special precautions for user : **Transport within user’s premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations :

United States inventory (TSCA 8b): All components are listed or exempted.

Clean Water Act (CWA) 307: Phosphorodithioic acid, O,O-di-C1-14-alkyl esters, zinc salts; toluene; phenol

Clean Water Act (CWA) 311: toluene; phenol

This material is classified as an oil under Section 311 of the Clean Water Act (CWA) and the Oil Pollution Act of 1990 (OPA). Discharges or spills which produce a visible sheen on waters of the United States, their adjoining shorelines, or into conduits leading to surface waters must be reported to the EPA's National Response Center at (800) 424-8802.

SARA 302/304

Composition/information on ingredients

Name	%	EHS	SARA 302 TPQ (lbs)	SARA 302 TPQ (gallons)	SARA 304 RQ (lbs)	SARA 304 RQ (gallons)
Phenol	<0.001	Yes.	500 / 10000	-	1000	-

SARA 304 RQ : 106837606.8 lbs / 48504273.5 kg [14899387.7 gal / 56400318 L]

SARA 311/312

Classification : Not applicable.

Section 15. Regulatory information

Composition/information on ingredients

No products were found.

State regulations

Massachusetts : None of the components are listed.

New York : None of the components are listed.

New Jersey : None of the components are listed.

Pennsylvania : None of the components are listed.

California Prop. 65 Clear and Reasonable Warnings (2018)

⚠ **WARNING**: This product can expose you to chemicals including Ethyl acrylate, which is known to the State of California to cause cancer, and Toluene, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Ingredient name	%	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
toluene	<0.01	No.	Yes.	-	Yes.
ethyl acrylate	<0.001	Yes.	No.	-	-

International regulations

WHMIS (Canada) : Not controlled under WHMIS (Canada).

Inventory list

United States : All components are listed or exempted.

Australia : All components are listed or exempted.

Canada : All components are listed or exempted.

China : All components are listed or exempted.

Europe : All components are listed or exempted.

Japan : **Japan inventory (ENCS)**: Not determined.
Japan inventory (ISHL): Not determined.

Malaysia : Not determined.

New Zealand : All components are listed or exempted.

Philippines : All components are listed or exempted.

Republic of Korea : All components are listed or exempted.

Taiwan : Not determined.

Thailand : Not determined.

Turkey : Not determined.

Viet Nam : Not determined.

Section 16. Other information

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

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Section 16. Other information

Procedure used to derive the classification

Classification	Justification
Not classified.	

History

Date of printing : 4/30/2018

Date of issue/Date of revision : 4/16/2018

Date of previous issue : 11/8/2017

Version : 3

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

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SAFETY DATA SHEET

03650

Section 1. Identification

Product name : KRYLON® Industrial QUIK-MARK™ Water-Based Inverted Marking Paint (Fluorescent) Red Orange

Product code : 03650

Other means of identification : Not available.

Product type : Aerosol.

Relevant identified uses of the substance or mixture and uses advised against

Not applicable.

Manufacturer : Krylon Products Group
Cleveland, OH 44115

Emergency telephone number of the company : (216) 566-2917

Product Information Telephone Number : (800) 247-3266

Regulatory Information Telephone Number : (216) 566-2902

Transportation Emergency Telephone Number : (800) 424-9300

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE AEROSOLS - Category 1
GASES UNDER PRESSURE - Compressed gas
TOXIC TO REPRODUCTION (Unborn child) - Category 2
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2
ASPIRATION HAZARD - Category 1

Percentage of the mixture consisting of ingredient(s) of unknown toxicity: 18.7%

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Extremely flammable aerosol.
Contains gas under pressure; may explode if heated.
Suspected of damaging the unborn child.
May be fatal if swallowed and enters airways.
May cause respiratory irritation.
May cause drowsiness or dizziness.
May cause damage to organs through prolonged or repeated exposure.

Section 2. Hazards identification

Precautionary statements

General : Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand.

Prevention : Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves. Wear eye or face protection. Wear protective clothing. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Do not spray on an open flame or other ignition source. Use only outdoors or in a well-ventilated area. Do not breathe dust or mist. Pressurized container: Do not pierce or burn, even after use.

Response : Get medical attention if you feel unwell. IF exposed or concerned: Get medical attention. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. IF SWALLOWED: Immediately call a POISON CENTER or physician. Do NOT induce vomiting.

Storage : Store locked up. Protect from sunlight. Do not expose to temperatures exceeding 50 °C/122 °F. Store in a well-ventilated place.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements

DANGER: Rags, steel wool, other waste soaked with this product, and sanding residue may spontaneously catch fire if improperly discarded. Immediately place rags, steel wool, other waste soaked with this product, and sanding residue in a sealed, water-filled, metal container. Dispose of in accordance with local fire regulations. DELAYED EFFECTS FROM LONG TERM OVEREXPOSURE. Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents can be harmful or fatal. WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

Please refer to the SDS for additional information. Keep out of reach of children. Keep upright in a cool, dry place. Do not discard empty can in trash compactor.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Other means of identification : Not available.

CAS number/other identifiers

Ingredient name	% by weight	CAS number
Toluene	9.77	108-88-3
Propane	9.52	74-98-6
Med. Aliphatic Hydrocarbon Solvent	8.01	64742-88-7
Butane	4.48	106-97-8
Lt. Aliphatic Hydrocarbon Solvent	1.17	64742-89-8

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention following exposure or if feeling unwell.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Aspiration hazard if swallowed. Can enter lungs and cause damage. Do not induce vomiting. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : Can cause central nervous system (CNS) depression. May cause drowsiness or dizziness. May cause respiratory irritation.

Skin contact : No known significant effects or critical hazards.

Ingestion : Can cause central nervous system (CNS) depression. May be fatal if swallowed and enters airways.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
irritation
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing
nausea or vomiting
headache
drowsiness/fatigue
dizziness/vertigo
unconsciousness
reduced fetal weight
increase in fetal deaths
skeletal malformations

Skin contact : Adverse symptoms may include the following:
reduced fetal weight
increase in fetal deaths
skeletal malformations

Section 4. First aid measures

Ingestion : Adverse symptoms may include the following:
nausea or vomiting
reduced fetal weight
increase in fetal deaths
skeletal malformations

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Extremely flammable aerosol. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. Gas may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back, causing fire or explosion. Bursting aerosol containers may be propelled from a fire at high speed. Runoff to sewer may create fire or explosion hazard.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
nitrogen oxides
sulfur oxides

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. In the case of aerosols being ruptured, care should be taken due to the rapid escape of the pressurized contents and propellant. If a large number of containers are ruptured, treat as a bulk material spillage according to the instructions in the clean-up section. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

Section 6. Accidental release measures

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Pressurized container: protect from sunlight and do not expose to temperatures exceeding 50°C. Do not pierce or burn, even after use. Avoid exposure - obtain special instructions before use. Avoid exposure during pregnancy. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not swallow. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Protect from sunlight. Store locked up. Eliminate all ignition sources. Use appropriate containment to avoid environmental contamination.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits (OSHA United States)

Section 8. Exposure controls/personal protection

Ingredient name	Exposure limits
Toluene	**OSHA PEL Z2 (United States, 2/2013).** TWA: 200 ppm 8 hours. CEIL: 300 ppm AMP: 500 ppm 10 minutes. **NIOSH REL (United States, 10/2013).** TWA: 100 ppm 10 hours. TWA: 375 mg/m³ 10 hours. STEL: 150 ppm 15 minutes. STEL: 560 mg/m³ 15 minutes. **ACGIH TLV (United States, 3/2015).** TWA: 20 ppm 8 hours.
Propane	**NIOSH REL (United States, 10/2013).** TWA: 1000 ppm 10 hours. TWA: 1800 mg/m³ 10 hours. **OSHA PEL (United States, 2/2013).** TWA: 1000 ppm 8 hours. TWA: 1800 mg/m³ 8 hours.
Med. Aliphatic Hydrocarbon Solvent	**OSHA PEL (United States, 2/2013).** TWA: 100 ppm 8 hours. TWA: 400 mg/m³ 8 hours.
Butane	**NIOSH REL (United States, 10/2013).** TWA: 800 ppm 10 hours. TWA: 1900 mg/m³ 10 hours. **ACGIH TLV (United States, 3/2015).** STEL: 1000 ppm 15 minutes.
Lt. Aliphatic Hydrocarbon Solvent	None.

Occupational exposure limits (Canada)

Ingredient name	Exposure limits
Toluene	**CA Alberta Provincial (Canada, 4/2009). Absorbed through skin.** 8 hrs OEL: 50 ppm 8 hours. 8 hrs OEL: 188 mg/m³ 8 hours. **CA British Columbia Provincial (Canada, 5/2015).** TWA: 20 ppm 8 hours. **CA Ontario Provincial (Canada, 7/2015).** TWA: 20 ppm 8 hours. **CA Quebec Provincial (Canada, 1/2014). Absorbed through skin.** TWAEV: 50 ppm 8 hours. TWAEV: 188 mg/m³ 8 hours. **CA Saskatchewan Provincial (Canada, 7/2013). Absorbed through skin.** STEL: 60 ppm 15 minutes. TWA: 50 ppm 8 hours.
Propane	**CA Alberta Provincial (Canada, 4/2009).** 8 hrs OEL: 1000 ppm 8 hours. **CA British Columbia Provincial (Canada, 5/2015).** TWA: 1000 ppm 8 hours. **CA Quebec Provincial (Canada, 1/2014).** TWAEV: 1000 ppm 8 hours. TWAEV: 1800 mg/m³ 8 hours. **CA Ontario Provincial (Canada, 7/2015).** TWA: 1000 ppm 8 hours.

Section 8. Exposure controls/personal protection

	CA Saskatchewan Provincial (Canada, 7/2013). STEL: 1250 ppm 15 minutes. TWA: 1000 ppm 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid.

Color : Not available.

Odor : Not available.

Odor threshold : Not available.

pH : 7

Melting point : Not available.

Section 9. Physical and chemical properties

Boiling point : Not available.

Flash point : Closed cup: -29°C (-20.2°F) [Pensky-Martens Closed Cup]

Evaporation rate : 2 (butyl acetate = 1)

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Lower: 0.9%
Upper: 9.5%

Vapor pressure : 13.5 kPa (101.325 mm Hg) [at 20°C]

Vapor density : 1 [Air = 1]

Relative density : 0.86

Solubility : Not available.

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

Viscosity : Kinematic (room temperature): <0.205 cm^2/s (<20.5 cSt)
Kinematic (40°C (104°F)): <0.205 cm^2/s (<20.5 cSt)

Molecular weight : Not applicable.

Aerosol product

Type of aerosol : Spray

Heat of combustion : 13.2 kJ/g

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame).

Incompatible materials : No specific data.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Toluene	LC50 Inhalation Vapor	Rat	49 g/m^3	4 hours
	LD50 Oral	Rat	636 mg/kg	-
Butane	LC50 Inhalation Vapor	Rat	658000 mg/m^3	4 hours

Irritation/Corrosion

Section 11. Toxicological information

Product/ingredient name	Result	Species	Score	Exposure	Observation
Toluene	Eyes - Mild irritant	Rabbit	-	0.5 minutes 100 milligrams	-
	Eyes - Mild irritant	Rabbit	-	870 Micrograms	-
	Eyes - Severe irritant	Rabbit	-	24 hours 2 milligrams	-
	Skin - Mild irritant	Pig	-	24 hours 250 microliters	-
	Skin - Mild irritant	Rabbit	-	435 milligrams	-
	Skin - Moderate irritant	Rabbit	-	24 hours 20 milligrams	-
	Skin - Moderate irritant	Rabbit	-	500 milligrams	-

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Classification

Product/ingredient name	OSHA	IARC	NTP
Toluene	-	3	-

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Toluene	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects
Propane	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects
Med. Aliphatic Hydrocarbon Solvent	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects
Butane	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects
Lt. Aliphatic Hydrocarbon Solvent	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects

Specific target organ toxicity (repeated exposure)

Section 11. Toxicological information

Name	Category	Route of exposure	Target organs
Toluene	Category 2	Not determined	Not determined
Propane	Category 2	Not determined	Not determined
Med. Aliphatic Hydrocarbon Solvent	Category 2	Not determined	Not determined
Butane	Category 2	Not determined	Not determined
Lt. Aliphatic Hydrocarbon Solvent	Category 2	Not determined	Not determined

Aspiration hazard

Name	Result
Toluene	ASPIRATION HAZARD - Category 1
Propane	ASPIRATION HAZARD - Category 1
Med. Aliphatic Hydrocarbon Solvent	ASPIRATION HAZARD - Category 1
Butane	ASPIRATION HAZARD - Category 1
Lt. Aliphatic Hydrocarbon Solvent	ASPIRATION HAZARD - Category 1

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : Can cause central nervous system (CNS) depression. May cause drowsiness or dizziness. May cause respiratory irritation.

Skin contact : No known significant effects or critical hazards.

Ingestion : Can cause central nervous system (CNS) depression. May be fatal if swallowed and enters airways.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
irritation
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing
nausea or vomiting
headache
drowsiness/fatigue
dizziness/vertigo
unconsciousness
reduced fetal weight
increase in fetal deaths
skeletal malformations

Skin contact : Adverse symptoms may include the following:
reduced fetal weight
increase in fetal deaths
skeletal malformations

Ingestion : Adverse symptoms may include the following:
nausea or vomiting
reduced fetal weight
increase in fetal deaths
skeletal malformations

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : May cause damage to organs through prolonged or repeated exposure.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : Suspected of damaging the unborn child.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Oral	5293.2 mg/kg

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Toluene	Acute EC50 12500 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 11600 µg/l Fresh water	Crustaceans - Gammarus pseudolimnaeus - Adult	48 hours
	Acute EC50 6000 µg/l Fresh water	Daphnia - Daphnia magna - Juvenile (Fledgling, Hatchling, Weanling)	48 hours
	Acute LC50 5500 µg/l Fresh water	Fish - Oncorhynchus kisutch - Fry	96 hours
	Chronic NOEC 1000 µg/l Fresh water	Daphnia - Daphnia magna	21 days
Lt. Aliphatic Hydrocarbon Solvent	Acute LC50 >100000 ppm Fresh water	Fish - Oncorhynchus mykiss	96 hours

Persistence and degradability

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
Toluene	-	-	Readily

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Toluene	-	90	low
Lt. Aliphatic Hydrocarbon Solvent	-	10 to 2500	high

Mobility in soil

Section 12. Ecological information

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT Classification	TDG Classification	Mexico Classification	IATA	IMDG
UN number	UN1950	UN1950	UN1950	UN1950	UN1950
UN proper shipping name	AEROSOLS	AEROSOLS	AEROSOLS	AEROSOLS, flammable	AEROSOLS
Transport hazard class(es)	2.1 	2.1 	2.1 	2.1 	2.1 
Packing group	-	-	-	-	-
Environmental hazards	No.	No.	No.	No.	No.
Additional information	- **ERG No.** 126	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2. 13-2.17 (Class 2). **ERG No.** 126	- **ERG No.** 126	-	**Emergency schedules (EmS)** F-D, S-U

Special precautions for user : Multi-modal shipping descriptions are provided for informational purposes and do not consider container sizes. The presence of a shipping description for a particular mode of transport (sea, air, etc.), does not indicate that the product is packaged suitably for that mode of transport. All packaging must be reviewed for suitability prior to shipment, and compliance with the applicable regulations is the sole responsibility of the person offering the product for transport. People loading and unloading dangerous goods must be trained on all of the risks deriving from the substances and on all actions in case of emergency situations.

Section 14. Transport information

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Proper shipping name : Not available.

Ship type : Not available.

Pollution category : Not available.

Section 15. Regulatory information

SARA 313

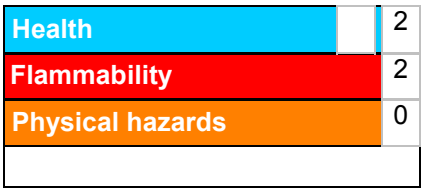
SARA 313 (40 CFR 372.45) supplier notification can be found on the Environmental Data Sheet.

California Prop. 65

WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

Section 16. Other information

Hazardous Material Information System (U.S.A.)



The customer is responsible for determining the PPE code for this material.

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

Procedure used to derive the classification

Classification	Justification
FLAMMABLE AEROSOLS - Category 1	On basis of test data
GASES UNDER PRESSURE - Compressed gas	Calculation method
TOXIC TO REPRODUCTION (Unborn child) - Category 2	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2	Calculation method
ASPIRATION HAZARD - Category 1	Calculation method

History

Date of printing : 6/20/2016

Date of issue/Date of revision : 6/20/2016

Date of previous issue : 6/4/2016

Version : 3.01

Section 16. Other information

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

Notice to reader

It is recommended that each customer or recipient of this Safety Data Sheet (SDS) study it carefully and consult resources, as necessary or appropriate, to become aware of and understand the data contained in this SDS and any hazards associated with the product. This information is provided in good faith and believed to be accurate as of the effective date herein. However, no warranty, express or implied, is given. The information presented here applies only to the product as shipped. The addition of any material can change the composition, hazards and risks of the product. Products shall not be repackaged, modified, or tinted except as specifically instructed by Sherwin-Williams, including but not limited to the incorporation of non Sherwin-Williams products or the use or addition of products in proportions not specified by Sherwin-Williams. Regulatory requirements are subject to change and may differ between various locations and jurisdictions. The customer/buyer/user is responsible to ensure that his activities comply with all country, federal, state, provincial or local laws. The conditions for use of the product are not under the control of the manufacturer; the customer/buyer/user is responsible to determine the conditions necessary for the safe use of this product. The customer/buyer/user should not use the product for any purpose other than the purpose shown in the applicable section of this SDS without first referring to the supplier and obtaining written handling instructions. Due to the proliferation of sources for information such as manufacturer-specific SDS, the manufacturer cannot be responsible for SDSs obtained from any other source.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.09.2015 **Revision** : 12.10.2015

Trade Name: Liquinox

1 Identification of the substance/mixture and of the supplier

1.1 Product identifier

Trade Name: Liquinox
Synonyms:
Product number: Liquinox

1.2 Application of the substance / the mixture : Cleaning material/Detergent

1.3 Details of the supplier of the Safety Data Sheet

Manufacturer	Supplier
Alconox, Inc. 30 Glenn Street White Plains, NY 10603 1-914-948-4040	Not Applicable

Emergency telephone number:
ChemTel Inc
North America: 1-800-255-3924
International: 01-813-248-0585

2 Hazards identification

2.1 Classification of the substance or mixture:

In compliance with EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments.

