

HEALTH AND SAFETY PLAN

SITE HEALTH AND SAFETY PLAN

**FORMER KAST
PROPERTY CARSON,
CALIFORNIA**

Prepared for:

Shell Oil Products US
20945 South Wilmington Avenue
Carson, California

October 14, 2015



999 Town and Country Road
Orange, California 92868

HEALTH AND SAFETY PLAN
FORMER KAST PROPERTY
CARSON, CALIFORNIA

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APPROVALS


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This Health and Safety Plan is valid only for this specific project as described in Section 3.0. It is not to be used for other projects or subsequent phases of this project without the written approval of the Area Safety Manager. A copy of this plan is to be maintained at the Site at all times.

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List of Attachments

Former Kast Property Health and Safety Plan

- Attachment A Health Clinic Route Map / Hospital Route Map / Site Map
- Attachment B Safety Plan Compliance Agreement
- Attachment C AECOM-Shell Daily Tailgate Meeting and Work Clearance Form
- Attachment D Shell Oil Products US Forms
- Attachment E Material Safety Data Sheets/Safety Data Sheets
- Attachment F Behavior Based Safety Checklist
- Attachment G AECOM Safety Management Standards
- Attachment H Visitor Log form
- Attachment I Task Hazard Analyses
- Attachment J Blank Daily Task Hazard Analysis Form

GLOSSARY OF TERMS, ACRONYMS, AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
analyzer	refers to the field instrument described in Section 8.1
ASHEM	Area Safety, Health, and Environment Manager
atm	atmosphere
°C	centigrade
Carcinogen	a substance that can cause cancer
cc	cubic centimeter
CIH	Certified Industrial Hygienist
CGI	Combustible Gas Indicator
CNS	Central Nervous System
CSP	Certified Safety Professional
eV	Electron Volts
°F	Fahrenheit
HSMS	Health and Safety Program and Management System
HSP	Health and Safety Plan
IP	Ionization Potential
kg	kilogram
LACFD	Los Angeles County Fire Dept.
LEL	Lower Explosive Limit
LNAPL	light non-aqueous phase liquid
Lpm	liters per minute
MSDS	Material Safety Data Sheet
m	meter
mg	milligram
mg/M ³	milligrams per cubic meter
ml	milliliter
mm	millimeter
ND	not detected
NIOSH	National Institute for Occupational Safety and Health
OBZ	operator's breathing zone
OEL	Occupational Exposure Limit
OSHA	Occupational Safety and Health Administration
OSR	Office Safety Representative
PEL	Permissible Exposure Limit
PID	Photoionization Detector
PM	project manager
ppb	parts per billion
ppm	parts per million
REL	Recommended Exposure Limit
SHE	Safety, Health, and Environment
SMS	Safety Management Standard
SOPUS	Shell Oil Products United States
SOURCE	URS' Corporate Intranet
SSO	Site Safety Officer
SSR	Subcontractor's Safety Representative
STEL	Short Term Exposure Limit
TLV	Threshold Limit Value
UEL	Upper Explosive Limit
VOC	Volatile Organic Compound

1.0 PLAN-AT-A-GLANCE

HSP SUMMARY SHEET

THIS SUMMARY SHEET IS PROVIDED AS A QUICK-REFERENCE/OVERVIEW ONLY. THE REMAINDER OF THIS SITE-SPECIFIC HSP IS INTEGRAL TO THE SAFE CONDUCT OF SITE OPERATIONS AND MUST BE APPLIED IN ITS ENTIRETY.

EMERGENCY INFORMATION

Ambulance -	911
Fire -	911
Police -	911
Hospital -	(310) 222-3528 Los Angeles County Harbor-UCLA Medical Center 1000 West Carson Street, Torrance, CA 90509
Occupational Clinic -	(310) 638-1113 US Healthworks Medical Group of CA 2499 South Wilmington Ave, Compton, CA Hours: 8 am to 5 pm (URGENT CARE) Monday through Friday
Occupational Health Nurse: WorkCare	(888) 449-7787 (24/7)
AECOM Project Manager: Christian Osterberg	(714) 689-7316 (714) 227-1363 (cell)
AECOM Site Manager: Robert Ponce	(714) 720-4051 (cell)
AECOM SH&E Rep: Devon Molitor, CSP	(858) 531-9666 (cell)
AECOM ASM: Galen Cooter, CSP	(805) 452-3523 (cell)
Cal OES	(800) 852-7550
Shell SGW Project Manager: Douglas Weimer	(310) 816-2043 (703) 403-6790 (cell)

Note that persons without serious or life-threatening injuries should be escorted to an occupational health clinic or urgent care facility instead of a hospital. Contact the Occupational Health Nurse or Workcare prior to proceeding to the clinic (888) 449-7787. See Section 14.5.

OCCUPATIONAL CLINIC DIRECTIONS:

(310) 638-1113
US Healthworks Medical Group of CA
2499 South Wilmington Ave, Compton, CA
Hours: 8 am to 5 pm (URGENT CARE) Monday through Friday

Refer to occupational clinic route map in Attachment A.

HOSPITAL DIRECTIONS:

(310) 222-3528
Los Angeles County Harbor-UCLA Medical Center
1000 West Carson Street, Torrance, CA 90509

Refer to the hospital route map in Attachment A.

Additional information concerning emergency procedures is located in Section 14.0 and the hospital route map is located in Attachment A. A copy of the hospital route map must be readily available in each Site vehicle that may be used to transport accident victims to the hospital.

CONSTITUENTS OF CONCERN

1. Gasoline, methane, diesel, fuel oil, and crude oil and constituents
2. Chlorinated solvents

Additional information regarding Site history, constituents of concern, and scope of work activities is located in sections 2.0 and 5.0.

PROJECT HAZARD ANALYSIS

Task	Chem. Hzds.	Heat Stress	Noise	Slip/Trip /Fall	Lifting Hzds.	Mech'l. Hzds.	Electro-cution	Explosion/Methane
1. Site Mobilization	N/A	Med	Low	Med	Med	Low	N/A	N/A
2. Calibration of field instruments	Low	Low	Low	Med	Low	Low-Med	Low	Low
3. Utility clearance using subsurface geophysical	N/A	Med	Low	Med	Med	Med-High	Med-High	Low
4. Shallow soil hand augering and soil sampling	Low-Med	Med	Low	Med	Low-Med	Med-High	Low	Low
5. Sub-slab and soil vapor probe installation	Low-Med	Med	Med-High	Med	Low-Med	Med-High	Low	Low
6. Sub-slab vapor probe sampling	Low-Med	Med	Low	Med	Low-Med	Low-Med	Low	Low
7. Street soil vapor probe sampling	Low-Med	Med	Low	Med	Low-Med	Med-High	Low	Low
8. Borehole clearance by air knife	Low-High	Low-High	Med-High	Med	Med	Med-High	Low	Low
9. Drilling, soil sampling and well installation by hollow-stem auger, mud/air-rotary or sonic drilling methods	Low-High	Low-High	Med-High	Med	Med	Med-High	Low	Low
10. Groundwater well development	Low-High	Low-High	Med-High	Med	Med	Med-High	Low	Low
11. Direct push soil sampling and vapor probe installation using Geoprobe rig or CPT rig	Low-High	Low-High	Med-High	Med	Med	Med-High	Low	Low
12. Hydropunch groundwater sampling	Low-Med	Med	Med-High	Med	Low-Med	Med-High	Low	Low
13. Abandonment of boreholes	Low-Med	Med	Med-High	Med	Low-Med	Low-Med	Low	Low
14. Installation of shallow pilot test wells via hand augering	Low-Med	Med	Low	Med	Low-Med	Low-Med	Low	Low
15. Management of investigation-derived waste	Low-Med	Med	Med-High	Med	Low-Med	Low-Med	Low	Low
16. Conducting initial indoor air preliminary interviews of homeowners	N/A	Low	Low	Med	Low-Med	Low	Low	Low
17. Indoor air methane field screening	Low	Low	Low	Med	Low-Med	Low	Low-Med	Low
18. Inventory, segregation and field screening of stored household chemicals	Low-Med	Low-Med	Low	Med	Low-High	Low	Low	Low

Former Kast Property Health and Safety Plan

Task	Chem. Hzds.	Heat Stress	Noise	Slip/Trip /Fall	Lifting Hzds.	Mech'l. Hzds.	Electro-cution	Explosio n/Methan e
19. Indoor air sampling	Low	Low	Low	Med	Low	Low	Low	Low
20. Groundwater/LNAPL gauging and sampling	Low-Med	Med	Low	Med	Low-Med	Low-Med	Low	Low
21. LNAPL bail down test and/or recovery	Med-High	Med	Med-High	Med	Med	Med	Low	Low
22. Working in the railroad right of way (see Sec. 2.2)	Med-High	Med-High	Med-High	Med	Med	Med-High	Low	Low
23. Soil vapor extraction pilot test and operation	Low-Med	Med	Med-High	Med	Low-Med	Med	Med	Low
24. Excavation, trenching and shoring	Med-High	Med-High	Med-High	Med-High	Med-High	Med-High	Low	Low
25. Installation of horizontal wells via trenching	Med-High	Med-High	Med-High	Med-High	Med-High	Med-High	Low	Low
26. Excavation side wall sampling	Med-High	Med-High	Med-High	Med-High	Med-High	Med-High	Low	Low
27. Soil compaction testing	Low-Med	Med	Low	Med	Med	Med	Low	Low
28. Confined space entry	Low-Med	Low	Low	Med-High	Med	Low-Med	Low	Low
29. Operation and maintenance of SVE system	Low-High	Low-High	Med-High	Med	Med	Med-High	Med-High	Low
30. Excavation, disposal and site surface restoration	Low	Med-High	Med-High	Med-High	Med-High	Med-High	Low	Low
31. Chemical injection and monitoring	Med-High	Med	Low-Med	Med	Low-Med	Low-Med	Low	Low
32. Bioventing using SVE system	Low-Med	Med	Med-High	Med	Low-Med	Med	Med	Low
33. Installation and repair of methane mitigation system	Low-Med	Med	Med-High	Med	Low-Med	Med	Med	Low
34. Sampling and monitoring of methane mitigation system	Low-Med	Low-Med	Low	Med	Low	Low	Low	Low
35. Oversight and sampling on non-project utility excavations	Med-High	Med-High	Med-High	Med-High	Med-High	Med-High	Low	Low

High - Exposure likely more than 50% of the time Med - Exposure likely 10-50% of the time
 Low - Exposure likely less than 10% of the time N/A – Exposure not anticipated

Additional information concerning Project Hazards and their control can be found in Section 5.0.

TASK	MINIMUM PROTECTIVE CLOTHING/EQUIPMENT REQUIREMENTS
1, 2, 6, 17-19 & 34	Hard hat (as appropriate and not required for indoor activities where overhead hazards are not present), steel-toed boots, safety glasses, hearing protection (as appropriate), work gloves (as appropriate), nitrile gloves (as appropriate and where contact with chemicals and/or possible contamination is present), and traffic vest.
3-5, 7-15, 22, 23, 32, 33 & 35	Hard hat, steel-toed boots, safety glasses, hearing protection (as appropriate), work gloves (as appropriate), nitrile gloves (as appropriate where contact with possible contaminated is present), traffic vest and respirator (as appropriate).
16	Nitrile gloves (as appropriate where contact with household chemicals may be present).
28	Equipment for confined space entry per Confined Space Entry permit conditions.
20, 21, 29 & 31	Hard hat, steel-toed boots, safety glasses, hearing protection (as appropriate), work gloves (as appropriate), nitrile gloves or nitrile coated work gloves, face shield or splash goggles (as appropriate when possibility of splashing is present), traffic vest, and respirator (as appropriate).
24-27 & 30	Hard hat, steel-toed boots, safety glasses, hearing protection (as appropriate), work gloves (as appropriate), nitrile gloves where contact with possible contaminated soil or groundwater is present, face shield (as appropriate), traffic vest, and respirator (as appropriate). Dosimeter for work involving soil density gauges.

PROTECTIVE CLOTHING (First Action Level)

Chemical Protective Clothing

Outer Coveralls: Kleenguard® or Tyvek®‡

Outer Gloves: Nitrile

Inner Gloves: Surgical Nitriles

Chemical protective steel-toed boots or chemical-resistant boot covers over steel-toed boots

‡ Substitute poly-Coated Tyvek® if there is a potential for contact with liquids (groundwater, mud, etc.)

The HSP Preparer has conducted a Hazard Assessment for this project based upon information provided by the Project Manager, in accordance with 8 CCR 3380(f).

For more information on PPE and respiratory protection requirements, see the Action Levels tables (Pages 1-8 and 1-9) and Sections 9.0 and 10.0.

ENGINEERING CONTROLS TO BE USED (as applicable)

Former Kast Property Health and Safety Plan

- ◆ Natural wind forces to reduce exposure to airborne contaminants
- ◆ Light colored PPE to reduce solar load for heat stress control
- ◆ Exhaust fans for local ventilation
- ◆ Sound curtains for noise abatement
- ◆ Water and/or suppressants to control fugitive dust, vapors, and odors
- ◆ Construction Traffic Management Plan will be implemented to provide traffic, pedestrian and bicycle safety

For more information, see Section 5.0.