Hazard-determining components of labeling:
Ethylenediaminetetraacetic acid, tripotassium salt
Alcohol Ethoxylate
Sodium Alkylbenzene Sulfonate
sodium xylenesulphonate
Coconut diethanolamide

2.2 Label elements:

Eye irritation, category 2A.
Skin irritation, category 2.

Hazard pictograms:

Signal word: Warning

Hazard statements:
H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P332+P313 If skin irritation occurs: Get medical advice/attention.
P501 Dispose of contents and container as instructed in Section 13.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.09.2015 **Revision** : 12.10.2015

Trade Name: Liquinox

Additional information: None.

Hazard description

Hazards Not Otherwise Classified (HNOC): None

Information concerning particular hazards for humans and environment:

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

Classification system:

The classification is according to EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments, and extended by company and literature data. The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

3 Composition/information on ingredients

3.1 Chemical characterization : None

3.2 Description : None

3.3 Hazardous components (percentages by weight)

Identification	Chemical Name	Classification	Wt. %
CAS number: 68081-81-2	Sodium Alkylbenzene Sulfonate	Acute Tox. 4; H303 Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	10-25
CAS number: 1300-72-7	Sodium Xylenesulphonate	Eye Irrit. 2; H319	2.5-10
CAS number: 84133-50-6	Alcohol Ethoxylate	Skin Irrit. 2 ; H315 Eye Dam. 1; H318	2.5-10
CAS number: 68603-42-9	Coconut diethanolamide	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	2.5-10
CAS number: 17572-97-3	Ethylenediaminetetraacetic acid, tripotassium salt	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319 Stot SE 3; H335	2.5-10

3.4 Additional Information : None.

4 First aid measures

4.1 Description of first aid measures

General information: None.

After inhalation:

Maintain an unobstructed airway.

Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:

Wash affected area with soap and water.

Seek medical attention if symptoms develop or persist.

After eye contact:

Rinse/flush exposed eye(s) gently using water for 15-20 minutes.

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.09.2015 **Revision** : 12.10.2015

Trade Name: Liquinox

Remove contact lens(es) if able to do so during rinsing.
Seek medical attention if irritation persists or if concerned.

After swallowing:
Rinse mouth thoroughly.
Seek medical attention if irritation, discomfort, or vomiting persists.

4.2 Most important symptoms and effects, both acute and delayed

None

4.3 Indication of any immediate medical attention and special treatment needed:

No additional information.

5 Firefighting measures

5.1 Extinguishing media

Suitable extinguishing agents:
Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition.

For safety reasons unsuitable extinguishing agents : None

5.2 Special hazards arising from the substance or mixture :

Thermal decomposition can lead to release of irritating gases and vapors.

5.3 Advice for firefighters

Protective equipment:
Wear protective eye wear, gloves and clothing.
Refer to Section 8.

5.4 Additional information :

Avoid inhaling gases, fumes, dust, mist, vapor and aerosols.
Avoid contact with skin, eyes and clothing.

6 Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures :

Ensure adequate ventilation.
Ensure air handling systems are operational.

6.2 Environmental precautions :

Should not be released into the environment.
Prevent from reaching drains, sewer or waterway.

6.3 Methods and material for containment and cleaning up :

Wear protective eye wear, gloves and clothing.

6.4 Reference to other sections : None

7 Handling and storage

7.1 Precautions for safe handling :

Avoid breathing mist or vapor.
Do not eat, drink, smoke or use personal products when handling chemical substances.

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.09.2015 **Revision** : 12.10.2015

Trade Name: Liquinox

7.2 Conditions for safe storage, including any incompatibilities :
Store in a cool, well-ventilated area.

7.3 Specific end use(s):
No additional information.

8 Exposure controls/personal protection

8.1 Control parameters :
84133-50-6, Alcohol Ethoxylate, AIHA TWA 10 mg/m3.

8.2 Exposure controls

Appropriate engineering controls:
Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling.

Respiratory protection:
Not needed under normal conditions.

Protection of skin:
Select glove material impermeable and resistant to the substance.

Eye protection:
Safety goggles or glasses, or appropriate eye protection.

General hygienic measures:
Wash hands before breaks and at the end of work.
Avoid contact with skin, eyes and clothing.

9 Physical and chemical properties

Appearance (physical state, color):	Pale yellow liquid	**Explosion limit lower**: **Explosion limit upper**:	Not determined or not available. Not determined or not available.
Odor:	Not determined or not available.	**Vapor pressure at 20°C**:	Not determined or not available.
Odor threshold:	Not determined or not available.	**Vapor density**:	Not determined or not available.
pH-value:	8.5 as is	**Relative density**:	Not determined or not available.
Melting/Freezing point:	Not determined or not available.	**Solubilities**:	Not determined or not available.
Boiling point/Boiling range:	Not determined or not available.	**Partition coefficient (n-octanol/water)**:	Not determined or not available.
Flash point (closed cup):	Not determined or not available.	**Auto/Self-ignition temperature**:	Not determined or not available.

Safety Data Sheet

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Trade Name: Liquinox

Evaporation rate:	Not determined or not available.	**Decomposition temperature**:	Not determined or not available.
Flammability (solid, gaseous):	Not determined or not available.	**Viscosity**:	a. Kinematic: Not determined or not available. b. Dynamic: Not determined or not available.
Density at 20°C:	Not determined or not available.		

10 Stability and reactivity

10.1 Reactivity : None

10.2 Chemical stability : None

10.3 Possibility hazardous reactions : None

10.4 Conditions to avoid : None

10.5 Incompatible materials : None

10.6 Hazardous decomposition products : None

11 Toxicological information

11.1 Information on toxicological effects :

Acute Toxicity:

Oral:

: LD50 >5000 mg per kg Rat, Oral) - product .

Chronic Toxicity: No additional information.

Skin corrosion/irritation:

Alcohol Ethoxylate: May cause mild to moderate skin irritation .

Sodium Alkylbenzene Sulfonate: Causes skin irritation. .

Coconut diethanolamide: Causes skin irritation .

Serious eye damage/irritation:

Sodium Alkylbenzene Sulfonate: Causes serious eye irritation .

Alcohol Ethoxylate: Causes moderate to severe eye irritation and conjunctivitis .

sodium xylenesulphonate: Rabbit: irritating to eyes .

Coconut diethanolamide: Causes eye irritation .

Respiratory or skin sensitization: No additional information.

Carcinogenicity: No additional information.

IARC (International Agency for Research on Cancer): None of the ingredients are listed.

NTP (National Toxicology Program): None of the ingredients are listed.

Germ cell mutagenicity: No additional information.

Reproductive toxicity: No additional information.

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Trade Name: Liquinox

STOT-single and repeated exposure:

Ethylenediaminetetraacetic acid, tripotassium salt: SE: May cause respiratory irritation.

Additional toxicological information: No additional information.

12 Ecological information

12.1 Toxicity:

Sodium Alkylbenzene Sulfonate: Fish, LC50 1.67 mg/l, 96 hours.
Sodium Alkylbenzene Sulfonate: Aquatic invertebrates, EC50 Daphnia 2.4 mg/l, 48 hours.
Sodium Alkylbenzene Sulfonate: Aquatic Plants, EC50 Algae 29 mg/l, 96 hours.
Coconut diethanolamide: Fish, (LC50): 3.6 mg/l 96 hours [Fish (Brachydanio rerio)].
Coconut diethanolamide: Aquatic invertebrates, 4.2 mg/l 24 hours [Daphnia (daphnia magna)].
Alcohol Ethoxylate: Fish, (LC50): 4.01 mg/l 48 hours [Daphnia (daphnia)].

12.2 Persistence and degradability: No additional information.

12.3 Bioaccumulative potential: No additional information.

12.4 Mobility in soil: No additional information.

General notes: No additional information.

12.5 Results of PBT and vPvB assessment:

PBT: No additional information.

vPvB: No additional information.

12.6 Other adverse effects: No additional information.

13 Disposal considerations

13.1 Waste treatment methods (consult local, regional and national authorities for proper disposal)

Relevant Information:

It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities. (US 40CFR262.11).

14 Transport information

14.1 UN Number: ADR, ADN, DOT, IMDG, IATA		None
14.2 UN Proper shipping name: ADR, ADN, DOT, IMDG, IATA		None
14.3 Transport hazard classes: ADR, ADN, DOT, IMDG, IATA	**Class:** **Label:** **LTD. QTY:**	None None None
US DOT **Limited Quantity Exception:**		None

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Trade Name: Liquinox

Bulk:	**Non Bulk:**
RQ (if applicable): None	**RQ (if applicable):** None
Proper shipping Name: None	**Proper shipping Name:** None
Hazard Class: None	**Hazard Class:** None
Packing Group: None	**Packing Group:** None
Marine Pollutant (if applicable): No additional information.	**Marine Pollutant (if applicable):** No additional information.
Comments: None	**Comments:** None

14.4	**Packing group:** ADR, ADN, DOT, IMDG, IATA	None
14.5	**Environmental hazards** :	None
14.6	**Special precautions for user:**	None
	Danger code (Kemler):	None
	EMS number:	None
	Segregation groups:	None
14.7	**Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code:**	Not applicable.
14.8	**Transport/Additional information:**	
	Transport category:	None
	Tunnel restriction code:	None
	UN "Model Regulation":	None

15 Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture.

North American

SARA

Section 313 (specific toxic chemical listings): None of the ingredients are listed.
Section 302 (extremely hazardous substances): None of the ingredients are listed.

CERCLA (Comprehensive Environmental Response, Clean up and Liability Act) Reportable

Spill Quantity: None of the ingredients are listed.

TSCA (Toxic Substances Control Act):

Inventory: All ingredients are listed.
Rules and Orders: Not applicable.

Proposition 65 (California):

Chemicals known to cause cancer: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for females: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for males: None of the ingredients are listed.

Chemicals known to cause developmental toxicity: None of the ingredients are listed.

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Canadian

Canadian Domestic Substances List (DSL):
All ingredients are listed.

EU

REACH Article 57 (SVHC): None of the ingredients are listed.

Germany MAK: Not classified.

Asia Pacific

Australia

Australian Inventory of Chemical Substances (AICS): All ingredients are listed.

China

Inventory of Existing Chemical Substances in China (IECSC): All ingredients are listed.

Japan

Inventory of Existing and New Chemical Substances (ENCS): All ingredients are listed.

Korea

Existing Chemicals List (ECL): All ingredients are listed.

New Zealand

New Zealand Inventory of Chemicals (NZOIC): All ingredients are listed.

Philippines

Philippine Inventory of Chemicals and Chemical Substances (PICCS): All ingredients are listed.

Taiwan

Taiwan Chemical Substance Inventory (TSCI): All ingredients are listed.

16 Other information

Abbreviations and Acronyms: None

Summary of Phrases

Hazard statements:
H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P332+P313 If skin irritation occurs: Get medical advice/attention.
P501 Dispose of contents and container as instructed in Section 13.

Manufacturer Statement:

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling,

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use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

NFPA: 1-0-0

HMIS: 1-0-0

APPENDIX D
FIELD FORMS

Alternate Procedures Confined Space Entry Checklist

Project Name:	Date / Time:
Project Number:	Project Location:
Checklist Completed By:	Project Manager:
Location and Description of Confined Space:	
Entry Objectives:	
Equipment / Materials Required for Entry:	
Time of Entry:	Expiration of Entry:

Pre-Entry Air Monitoring

Enter pre-entry readings below to confirm that space is safe for entry - maintain the permit space safe for entry (e.g. defined as, <5% LEL; toxic substance levels 50% or less of the ACGIH TLV or OSHA PEL, whichever is more stringent)

Monitoring For	Monitoring Equipment	Calibration Info: Date	Calibration Info: Time	Pre-Entry Reading	Defined Acceptable Range for Entry[1]
% Oxygen					19.5 – 23.5%
% of LEL					<5% LEL
Hydrogen Sulfide-H_2S					<0.5 ppm TLV-TWA <2.5 ppm TLV-STEL
Carbon Monoxide-CO					<12.5 ppm
Combustible Dust (LFL)					< 50% of LFL
Other:					<50% of TLV or PEL (whichever is more stringent)

[1] Refer to the Confined Space Standard for details on acceptable ranges based on entry classification.
TLV-STEL - Short-term exposure limit: Employee can work in the area up to 15 minutes
TLV-TWA - 8 hr. Time Weighted Avg (PEL/TLV): Employee can work in area 8 hrs (longer with appropriate respiratory protection)

Pre-Entry Atmospheric Testing Conducted By

Print Name:	Date:
Signature:	Time:

Pre-Entry Checklist

Checklist	YES	NO	N/A	Comment
Competent Person completed confined space evaluation?	☐	☐	☐	Attach copy of signed confined space evaluation to this entry checklist and make available to all entrants
Entry staff completed Confined Space awareness level training?	☐	☐	☐	If ***NO*** , ***STOP WORK*** - Staff must possess the understating, knowledge, and skills necessary for safe use of Alternate Procedures entry.
Arcadis can demonstrate that all physical hazards in the space are eliminated or isolated through engineering controls so that the only hazard posed by the permit space is an actual or potential hazardous atmosphere?	☐	☐	☐	

Pre-Entry Checklist				
Checklist	**YES**	**NO**	**N/A**	**Comment**
Arcadis can demonstrate that continuous forced air ventilation alone is sufficient to maintain that permit space safe for entry, and that, in the event the ventilation system stops working, entrants can exit the space safely.	☐	☐	☐	
Arcadis has developed air monitoring and inspection data that addresses air monitoring to verify that a hazardous atmosphere is not present during Alternate Procedures entry.	☐	☐	☐	
Is an initial entry of the permit space necessary to obtain monitoring and inspection data?	☐	☐	☐	If ***YES***, ***STOP WORK*** - Do not enter the confined space. If entry is required to conduct air monitoring/inspection, then this must be performed as a Permit Required Confined Space entry
Have any conditions making it unsafe to remove an entrance cover been eliminated before the cover is removed?	☐	☐	☐	
When entrance covers are removed, has the opening been immediately guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening and that will protect each employee working in the space from foreign objects entering the space?	☐	☐	☐	
Before an employee enters the space, the internal atmosphere has been tested, with a calibrated direct-reading instrument, for oxygen content, for flammable gases and vapors, and for potential toxic air contaminants, in that order?	☐	☐	☐	Any employee who enters the space, or that employee's authorized representative, must be provided an opportunity to observe the pre-entry testing
Is Arcadis actively monitoring and or assessing to confirm that a hazardous atmosphere is not present within the confined space whenever any employee is inside the space?	☐	☐	☐	
Forced air ventilation has eliminated any hazardous atmosphere before employees are allowed to enter the confined space?	☐	☐	☐	

Pre-Entry Checklist				
Checklist	**YES**	**NO**	**N/A**	**Comment**
Is forced air ventilation directed as to ventilate the immediate areas where an employee is or will be present within the confined space and will continue until all employees have left the space?	☐	☐	☐	
Is the air supply for the forced air ventilation from a clean source and doesn't increase the hazards in the space?	☐	☐	☐	
Is the atmosphere within the space continuously monitored unless Arcadis can demonstrate that equipment for continuous monitoring is not commercially available or periodic monitoring is sufficient?	☐	☐	☐	
If continuous monitoring is used, does the monitoring equipment have an alarm that will notify all entrants if a specified atmospheric threshold is achieved, or an established process that an employee will check the monitor with sufficient frequency to ensure that entrants have adequate time to escape?	☐	☐	☐	
If continuous monitoring is not used, have we established a adequate periodic monitoring timeframe?	☐	☐	☐	
If a hazard has developed, did Arcadis stop work and evacuate the space until an evaluation determined how the hazard developed?	☐	☐	☐	
If a hazard developed during confined space entry, did Arcadis implement measures to protect employees from this hazard before any subsequent entry takes place?	☐	☐	☐	
Is there a safe method of entering and exiting the confined space?	☐	☐	☐	If a hoisting system is used, it must be designed and manufactured for personnel hoisting
Adequate emergency supplies on hand?	☐	☐	☐	Fire extinguisher, first aid/CPR supplies, etc.
Note: A permit-required confined space may be entered using Alternate Procedures for as long as the non-atmospheric hazards remain eliminated or isolated; forced air ventilation alone is sufficient to maintain that permit space safe for entry and that, in the event the ventilation system stops working, entrants can exit the space safely; Arcadis develops monitoring and inspection data to confirms the above; and the monitoring and inspection can be completed without initially entering the space. If hazards arise within an Alternate Procedures space: (A) Each employee must leave the space immediately; (B) The space must be evaluated to determine how the hazard developed; and (C) Arcadis must implement measures to protect employees from the hazard before any subsequent entry takes place.				

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Arcadis Alternate Procedures Confined Space Entrant(s)	
Total Number of Entrants (Arcadis + Other Authorized Entrants):	
I have been properly instructed with regards to safe entry into this confined space using Alternate Procedures and understand my duties and STOP WORK Authority:	
Names of Entrant(s)	**Signature of Entrants**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Other Authorized Entrants (Contractor, Client, Regulator) Entering Confined Space - Alternate Procedures	
Multi-employer work site activities coordinated?	Yes / No / NA
Confirmed that workers working outside confined space won't introduce hazards into the Non- Permit Required Confined Space?	Yes / No / NA
I have been properly instructed with regards to safe entry into this confined space using Alternate Procedures and understand my duties and my STOP WORK Authority:	
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date

Individual Authorizing Confined Space Entry using Alternate Procedures	
The following signatory has reviewed this pre-entry checklist, the information contained here-in and has reviewed the confined space evaluation form. Written instructions and safety procedures have been received and are understood. Entry cannot be approved if any questions are answered with a "NO".	
Name (Print):	Date:
Signature:	Time:

Documenting Problems Encountered during Non-PRCS Entry
If problems are encountered during entry, submit a copy of this checklist to corporate H&S so necessary program/standard revisions can be developed and that a record of documented problems/incidents during Non-PRCS is maintained. A copy of the Non-PRCS Entry Checklist will be forwarded to 4-sight-support@arcadis-us.com
Describe problem/incident:
Detail confined space program / standard revisions required:
Date Copy of Non-PRCS Entry Checklist provided to Corporate H&S:
Copy of Non-PRCS Entry Checklist provided to Corporate H&S Dept via e-mail: **4-Sight-Support@arcadis-us.com**

ARCADIS Design & Consultancy for natural and built assets

Alternate Procedures Confined Space Entry
Air Monitoring Documentation

Project Name:	Date:
Project Number:	Location:
Air Monitoring Conducted By:	Project Manager:

Air Monitoring

Aceptable Range		19.5–23.5%	<5% LEL	<0.5ppm TWA <2.5ppm STEL	<12.5 ppm	< 50% LFL	
Time	Monitoring Equipment	% Oxygen	% of LEL	Hydrogen Sulfide-H_2S	Carbon Monoxide-CO	Combustible Dust (LFL)	Other / Comment

Competent person shall use a meter calibrated to manufacturer specifications and validated using calibration grade gas daily. Calibration and validation must be documented and attached to this form.

Print Name:	Date:
Signature:	

Confined Space Evaluation Form

Must be attached to Completed Non PRCS & Alternative Procedures Checklist or PRCS Entry Permit

Project Name:	Date / Time:
Project Number:	Project Location:
Evaluation Completed By:	Project Manager:

1. Description of Confined Space

Location of the Space:	
Owner/Host Employer of Space:	Description of the Space:
Dimensions of the Space Entrance:	Dimensions of the Space:
Volume of the Space (Formulas in Instruction Guide):	

2. Definition of the Confined Space

	YES	NO
The space is large enough and so configured that an employee can bodily enter and perform assigned work? **Note:** In order to meet this criteria, an employee must physically be able to enter and work in the space	☐	☐
The space has limited or restricted means of entry of exit?	☐	☐
The space is not designed for continuous occupancy?	☐	☐

1) If any of the above questions are marked ***NO***, this is not a confined space. Stop here and go to ***Section 5***.
2) If all of the above questions are marked ***YES***, go to ***Section 3***.

3. Identification of Confined Space Hazards

Documentation of Pre-Entry Air Monitoring

Monitoring For	Monitoring Equipment	Calibration Info: Date / Time	Calibration Info: By	Pre-Entry Reading	Defined Acceptable Range for Entry[1]
% Oxygen					19.5 – 23.5%
% of LEL					<10% LEL
Hydrogen Sulfide-H_2S					<1 ppm TLV-TWA <5 ppm TLV-STEL
Carbon Monoxide-CO					<25 ppm
Combustible Dust (LFL)					< LFL (Dust that doesn't not obscure vision at a distance of 5ft)
Other:					

[1] Refer to the Confined Space Standard for details on acceptable ranges based on entry classification.
TLV-STEL - Short-term exposure limit: Employee can work in the area up to 15 minutes
TLV-TWA - 8 hr. Time Weighted Avg (PEL/TLV): Employee can work in area 8 hrs (longer with appropriate respiratory protection)

Pre-Entry Atmospheric Testing Conducted By

Print Name:	Date:
Signature:	Time:

Does the confined space contain, or have the potential to contain, a Hazardous Atmosphere? ***Note:*** See Alternate Procedures Confined Space Entry	**YES**	**NO**
Oxygen deficient <19.5% or enriched >23	☐	☐
Combustible gases, vapors above 10% of Lower Explosive Limit (LEL)	☐	☐
Hydrogen Sulfide >1 ppm	☐	☐
Carbon Monoxide >25 ppm	☐	☐
An airborne combustible dust at a concentration that meets or exceeds its Lower Flammable Limit (LFL). This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet (1.52 m) or less.	☐	☐
Other toxic gas or vapors exceeding the OSHA PEL or ACGIH TLV, whichever is more stringent.	☐	☐
Any other atmospheric condition that is immediately dangerous to life or health. **Describe:**	☐	☐
Does the confined space contain a material with the potential for engulfment of an entrant? (e.g., grain, sand or water). **Describe:**	☐	☐
Does the confined space have an internal shape such that a worker could be trapped or suffocated by inwardly converging walls, floor or ceiling? **Describe:**	☐	☐
Does the confined space contain any other recognized serious safety or health hazards? **Note:** A serious safety or health hazard is described as the substantial probability that death or serious physical harm could result from a condition that exists, or from one or more practices, means, methods, operations or processes that have been adopted or are in use.	**YES**	**NO**
Mechanical - (agitators, blenders, stirrers, conveyors, unguarded moving parts)	☐	☐
Electrical - (power line contact hazard, exposed energized equipment or terminals)	☐	☐
Chemical - (acids, alkali, coal tar products, skin irritants, solvents)	☐	☐
Environment - (heat stress; cold stress; lighting; flooding)	☐	☐
Biological - (sewage, waste water, blood or other bodily fluids, live or dead animals)	☐	☐
Pressure - (compressed gas cylinders, pneumatic or hydraulic lines/equipment, tanks, heated vessels)	☐	☐
Radiation - (Radioactive sources, lasers, Infrared or UV sources, microwaves, RF, welding flash)	☐	☐
Hot Work - Welding, cutting, torch work or other (note that a hot work permit is required)	☐	☐
Any other recognized serious safety or health hazards. **Describe:**	☐	☐

1) If ***ALL*** of the above hazards are marked ***NO*****,** stop here, classify as a Confined Space Only and go to ***Section 5***.
2) If any of the above hazards are marked ***YES***, complete ***Section 4*** and continue to classify your space. If the nature of the work creates any of the above hazards, this may become a Permit Required Confined Space. Go to ***Section 4***.

4. Definition of Hazards and Description of Controls

(List all of the hazards marked *YES* in Section 3 and complete the information in the table below)

Hazard	Description	Controls

1) If the permit space ***poses no actual or potential atmospheric hazards*** and if all ***non-atmospheric hazards*** within the space are ***eliminated without entry into the space***, the permit space may be reclassified as a ***NON PERMIT REQUIRED CONFINED SPACE*** for as long as the non-atmospheric hazards remain eliminated, stop here and go to ***Section 5.***
2) If all ***non-atmospheric hazards within the space are eliminated*** without entry into the space and actual or potential ***atmospheric hazards are isolated or eliminated through forced air ventilation*** use ***Alternate Procedures Confined Space Entry*** below.
3) If ***Hazards listed are not isolated or eliminated*** the space must be classify this space a ***PERMIT REQUIRED CONFINED SPACE***, stop here and go to ***Section 5***.

4.a Alternate Procedures Confined Space Entry

For Controlling Atmospheric Hazards

If Arcadis can demonstrate that physical hazards within the space are eliminated or isolated using engineering controls and the only hazard was a potential or actual atmospheric hazard, without entry into the space to assess, and we can demonstrate that continuous forced air ventilation is sufficient to maintain the permit space safe for entry (e.g. defined as, <5% LEL; toxic substance levels 50% or less of the ACGIH TLV or OSHA PEL, whichever is more stringent), then Arcadis may use the Alternate Procedures outlined in (c)(5)(ii) of the OSHA General Industry Permit-Required Confined Space Standard (29 CFR 1910.146) or 29 CFR 1926.1203(e)(2) for Construction Work.

If an initial entry of the permit space necessary to obtain monitoring and inspection data, STOP WORK – This must be performed as a Permit Required Confined Space Entry.

What is the capacity and configuration of the ventilation equipment to be used?
Describe:

Identify atmospheric hazards and potential hazards created by work in the space.
Describe:

In the event the ventilation system stops working, define what atmospheric monitoring procedures will be set-up to detect an increase in atmospheric hazard levels in sufficient time for the entrants to safely exit the space:
Describe:

Alternate Procedures Confined Space Entry Readings

Detail below final sampling results from routine testing of the space from the time ventilating began through final determination of acceptable entry conditions (LEL and toxic substance values must be 50% or less of TLV or PEL): (Use table below and the Confined Space Evaluation Air Monitoring Documentation Form)

Monitoring For	Monitoring Equipment	Calibration Info: Date / Time	Calibration Info: By	Pre-Entry Reading	Defined Acceptable Range for Entry[1]
% Oxygen					19.5 – 23.5%
% of LEL					<5% LEL
Hydrogen Sulfide-H_2S					<0.5 ppm TLV-TWA <2.5 ppm TLV-STEL
Carbon Monoxide-CO					<12.5 ppm
Combustible Dust (LFL)					< 50% of LFL
Other:					<50% of TLV or PEL (whichever is more stringent)

[1] Refer to the Confined Space Standard for details on acceptable ranges based on entry classification.
TLV-STEL - Short-term exposure limit: Employee can work in the area up to 15 minutes
TLV-TWA - 8 hr. Time Weighted Avg (PEL/TLV): Employee can work in area 8 hrs (longer with appropriate respiratory protection)

Pre-Entry Atmospheric Testing Conducted By

Print Name:	Date:
Signature:	Time:

1) For ***Permit Required Confined Space Qualifying for Alternate Procedures Confined Space Entry Procedures*** - Go to ***Section 5***.
2) If the permit space has actual or potential atmospheric **hazards that can not be controlled** with ventilation OR the Non-*Atmospheric hazards listed above have no controls, or if the controls are not achievable for the hazards listed above*, this ***area will be considered a: Permit Required Confined Space***. Go to ***Section 5***.

5. Confined Space Classification		
Select how the space was classified and associated Checklist or Permit	**YES**	**NO**
Is the Space classified as a Confined Space? **Note:** If ***NO*** proceed to Section 6. If ***YES*** answer the questions below.	☐	☐
Is the Space classified as Non Permit Required Confined Space? **Note:** If ***YES*** this evaluation must be attached to the ***Completed Non Permit Required Confined Space Entry Checklist***.	☐	☐
Is the space a Permit Required Confined Space Qualifying for Alternate Procedures Confined Space Entry Procedures? **Note:** If ***YES*** this evaluation must be attached to the ***Completed Alternate Procedures Confined Space Entry Checklist.***	☐	☐
Is the space classified as Permit Required Confined Space? **Note:** If ***YES*** this evaluation must be attached to the ***Completed Permit-Required Confined Space Entry Permit.***	☐	☐
1) Evaluation Complete. Go to **Step 6**		

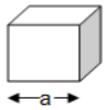
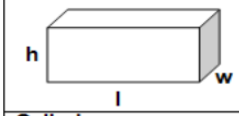
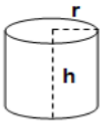
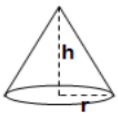
6. Competent Person Completing Confined Space Evaluation Form	
Please note that the minimal credentials for the person authorized to evaluate confined spaces and to certify the space safe for entry, when it relates to Alternate Procedures or Non-Permit Required Confined Space entry, is a competent person (e.g., one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them). A copy of this evaluation form must be attached to the Entry Permit, Alternate Procedures entry checklist and/or Non-Permit Required Confined Space entry checklist	
Name (Print):	Date:
Signature:	Time:

Confined Space Evaluation Form Instruction Guide

The Confined Space Evaluation From must be completed to properly classify a space as a confined space and must be completed prior to entering a confined space. The evaluation form must be attached to the completed Non Permit Required Confined Space Checklists, Alternative Procedures Checklist or the Permit Required Confined Space Entry Permit.

Section 1. Description of Confined Space

Location: Fill in building pertinent information as indicated on the form. Locations can be uniquely identifiable such as Manhole #, Chemical Building, or Tank C.
Description of the space: Give a short but detailed description of the space to be entered.
Dimension of entrance: Fill in the dimensions of the opening into the space.
Dimension of space: Fill in the approximate depth and width of the space in feet.
Volume of space: Fill in the approximate volume of the space.

Figure	Formula	Variables
Cube 	a^3	a = length of edge
Rectangular prism 	l × w × h	l = length w = width h = height
Cylinder 	$\pi \times r^2 \times h$	r = radius of circular face h = height
Cone 	$1/3 \times \pi \times r^2 \times h$	r = radius of circular base h = height from tip to base

Section 2. Definition of the Confined Space

Check ***Yes*** or ***No*** to the three questions, then follow instructions on the form. If Yes is marked for all 3 questions, the space will be classified as a confined space.

3. Identification of Confined Space Hazards

Mark the appropriate ***Yes*** or ***No*** box for each Question. For the Other recognized serious safety or health hazards question, check those categories that apply. For example, if there is an exposed electrical hazard that poses an electrical shock/arc flash hazard located in the confined space, the box labeled Electrical would be checked on the form. The box labeled "Other" may be used for other undefined serious safety or health hazards. **If no hazards can be identified, please indicate "None" in *Section 4* and proceed to *Section 5*.**

Note: A serious safety or health hazard is described as the substantial probability that death or serious physical harm could result from a condition that exists, or from one or more practices, means, methods, operations or processes that have been adopted or are in use.

Section 4. Definition of Hazards and Description of Controls

Describe the hazards present at the time of entry. This rating is irrelevant of what activity is going to occur. (Follow the instructions of the form). Examples of these types of hazards include:

(HA) Hazardous Atmosphere Oxygen level < 19.5 or > 23.5 percent. Flammable range (LFL or LEL) of > than 10%. Toxic air > than TLV or PEL, whichever is more stringent (e.g. CO, H2S).

(M) Mechanical hazards such as sharp objects, augers, paddles, moving gears or parts, rotating, equipment, etc.

(E) Electrical Hazards - electrical sources significant enough to cause personal injury.

(CC) Chemical Contact, typically skin and eye hazard. Corrosive materials that could cause burns, sensitization.

(EN) Environment - heat stress; cold stress; lighting; flooding)

(B) Biological Hazards - sewage, waste water, blood or other bodily fluids, live or dead animals

(P) Pressure - compressed gas cylinders, pneumatic or hydraulic lines/equipment, tanks, well heads, heated vessels

(R) Radiation - Radioactive sources, lasers, Infrared or UV sources, microwaves, RF, welding flash

(W) Welding, cutting, torch work or other hot work (note that a hot work permit is required)

(O) Other recognized serious safety or health hazards

Note: Corrosive chemicals on the wall which pose a skin hazard rather than a respiratory hazard should be listed under "Chemical Contact" hazards.

Section 4 must be extremely well documented, especially the hazard column if you are using this section to confirm whether a space is considered a non permit required confined space. A space classified by the employer as a permit required confined space may be reclassified as a non permit confined if the permit space poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated without entry into the space. For example: if an auger is in a confined space, a Lock out/Tag out of the auger may still require the space to be a permit required confined space, but the LO/TO or hazard removal of the auger could reclassify the space as a non permit required confined space.

Arcadis recommends confined spaces that had contained materials with a NFPA/HMIS rating of 2 or more to be classified as a permit required confined space. Furthermore, Site sewers should also be treated as a permit required confined space. Good candidates for non permit required confined spaces are: tanks which do not/did not contain a hazardous material and storm water sewers.

Hazard	Description	Controls
(HA)	Specific chemical creating a toxic or flammable hazard	State the location of the valve to shut off the chemical. If ventilation is used to control the atmospheric hazard, include flow rates, number of air changes needed, etc.
(M)	Pneumatic press, hydraulic lift, auger, propellers, agitators	State what action needs to be taken to eliminate the hazard. For example: Hydraulic - lockout hydraulic source and place pin in the lift, or block it so it can not fall. For an auger or paddle - remove the auger or lock it/tag it
(E)	State the voltage/amperage and the source. For example: 208v/40amp/vacuum pump	State what needs to be done to lock out the electrical supply and bleed off the vacuum. For example: Lock out and tag out the knife switch located next to the vacuum pump. Open valve on vacuum line to bring to atmospheric pressure.
(CC)	List what chemical hazards might be present. Examples include chemical contact that is a corrosive, or chemical gases, etc.	State the actions to be taken to minimize/eliminate the chemical hazard. For chemical contact, list the PPE or method to decontaminate the tank.
(O)	List all other hazard that might be present. An example may be water that might present a drowning hazard, or dirt that may fall in on you.	State the actions to be taken to minimize/eliminate the hazard. Drain any water that may present a drowning hazard or use a harness device that prevents a person from being submerged

Note:
Hazard - This space is a listing of the hazards identified in ***Section 3.***
Description and Controls - In these two columns, provide a DESCRIPTION of the hazard associated with the confined space and the CONTROL used to minimize or eliminate the hazard.

5. Confined Space Classification

List the classification of the space. Check ***YES*** or ***NO*** or questions. Follow directions at the bottom of the section.
If the space is not classified as a confined space keep evaluation with project records. The evaluation form must be attached to the completed Non Permit Required Confined Space Checklists, Alternative Procedures Checklist or the Permit Required Confined Space Entry Permit.

6. Competent Person Completing Confined Space Evaluation Form

The Competent Person signs this form prior to entry into the confined space.

Note: the minimal credentials for the person authorized to evaluate confined spaces and to certify the space safe for entry, when it relates to Alternate Procedures or Non-Permit Required Confined Space entry, is a competent person (e.g., one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them).

PRCS entries must be reviewed and approved by an Entry Supervisor.

Confined Space Evaluation
2.& 4. Air Monitoring Documentation

Project Name:	Date:
Project Number:	Location:
Air Monitoring Conducted By:	Project Manager:

Air Monitoring

Time	Monitoring Equipment	% Oxygen	% of LEL	Hydrogen Sulfide-H_2S	Carbon Monoxide-CO	Combustible Dust (LFL)	Other / Comment
Values beyond defined Aceptable Range = Hazardous Atmosphere		19.5–23.5%	<10% LEL	<1 ppm TWA <5ppm STEL	<25 ppm	< LFL *	

Competent person shall use a meter calibrated to manufacturer specifications and validated using calibration grade gas daily. Calibration and validation must be documented and attached to this form.