INSTRUMENTATION TO BE USED (AS REQUIRED PER TASK)

- HNu PID w/ ___ eV probe
- OVM PID w/ ___ eV lamp
- Photovac MicroFID I/S (FID) or equivalent
- Photovac Microtip PID w/ _11.7_ eV lamp or equivalent
- MiniRAE PID w/ 11.7 eV lamp or equivalent
- 4-gas Combustible Gas/O₂ Indicator or equivalent
- Foxboro TVA-1000 (FID/PID)
- Miniram Real-time Dust Monitor
- Colorimetric tubes
- Multi-gas/H₂S Monitor or equivalent
- IH sampling equipment; validated passive samplers

For more information, see Section 8.0.

PERSONAL EXPOSURE SAMPLING

- Will be conducted
- Will be conducted if PID readings require the use of respiratory protection as described in the Action Level Table (page 1-7) and in Section 8.1
- Will be conducted for selected excavation areas if required by AECOM RSHEM/CHMM
- Is not anticipated (other than excavation)

For more information on Monitoring, see Section 8.0.

HAZ-COM MATERIALS INVENTORY

- ◆ ABC fire extinguisher
- ◆ TSP or Alconox (decontamination)
- ◆ Isobutylene (calibration gas)
- ◆ Methane/50% LEL (calibration gas)
- ◆ Hydrogen (equipment fuel - FID)
- ◆ Gasoline (equipment fuel)
- ◆ Hydrogen sulfide (calibration gas)
- ◆ Hexane (calibration gas)
- ◆ Hydrochloric Acid (sample preservative)
- ◆ Bentonite (well construction and abandonment)
- ◆ Cement (well construction and abandonment) or cement slurry (excavation)
- ◆ Quick-expanding cement (probe installation)
- ◆ Silica Sand (well construction)
- ◆ Helium (tracer gas)

- ◆ Isopropanol (tracer gas)
- ◆ Difluorethane (tracer gas)
- ◆ Rhodamine (ISCO injection tracer dye)
- ◆ Oxygen (compressed for ozone generation)
- ◆ Ozone (ISCO injection gas)
- ◆ PVC pipe primers and cements
- ◆ Nitrogen, compressed gas (compressed air source)
- ◆ Simple Green (decontamination and odor suppression)
- ◆ Various cleaning agents for field office (update SDS folder in field office)

SHELL SITE ACTION LEVELS FOR ORGANIC VAPOR (for Photoionization Detector)

Analyzer Reading*	Location	Duration	Action	Personal Protective Equipment
<10 ppm	Point of Operations/ Release Source point	-----	Continued periodic monitoring	Minimum Site ensemble
>10 ppm (1st Action Level)	Point of Operations/ Release Source point	> 1 minute	Monitor OBZ; don protective clothing	Minimum Site Ensemble
<10 ppm	OBZ	----	No respirators required	Minimum Site Ensemble
>10 ppm (2nd Action Level)	OBZ	> 1 minute	Provide respiratory protection; Contact the ASM to discuss personal exposure monitoring per Section 8.1.1.	Add half-face or full face respirators with organic vapor cartridges
>50 ppm (3rd Action Level)	OBZ	>1 minute	Increase respiratory protection	Replace ½-face respirators with full-face respirators with organic vapor cartridges.
>100 ppm OR >200 ppm (4th Action Level)	OBZ OBZ	>1 minute instantaneous	Stop work; move upwind while vapors dissipate. If elevated levels remain, cover boring and cuttings, evacuate upwind and notify ASM or PM.	As specified by ASM

*above background readings

OBZ= Operator's Breathing Zone

‡Substitute poly-coated Tyvek® if there is potential for contact with liquids (groundwater, mud, etc)

For additional information on Action Levels and their implementation, see Sections 8.0 and 9.0.

SHELL SITE PERSONNEL ACTION LEVELS FOR METHANE (for Flame ionization detector)

NOTE: FID shall be calibrated to methane or correction factor shall be applied FID readings

Analyzer Reading*	Location	Duration	Action	Personal Protective Equipment
<500 ppm	Point of Operations/ Release Source point	-----	Continuous monitoring	Minimum Site Ensemble
>500 ppm	Point of Operations/ Release Source point	> 1 minute	Monitor OBZ	Minimum Site Ensemble
>500 ppm to 1000 ppm	OBZ	> 1 minute	Continuous monitoring	Minimum Site Ensemble
>1000 ppm	OBZ	> 1 minute	Stop work; Ventilate area	Minimum Site Ensemble; contact ASM if elevated levels above 1000 ppm persist

*above background readings

OBZ= Operator's Breathing Zone

‡Substitute poly-coated Tyvek® if there is potential for contact with liquids (groundwater, mud, etc)

ACTION LEVELS (for the Combustible Gas Indicator) – Standard Operations Outdoors*

LEL Reading	Location	Action
>1% LEL	Point of Operations/General Work Area	Continue site operations and continue periodic monitoring. Notify Project Manager
>10% LEL	Point of Operations/General Work Area	Shut down operations, evaluate source, ventilate work area

LEL = Lower Explosive Limit

*Non-residential operations

ACTION LEVELS (Hydrogen Sulfide)

H₂S Reading	Location	Action
<3 ppm	Point of Operations/General Work Area	Continue site operations and continue periodic monitoring
3-5 ppm	Point of Operations/General Work Area	Continue site operations and perform continuous monitoring
>5 ppm	Point of Operations/General Work Area	Shut down operations, evaluate source, ventilate work area

For additional information on Action Levels and their implementation, see Sections 8.0 and 9.0.