Print Name:	Date:
Signature:	

Note: * approximated as a condition in which the dust obscures vision at a distance of 5 feet

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Confined Space Evaluation
4. Definition of Hazards and Description of Controls

Project Name:	Date:
Project Number:	Location:
Evaluation Conducted By:	Project Manager:

Hazard	Description	Controls

Print Name:	Date:
Signature:	

Lockout/Tagout Exchange of Information Documentation

The LO/TO standard requires that Arcadis exchange energy control procedures with outside employers who service and/or maintain equipment/machines owned by Arcadis that require LO/TO. Arcadis staff will use this form to notify all parties that they must comply with any identified restrictions and prohibitions, as outlined below. This form should be completed by an Arcadis Qualified LO/TO staff person in conjunction with the outside employer's LO/TO Authorized representative. This exchange of information must occur before service/maintenance activities begin on Arcadis-owned equipment. If Arcadis staff will also be working on this equipment or in surrounding areas, then attach this documentation form to the Equipment Specific LO/TO Procedure and the LO/TO Permit to Work.

1. **Identification of Outside Employer(s):**

   Company:_____
   Name:_____
   Address:_____

   _____

   Telephone #:_____

2. **Identify Location of Equipment:**_____

   Identify Equipment/Machine to be serviced:_____

   Hazardous energy control procedures for the equipment/machine have been exchanged?_____
   (No response would trigger Stop Work Authority)

3. **After comparing the Arcadis and Outside Employer LO/TO programs/procedures, identify any specific restrictions/prohibitions or procedural steps below:**

   _____

   _____

4. **Affected Persons (listed below) shall review, understand and comply with the above-identified specific restrictions/prohibitions or procedural steps.**

(Printed Name)	(Signature)
_____	_____
_____	_____
_____	_____

5. **Acknowledged acceptance of the provisions of this exchange of information form:**

   Outside Employer Representative:_____ _____
   (LO/TO Qualified) (Signature) (Date)

   Arcadis Authorized LO/TO Staff:_____ _____
   (Signature) (Date)

Lockout Tagout (LO/TO) Periodic Inspection Checklist

DRAFT

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Periodic inspections of energy control procedure(s) are required at least annually to ensure that the requirements of the established energy control procedure and the LO/TO standard are being followed. This form must be attached to the Periodic Inspection Log. The Arcadis LO/TO TIP maybe used in place of this checklist.

All <u>No</u> responses require an update to the written LO/TO procedure.

		Yes/No	Details
1	Is all machinery or equipment capable of movement, required to be de-energized or disengaged and locked-out during cleaning, servicing, adjusting or setting up operations, whenever required?		
2	Where the power disconnecting means for equipment does not also disconnect the electrical control circuit:	--	--
2a	Are the appropriate electrical enclosures identified?		
2b	Is means provided to assure the control circuit can also be disconnected and locked-out?		
2c	Is the locking-out of control circuits in lieu of locking-out main power disconnects prohibited?		
3	Are all equipment control valve handles provided with a means for locking-out?		
4	Does the lock-out procedure require that stored energy (mechanical, hydraulic, air, etc.) be released or blocked before equipment is locked-out for repairs?		
5	Are appropriate employees provided with individually keyed personal safety locks?		
6	Are employees required to keep personal control of their key(s) while they have safety locks in use?		
7	Is it required that only the employee exposed to the hazard, place or remove the safety lock?		
8	Is it required that employees check the safety of the lock-out by attempting a startup after making sure no one is exposed?		
9	Are employees instructed to always push the control circuit stop button immediately after checking the safety of the lock-out?		
10	Is there a means provided to identify any or all employees who are working on locked-out equipment by their locks or accompanying tags?		
11	Are a sufficient number of accident preventive signs or tags and safety padlocks provided for any reasonably foreseeable repair emergency?		
12	When machine operations, configuration or size requires the operator to leave his or her control station to install tools or perform other operations, and that part of the machine could move if accidentally activated, is such element required to be separately locked or blocked out?		
13	In the event that equipment or lines cannot be shut down, locked-out and tagged, is a safe job procedure established and rigidly followed?		

Lockout Tagout (LO/TO) Periodic Inspection Checklist

Machine ID# or Equipment ID# _____

Written LOTO Procedure ID# _____

Date of Inspection	Authorized Person Conducting Inspection	Additional Staff Included in Inspection	LO/TO Procedure Adequate? (Yes/No)	List changes to the LOTO Procedure

Lockout Tagout (LOTO) Procedure

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Project Name:		**Project Location:**	
Project Number:		**Project Manager:**	
Developed By:		**Reviewed By:**	
Origin Date:	**Revision #:**	**Revision Date:**	**Revised By:**
Equipment #:		**Equipment Manufacture:**	
Equipment Description:		**Equipment Location:**	

Warning: Only Authorized Employees who have been Trained and Authorized can perform the LOTO procedures below

Equipment Diagram

Insert photos of equipment or schematic showing location of equipment to be locked out

Adjacent & Associated Equipment

Adjacent & Associated Equipment	Location of Adjacent & Associated Equipment and Action to be Taken

Lockout Tagout (LOTO) Procedure

Energy Source	Lockout Device	Isolation Location	Lockout Method	Zero Energy Check, Verification & Testing

Non Permit-Required Confined Space Entry Checklist

Project Name:	Date / Time:
Project Number:	Project Location:
Checklist Completed By:	Project Manager:
Location and Description of Confined Space:	
Entry Objectives:	
Equipment / Materials Required for Entry:	
Time of Entry:	Expiration of Entry:

Pre-Entry Air Monitoring

(enter pre-entry readings below to confirm that space poses no actual atmospheric hazard)

Monitoring For	Monitoring Equipment	Calibration Info: Date / Time	Calibration Info: By	Pre-Entry Reading	Defined Acceptable Range for Entry[1]
% Oxygen					19.5 – 23.5%
% of LEL					<10% LEL
Hydrogen Sulfide-H_2S					<1 ppm TLV-TWA <5 ppm TLV-STEL
Carbon Monoxide-CO					<25 ppm
Combustible Dust (LFL)					< LFL (Dust that doesn't not obscure vision at a distance of 5ft)
Other:					

[1] Refer to the Confined Space Standard for details on acceptable ranges based on entry classification.
TLV-STEL - Short-term exposure limit: Employee can work in the area up to 15 minutes
TLV-TWA - 8 hr. Time Weighted Avg (PEL/TLV): Employee can work in area 8 hrs (longer with appropriate respiratory protection)

Pre-Entry Atmospheric Testing Conducted By

Print Name:	Date:
Signature:	Time:

Pre-Entry Checklist

Checklist	YES	NO	N/A	Comment
Competent Person completed confined space evaluation?	☐	☐	☐	Attach copy of signed confined space evaluation to this entry checklist and make available to all entrants
Confirmed that permit space poses no actual or potential atmospheric hazards?	☐	☐	☐	
All hazards within the space are eliminated or isolated?	☐	☐	☐	Cross-reference against the confined space evaluation form

Pre-Entry Checklist				
Checklist	**YES**	**NO**	**N/A**	**Comment**
Hazards have been eliminated or isolated without entry into the space (unless we can demonstrate that doing so without entry is infeasible)?	☐	☐	☐	
If it is necessary to enter the permit space to eliminate or isolate hazards, STOP WORK - such entry must be performed as PRCS	☐	☐	☐	If testing and inspection during that entry demonstrate that the non-atmospheric hazards within the permit space have been eliminated or isolated, the permit space may be reclassified as a non-permit confined space for as long as the non-atmospheric hazards remain eliminated or isolated
Has there been changes in the use or configuration of a non-permit confined space that might increase the hazards to entrants, or some indication that the initial evaluation of the space may not have been adequate?	☐	☐	☐	**If *YES*, *STOP WORK*** and/or exit the confined space immediately. Each entry employer must have a competent person reevaluate that space and, if necessary, reclassify it as a permit-required confined space.
Adequate emergency supplies on hand?	☐	☐	☐	Fire extinguisher, first aid/CPR supplies, etc.

A permit-required confined space may be reclassified as a non-permit confined space for as long as the non-atmospheric hazards remain eliminated or isolated. If hazards arise within a permit space that has been reclassified as a non-permit space, each employee in the space must exit the space

Arcadis Non-Permit Required Confined Space Entrant(s)

Total Number of Entrants (Arcadis + Other Authorized Entrants):

I have been properly instructed with regards to safe entry into this Non-Permit Required Confined Space and understand my duties and STOP WORK Authority:

Names of Entrant(s)	Signature of Entrants
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Other Authorized Entrants (Contractor, Client, Regulator) Entering Non-Permit Required Confined Space	
Multi-employer work site activities coordinated?	Yes / No / NA
Confirmed that workers working outside confined space won't introduce hazards into the Non- Permit Required Confined Space?	Yes / No / NA

I have been properly instructed with regards to safe entry into this Non-Permit Required Confined Space and understand my duties and my STOP WORK Authority

Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date
Name of Authorized Entrant:	Company
Signature of Authorized Entrant:	Date

Individual Authorizing Non-Permit Required Confined Space Entry

The following signatory has reviewed this pre-entry checklist, the information contained here-in and has reviewed the confined space evaluation form. Written instructions and safety procedures have been received and are understood. Entry cannot be approved if any questions are answered with a "*NO*".

Name (Print):	Date:
Signature:	Time:

Documenting Problems Encountered during Non-Permit Required Confined Space

If problems are encountered during entry, submit a copy of this checklist to corporate H&S so necessary program/standard revisions can be developed and that a record of documented problems/incidents during Non-PRCS is maintained.
A copy of the Non-PRCS Entry Checklist will be forwarded to 4-sight-support@arcadis-us.com

Describe problem/incident:

Detail confined space program / standard revisions required:

Date Copy of Non-Permit Required Confined Space Entry Checklist provided to Corporate H&S:

Copy of Non-Permit Required Confined Space Entry Checklist must be provided to Corporate H&S via **4-Sight-Support@arcadis-us.com.**

ARCADIS Design & Consultancy for natural and built assets

Scheduled Monitoring Sampling Form for Silica

Filter/Cassette #_____

Project Number	Date	Project Name

Employee Name	Employee Number

Employee Business Line

Job Description

Type of Work Being Performed

Task	% Time Performing	Task	% Time Performing
☐ Abrasive Blasting	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%	☐ Mixing Concrete	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%
☐ Cutting	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%	☐ Mixing Mortar	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%
☐ Chipping	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%	☐ Patching	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%
☐ Drilling	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%	☐ Polishing	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%
☐ Excavating	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%	☐ Scabbing/ Scappling	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%
☐ Formwork Cleaning	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%	☐ Scarifying	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%
☐ Grading	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%	☐ Scraping	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%
☐ Grinding	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%	☐ Terrazzo Work	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%
☐ Hand Sweeping	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%	☐ Tile Work	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%
☐ Milling	☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%		
☐ Other:			☐ <25% ☐ 25-50% ☐ 50-75%, ☐ >75%

Base Material Spec.		Silica Contained in Base Material
☐ Asphalt ☐ Block ☐ Brick ☐ Concrete ☐ Cement ☐ Grout	☐ Gunite ☐ Mortar ☐ Soil ☐ Terrazo ☐ Tile ☐ Other Material: _____	☐ From bulk sample _____ ☐ From estimate (SDS or list) _____

Tool Being Used Attach Photo	PPE Utilized
Make:_____ Model: _____	☐ Dust Mask (DM) ☐ Half Face (HF) ☐ Full Face (FF) ☐ Protective Clothing (PC) ☐ Gloves (G)

Control Methods

☐ None (N)
☐ Dry (D)
☐ Natural Ventilation (NV)
- ☐ Employee Downwind
- ☐ Employee Upwind
- ☐ Employee Crosswind

☐ General Mechanical (GM)
☐ Local Exhaust Ventilation - with HEPA vacuum (LE-HEPA)
☐ Local Exhaust Ventilation - with shop vac or other vacuum (LE-OTHER)
☐ Wet Method - Continuous Drip (WM-CD)
☐ Wet Method - Continuous Spray (WM-CS)
☐ Wet Method - Non-continuous Drip (WM-NCD) Frequency: _____
☐ Wet Method - Non-continuous Spray (WM-NCS) Frequency: _____

ARCADIS Design & Consultancy for natural and built assets

Scheduled Monitoring Sampling Form for Silica

Filter/Cassette #_____

Project Numberr	Date	Project Name

Silica controls maintenance plan in effect?	☐ Yes	☐ No
Controls checked during sampling period?	☐ Yes	☐ No
Employee trained and familiar with operation of controls?	☐ Yes	☐ No

Weather Conditions

☐ Sunny ☐ Overcast ☐ Rain ☐ Snow

Environment	Air/Wind Currents	Temperature
☐ Outdoors ☐ Open Sided(Free Flow) ☐ Enclosed 1Side (Limited Flow) ☐ Enclosed All Sides (No Flow)	☐ None ☐ < 5mph ☐ 5-10 mph ☐ > 10 mph	☐ < 40^0F (<40) ☐ 40^0F < x < 90^0F (40-90) ☐ > 90^0 F (>90)

Nearby Visible Dust Sources	Humidity
☐ None ☐ Other workers doing same task ☐ Partial from Other tasks and sources ☐ Continuous from Other tasks and sources	☐ < 20% (<20) ☐ 20% < **x** < 40% (20-40) ☐ 40% < **x** < 60% (40-60) ☐ 60% < **x** < 80% (60-80) ☐ < 80% (<80)

Sampling Intent

☐ Respirable Silica (RS)

Sampling Type

☐ Personal (P) ☐ Area (A - Distance to Activity) ☐ Bulk (B)

Pump Identification	Analytical Method
Make/Model:	NIOSH 7500; OSHA ID-142

Filter / Cassette #	Pre-Calibration	Post- Calibration	Flow Rates
	Date	Date	Pre Rate
Cyclone Type			
	Sampling Times		Post Rate

Agent	Start	Stop	Time	
Respirable Silica				
	Start	Stop	Time	Average Flow rate

Average Flow Rate X	Total Sampling Time	Total Volume

Laboratory Results (ug/m3)

Quartz	Cristobalite	Trydymite	RCS

Notations

Samplers Name (Print)

Samplers Signature

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Document Control Number:TGM - _____
TGM + project number plus date as follows: xxxxxxxx.xxxx.xxxxx - dd/mm/year

TAILGATE HEALTH & SAFETY MEETING FORM

This form documents the tailgate meeting conducted in accordance with the Project HASP. Personnel who perform work operations on-site during the day are required to attend this meeting and to acknowledge their attendance, at least daily.

Project Name:			**Project Location:**
Date:	**Time:**	**Conducted by:**	**Signature/Title:**
Client:		**Client Contact:**	**Subcontractor companies:**

TRACKing the Tailgate Meeting

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

1 _____ 3 _____ 5 _____
2 _____ 4 _____ 6 _____

Other Hazardous Activities - Check the box if there are any other Arcadis, Client or other party activities that may pose hazards to Arcadis operations ☐ If there are none, write "None" here: _____

If yes, describe them here: _____

How will they be controlled? _____

Prework Authorization - check activities to be conducted that require permit issuance or completion of a checklist or similar before work begins:

	Doc #		Doc #		Doc #
☐ Not applicable		☐ Working at Height		☐ Confined Space	
☐ Energy Isolation (LOTO)		☐ Excavation/Trenching		☐ Hot Work	
☐ Mechanical Lifting Ops		☐ Overhead & Buried Utilities		☐ Other permit	

Discuss following questions (for some review previous day's post activities). **Check if yes :**

☐ Incidents from day before to review?	☐ Lessons learned from the day before?	☐ Any Stop Work Interventions yesterday?
☐ Any corrective actions from yesterday?	☐ Will any work deviate from plan?	☐ If deviations, notify PM & client
☐ JSAs or procedures are available?	☐ Field teams to "dirty" JSAs, as needed?	☐ All equipment checked & OK?
☐ Staff has appropriate PPE?	☐ Staff knows Emergency Plan (EAP)?	☐ Staff knows gathering points?

Topics from Corp H&S to cover? ☐

Comments: _____

Recognize the hazards (check all those that are discussed) (Examples are provided) and **A**ssess the Risks (Low, Medium, High - circle risk level) - Provide an overall assessment of hazards to be encountered today and briefly list them under the hazard category.

☐ Gravity (i.e., ladder, scaffold, trips) (L M H)	☐ Motion (i.e., traffic, moving water) (L M H)	☐ Mechanical (i.e., augers, motors) (L M H)
☐ Electrical (i.e., utilities, lightning) (L M H)	☐ Pressure (i.e. gas cylinders, wells) (L M H)	☐ Environment (i.e., heat, cold, ice) (L M H)
☐ Chemical (i.e., fuel, acid, paint) (L M H)	☐ Biological (i.e., ticks, poison ivy) (L M H)	☐ Radiation (i.e., alpha, sun, laser) (L M H)
☐ Sound (i.e., machinery, generators) (L M H)	☐ Personal (i.e. alone, night, not fit) (L M H)	☐ Driving (i.e. car, ATV, boat, dozer) (L M H)

Continue TRACK Process on Page 2

TAILGATE HEALTH & SAFETY MEETING FORM - Pg. 2

Control the hazards (Check all and discuss those methods to control the hazards that will be implemented for the day): Review the HASP, applicable JSAs, and other control processes. Discuss and document any additional control processes.

- [x] **STOP WORK AUTHORITY** (Must be addressed in every Tailgate meeting - (*See statements below*)

☐ Elimination	☐ Substitution	☐ Isolation
☐ Engineering controls	☐ Administrative controls	☐ Monitoring
☐ General PPE Usage	☐ Hearing Conservation	☐ Respiratory Protection
☐ Personal Hygiene	☐ Exposure Guidelines	☐ Decon Procedures
☐ Emergency Action Plan (EAP)	☐ Fall Protection	☐ Work Zones/Site Control
☐ JSA to be developed/used ***(specify)***	☐ TIP conducted ***(specify job/JSA)***	☐ Traffic Control
☐	☐	☐ Other ***(specify)***
☐	☐	☐

Signature and Certification Section - Site Staff and Visitors

Name/Company/Signature	Initial & Sign in Time	Initial & Sign out Time	I have read and understand the HASP

Important Information and Numbers

All site staff should arrive fit for work. If not, they should report to the supervisor any restrictions or concerns.

In the event of an injury, employees will call WorkCare at **1.888-449-7787** and then notify the field supervisor who will then notify the Project or Task Manager.

In the event of a motor vehicle accident, employees will notify the field supervisor who will then notify the Project or Task Manager.

In the event of a utility strike or other damage to property of a client or 3rd party, employees will immediately notify the field supervisor, who will then immediately notify the Project or Task Manager.

Visitor Name/Co - not involved in work

	In	Out
	In	Out
	In	Out
	In	Out

I will STOP the job any time anyone is concerned or uncertain about health & safety or if anyone identifies a hazard or additional mitigation not recorded in the site, project, job or task hazard assessment.

I will be alert to any changes in personnel, conditions at the work site or hazards not covered by the original hazard assessments.

If it is necessary to **STOP THE JOB,** I will perform **TRACK**; and then amend the hazard assessments or the HASP as needed.

I will not assist a subcontractor or other party with their work unless it is absolutely necessary and then only after I have done TRACK and I have thoroughly controlled the hazard.

Post Daily Activities Review - Review at end of day or before next day's work (Check those applicable and explain:)

- ☐ Lessons learned and best practices learned today: _____
- ☐ Incidents that occurred today: _____
- ☐ Any Stop Work interventions today? _____
- ☐ Corrective/Preventive Actions needed for future work: _____
- ☐ Any other H&S issues: _____

Keep H&S 1st in all things

WorkCare - 1.888.449.7787

Task Improvement Process

General

Observed Company:
Observation Type:
TIP Form: H&S Field Multi-Task (General)
Task Observed:
Observee Name:
Observer Name:
Observation Date:
Project Number: 0
Project Name: 0
Supervisor:
Equipment On Site:
Pertinent Information:

Observation

Task	Correct	Questionable	Comments
General			
PPE worn according to HASP/JLA specifications and inspected before use?			
STOP work authority used where appropriate?			
Body Use/Positioning			
Proper lifting/pushing/pulling techniques used (no awkward positions/posture; no twisting or excessive reaching; no straining; no excessive weight; load under control/stable; etc.)?			
Body parts away from pinch points (clear or protected from being caught between objects/equipment or from contacting sharp objects/edges, etc.)?			
Body parts not in the Line of Fire (protected from being struck by traffic, equipment, falling/flying objects, etc.)?			
Work Procedures/Environment			
Correct type and number of barricades/warning devices/cones?			

Communication with others when necessary (hand signals, flags, etc.)?			
Right tools and equipment selected for the job and inspected before use?			
Tools and equipment used properly?			
Housekeeping performed (work areas and pathways clear of hazards, uneven surfaces addressed, etc.)?			
Slip/trip/fall hazards addressed (path selected and cleared, eyes on path, speed footing, etc.)?			
Proper energy control (electrical systems grounded, lock out/tag out performed, isolated, cords/fixtures in good condition, GFCI inspected and utilized when appropriate and used properly, etc.)?			
Protected from overhead/underground utilities (proper clearance, properly marked, spotters as necessary, etc.)?			
Safe work on/near water (appropriate flotation device, appropriate boat for body of water and operation of boat, etc.)?			
Chemical/Radiation protection (decontamination zones set up properly, air monitoring, completed, and logged, etc.)?			
Fall from elevated height prevention (maintains 3-points of contact, appropriate ladder, mounting/dismounting vehicle/equipment, fall arrest system, etc.)?			
Any additional safety issues identified:			

Tip Summary **Enter details of the TIP and follow up discussion provide details on how any questionable items were resolved.**

Discussion following the TIP led by: _____

Date of follow-up discussion: _____

Positive Comments:

Discussion Summary Completed:

- ☐ Supervisor Led
- ☐ Peer to Peer
- ☐ Arcadis Employee to Subcontractor

Summary of Questionable Items

Action Items (Optional) Assign appropriate action items based on the observations made. You can add more than one action item if needed.

Item #	Action Item	Responsible Person	Due Date	Comp. Date
1				
2				
3				

Standard Review

Reviews to be performed after entry of this TIP into 4-Sight.

Quality Review

Quality Reviews to be performed after entry of this TIP into 4-Sight.

Field Validation and Verification

Use the 4-Sight generated copy of this TIP to perform field V&V activities.

Utilities and Structures Checklist

DRAFT

ARCADIS Design & Consultancy for natural and built assets

THIS FORM MUST BE COMPLETED IN ENTIRETY PRIOR TO BEGINNING ANY INTRUSIVE WORK

Project: _____

Project Number: _____

Form Completion Date: _____ Form Expiration Date: _____

All utility markings must be refreshed ≤15 days when work is ongoing. (15 business days post form completion date)

Pre-Field Work

Required: One Call or "811" notified 48-72 hours in advance of work? #: _____

Ticket Expiration Date _____ (Review State Requirements)

Utility companies notified during the One Call process ☐ See attached ticket

_____ _____ _____ _____

_____ _____ _____ _____

List any other utilities requiring notification: ☐ None

_____ _____ _____ _____

Private Locator Contacted ☐ Yes ☐ No

Plan private utility clearance subcontractor assignments, areas, required clearance equipment, depth of clearance needed, types of utilities. When possible re-clear 811 markings to confirm utility locations.

Client provided utility maps or "as built" drawings showing utilities? ☐ Yes ☐ No

Field Work - This must be completed on site, by staff who have a minimum of one year of field experience in identifying utilities. Review Check list with PM or designee prior to beginning intrusive work.

Mechanized intrusive work in utility Tolerance Zone (<30-in.) requires pre-approval by Corporate H&S

List Soil Boring / Well IDs or Excavation Locations applicable to this clearance checklist:

3 Reliable Lines of Evidence Required Prior to Starting any Subsurface Intrusive Work

☐ One Call/"811" (Reliable as a line of evidence when working in public right of way or easement)

Utility Markings Present: ☐ Paint ☐ Pin flags/stakes ☐ Other ☐ None

☐ Client Provided Maps/Drawings **OR** ☐ Maps/Drawings requested but not provided

☐ Client Clearance Name(s)/Affiliation(s) _____

☐ Interview(s): Name(s)/Affiliation(s) _____

_____

Did person(s) interviewed indicate depths of any utilities in the subsurface?

☐ Yes, depths provided: ☐ Did not know or refused to answer

Additional Comments:

☐ Site Inspection (**Complete Page 2 & Photo Document Marked Utilities & Utility Structures**)

☐ Public Records / Maps / As-Builts

☐ **Private Locator: (Name and Company)** _____

☐ Ground Penetrating Radar (GPR)

☐ Radiofrequency (RF Loc)

☐ Electromagnetic (EM)

☐ Metal Detector

Soft Dig Methods

☐ Termination Depth _____ft. bgs

☐ Potholing / Vacuum Extraction

☐ Air knife ☐ Hydro knife

☐ Probing

☐ Hand Auguring

Tips for Successful Utility Location (H&S Standard Section 5.6):

1. Don't forget to look up (mark above grade utilities if warranted)
2. Be on-site with Private Utility Locators
3. Ask Private Locators to "confirm" other's markings
4. Select alternate/backup locations during clearance process
5. Mark out all known utilities. Leave nothing to question
6. No hammering - no pickaxes - no digging bars - no shortcutting
7. No excessive turning or downward force of hand augers/shovels
8. Utilities may run in or directly under asphalt/concrete
9. Clearing, grubbing, and heavy equipment may damage shallow utilities.
10. Is Spotter needed for Heavy Equipment near aboveground utilities?

☐ Other: _____

☐ Marine Locator: (Name and Company) _____

Utilities and Structures Checklist

DRAFT

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During the site inspection look for the following: **("YES" requires additional investigation and the utility must be marked properly prior to beginning subsurface intrusive work)**:

Site Inspection	Utility Color Codes	Present	
A) Natural gas line present (evidence of a gas meter)?	Yellow	☐ Yes	☐ No
i) Feeder Lines to buildings or homes?		☐ Yes	☐ No
B) Evidence of electric lines:	Red		
i) Conduits to ground from electric meter or along wall?		☐ Yes	☐ No
ii) Conduits from power poles running into ground?		☐ Yes	☐ No
iii) Light poles, electric devices with no overhead lines?		☐ Yes	☐ No
iv) Overhead electric lines present? Marked? (See Section L)		☐ Yes	☐ No
C) Evidence of sewer drains:	Green		
i) Restrooms or kitchen on site?		☐ Yes	☐ No
ii) Sewer cleanouts present?		☐ Yes	☐ No
iii) Combined sewer /storm lines or multiple sewer lines?		☐ Yes	☐ No
D) Evidence of water lines:	Blue		
i) Water meter on site or multiple water lines?		☐ Yes	☐ No
ii) Fire hydrants in vicinity of work?		☐ Yes	☐ No
iii) Irrigation systems? (Sprinkler heads, valve boxes, controls in building)		☐ Yes	☐ No
E) Evidence of storm drains:	Green		
i) Open curbside or slotted grate storm drains		☐ Yes	☐ No
ii) Gutter down spouts going into ground		☐ Yes	☐ No
F) Evidence of telecommunication lines:	Orange		
i) Fiber optic warning signs in areas?		☐ Yes	☐ No
ii) Aboveground cable boxes or housings or wires in work area? Marked?		☐ Yes	☐ No
G) Underground storage tanks:			
i) Tank pit present, tank vent present?		☐ Yes	☐ No
ii) Product lines running to dispensers/buildings?		☐ Yes	☐ No
H) Do utilities enter or exit existing structures/buildings?			
If Yes, confirm the utility markings outside of structure/building match up.		☐ Yes	☐ No
I) Proposed excavation marked in white?	White	☐ Yes	☐ No
J) Unclassed utilities / anomalies marked in pink?	Pink	☐ Yes	☐ No
K) **Overhead** Utilities/Communication Lines - **Look Up and MARK**:			
i) Overhead electrical conduit, pipe chases, cable trays, product lines?		☐ Yes	☐ No
ii) Overhead fire sprinkler system?		☐ Yes	☐ No
L) **Overhead** Power lines in or near the work area:			
i) < 50 kV within 10 ft. of work area?		☐ Yes	☐ No
ii) >50 - 200 kV within 15 ft. of work area?		☐ Yes	☐ No
iii) >200-350 kV within 20 ft. of work area?		☐ Yes	☐ No
iv) >350-500 kV within 25 ft. of work area?		☐ Yes	☐ No
v) >500-750 kV within 35 ft. or work area?		☐ Yes	☐ No
vi) >750-1000 kV within 45 ft. of work area?		☐ Yes	☐ No
M) Other:			
i) Evidence of linear asphalt or concrete repair?		☐ Yes	☐ No
ii) Evidence of linear ground subsidence or change in vegetation?		☐ Yes	☐ No
iii) Unmarked manholes or valve covers in work area?		☐ Yes	☐ No
iv) Warning signs (Call Before you Dig, Look Up, etc.) on or adjacent to site?		☐ Yes	☐ No
v) Utility color markings not illustrated in this checklist?	i.e. Purple	☐ Yes	☐ No
vii) Operating heavy equipment on unpaved/unimproved ground; review equipment route for shallow utilities crossing it and modify if necessary.		☐ Yes	☐ No
O) Utilities & Structures Checklist been reviewed by the PM or Designee		Yes	No*
PM or Designee Name: _____		* If no, STOP WORK, call PM	

Name and Signature of person completing the checklist: _____

Date: _____ _____

Do not perform mechanized intrusive work within 30 inches of a utility marking without receiving pre-approval by Corporate H&S.

ALL UTILITY STRIKES REQUIRE CORPORATE H&S NOTIFICATION (EMAIL OR CALL) WITH A CONFIRMED RESPONSE

Attorney-Client Privileged

UTILITY LINE STRIKE INVESTIGATION FORM

This form is to be used for all utility-related investigations.

Notification of Corporate H&S is required for all utility strikes (Email or phone conversation) with an affirmative response from Corporate H&S.

No information is to be entered into the 4-Sight database or shared with outside sources until approved by the Legal Department.

REPORTED BY	
DATE/TIME OF INCIDENT	
INCIDENT DESCRIPTION (FACTS ONLY)	

	YES	NO
ARCADIS Employee Injured (includes first aid injuries and calls to WorkCare)		
Non-ARCADIS Employee Injured (subcontractors or Third-Parties)		
Public Utility		
Fire		
Spill/Leak		
Other Property / Equipment Damage (non-vehicle)		
Accident involves other motorized equipment (ATV, backhoe, etc.)		
Utility Damaged Requiring Repair		
ARCADIS onsite staff met required utility experience		
Client Business Disruption, Downtime, Financial Loss		
Project Profit Loss		

PROJECT NUMBER OR NAME	
CLIENT / COMPANY	
PM & PIC	
WORK TYPE	
INCIDENT ADDRESS (Street, City, State/Province, Country, Zip/Location Code)	

EMPLOYEES INVOLVED	
WITNESSES	

Attorney-Client Privileged

INVESTIGATION TEAM	
REVIEWERS	

UTILITY STRIKE INFORMATION				
ANA Managing office				
Utility struck by	☐	ARCADIS	☐	Subcontractor
	☐	Other:		
Type of Utility Hit	☐	Choose an item.		
	☐	Other:		
Utility Material	☐	Choose an item.		
	☐	Other:		
Depth/Height of Utility	☐	Choose an item.		
	☐	Not applicable		
Lithology	☐	Choose an item.		
	☐	Other:		
	☐	Not applicable		
Type of Device Striking Utility	☐	Choose an item.		
	☐	Other:		
Type of Work Being Conducted	☐	Choose an item.		
	☐	Other:		
Lines of Evidence Used (Check all used)	☐	Public locate (One Call, 811, etc.)	☐	ARCADIS locate—GPR
	☐	Site map/drawing	☐	ARCADIS locate—
	☐	Site operator/owner interview	☐	ARCADIS locate—
	☐	ARCADIS site inspection	☐	Air Knife
	☐	3rd Party locate—GPR	☐	Hydroknife
	☐	3rd Party locate—Electromagnetic	☐	Hand Augering
	☐	3rd Party locate—Radiofrequency	☐	Potholing/Day-lighting
	☐	3rd Party locate—Other	☐	Probing
	☐	Other:		
Total lines of evidence	☐	**(enter total number used to locate utilities)**		

CONTRIBUTING FACTORS (list reasons why incident occurred).

Attorney-Client Privileged

Root Cause(s) (Indicate Primary Root Cause)	Root Cause Category(s)	
	Choose an item.	Other:
	Choose an item.	Other:
	Choose an item.	Other:
	Choose an item.	Other:

ROOT CAUSE

Take your KEY Contributing Factors and ask "why" to determine what caused the incident (e.g. drill down to the Primary ROOT CAUSE).

Root Cause Category

Assign at least one Root Cause Category (you can select more than one for a root cause if needed). Indicate the Primary Root Cause Category for this incident.

- Training / Competency
  - Did not recognize the risk
  - Did not have skill, competence experience, or knowledge
  - Has not completed required training
  - Training inadequate or ineffective
- Adherence to standards, practices, expectations
  - Did not use TRACK, PM and quality tools
  - Did not use Stop Work Authority
  - Not familiar with or did not follow standards, procedures (HASP, QA plan, JSA, etc)
  - Inadequate project planning, including budgeting and scheduling and/or follow-up review
  - Behavior encouraged or tolerated with no consequence by supervisor, co-workers, or other parties
  - Employee or supervisor does not support H&S
  - Improper use of tools or equipment
- Availability of Standards, Practices, Procedures
  - No standard, procedure or practice (QA Plan, HASP, JSA, standard)
  - Inadequate standard, procedure or practice (QA Plan, HASP, JSA, standard)
- Communications
  - Inadequate management establishment and communication of expectations / culture
  - Inadequate team communication (i.e., tailgate, kickoff meeting, management of change)
  - Inadequate communication with client
- Tools/Equipment
  - Proper tools or equipment unavailable (including software)
  - Tools or equipment damaged
  - Tools improperly maintained/calibrated equipment
- Factors out of our Control
  - Natural Forces - Events outside of human control
  - Third party out of our control

Attorney-Client Privileged

ANY POSITIVE OUTCOME	

ASSIGN SOLUTIONS
You can add more than one solution if needed.

Solution	**Responsible Party**	**Due Date**

Attorney-Client Privileged

Please attach supporting documents [e.g. Public utility location ticket/response, site map(s) and photo(s)] as appropriate.