HEALTH AND SAFETY EQUIPMENT LIST

REQ	OPT	
✓		URS Safety Management Standards (relevant to project – see next page)
	✓	Cal/OSHA “Safety on the Job” Posters
✓		Hardhats (optional for indoor air sampling associated activities)
✓		Safety glasses
✓		Ear plugs or muffs
	✓	Nomex coveralls
✓		Traffic safety vest
	✓	Tyvek [®] coveralls
	✓	Polycoated Tyvek [®] Q-23 Coveralls
✓		Steel-toed boots
✓		Chemical-resistant steel-toed boots or chemical-resistant boot covers
✓		Work gloves
	✓	Nitrile outer gloves
✓		Surgical nitrile inner gloves
✓		Plastic sheeting (visqueen)
✓		55 gallon 17-H drums (for contaminated solids)
✓		55 gallon 17-E drums (for liquids)
	✓	Drum liners
✓		Barricade tape and barricades
	✓	Wash tubs and scrub brushes
✓		Decon solution (i.e., TSP)
	✓	Folding chairs
✓		5 or 10 gallon ANSI-approved portable eyewash (concrete work, corrosives)
✓		Neutralizer (for concrete operations)
	✓	Respirator sanitizing equipment
✓		First Aid kit
✓		Infection control kit
✓		Drinking water
	✓	Gatorade or similar drink
✓		Type ABC fire extinguishers or CO ₂ extinguisher
✓		Half-face respirators (NIOSH approved)
✓		Full-face respirators (NIOSH approved) as needed
✓		Respirator cartridges (organic vapor or organic vapor/P100)
✓		Photoionization Detector (PID) w/11.7 eV lamp and calibration kit
✓		Combustible Gas Meter (4-gas meter) and calibration kit
✓		Flame ionization detector (FID) and calibration kit
	✓	Garden sprayer
	✓	Compressed gas horn
✓		Duct tape
✓		Paper towels and hand soap
✓		Spill sorbent
✓		Plastic garbage bags
✓		Broom and/or shovel

SAFETY MANAGEMENT STANDARDS REFERENCED BY THIS HSP

URS Safety Management Standards (SMS's) were utilized in the development of safety documentation for this project. I should be noted that due to the merger between the AECOM and URS Corporation, documentation is currently being updated to reflect a unified organization and set of standards. Any changes made to documentation relevant to this HASP will be reflected in HASP updates. Updates to safety related documentation will in no way compromise the safety of individuals on-site; nor will it have major impacts on the day to day operations of work at the site. The majority of changes are expected to be cosmetic in nature.

SMS	TOPIC
1	Inspections by Regulatory Agencies
2	Hazard Communication (Worker Right to Know)
3	Emergency Preparedness Plans
5	Injury and Illness Prevention Program (California)
7	Aerial Lifts
8	Asbestos Operations
9	Corrosive and Reactive Materials
10	Confined Space Entry
12	Electrical Safety
13	Excavation
14	Fire Protection and Prevention
15	Flammable and Combustible Liquids and Gasses
16	Hand Tools and Portable Equipment
17	Hazardous Waste Operations
18	Heat Stress
19	Heavy Equipment Operations
20	Hot Work
21	Housekeeping
23	Lockout and Tagout Safety
24	Medical Screening and Surveillance
25	New Employee Health, Safety, and Environment Orientation
26	Noise and Hearing Conservation
28	Ladders
29	Personal Protective Equipment
30	Sanitation
32	Work Zone Traffic Control
34	Utility Clearances and Isolation
38	Cranes and Derricks
40	Fall Protection
41	Rigging
42	Respiratory Protection
43	Personal Monitoring (Industrial Hygiene)
44	Nuclear Soil Density Gauges
46	Subcontractor Health and Safety Requirements

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SMS	TOPIC
47	Biological Hazards
48	Hazardous Materials/Dangerous Goods Shipping
49	Injury/Illness/Incident Reporting and Notifications
50	Toxic and Hazardous Substances
54	Office Ergonomics
55	Health, Safety, and Environment Training
56	Drilling Safety Guidelines
57	Vehicle Safety Program
58	Process Safety Management
60	Fatigue Management
61	Machine Guarding
63	Railroad On-Track Safety
64	Hand Safety
65	Injury and Claims Management
66	Incident Investigation
69	Manual Material Handling
70	Powered Industrial Vehicles
72	Behavior Based Safety
78	Short Service Employees
86	Managing Health, Safety, and Environment-Related Risks
87	Compressed Air Systems and Testing
88	Signs, Signals, and Barricades
91	Concrete
98	Management of Change

Copies of Safety Management Standards (SMSs) are available on the SOURCE at <http://thesource.urscorp.com/thesource/corporate/hse/hse.nsf>. Click on the “Safety Management Standards” web page to print the complete SMS. For the duration of this project, procedures may be changed and updated as a matter of continuous improvement. If this occurs, this HASP and list of associated procedures will be updated as well.

SHELL OIL PRODUCTS US STANDARDS AND FORMS INCLUDED IN THIS HSP

TOPIC
ES Safe System of Work
AECOM Shell Life Saving Rules and Safety Expectations
AECOM Shell US Incident, Near Miss, and PI Report
ES Traffic Control Guidelines
ES Subsurface Investigation Procedure
ES Pre-Construction/Pre-Job Planning Checklist
ES Borehole Clearance Checklist

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Copies of the SMS documents and Shell Oil Products US (SOPUS) procedures referenced by this HSP are to be maintained on site. SOPUS forms and SMS documents are provided in Attachments D and G, respectively. Project Managers are responsible to see that other SMSs sections or Shell Oil Products US procedures relevant to field activities but not directly referenced by this HSP are also available on site.

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REQUIRED HEALTH & SAFETY AND FIELD DOCUMENTATION

FORM		TOPIC	COMMENT
AECOM	p. 14-4	Emergency Response	Complete as appropriate
AECOM Attachment B		Contact and Safety Compliance	Signed by all onsite personnel prior to starting Any fieldwork
AECOM-SHELL Attachment C		AECOM -Shell Daily Tailgate Meeting and Work Clearance Form	Completed daily as part of the tailgate meeting conducted prior to beginning work each day
AECOM-SHELL Attachment D		AECOM Shell US Incident, Near Miss, and PI Report	Follow incident reporting flowchart and timeline requirements
AECOM-SHELL Attachment D		Unsafe Act/Condition or Positive Intervention Report or enter into AECOM HSSE data	Completed once per every 750 man hours
AECOM-SHELL Attachment D		AECOM -Shell Daily Safety Observation Form or AECOM -Shell US Field HSSE Assessment Form	Completed once per every 750 man hours
AECOM Attachment I		Task Hazard Analysis (THA)	Reviewed daily and revised as appropriate (task specific)
AECOM Attachment J		Task Hazard Analysis Form	Completed for tasks without formal THAs
AECOM SMS 030	30-1	Sanitation Inspection Sheet	Completed at the beginning of project and mid-project
AECOM SMS 049	49-1	Incident Report Form	Complete and distribute within 24 hours of the incident (for injuries)
AECOM SMS 005	5-1	Evaluation Checklist	Initiation of project and annually thereafter
AECOM SMS 018	18-2	Employee Stress Exposure Monitoring Record	Complete as appropriate
AECOM SMS 019	19-1	Daily Heavy Equipment Safety Inspection Checklist	Completed daily when heavy equipment are in use
AECOM SMS 029	29-1	Hazard Assessment Certification Form	Completed at the start of field activities and as conditions change
AECOM SMS 029	29-2	Personal Protective Equipment Inspection Sheet	Completed periodically
AECOM SMS 046	46-1	Subcontractor Safety Evaluation Form	Completed prior to initiation of fieldwork
AECOM SMS 072	72-1	Behavior Based Safety Observation Form	Completed per every 200 man hours or a minimum of once a week.

2.0 SITE BACKGROUND & PROJECT SCOPE

2.1 SITE BACKGROUND

The Former Kast Property (Site) is a former crude oil and bunker storage facility from the mid-1920s to the mid-1960s that was redeveloped as the Carousel Community residential housing tract by others in the late 1960s. The Site is located in the area between Marbella Avenue on the west and Panama Avenue on the east and E. 244th Street on the north to E. 249th Street to the south. It is bordered to the north by the Los Angeles County Metropolitan Transportation Authority railroad tracks (this railroad right-of-way was formerly owned by the BNSF Railway Company); to the south by East Lomita Boulevard; to the west by residential properties in the Monterey Pines neighborhood and by the former Turco Products Facility, which currently operates as a warehouse and distribution center; and, to the east by residential properties in the Island Avenue neighborhood.

The Site is located in an area that historically has been heavily industrial. The Site was undeveloped until 1923 when Shell Company of California purchased the Site from Mary Kast and constructed oil storage reservoirs on the Site. Based upon the historical records found to date, Site use remained as an active oil storage facility until approximately the late 1950s or early 1960s, when the Site became used on a standby, reserve basis. The facility consisted of three oil reservoirs with capacities of approximately 750,000 barrels, 750,000 barrels, and 2,000,000 barrels; one of which was temporarily leased to General Petroleum Corporation in the 1920s. An oil pump house was located within the southwest portion of the 44-acre property. Oil was pumped into the reservoirs and withdrawn from the reservoirs via pipelines. The reservoirs were mostly used to store crude oil. There are some indications that bunker oil or heavier intermediate refinery streams may also have been stored in the reservoirs at one time.

In October of 1965, Shell Oil Company sold the Site, with the oil storage reservoirs intact, under a purchase option contract to Richard Barclay or his nominee. Richard Barclay was a principal in Barclay-Hollander-Curci, Inc. and Lomita Development Company. In December, 1965, Richard Barclay designated Lomita Development Company as his nominee for the purchase of the Site. The property was evaluated for BHC and Lomita Development by Pacific Soils Engineering, Inc., which performed soil borings and developed engineering studies and grading plans for the Site. In 1966, BHC and Lomita Development and their contractors conducted those studies, removed the residual oil and water from the reservoirs, demolished the reservoirs, submitted grading plans for the Site to the County of Los Angeles, and graded the Site. Lomita Development's request to rezone the Site from industrial to residential was approved by Los Angeles County in October 1966 and, in the same month title was transferred to Lomita Development under the purchase option contract. Construction and sale of 285 homes on the Site by Lomita Development began in 1967, proceeded in stages, and was apparently completed in 1969. The Site has remained residential since that time.

Current investigations include both Site-wide assessment of impacts to soil vapor, soil, and groundwater in roadways and an adjacent rail right-of-way, and property-specific indoor air, soil vapor and soil investigations at individual residential properties. Methane screening, soil sampling and testing along with sub-slab vapor probes installation and sampling have been

conducted in the majority of the homes present in the Carousel Community. Indoor air sampling and chemical inventory activities are currently being conducted at the residences.

Investigations of residential properties within the Former Kast Property are continuing as access is granted by individual homeowners or the owners' legal representatives.

Site investigations have detected soil impacts by a number of petroleum-related and non-petroleum-related constituents. Total petroleum hydrocarbons quantified as gasoline-range organics, diesel-range organics, and motor oil-range organics have been detected in Site soils and groundwater. A number of volatile organic compounds, including compounds associated with petroleum hydrocarbons (e.g., benzene, toluene, ethylbenzene, xylenes, trimethylbenzenes and other substituted aromatic compounds), and non-petroleum-related VOCs, including the chlorinated solvents trichloroethene and tetrachloroethene and related breakdown products have been detected in Site soils and to a lesser extent in soil vapor. In addition, a number of polycyclic aromatic hydrocarbons, including naphthalene and benzo(a)pyrene, have been detected in Site soils associated with hydrocarbon-impacted soils. Sampling data indicate the following maximum concentrations of contaminants that are more frequently detected: benzene to 24 mg/kg; ethylbenzene to 33 mg/kg; toluene to 57 mg/kg, xylenes to 140 mg/kg, TPH as diesel to 70,000 mg/kg, TPH as gasoline to 7,000 mg/kg, TPH as motor oil to 100,000 mg/kg, and methylene chloride to 2.1 mg/kg, vinyl chloride to 0.049 mg/kg. Additionally, 1,2,4-trimethylbenzene to 60 mg/kg, 1,3,5-trimethylbenzene to 25 mg/kg, and individual PAHs, such as 2-methylnaphthalene to 280 mg/kg were detected. Less prevalent concentrations of metals, such as lead, copper, nickel, arsenic, and others were also noted.

On March 11, 2011 the Regional Board issued Cleanup and Abatement Order (CAO) No. R4-2011-0046 to SOPUS. Among other directives, Section 3.a. of the CAO orders SOPUS to develop a pilot testing work plan to evaluate the feasibility of removing impacted soils to 10 feet below ground surface (bgs) and former reservoir concrete slabs encountered within the uppermost 10 feet beneath the residential properties.

2.2 SCOPE OF WORK

Field work at and around the Site consists of a number of sub-surface activities as well as disposal of impacted soil and water; site restoration; and indoor air field screening and sampling.