ARCADIS Design & Consultancy for natural and built assets

Weekly Vehicle Inspection Form

Vehicle # / License Plate # _____ **Wheels # / Last 6 of Vin #** _____

	Inspection Date												
	Odometer reading												
	Driver / Inspector Name												
	Check the appropriate box and enter repair date for identified repairs:	OK	Needs Repair	Repair Date	OK	Needs Repair	Repair Date	OK	Needs Repair	Repair Date	OK	Needs Repair	Repair Date
Interior[1]	Horn operational												
	Door Locks operational												
	Seat Belts in good repair & operational												
	Seats and Seating Controls operational												
	Steering Wheel - No Excessive Play												
	Interior Lights and Light Controls												
	Instrument Panel/Gauges												
	Wiper Controls operational												
	Heat/Defrost/Air Conditioning operational												
	Rear View Mirror present												
	Backup Camera/Sensors working												
	Jack and Lug Wrench present												
Exterior[1]	Lights and Signals operational												
	Tires and Spare Tire properly inflated												
	Tires have proper tread depth (Page 2)												
	Doors operational												
	Windows Cracked/Damaged												
	Side View Mirrors operational												
	Damaged Body Panels and Bumpers												
Engine & Brakes	Engine Start & Running Smoothly												
	Fluid Levels-OK?, No Noticeable Leaks												
	Belts tight, no cracks												
	Parking Brake & Brakes operational												
Emergency Equipment[2]	First Aid Kit, inspected monthly												
	Fire Extinguisher properly secured												
	Fire Extinguisher inspected monthly												
	Amber emergency warning light present												
	Roadside Assistance Information												
	Recommend spotter cones available												
Cargo	Cargo Secure and Properly Distributed												
	Securing Devices in Good Condition												
Registration	Valid License Plate /Tags												
	Valid Registration and Insurance												
	Valid City/State Inspection Decal												
	Lease Plan information/Fuel Card												

[1] **Note all damages to the vehicle on the back of this page**

[2] **Emergency Equipment required per Motor Vehicle Standard ARC HSGE024**

GOAL Get Out And Look

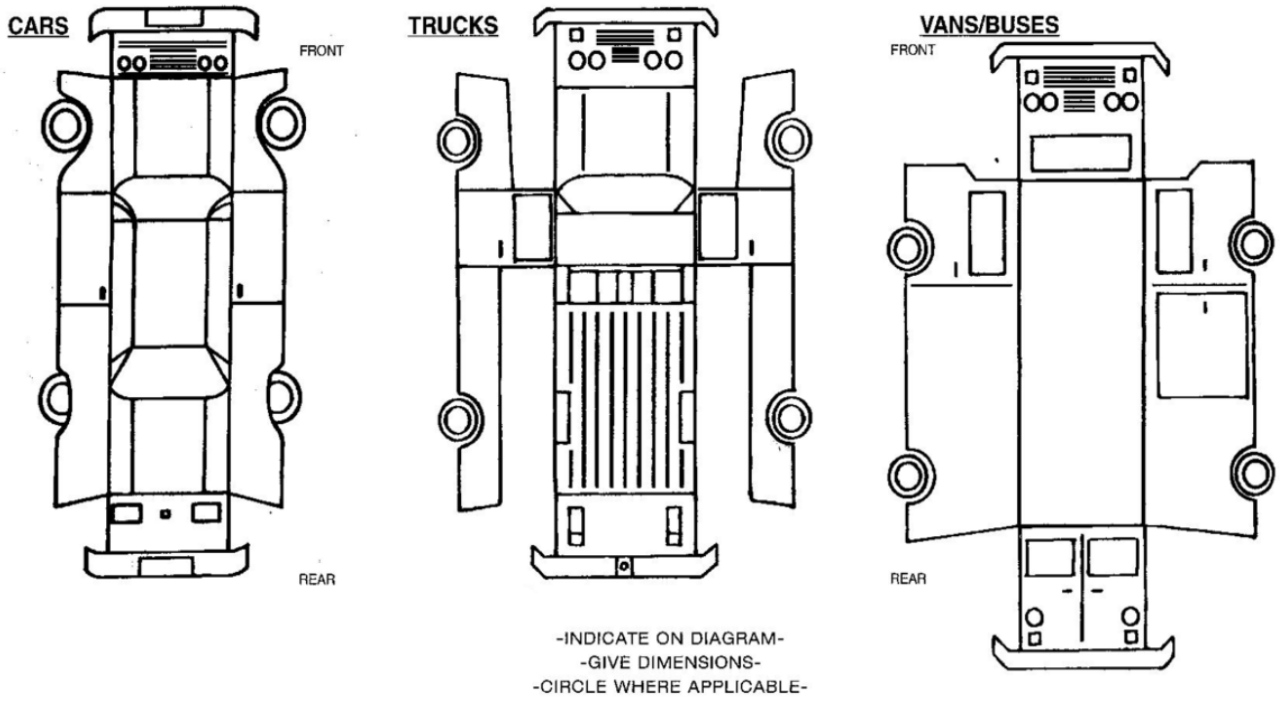
ARCADIS Design & Consultancy for natural and built assets

Note All Vehicle Damage Below

All Vehicle Damage must be reported to Anthony Cline (Corporate Fleet Manager) and Susan Berndt (Corporate Legal)

CODES:

B-BENT
BR-BROKEN
BU-BULGE
C-CHAFED
CH-CHIPPED
CPM-COVERED WITH PROTECTIVE MATERIAL-UNABLE TO DETERMINE DEFECTS IF ANY
CSA-CHAFED AND SCRATCHED ALL OVER
CR-CRACKED
D-DENTED
DMC-DUST AND MUD COVERED UNABLE TO DETERMINE OTHER DEFECTS IF ANY
G-GOUGED OR CUT
GC-GLASS CRACKED
HS-HAIRLINE SCRATCH
M-MISSING
P-PUNCTURED
R-RUSTY
S-SCRATCHED
SC-SCRAPED
SM-SMASHED
ST-STAINED AND/OR SOILED
T-TORN



Notes:

Tread Depth Guide: If a tread gauge is not available coins may be used to determine remaining tread. 2/32” is the minimum by law in most states (top of Lincoln’s head on penny), 4/32” is minimum recommended for wet surfaces (top of Washington’s head on quarter), 6/32” is minimum recommended for snowy surfaces (top of Lincoln Memorial on penny).Vehicle tires should be replaced if the tread depth is less than 6/32”.

2/32” remaining 4/32” remaining 6/32” remaining

Reference JSA 10907 For Weekly Vehicle Inspection

GOAL Get Out And Look

Water Risk Assessment Form

Project Name:	Project Location:
Project Number:	Date / Time:
Project Manager:	Evaluation Completed By:

Expiration Date:
(At a minimum the WRAF must be reviewed and update every 3 months)

1. Description of Water Operations

Scope of work:

Type or Water Body (Stream, Pond, River, Ocean, etc.):

Depth range of Water Body: _____ to _____	Typical Working Hours: _____ to _____

Water Body Flow Rate or Current (List unit of measurement):

Water Body Temperature Range (List unit of measurement):

Geographic Limits of Work Area including Start/End Location:

Surrounding Topography or Site Conditions:

2. Identification & Control of Water Hazards [1,2]

(Circle Answer that Applies)

1) Will work be conducted at a height of 6ft or greater with unprotected edges?

If **YES,** completion of the Elevated Work Permit is required. See Section 5.3 of Water Operations HSS

YES **NO**

2) Will work be conducted when water temperature is at or below 60˚F?

If **Yes**, below select type of cold water work PPE to be used : (See Section 5.6 of Water Operations HSS)

YES **NO**

PFD Type	Air Temperature	Water Temperature	Time of Rescue*
II or III	> 60°F	> 60°F	< 15 Minutes
I	> 60°F	≤ 60°F	< 5 Minutes
Anti-Exposure / Work Suit (CLO ≥0.40)	≤ 60°F	≤ 60°F	< 30 Minutes
Rescue / Immersion suit (CLO ≥0.96)	≤ 60°F	≤ 60°F	< 1 Hour

*Time of Rescue - Total time to secure victim in a dry location and treat for possible hypothermia

Type I PFD

Anti-Exposure / Work Suit

Rescue / Immersion Suit

2) Does the Water Operations listed in Section 1. present a risk of drowning?

If **YES,** select type of Inherently Buoyant PFD to be used: (See Section 5.1.1 of Water Operations HSS)

YES **NO**

Worn when employees are working in or near an open ocean, rough seas, or remote water where rescue may be slow coming. See Section 2.

Type I

Worn by employees when working around or on calm, inland waters, or where there is a good chance for fast rescue

Type II

Worn by employees when working around or on calm, inland waters, or where there is a good chance for fast rescue

Type III

4) Does the work require the use of a boat / vessel ?

If **YES**, an electronic Float Plan must be completed and submitted prior to starting work.
(See Section 5.5.1 of Water Operations HSS)

YES **NO**

5) Will work on boat/vessel be conducted within 3,000ft of a Dam, Spillway, Similar Feature?

If **YES**, completion of a communication plan is required. (See Section 5.7 of Water Operations HSS)

YES **NO**

2. Identification & Control of Water Hazards [1,2]

(Circle Answer that Applies)

6) Will staff be working alone (Lone Worker)? If **YES**, the use of the buddy system is required and completion of a communication plan is required. (See Section 5.1 of Water Operations HSS)	**YES**	**NO**
7) Will work be conducted at night with out the use of a boat / vessel? If **YES**, completion of a communication plan is required. (See Section 5.1 of Water Operations HSS)	**YES**	**NO**

2) If YES is selected for any questions 3, 4, 5, and 6 must be reviewed and completed.

3.Communcition Plan

(List Minimum Requirements as required in Section 5.1 of the Water Operations Safety HSS)

1) If working in water within 3,000ft of a dam, dam overflow, water intake, or similar structure, Arcadis will notify the structure owner and discuss the appropriate safety requirements and work restrictions and document the requirements here.

4. Emergency Action / Rescue Plan

(List the Rescue Requirements as required in Section 5.5.1 & 5.7 of the Water Operations HSS)

5.Restrictions

Minimum restrictions are listed below

1) The use of Type V and non-inherently buoyant PFDs is not approved unless approved by Corporate H&S.
2) The use of PFDs classified for recreational use are prohibited for use on Arcadis projects.
3) Snorkeling or diving work is prohibited unless reviewed and approval by the Arcadis Diving Control Board (DCB)

6.Site Safety Officer (SSO) Review and Signature

The signatory has reviewed this WRAF and has reviewed the Water Operations HSS. The WRAF must be shared with all personnel performing the work, and must also be available for review in the appropriate work area. After activation of the Emergency Response Plan contact Arcadis Corporate Health and Safety

Name (Print):	Date:
Signature:	Time:

APPENDIX E

SUPPLEMENTAL PLANS

BLOODBORNE PATHOGEN EXPOSURE CONTROL PLAN

(HASP Template 5-30-18)

PROJECT: Excavation and Capping of 1st Street Turning Basin	
WRITTEN BY:	**DATE WRITTEN:**
REVISED BY:	**DATE REVISED:**

Purpose:

Each project site that designates employees to render first aid as part of their job duties, are required to develop a written Bloodborne Pathogen Exposure Control Plan ("ECP"). The plan may be used in this format or incorporated in another way into the project HASP.

The purpose of the ECP is to eliminate or minimize employee exposure to bloodborne pathogens. It will be accessible to all employees and reviewed at least once per year. The ECP does not apply to employees who have not been designated to render first aid.

Definitions:

Bloodborne Pathogens ("BBP") are microorganisms present in human blood including, but not limited to, HBV (Hepatitis B virus) and HIV (human immunodeficiency virus).

BBP Exposure is a specific eye, mouth, mucous membrane, or non-intact skin (e.g., bites, cuts, abrasions) contact with another person's blood or other body fluid contaminated with blood.

Employees, for purposes of this ECP, are employees who have been designated to render first aid as part of their job duties.

First Aid, for purposes of Arcadis employees, includes rendering basic first aid and adult CPR, but does not include injections, intravenous interventions or any other invasive procedure, technique or treatment.

Victim is the person who is being given first aid.

Exposure Determination

The following employees have the potential for occupational exposure to BBPs because they have been designated to render first aid as part of their job responsibilities:

EMPLOYEE NAME & JOB TITLE

1. _____

2. _____

3. _____

4. _____

5. _____

Methods of Compliance
To help prevent exposure, we will follow “Universal Precautions”. That is, the victim’s blood and other bodily fluids will be treated as if known to be infectious for BBPs.

Materials and equipment detailed below may be kept in a first aid kit if that kit will be available to the employee at sites where he/she is expected to render first aid.

Engineering and work practice controls will be used to minimize the risk of employee exposure, and they are:

- o Employees will wash their hands and other potentially contaminated skin with antiseptic soap and water as soon as possible after removal of PPE.
- o Employees will flush mucous membranes with water as soon as possible after contact with potentially infectious materials.
- o If hand washing facilities are or may not be available, employees will be given an antiseptic hand cleanser to use immediately, and will wash their hands and other potentially contaminated skin with antiseptic soap and water as
- o Employees will try and minimize splashing, spraying, or spattering of blood or body fluids.

Personal protective equipment will be provided and employees are expected to have this equipment with them on any job site at which they are expected to render first aid. If an employee refuses to wear PPE, the manager will investigate and document the circumstances and any action taken.

Employees will be given and instructed on the proper use, maintenance and disposal of the following PPE:

- o Disposable gloves (non-latex gloves are preferred)
- o Eye protection (goggles with adjustable straps or face shields)
- o Mouth guard for mouth-to-mouth resuscitation
- o Disposable mask

If required to clean a surface that has been potentially contaminated with BBPs, the employee will wear gloves and will clean the area with disinfectant. Gloves and cleaning items will be discarded as noted below.

Any sharp object that has been contaminated (e.g., broken glass, piece of metal) will be picked up with a brush/dust pan rather than the hands and discarded as noted below.

Items contaminated with a victims blood or other body fluids will be placed in a closable and puncture/leak resistant biohazard trash bag labeled with the below red/red-orange symbol:

o The bag will be disposed of at or by [check with local resources on how to dispose of these bags – a local clinic, hospital or your trash local clinic, hospital or your trash pick-up company should be able to advise you – and note it here]:

If contaminated sharps (e.g., needles, metal or glass) or other contaminated material is an expected/potential hazard at a project site, the HASP will include instruction for its removal by a professional company/service. If such items are unexpectedly found at a site, Stop Work, isolate the area in question, contact the client and discuss with the client options for contracting with a professional company service for cleanup and removal.

Hepatitis B Vaccination Series

Employees who are designated to render first aid as part of their job duties will be offered the Hepatitis B vaccination series after they've received the required BBP training. The vaccination series is offered without cost to the employee and consists of three injections.

Employees who decline the injection will be asked to sign a Hepatitis B Declination form (Appendix 1- from the Arcadis Bloodborne Pathogens Exposure Control Plan Template) which will be placed in the employee's Corporate Health and Safety file. If an employee later decides to have the vaccination and is still designated to provide first aid, the vaccination will be made available at no cost to the employee.

Post Exposure Evaluation and Follow-Up

If an employee feels that he/she has had an exposure to a BBP, the employee will be sent for a medical evaluation if the employee so chooses. The employee's supervisor or a manager will complete the medical provider information form (Attachment 1) and send it with the employee to the evaluation.

The employee will receive a detailed report from the medical provider, and Arcadis will receive notification that the employee has been informed of the results of the evaluation and any recommended treatment.

The incident will also be reported to Corporate Health and Safety.

Training

All employees who are designated to render first aid will be given BBP training upon initial designation and annually thereafter. The training will be provided before the employee is offered the Hepatitis B vaccination.

Record Keeping

Medical records regarding an exposure to a BBP and Hepatitis B vaccination information will be maintained by the healthcare provider. Records provided to Arcadis will be maintained by Corporate Health and Safety permanently, and will be kept confidential and not disclosed without an employee's written consent except as required by law.

BBP exposure training records will be maintained in the Arcadis training database.

Attachment 1

INFORMATION TO THE MEDICAL PROVIDER FOLLOWING THE REPORT OF A BBP EXPOSURE

(To be completed by the employee's supervisor or manager or the project manager and sent with the employee to the medical evaluation)

Job Duties as They Relate To The Exposure Incident: The Employee is a designated first aid responder.

Route of Exposure: _____

(e.g., absorption through the skin, splashed in eyes, mouth or nose, etc.)

Circumstances Under Which Exposure Occurred: _____

(explain why the employee thinks he/she was exposed/came in contact with another person's blood or other bodily fluids)

Results of Source Individual's/Victim's Blood Test: _____

(if unavailable, if the blood hasn't been tested, if the source refused testing or the source is not known, note this)

The employee's medical records, including Hepatitis B vaccination status, should be sent with the employee if not already available to the medical provider.

A copy of the OSHA Bloodborne Pathogen Regulation will also be submitted to the medical provider if not already available to the provider.

Revised 5/30/2018

Traffic Safety Plan (TSP)

Notes: ROW - Right of Way (Public) formerly known as "TCP"
Non-ROW - Not in the ROW (parking lots, etc.) formerly known as "STAR"

1.0 General

Plan type	ROW and Non-ROW
Project Name:	Excavation and Capping of the 1st Street Turning Basin
Project Number:	
Developer Name:	Kasey Pelrah
Duration of Project (in hours or days):	TBD
Time Restrictions (Y/N, if Y describe below):	
Roadway Work Zone Start Point	1st Street at 3rd Ave
Roadway Work Zone End Point	1st Street at 3rd Ave
Posted Speed Limit (roadway in mph)	25
Number of Lanes (each direction)	2
Road Category Type (select)	Urban (≤40 mph)

☐ Working on multiple roads?

Comments: One lane and shoulder/parking of roadway may be blocked for short periods during mobilization and demobilization activities.

2.0 Work Description

Provide a brief description of scope of work:

Work potentially blocking traffic in ROW includes loading and unloading of trucks as well as backing into and pulling out of work areas.

3.0 Type and Duration

Work locations on this project will be: Long term work (>8 hours per location)

Roadway work will be performed: Travel lane

Non-ROW work will be performed in: Active parking lot

Special traffic conditions may include (select most prevalent): Large vehicles backing

4.0 Traffic Control Layout, Number of Devices Required, and Phasing

The following traffic control configuration in the Traffic Safety Handbook applies:

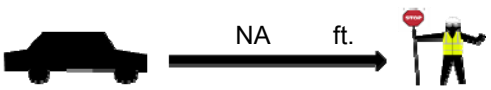
Section 6.5 Shoulder Work with Minor Encroachment (DOT Facts-301m)

The following Non-ROW requirements in the Traffic Safety Handbook applies:

Section 7.3 Intermediate Duration Work in Parking Areas (1 to 8 Hours) (DOT Facts-302b)

The menu below will be blank and is not applicable.

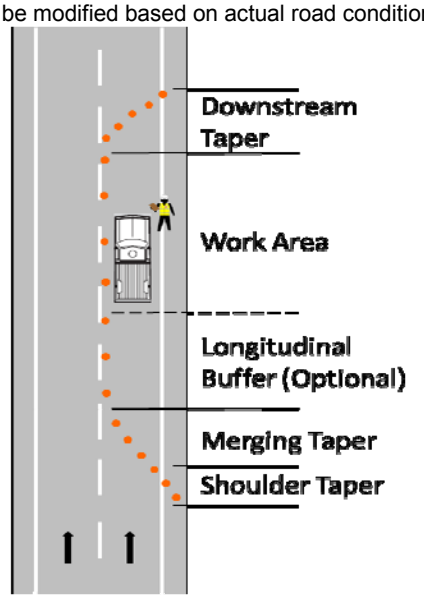
All contractor vehicles in a ROW will, at a minimum, have a functioning high intensity strobe or rotating orange light. All Arcadis employees in the ROW will wear, at a minimum, a retroreflective high visibility outer clothing meeting ANSI Class II or III requirements and other PPE required by JSA or HASP. Don't leave vehicle doors open. Park vehicles in ROW with front wheels turned to the right. Avoid work configurations requiring standing to rear of vehicles. Stage equipment in vehicles where it can be accessed from the right side of the vehicle to the extent practical. Do not park within 25 ft of the rear or front of parked large vehicles/construction equipment. An example non-ROW traffic control configuration for this project is illustrated below. The actual type and number of devices required are specified below.