Onsite activities include:

- ◆ Mobilization to and from the Site;
- ◆ Calibration of field instruments;
- ◆ Utility clearance using surface geophysical methods;
- ◆ Shallow soil hand augering and soil sampling;
- ◆ Sub-slab and soil vapor probe installation;
- ◆ Sub slab vapor probe sampling;
- ◆ Street soil vapor probe sampling;

- ◆ Borehole clearance by air knife;
- ◆ Drilling, soil sampling, Simulprobe sampling and well installation by hollow-stem auger, mud/air rotary or sonic drilling methods;
- ◆ Groundwater well development;
- ◆ Direct push soil sampling and vapor probe installation using Geoprobe rig or CPT rig;
- ◆ Hydropunch groundwater sampling;
- ◆ Abandonment of boreholes;
- ◆ Installation of shallow pilot test wells via hand augering;
- ◆ Management of investigation-derived residuals stored in soil bins and/or steel drums;
- ◆ Conducting initial indoor air preliminary interviews of homeowners;
- ◆ Indoor air methane field screening;
- ◆ Inventory, segregation and field screening of stored household chemicals in preparation for indoor air sampling activities;
- ◆ Indoor air sampling;
- ◆ Groundwater and LNAPL gauging and sampling;
- ◆ LNAPL recovery and bail down test;
- ◆ Work tasks listed above (drilling and soil sampling, vapor probe installation, vapor probe sampling) conducted within the railroad right of way.
- ◆ Operation of mobile soil vapor extraction/treatment equipment (the operation of mobile soil vapor equipment is anticipated to require operation of carbon canister equipment powered by a portable generator; additional methods [such as thermal oxidation] may be used in the future);
- ◆ Excavation pilot testing and excavation of impacted soils using the following methods:
 - Large unshored excavation to approximately 10 feet with sloped sidewalls,
 - Unshored slot trenches to 10 feet,
 - Slide - rail shored excavation,
 - Trench box shored excavation, and
 - Unshored surgical excavation.(Excavations will be backfilled with clean imported fill and area will be restored to pre-excavation conditions);
- ◆ Installation of horizontal for pilot testing wells via trenching;
- ◆ Excavation side wall sampling;
- ◆ Soil compaction testing;
- ◆ In-situ chemical oxidation pilot testing using the following technologies:
 - Rhodamine dye injection, and
 - Ozone injection.(Post pilot test monitoring and sampling will be conducted using work tasks listed above);
- ◆ Bioventing pilot testing using soil vapor extraction/treatment equipment;
- ◆ Installation and repair of methane mitigation system;

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- ◆ Sampling of methane mitigation system; and
- ◆ Oversight and sample collection on non-project utility excavations.

3.0 APPLICABILITY

The purpose of this plan, which was developed specifically for activities at the former Kast Property located in Carson, California, is to assign responsibilities, establish personal protection standards and mandatory safety procedures, and provide for contingencies that may arise while soil and groundwater exploration activities are being conducted at the Site. This plan complies with, but does not replace, Federal Health and Safety Regulations as set forth in 29 Code of Federal Regulations (CFR) 1910 and 1926, California Health and Safety Regulations as set forth in Title 8, California Code of Regulations (CCR), and guidance established by the California Environmental Protection Agency. This plan is to be used by AECOM and subcontractor personnel as a supplement to such rules, regulations, and guidance, as well as the Shell Products US Environmental Services Contractor Health, Safety, and Environment Program. This health and safety plan is to be augmented by the AECOM Health and Safety Program and Management System, relevant standards from which are required to be available on Site during all activities. Relevant sections of the SOPUS procedures and standards are also applicable to this project.

The provisions of the plan are mandatory for all onsite employees engaged in hazardous material management activities or work/operations covered by the OSHA HAZWOPER standard associated with this project which may involve health and safety hazards.

A separate Safe Work Plan is provided for use by non-HAZWOPER personnel engaged only in inventory, segregation and field screening of stored household chemicals in preparation for indoor air sampling activities.

Changing and/or unanticipated Site conditions may require modification of this Site safety plan in order to maintain a safe and healthful work environment. Any proposed changes to this plan should be reviewed with the AECOM Area Safety, Health, and Environment Manager and the SOPUS Project Manager prior to their implementation. The AECOM terms Area Safety, Health, and Environment Manager, ASHEM, Area Safety Manager, and ASM are equivalent to the legacy URS terms Regional Health, Safety, and Environment Manager, RHSEM, Regional Safety Manager and RSM. If this is not feasible, the Site/project manager may modify the plan and record all changes in the field log book; under no circumstances will modifications to this plan conflict with Federal, state, or other governmental health and safety regulations.

AECOM is providing a copy of this Health and Safety Plan to each Site subcontractor in order to fulfill its obligation under 8 CCR 5192(b) to inform subcontractors of Site hazards.

This Health and Safety Plan is part of AECOM's Injury and Illness Prevention Program (IIPP), as required by 8 CCR 3203. A copy of AECOM's written Injury and Illness Prevention Program is located in Safety Management Standard (SMS) 5, which is to be available on Site. Each subcontractor is required to implement their company's IIPP, as relevant to their operations.

4.0 RESPONSIBILITIES

AECOM will have Site safety and health oversight and coordination responsibilities for AECOM and subcontractor personnel; however, each subcontractor will be expected to participate in the implementation of this plan and safety process and require safe and healthful work performance by each of their employees, subcontractors, or support personnel who may enter the Site.

AECOM will strictly adhere to the provisions of this health and safety plan, along with the applicable regulations issued by governmental entities.

4.1 PROJECT MANAGER (AECOM)

The Project Manager (PM) shall direct onsite operations. The PM is responsible for holding a pre-deployment operational readiness meeting to discuss the scope of work, staffing, equipment, budget, etc. The PM may delegate all or part of these duties to a properly qualified AECOM employee who is designated as the Site Manager. At the Site, the PM, assisted by the Site Safety Officer (SSO), has primary responsibility for:

1. Seeing that appropriate personal protective equipment and monitoring equipment is available and properly utilized by all onsite employees.
2. Establishing that personnel are aware of the provisions of this plan, are instructed in the work practices necessary to ensure safety, and are familiar with planned procedures for dealing with emergencies.
3. Evaluation of project health and safety hazards in accordance with SMS 86, Managing Health and Safety and Environment-Related Risks.
4. Establishing that all onsite personnel have completed a minimum of 40 hours of health and safety training and have appropriate medical clearance as required by 8 CCR 5192, have been fit tested for the appropriate respirators, and completed the SOPUS 12 Life Saving Rules training.
5. Ensures that SSEs are identified and mentored in the field per SMS 78.
6. Ensure all new employees are trained per SMS 25.
7. Verifying that subcontractors (of any tier) retained by AECOM meet minimum health and safety criteria as described by SMS 46.
8. Seeing that personnel are aware of the potential hazards associated with Site operations.
9. Monitoring the safety performance of all personnel to see that the required work practices are employed.
10. Correcting any work practices or conditions that may result in injury or exposure to hazardous substances.
11. Preparing any accident/incident reports for activities (see Section 14.6).
12. Seeing to the completion of Safety Plan Compliance Agreements by personnel (See Attachment B).
13. Halting Site operations, if necessary, in the event of an emergency or to correct unsafe work practices.