ROW minimum sign spacing distances for "A", "B" and "C" (as applicable) in referenced DOT Facts.		ROW oncoming traffic minimum site distance required to see Flagger and properly decelerate and stop.
A	100 ft.	
B	100 ft.	
C	100 ft.	

ROW Cone Calculation (Values are default. Light grey fields may be modified based on actual road conditions)

	Active work area length (feet)	200
x	Apply Optional Longitudinal Buffer (ft)?	155
	Lane width of offset (feet)	12
	Shoulder width of offset (feet)	8
	Posted speed limit	25

x	**Shoulder Taper**	
	Taper Length (feet)	28
	Cones Required	1
	Cones Spacing (max., ft)	25
x	**Merging Taper**	
	Taper Length (feet)	125
	Cones Required	5
	Cones Spacing (max., ft)	25



x	**Work Area/Longitudinal Buffer**	
	Cone Spacing (max., ft)	50
	Cones Required	7
x	**Downstream Taper**	
	Taper Length (feet)	100
	Cones Required	5
	Cone Spacing (max., ft)	20
	Cones Required (minimum)	18

Note: Review taper configuration and cone spacing after ROW implementation to ensure traffic is moving efficiently without motorist confusion in the RWZ.

Select the traffic control devices to be used and enter number each required:

Check all that apply:		*Wording or Pictogram*	*Number:*
1	Warning signs	Lane Closure	1, if needed
	Warning signs		
	Warning signs		
x	Stop/Slow paddle		1, if needed
x	Red flag		1, if needed
	Drums		
	Channelizer cone (42 inch height, 10 lb base)		
	Channelizer cone (42 inch height, 30 lb base)		
x	Traffic cones (≥ 18 inches tall)		18
	Barricade:		
	Flags for cones		
	Lights (for night work)		
	Plastic fencing (rolls)		
	Caution tape (rolls)		
	Other (specify):		

ROW Phasing:

1) Deploy warning signs at first approach, if required
2) Deploy subsequent approach warning signs, if required
3) Deploy channeling devices, if required, starting with first approach
4) Deploy "End Road Work" signs, if required
5) Position vehicle as shield to the extent practical
6) Commence work, SSO or designated contractor to maintain devices
7) Remove devices in reverse order

Non-ROW Phasing:

1) Position truck as shield, if practical
2) Deploy traffic control devices
3) Affix flags, caution tape or fencing
4) Unload project equipment
5) Commence work
6) SSO to maintain controls
7) Remove controls in reverse order

Reviewed By:

HASP Reviewer: _____

ARCADIS Design & Consultancy for natural and built assets

Silica Exposure Control Plan

Project Name: Excavation and Capping of 1st Street Turning Basin
Project Number:
Date:

Task Description:
Resizing of concrete footings/foundations during excavation activities.

1) *Arcadis Silica Competent Person:*
The above individual will ensure requirements stipulated in this plan are implemented and has the authority to take corrective measures and/or revise this plan to ensure employee, contractor and/or public exposure to silica dust remains below the respirable inhalation time weighted average action level of 25 µg/m3 over an 8-hour period.

2) *What material will the team be working with on this project?*
Concrete

3) *The following work activity will be performed on this project which have a potential for silica dust exposure:*
Demolishing/disturbing

The following controls will be utilized to mitigate exposure to silica dust hazards:
Based on the activity entered above, the following OSHA/Arcadis activity category is:
Heavy equipment and utility vehicles used to abrade or fracture silica-containing materials (e.g., hoe-ramming, rock ripping) or used during demolition activities involving silica-containing

4) *The controls to be utilized include:*
Operate equipment from within an enclosed cab.
When employees outside of the cab are engaged in the task, apply water and/or dust suppressants as necessary to minimize dust emissions.

4a) *Respiratory Protection:*	≤4 HRS	>4HRS		≤4 HRS	>4HRS
Indoors or Enclosed Area:	None	None	Outdoors:	None	None

Additional Housekeeping Requirements:
Project prohibits dry sweeping or dry brushing where such activity could contribute to employee exposure to respirable crystalline silica unless wet sweeping, HEPA-filtered vacuuming or other methods that minimize the likelihood of exposure are not feasible.

Project prohibits use of compressed air to clean clothing or surfaces where such activity could contribute to employee exposure to respirable crystalline silica unless:
The compressed air is used in conjunction with a ventilation system that effectively captures the dust cloud created by the compressed air. No alternative method allowed.

5) Air Monitoring Requirements for Activities with an Assigned Respirator APF Listed in Section 4a.

☐ Real-time air monitoring for silica is not required for this project

☐ Real-time air monitoring will be conducted during work activities where employees or contractors are exposed to or have the reasonable probability to be exposed to silica dust hazards. Silica air monitoring will include use of an aerosol monitor equipped with a Dorr-Oliver cyclone kit for respirable dust evaluation. Real-time air monitoring for silica will be performed in the employee breathing zone (personal air monitoring) and also performed at the perimeter of the work area (exclusion zone boundary). Air samples for laboratory analysis will also be required unless excepted from collection by a CIH.

Aerosol monitor selected for use on this project: _____
Frequency of air sample collection for laboratory analysis: _____
Air samples will be submitted to the following laboratory: _____

6) Medical Surveillance

Employees performing work activities where exposure to silica dust is known to be or has a reasonable probability to be above the OSHA 8 Hr. TWA action level of 25 µg/m3 will participate in silica medical surveillance in conjunction with their annual HAZWOPER physical. New entrants into the silica medical surveillance program at times when the HAZWOPER physical is not due will coordinate the required surveillance with WorkCare and then maintain the surveillance with their HAZWOPER physical going forward.

7) Additional Instructions

Contractor/sub-contractor will be required to complete additional silica plans if new dust generating tasks are encountered.

Signatures:

Preparer Name Printed	Date
Preparer Signature	
Competent Person Name Printed	Date
Competent Person Signature	

Arcadis Site Security Plan Template

Date: 1/0/1900
Project Name: 0
Project Number: 0
Client Name: 0

Overview of the security hazards for the project:

☐ Work will be conducted during non-daylight hours.

Current security controls:

Select
Select
Select
Select
Select

Additional controls to be utilized.

Method of Communication:

☐ Cell Phone (including text communication)
☐ Landline
☐ 2-way Radio
☐ Satellite Phone
☐ GPS
☐ Transponder
☐ Other:

Frequency of Communication: HOURLY
Enter time in military format ##:##
Planned Start Time: _____ Planned End Time: 12:00:00 PM

Client Contact Name: 0
Client Contact Number: 0
Field Worker Name
Field Worker Phone Number
Office Contact Name 0
Office Contact Phone Number 0

Contingency Plan (if the Field Worker cannot be reached, describe actions the Office Contact will take)

Notification Log

Time	Field Worker Notification	Office Receipt of Notification
12:00:00 AM		
1:00:00 AM		
2:00:00 AM		
3:00:00 AM		
4:00:00 AM		
5:00:00 AM		
6:00:00 AM		
7:00:00 AM		
8:00:00 AM		
9:00:00 AM		
10:00:00 AM		
11:00:00 AM		
12:00:00 PM		

APPENDIX F

AIR MONITORING REQUIREMENTS

Air Monitoring

☐ There are no atmospheric chemical, radiological, or particulate hazards on this project requiring air monitoring.
☐ Air monitoring is the responsibility of the client or subcontractor.

Constituents of Interest:

Time Weighted Averages (TWAs) are ACGIH 8-Hr Threshold Limit Values (TLVs) unless noted.

Aroclor 1242	Anticipated Breathing Zone Concentration <=	10	mg/m3
TWA 1 mg/m3, skin	LEL/UEL (%):	NA/NA	
STEL NA	VD (Air = 1):	NA	
IDLH 5 mg/m3, NIOSH	VP (mmHg):	0.001	
Aroclor 1254	Anticipated Breathing Zone Concentration <=	10	mg/m3
TWA 0.5 mg/m3, skin	LEL/UEL (%):	NA/NA	
STEL NA	VD (Air = 1):	NA	
IDLH 5 mg/m3, NIOSH	VP (mmHg):	0.00006	
PCBs	Anticipated Breathing Zone Concentration <=	10	mg/m3
TWA 0.5 mg/m3, skin	LEL/UEL (%):	NA/NA	
STEL NA	VD (Air = 1):	NA	
IDLH 5 mg/m3, NIOSH	VP (mmHg):	0.001	
Naphthalene			
TWA 10 ppm, skin	LEL/UEL (%):	0.9/5.9	
STEL NA	VD (Air = 1):	NA	
IDLH 250 ppm, NIOSH	VP (mmHg):	0.08	
2-Butanone			
TWA 200 ppm	LEL/UEL (%):	1.4/11.4	
STEL 300 ppm	VD (Air = 1):	NA	
IDLH 3000 ppm, NIOSH	VP (mmHg):	78	
Benzene			
TWA 0.5 ppm, OSHA Reg. See Notes	LEL/UEL (%):	1.2/7.8	
STEL 2.5 ppm	RGD (Air = 1):	NA	
IDLH 500 ppm, NIOSH	VP (mmHg):	75	

TWA - Time Weighted Average (ACGIH TLV unless noted)
STEL - Short Term Exposure Limit
IDLH - Immediately Dangerous to Life and Health
LEL/UEL - Lower /Upper Explosive Limit
RGD - Relative Gas Density
VP - Vapor Pressure

Notes:
One or more constituents above is listed with a skin notation. Avoid conditions where dusts, mists, or aerosols are created. Avoid skin contact with impacted media.

As noted, one or more of the above constituents is an OSHA regulated substance. If exposure is expected to be above the TWA, contact a CIH or CSP for assistance unless otherwise permitted by a substance specific plan template identified in this section.

Required Monitoring Instruments, Action Levels and Monitoring Frequency

Photoionization Detector — Select Lamp: 9.8 eV

Action levels are in PID units:		
<	1.2	Continue working
	1.2 - 2.5	Levels sustained > 5 minutes, monitor continuously and review engineering controls and PPE. Proceed with caution.
>	2.5	Stop work and contact SSO

Particulate monitoring is not required. Re-evaluate need for monitoring if visible dusts cannot be controlled.

Action levels are in mg/m3		
<	NA	Continue working
	NA	Levels sustained > 5 minutes, monitor continuously and review engineering controls and PPE. Proceed with caution.
>	NA	Stop work and contact SSO

LEL/O2 monitoring is not required. Reevaluate need for monitoring if high PID/FID readings are encountered.

LEL/O2 Meter		
NA	0-5% LEL	Continue work
	>5-10% LEL	Continually monitor, review engineering controls, proceed with caution
	>10% LEL	Stop work, evacuate, contact SSO
	19.5%-23.5% O2	Normal, continue work
	<19.5% O2	O2 deficient, stop work, evacuate, contact SSO
	>23.5% O2	O2 enriched, stop work, evacuate, contact SSO

All air-monitoring instruments must be calibration checked daily, if used, per manufacturer's instructions. Calibration checks, including calibration gases used, must be documented.

Breathing zone air monitoring using the above instruments will be performed at the following frequency:
Continuously

The monitoring instrument(s) used must be capable of data logging if continuous monitoring is required. Staff using these instruments must be trained in data logging procedures for the actual instrument(s) used. Data logging results must be backed up daily.

Compound specific monitoring is not required.

Indicator:		
	Tube	Chip
≤TWA	Continue work	
>TWA	Stop work, review engineering controls and PPE, contact SSO	
Compound(s):		

Indicator tube/chip monitoring frequency: Not applicable

Air Monitoring

Task or Area of Concern: _____

Constituents of Interest:

Time Weighted Averages (TWAs) are ACGIH 8 Hr Threshold Limit Values (TLVs) unless noted.

Ethylbenzene			
TWA	20 ppm	LEL/UEL (%):	0.8/6.7
STEL	125 ppm	VD (Air = 1):	NA
IDLH	800 ppm, NIOSH	VP (mmHg):	7
Tetrachloroethene			
TWA	25 ppm	LEL/UEL (%):	NA/NA
STEL	100 ppm	VD (Air = 1):	NA
IDLH	150 ppm, NIOSH	VP (mmHg):	14
Xylene			
TWA	100 ppm	LEL/UEL (%):	1.1/7.0
STEL	150 ppm	VD (Air = 1):	NA
IDLH	900 ppm, NIOSH	VP (mmHg):	9
Barium		Anticipated Breathing Zone Concentration <=	10 mg/m3
TWA	0.5 mg/m3	LEL/UEL (%):	NA/NA
STEL	NA	VD (Air = 1):	NA
IDLH	NA	VP (mmHg):	NA
Toluene			
TWA	20 ppm	LEL/UEL (%):	1.1/7.1
STEL	150 ppm, NIOSH	VD (Air = 1):	NA
IDLH	500 ppm, NIOSH	VP (mmHg):	21
Arsenic		Anticipated Breathing Zone Concentration <=	10 mg/m3
TWA	0.01 mg/m3, OSHA Reg. See Notes	LEL/UEL (%):	NA/NA
STEL	NA	RGD (Air = 1):	NA
IDLH	5 mg/m3	VP (mmHg):	NA
Cadmium		Anticipated Breathing Zone Concentration <=	10 mg/m3
TWA	0.005 mg/m3, OSHA, OSHA Reg. See Notes	LEL/UEL (%):	NA/NA
STEL	NA	RGD (Air = 1):	NA
IDLH	9 mg/m3, NIOSH	VP (mmHg):	NA
Lead		Anticipated Breathing Zone Concentration <=	10 mg/m3
TWA	0.05 mg/m3, OSHA Reg. See Notes	LEL/UEL (%):	NA/NA
STEL	NA	RGD (Air = 1):	NA
IDLH	100 mg/m3	VP (mmHg):	NA

TWA - Time Weighted Average (ACGIH TLV unless noted)
STEL - Short Term Exposure Limit
IDLH - Immediately Dangerous to Life and Health
LEL/UEL - Lower/Upper Explosive Limit
RGD - Relative Gas Density
VP - Vapor Pressure

Notes:

One or more constituents listed above is a particulate hazard. Use wetting as the primary control to eliminate dust hazards.

As noted, one or more of the above constituents is an OSHA regulated substance. If exposure is expected to be above the TWA, contact a CIH or CSP for assistance unless otherwise permitted by a substance specific plan template identified in this section.

Required Monitoring Instruments, Action Levels and Monitoring Frequency

Photoionization Detector Select Lamp: 9.8 eV

Action levels are in PID units:		
<	23.4	Continue working
	23.4 - 46.7	Levels sustained > 5 minutes, monitor continuously and review engineering controls and PPE. Proceed with caution.
>	46.7	Stop work and contact SSO

Particulate monitoring is not required. Re-evaluate need for monitoring if visible dusts cannot be controlled.

Action levels are in mg/m3		
<	NA	Continue working
	NA	Levels sustained > 5 minutes, monitor continuously and review engineering controls and PPE. Proceed with caution.
>	NA	Stop work and contact SSO

LEL/O2 monitoring is not required. Reevaluate need for monitoring if high PID/FID readings are encountered.

LEL/O2 Meter		
NA	0-5% LEL	Continue work
	>5-10% LEL	Continually monitor, review engineering controls, proceed with caution
	>10% LEL	Stop work, evacuate, contact SSO
	19.5%-23.5% O2	Normal, continue work
	<19.5% O2	O2 deficient, stop work, evacuate, contact SSO
	>23.5% O2	O2 enriched, stop work, evacuate, contact SSO

All air-monitoring instruments must be calibration checked daily, if used, per manufacturer's instructions. Calibration checks, including calibration gases used, must be documented.
Breathing zone air monitoring using the above instruments will be performed at the following frequency:
Select

Compound specific monitoring is not required.

Indicator:		
☐ Tube ☐ Chip	≤TWA	Continue work
	>TWA	Stop work, review engineering controls and PPE, contact SSO
Compound(s):		

Indicator tube/chip monitoring frequency: Not applicable

Air Monitoring Acronyms and Definitions

Arcadis Acronym	*Meaning*	*Definition*
	Action Levels	
A	Arcadis Specific TWA	An Arcadis administrative TWA.
c	Ceiling (TLV-C)	The concentration that shall not be exceeded during any part of the working exposure.
i	Inhalable	Particles that enter the respiratory system via the nose or mouth.
IDLH	Immediately Dangerous to Life and Health	The exposure concentration which is likely to cause significant injury/illness or death.
PEL	Permissible Exposure Limit (OSHA)	OSHA exposure limit and is legally enforceable in the United States.
r	Respirable	The portion of inhalable particles that enter the deepest part of the lung, the nonciliated alveoli.
REL	Recommended Exposure Limit (NIOSH)	The NIOSH TWA for an exposure up to a 10-hour workday during a 40-hour work week.
s	Skin	Potential for dermal absorption
se	Sensitizer	Potential for dermal or respirable sensitization resulting from the interaction of an absorbed agent.
STEL	Short Term Exposure Limit (TLV-STEL)	Usually a 15-minute TWA exposure that should not be exceeded at any time during the workday, even if the 8-hour TWA is within the TLV,PEL, or REL TWAs.
TLV	Threshold Limit Value (ACGIH)	The ACGIH TWA for an exposure up to a 8-hour workday during a 40-hour work week.
TWA	Time Weighted Average (TLV-TWA)	Time-weighted average exposure concentration for a conventional 8-hour (TLV,PEL) or up to 10-hour (REL) workday and a 40-hour week.
	Chemical and Physical Properties	
IP	Ionization Potential	Ionization potential, eV (electron volts) [Ionization potentials are given as a guideline for the selection of photoionization detector lamps used in some direct-reading instruments.]
LEL	Lower Explosive Limit	The minimum concentration of a vapor in air below which propagation of a flame will not occur in the presence of an ignition source.
UEL	Upper Explosive Limit	The maximum concentration of a vapor in air below which propagation of a flame will not occur in the presence of an ignition source.
RGD	Relative Gas Density	Weight of a vapor or gas compared to an equal volume of air (air = 1). If greater than 1.0, the vapor or gas is heavier than air and will concentrate in the low places. If less than 1.0, the vapor or gas will rise.