14. Implementing management of change procedures as described in SMS 98.
15. Seeing that utility clearances are obtained prior to the commencement of work.
16. Seeing that the SOPUS Borehole Clearance Check List is completed prior to drilling operations (see Attachment D).
17. Seeing that required permits (such as "hot work") are obtained through the appropriate personnel trained in SOPUS Safe System of Work 2.0.
18. Seeing that the appropriate SMSs and SOPUS HES sections are appended to this HSP and are available on Site (see "Plan at a Glance").
19. Reviewing and approving this project health and safety plan.
20. Preparing a "Post Job HSE Review" as detailed in the Shell Products US Environmental Services Contractor Health, Safety, and Environment Program.

4.2 SITE SAFETY OFFICER

The SSO's duties may be carried out by the PM or other qualified AECOM Site Manager. The SSO is responsible for:

1. Implementing project Health and Safety Plans, and reporting any deviations from the anticipated conditions described in the plan to the PM, and, if necessary, the RSM.
2. Evaluating that monitoring equipment is used properly by personnel and is calibrated in accordance with manufacturer's instructions or other standards, and that results are properly recorded and filed.
3. Checking with the office Health and Safety Representative or ASM to see that assigned AECOM personnel have current medical and training authorizations.
4. Assuming any other duties as directed by the PM or ASM.
5. Coordinating with AECOM's Medical Surveillance Program Administrator to identify AECOM personnel on Site for whom special PPE, exposure monitoring, or work restrictions may be required. Contractor personnel are to be participating in their own medical surveillance program.
6. Conducting safety meetings for all Site personnel in accordance with Section 15.0, and completing the Daily Tailgate Meeting and Work Clearance Form (see Attachment C).
7. Conducting task hazard analysis (THAs) (Attachment I or J) prior to the start of each shift and documenting on the Daily Tailgate Meeting and Work Clearance Form found in Attachment C.
8. Providing ongoing review of the protection level needs as project work is performed, and informing the PM of the need to upgrade/downgrade protection levels as appropriate.
9. Seeing that decontamination procedures described in Section 12.0 are followed by personnel.
10. Establishing monitoring of personnel and recording results of exposure evaluations.
11. Halting Site operations, if necessary, in the event of an emergency or to correct unsafe work practices.
12. Maintaining the visitor log (provided in Attachment H).
13. Posting OSHA "Safety of the Job" and other required posters at the site.

4.3 AREA SAFETY MANAGER (AECOM)

The Area Safety Manager (ASM) is responsible for:

1. Evaluating the need for periodic audits of the operation to evaluate compliance with this plan.
2. Providing health and safety support as requested by the SSO and PM.

4.4 PROJECT PERSONNEL

Project personnel involved in onsite explorations and operations are responsible for:

1. Taking reasonable precautions to prevent injury to themselves and to their fellow employees.
2. Performing only those tasks that they believe they can do safely, and immediately reporting any accidents and/or unsafe conditions to the SSO or PM.
3. Implementing the procedures set forth in the Health and Safety Plan, and reporting any deviations from the procedures described in the Plan to the SSO or PM for action.
4. Notifying the PM and SSO of any special medical problems (i.e., allergies) and seeing that onsite personnel are aware of such problems.
5. Reviewing the project health and safety plan and signing Safety Plan Compliance Agreement (see Attachment B).
6. Halting Site operations, if necessary, in the event of an emergency or to correct unsafe work practices.

4.5 SUBCONTRACTOR'S SAFETY REPRESENTATIVE

Each subcontractor is requested to designate a Subcontractor's Safety Representative (SSR) who is the subcontractor supervisor. The SSR is responsible for the safe and healthful performance of work by his work force and subcontractors. During the subcontractor's activities onsite, the SSR will perform continuing work area inspections, conduct safety meetings and safety orientations for all new employees, and participate in the development of THAs. The SSR will attend periodic safety meetings with the SSO. The SSR will also investigate accidents and overexposures involving subcontractor personnel.

5.0 JOB HAZARD ANALYSIS

5.1 CHEMICAL HAZARDS

There are two categories of chemical hazards associated with Site activities:

- ◆ Site Constituents
- ◆ Chemicals used to conduct the Site work

Site constituents are those which may exist at the Site and are the cause for conducting Site activities. The chemicals that are brought on Site in order to conduct the work may be hazardous and subject to regulation under Cal/OSHA's Hazard Communication Standard (8 CCR 5194).

5.1.1 Site Constituents

From an occupational health standpoint, the levels of contaminants that could be encountered during Site activities should not represent a significant concern if the provisions of this HSP are appropriately implemented. However, the Site is still under evaluation, so the potential for exposure to elevated levels of these contaminants may exist. Overviews of the hazards associated with exposure to the chemicals that may pose a hazard during Site activities are presented below in terms of the following types of occupational exposure limits:

PEL	Permissible Exposure Limit (Cal/OSHA Standard)
TLV	Threshold Limit Value (ACGIH Guidance)
REL	Recommended Exposure Limit (NIOSH Guidance)
STEL	Short Term Exposure Limit
C	Ceiling
NIC	Notice of Intended Change (ACGIH)

Cal/OSHA PELs and ACGIH TLVs are time-weighted averages (TWAs) defined as concentrations for a normal 8-hour work day and 40-hour work week to which almost all workers can be repeatedly exposed without suffering adverse health effects. NIOSH RELs are time-weighted averages (TWAs) defined as concentrations for up to a 10-hour work day and 40-hour work week.

STEL is defined as the concentration to which workers can be exposed for short time periods without irritation, tissue damage, or narcosis sufficient to likely cause impairment of self-rescue or precipitate accidental injury. The STEL is a 15-minute time-weighted average that should not be exceeded at any time during the workday. STELs are used by OSHA, ACGIH and NIOSH for chemical exposure criteria.

C is a concentration that should not be exceeded at any time in any workday. Ceiling limits are used by OSHA, ACGIH, and NIOSH for chemical exposure criteria.

Summaries on the Site constituents of concern follow.

Petroleum Hydrocarbons

PEL/TLV = specific to individual compounds

Petroleum hydrocarbons are a large chemical grouping that includes compounds such as gases, fuels, oils, greases, waxes, and tars. Most petroleum hydrocarbons present some fire risk, are variably toxic by ingestion and inhalation and cause local skin irritation. Because of the variety of substances that are in this category, an ionization potential (IP) or vapor pressure is not available.

Gasoline

Cal/OSHA PEL = 300 ppm

PEL/TLVSTEL = 500 ppm

TLV = 300 ppm

REL = Carcinogen

Gasoline is an eye and throat irritant at levels around the PEL, and causes narcotic effects (with symptoms including headache, nausea, dizziness, and blurred vision) at higher levels. Long term exposure can affect liver and kidney function. Some studies indicate a potential for gasoline to be an animal carcinogen, but this has not been fully established. Because gasoline is a mixture of varying proportions of dozens of hydrocarbons, a mean odor threshold has not been determined.

Methane

Cal/OSHA PEL = None, minimum 19.5% oxygen content required

Explosive Range = approximately 5% to 15% in air (50,000 to 150,000 ppmv)

Methane is a colorless, odorless gas associated with petroleum production and refining, and the microbial degradation of organic matter in landfills. Methane is both an asphyxiant and may explode at a concentration between 5% in air (50,000 ppm, termed the lower explosive limit, or LEL) and 15% in air (150,000 ppm, termed the upper explosive limit, or UEL). Typical symptoms of exposure to an oxygen deficient atmosphere include dizziness, nausea, and headache. At higher levels, exposure to methane may result in unconsciousness, coma, and death. The ACGIH has set the TLV at 1000 ppm for some indications that high concentrations may cause cardiac sensitization.

Diesel Fuel (Fuel Oil)

TLV = 100 mg/m³ "skin" (as total hydrocarbons, inhalable fraction and vapor)

Diesel fuel is mildly toxic by ingestion. When inhaled, many of the constituents function as central nervous system depressants, with characteristic symptoms (headaches, nausea, dizziness, uncoordination, and vomiting). Diesel fuel has been shown to be a strong skin irritant.

Few chronic inhalation or ingestion studies of the toxic effects of diesel vapors/fuels are available. Skin painting studies of experimental animals suggest the potential for weak tumor-producing activity.

Because diesel fuel is a complex mixture of varying proportions of hydrocarbons, a mean odor threshold or IP has not been determined.

Kerosene

TLV = 200 mg/m³ "skin" (as total hydrocarbon vapor)

REL = 100 mg/m³ (~14 ppm)

Inhalation produces effects typical of other lower molecular weight hydrocarbons, namely dizziness and nausea. Narcosis may occur at high exposure levels due to central nervous system depression.

Kerosene vapors are moderately explosive when exposed to heat or flame. Because kerosene is a mixture of varying proportions, a mean odor threshold or IP has not been determined.

Benzene

PEL = 1 ppm "skin"

PEL/STEL = 5 ppm

REL = 0.1 ppm

TLV = 0.5 ppm "skin"

TLV/STEL = 2.5 ppm

Benzene is a central nervous system depressant. Symptoms include headache, nausea, tremors, and fatigue, but these typically do not occur until exposure concentrations are in excess of 150 ppm. There is significant evidence that chronic exposures are carcinogenic causing a progressively malignant disease of the blood-forming organs (leukemia). Benzene is poorly absorbed through intact skin, but contact with liquid benzene may cause blistering and dermatitis. Benzene vapors can cause transient eye irritation. The mean air odor threshold for benzene is 34 ppm. Benzene's IP is 9.25 eV and its vapor pressure is 75 mm Hg. Benzene is known to the State of California to cause cancer under the criteria of Proposition 65.

Toluene

Cal/OSHA PEL = 10 ppm "skin"

Cal/OSHA STEL = 150 ppm

Ceiling = 500 ppm

TLV = 20 ppm "skin"

REL = 100 ppm

Toluene is a central nervous system depressant. Symptoms include headache, nausea, dizziness and fatigue, but such symptoms typically do not occur at exposures below 200 ppm. Repeated and prolonged contact with liquid toluene may cause drying of the skin and dermatitis. Mild, transitory eye irritation may be experienced with exposure to vapors above 200 ppm. Toluene is not considered carcinogenic. Toluene's mean odor threshold is 3 ppm. Toluene's IP is 8.82 eV, and its vapor pressure is 22 mm Hg. Toluene is known to the State of California to cause reproductive toxicity under the criteria of Proposition 65.

Ethyl Benzene

PEL = 5 ppm

PEL STEL = 30 ppm

TLV = 20 ppm

TLV STEL = 125 ppm

Ethyl benzene is an eye and mucous membrane irritant at levels well above the TLV. Liquid ethyl benzene is a significant skin irritant, and can cause defatting and blistering with repeated exposures. Vapor can cause transitory eye irritation at concentrations above 200 ppm. The mean odor threshold is 0.5 ppm. Ethyl benzene's IP is 8.76 eV, and its vapor pressure is 10 mm Hg. Ethyl benzene is known to the State of California to cause cancer under the criteria of Proposition 65.

Xylene (o-, m-, p-isomers)

PEL/TLV/REL = 100 ppm

TLV/STEL = 150 ppm

Ceiling = 300 ppm

Xylene is an eye, nose and throat irritant at concentrations nearing 200 ppm. At higher concentrations, it is a central nervous system depressant, with symptoms including nausea, fatigue, and headaches. Liquid xylene acts on the skin as an irritant and can cause dermatitis. Exposure to vapor can cause eye irritation. Xylene is not considered carcinogenic. Xylene's mean odor threshold is 1 ppm. The IP for the Xylene isomers are 8.56, 8.56, and 8.44 eV, respectively, and the vapor pressures range from 7 to 9 mm Hg. Ethyl benzene is known to the State of California to cause cancer under the criteria of Proposition 65.

Polynuclear Aromatic Hydrocarbons (PAH)

Polynuclear aromatic hydrocarbons (PAHs) are a class of compounds form during the incomplete combustion of organic materials containing carbon and hydrogen. Several hundred different PAHs have been identified. These include naphthalene, benzanthracene, benzpyrene, and chrysene among many others. PAHs are highly lipid soluble and, in general, are probably readily absorbed by all routes of exposure. A most significant aspect of the PAHs is that several compounds in this category have been shown to cause cancer in humans or in experimental animals. Many PAHs are known to the State of California to cause cancer under the criteria of Proposition 65.

Naphthalene

PEL/REL = 10 ppm "skin"

PEL STEL = 15 ppm

TLV = 10 ppm "skin"

Inhalation of naphthalene vapor may cause headache, nausea, and loss of appetite. Concentrations above 15 ppm produce noticeable eye irritation. Optical neuritis and injury to the cornea and lens have been reported in workers occupationally exposed to naphthalene. The STEL is based on minimizing eye irritation. Naphthalene has a strong coal tar odor, with a mean air-odor threshold for naphthalene is 0.038 ppm. Naphthalene's IP is 8.14 eV, and its vapor pressure is 0.08 mm Hg. Naphthalene has designated as carcinogen by the State of California under the criteria of Prop 65.

Hydrogen Sulfide (H₂S)

Cal/OSHA PEL = 10 ppm

Cal/OSHA STEL = 15 ppm

Cal/OSHA Ceiling = 50 ppm

TLV= 1 ppm

TLV STEL = 5 ppm

REL = 10