Units		
eV	Electron volt	A unit of energy equal to the energy acquired by an electron falling through a potential difference of one volt.
m	mg/m3	Milligrams per cubic meter
p	ppm	Parts per million
Organizations/Agencies		
ACGIH	American Conference of Governmental Industrial Hygienists	
NIOSH	National Institute for Occupational Safety and Health	
OSHA	Occupational Safety and Health Administration	

Appendix 1A
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

Appendix 1B
Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.

2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.

3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:

(a) Objects to be measured: Dust, mists or aerosols;
(b) Measurement Ranges: 0.001 to 400 mg/m3 (1 to 400,000 :ug/m3);
(c) Precision (2-sigma) at constant temperature: +/- 10 :g/m3 for one second averaging; and +/- 1.5 g/m3 for sixty second averaging;
(d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
(e) Resolution: 0.1% of reading or 1g/m3, whichever is larger;
(f) Particle Size Range of Maximum Response: 0.1-10;
(g) Total Number of Data Points in Memory: 10,000;
(h) Logged Data: Each data point with average concentration, time/date and data point number
(i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
(j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
(k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
(l) Operating Temperature: -10 to 50^{o} C (14 to 122^{o} F);
(m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.

5. The action level will be established at 150 ug/m3 (15 minutes average). While conservative,

this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m3, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m3 above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m3 continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM10 at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

(a) Applying water on haul roads;
(b) Wetting equipment and excavation faces;
(c) Spraying water on buckets during excavation and dumping;
(d) Hauling materials in properly tarped or watertight containers;
(e) Restricting vehicle speeds to 10 mph;
(f) Covering excavated areas and material after excavation activity ceases; and
(g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m3 action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

APPENDIX G

ENHANCED LEVELS OF PERSONAL PROTECTIVE EQUIPMENT PROTECTION

Level C Supplement for the Standard HASP (Revision 7, 6/19/2017)

Level C Scope of Work

Describe the task(s) requiring Level C upgrade:

*Verify the following (check box if condition **does not exist** for the task(s) listed above):*

- ☐ NO IDLH atmospheres
- ☐ NO oxygen deficient atmospheres
- ☐ NO permit required confined spaces
- ☐ NO unknown contaminant atmospheres

If any of the above conditions exist, contact your project H&S contact for assistance.

Roles and Responsibilities

Identify project team members and Level C responsibilities for each member for this work:

	Employee Name	Responsibilities
1		
2		
3		
4		
5		
6		
7		
8		

Training

The following training is required beyond the training specified in the HASP:

- ☑ Respirator use and limitations
- ☑ Level C PPE specific to the project
- ☑ Site control specific to the project
- ☑ Decontamination specific to the project.
- ☑ Project air monitoring requirements under Level C
- ☑ Emergency Action Plan specific to this Level C project
- ☐ Other (specify): _____
- ☐ Other (specify): _____

Training will be provided on site prior to imitation of work and documented on:

- ☐ Tailgate Safety Briefing Form
- ☐ Field Logbook
- ☐ Other (specify): _____

Medical Surveillance

☐ All project team members have a current medical clearance to wear a respirator
☐ The following project team members are required to have a current medical clearance to wear a respirator:

Air Monitoring Supplement
(Will Update automatically once Monitor AOC 1 Tab is updated)
The following air monitoring requirements are in addition to the requirements in the HASP when work is performed under Level C conditions.

Constituent(s)	Odor Threshold (ppm)	Full Facepiece APR MUC QLFT (ppm)	Full Facepiece APR MUC QNFT (ppm)
None	NA	9999	9999
None	NA	9999	9999
None	NA	9999	9999
None	NA	9999	9999
None	NA	9999	9999
None	NA	9999	9999

Other air monitoring equipment required for Level C work not specified in the HASP:

☐ 1) PID
☐ 2) FID
☐ 3) LEL/O2 Meter
☐ 4) Particulate monitor
☐ 5) Colorimetric indicator tubes (specify type):
☐ 6) Other:
☐ 7) Weather:
☐ Temperature ☐ Wind direction
☐ Humidity ☐ Wind speed
☐ Precipitation ☐ Other:

Air monitoring will be conducted at (check all that apply):

Location:	Frequency:	Specify Instruments (# from above)
☐ Breathing zone		
☐ Exclusion zone boundary		
☐ Upwind		
☐ Downwind		
☐ Crosswind		
☐ Site perimeter		
☐ Other:		

☐ A windsock is required.

Comments:

Respirator Selection and Fit Testing

The following respirator is required for this project:

	APF	Permitted Fit Test
☐ Disposable dust mask	5	QLFT
☐ Half facepiece air purifying respirator (dual cartridge)	10	QLFT
☐ Full facepiece air purifying respirator	10	QLFT
☐ Full facepiece air purifying respirator	50	QNFT
☐ Loose fitting facepiece powered air purifying respirator	25	QLFT
☐ Half facepiece powered air purifying respirator	50	QLFT
☐ Full facepiece powered air purifying respirator	1000	QNFT

Required fit test for project: ☐ Qualitative (QLFT) ☐ Quantitative (QNFT)
☐ QLFT fit test protocol attached

Cartridge Selection

The following cartridges are required for this project:
Note: Consult the manufacturer's literature for specific constituents of interest to ensure correct cartridge is selected.

Chemical:
- ☐ Multigas
- ☐ Organic vapor
- ☐ Organic vapor/acid gas
- ☐ Ammonia/methylamine
- ☐ Mercury vapor/chlorine
- ☐ Other (specify):

Particulate/Dust/Mists:
- ☐ P-100
- ☐ N-95
- ☐ R-95
- ☐ Other (specify):

Combination:
- ☐ Organic vapor/P-100
- ☐ Organic vapor/acid gas/P-100
- ☐ Ammonia/methylamine/P-100
- ☐ Mercury vapor/chlorine/P-100
- ☐ Other (specify):

End of Service Life Indicators (ESLIs) (aka Respirator Cartridge Change Out)

Respirator cartridge ESLIs shall be factored when selecting the appropriate cartridge. Use of warning properties such as odor and taste are not permissible practices. The ESLI shall be identified and a cartridge change out schedule established prior to start of work. Information used to establish the change out schedule will be computed using manufacturer's supplied guidance or software (see below). At a minimum, chemical cartridges will be changed out daily. For particulate filters and cartridges, replace when breathing becomes difficult or daily whichever comes first.

☐ ESLI information is attached.

Comments:

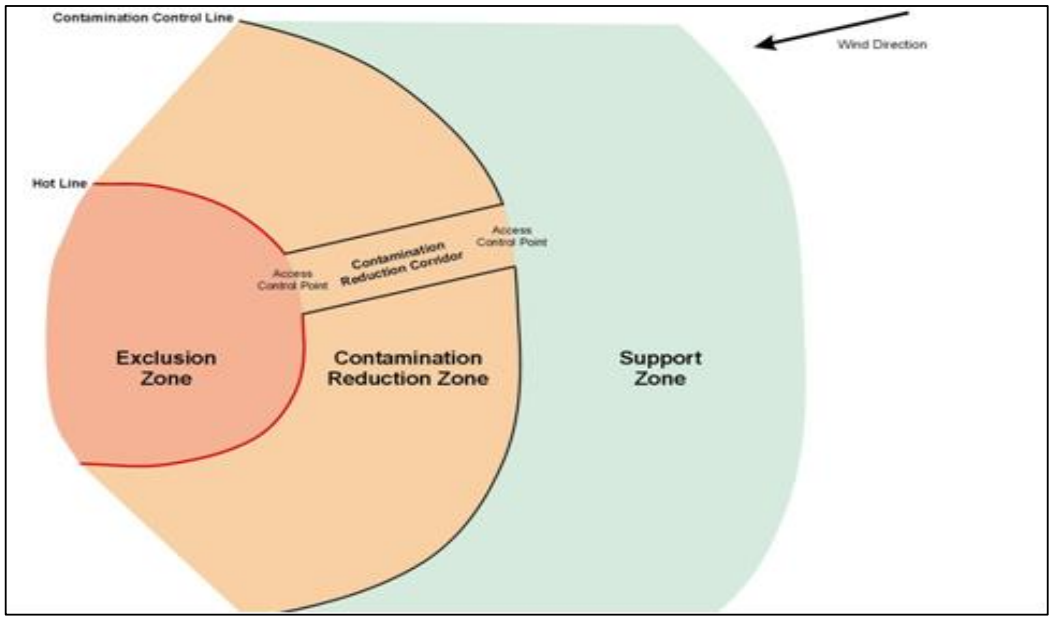
Respirator Care and Maintenance

☑ Cleaning protocol attached

All respirators will be stored in a clean and sanitary condition at all times. Each respirator used will be cleaned prior to be stored for the day. Each respirator will be inspected by the user prior to use. Any defective or worn part will be promptly replaced.

Site Control

Example site control layout (check configurations to be used below):



The size and configuration used for site control is dependent on many variables. Based on work being performed, identify site control requirements for this project:

Configuration?	How delineated?
☐ Exclusion zone (EZ)	☐ Cones
☐ Contamination reduction zone (CRZ)	☐ Channelizer cones
☐ Contamination reduction corridor (CRC)	☐ Caution tape
☐ Access control points (ACPs)	☐ Safety fencing
☐ Other: _____	☐ Other: _____
☐ Other: _____	☐ Other: _____

☐ Site control is integrated into the STAR Plan or TCP for the project

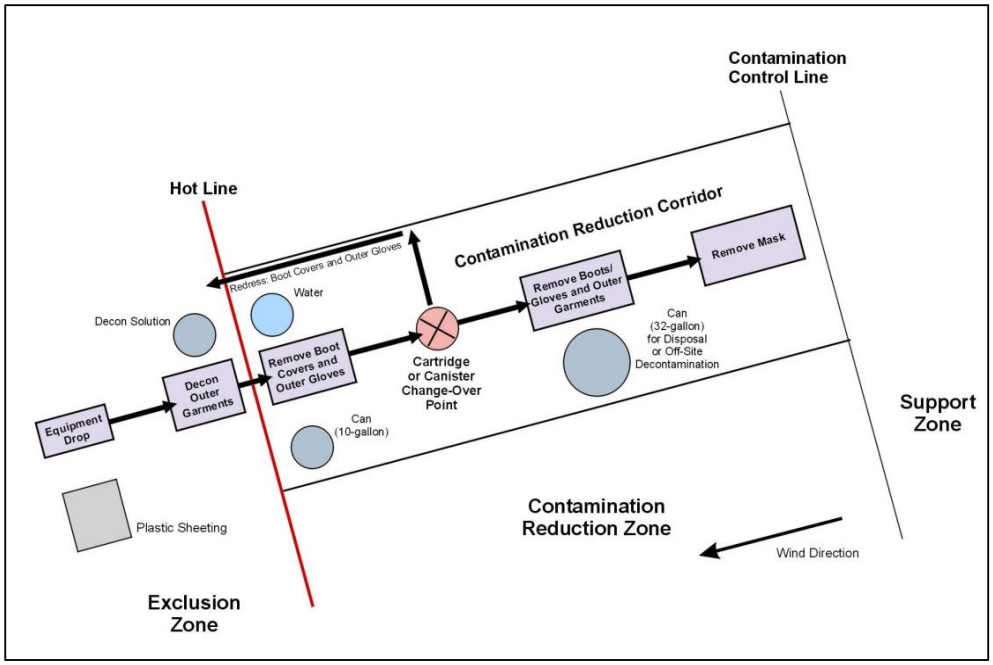
Additional Level C PPE specific for each zone (excluding respirator):

EZ and ACP at EZ		CRZ/CRC/ACP at Support Zone		Support Zone	
☐ Coveralls:		☐ Coveralls:		☐ See applicable JSA	
☐ Boot covers:		☐ Boot covers:		☐ See HASP	
☐ Outer gloves:		☐ Outer gloves:		☐ Other:	
☐ Inner gloves:		☐ Inner gloves:			
☐ Taping		☐ Taping			
☐ Other:		☐ Other:			
☐ Other:		☐ Other:			

Comments:

Decontamination

Example decontamination layout (check stations and supplies required below):



The number of stations required for decontamination is dependent on many variables. Based on work being performed, identify decontamination stations and supplies required for this project:

Station:	Zone:	Supplies:	Number:
☐ Equipment drop	EZ	☐ Plastic containers	
		☐ Plastic liners/bags	
		☐ Plastic sheeting (rolls)	
		☐	
☐ Outer garment decon	EZ	☐ Containers (20-30 gallon)	
		☐ Decon solutions (gallons)	
		☐ Rinse water (gallons)	
		☐ Long handled scrub brushes	
		☐	
☐ Boot cover/outer glove removal	CRZ	☐ Containers (20-30 gallon)	
		☐ Plastic liners/bags	
		☐ Bench or stools	
		☐	
☐ Cartridge change out	CRZ	☐ Spare cartridges (sets)	
		☐ Tape	
		☐ Boot covers (pair)	
		☐ Gloves (pair)	
		☐	
☐ Boot/glove/outer garment remov	CRZ	☐ Containers (20-30 gallon)	
		☐ Plastic liners/bags	
		☐ Bench or stools	
		☐	
☐ Mask Removal	CRZ	☐ Plastic sheeting (rolls)	
		☐ Buckets	
		☐ Soap	
		☐ Water (gallons)	
		☐ Paper towels (rolls/boxes)	
		☐	

Attachment A. Respirator Cleaning Protocol

1) Remove cartridges/canisters/filters. Disassemble facepiece by removing speaking diaphragm, demand and pressure-demand valve assemblies, hoses, or any components recommended by the manufacturer.

2) Wash components with warm (<110° F) water with a mild detergent or with a cleaner approved by the manufacturer. A soft, non-wire bristle brush may be used to facilitate dirt

3) Rinse with warm (<110° F) clean water, preferably running water.

4) If the cleaner used does not contain a disinfecting agent, respirator components should be immersed in one of the following for two minutes:

a. Hypochlorite solution (50 ppm chlorine) made by adding approximately 1 milliliter of laundry bleach to 1 liter of water at 110° F; or

b. Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliters of tincture of iodine [6-8 grams ammonium and/or potassium iodide/100 cubic centimeters (cc) of 45 percent alcohol] to one liter of water at 110° F; or

c. Other commercially available cleansers of equivalent disinfectant quality, when used as directed by the manufacturer, and are approved for use by the respirator manufacturer.

5) Thoroughly rinse the respirator components in clean, warm, (<110° F) running water.

6) Components should be hand dried with a soft lint free cloth or allowed to air dry.

7) Reassemble the facepiece and restore cartridges/canisters/filters as necessary.

8) Test the respirator for proper working condition.

Monitoring

Area of Concern:

For projects requiring air monitoring, list the ***relevant*** *constituents representing a hazard to site workers.*

Constituent	Max. Conc.	Units	TWA	Units	STEL	Units	IDLH	Units	LEL/UEL (%)	RGD Air=1	VP (mm Hg)	IP (eV)
None		ppm	9999	-	0	-	0	-	0	0	0	0
None		ppm	9999	-	0	-	0	-	0	0	0	0
None		ppm	9999	-	0	-	0	-	0	0	0	0
None		ppm	9999	-	0	-	0	-	0	0	0	0
None		ppm	9999	-	0	-	0	-	0	0	0	0
None		ppm	9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0

Notes: TWAs are ACGIH 8 hr-TLVs unless noted.

p-ppm m-mg/m3 c2- ceiling (2 hr) se-sensitizer A - Arcadis specific TWA*
s- skin c-ceiling "9999" - NA O-OSHA PEL "#N/A"-Manually enter information
r- respirable i-inhalable N-NIOSH 10 hr REL

Monitoring Equipment and General Protocols

Air monitoring is required for any task or activity where employees have potential exposure to vapors or particulates above the TWA. Action levels below are appropriate for most situations. Contact the project H&S contact for all stop work situations. Select monitoring frequency and instruments to be used.

Monitoring Frequency:	
Indicator Tube/Chip Frequency:	Indicator tube/chip monitoring not required

	Instrument	Action Levels			Actions
☐	Photoionization Detector		<	#DIV/0!	Continue work
		#DIV/0!	-	#DIV/0!	Sustained >5 min. continuous monitor, review eng. controls and PPE, proceed with caution
	Lamp (eV): 10.6		>	#DIV/0!	Sustained >5 min. stop work, contact SSO
☐	Flame Ionization Detector (FID)		<	0.0	Continue work
		0.0	-	0.0	Sustained >5 min. continuous monitor, review eng. controls and PPE, use caution
			>	0.0	Sustained >5 min. stop work, contact SSO
☐	LEL/O2 Meter	0-5% LEL			Continue work
		>5-10% LEL			Continuous monitor, review eng. controls, proceed with caution
		>10% LEL			Stop work, evacuate, contact SSO
		19.5%-23.5% O2			Normal, continue work
		<19.5% O2			O2 deficient, stop work, evacuate, cont. SSO
		>23.5% O2			O2 enriched, stop work, evacuate, contact SSO
☐	Indicator: ☐tube ☐chip	≤PEL/TLV			Continue work
		>PEL/TLV			Stop work, review eng. controls and PPE, contact SSO
	Compound(s):				
☐	Particulate Monitor		<	1.5	Continue work
	(mists, aerosols, dusts in mg/m^3)	1.5	-	3.00	Use engineering controls, monitor continuously
			>	3.00	Stop work, review controls, contact SSO
☐	Other:	Specify:			Specify: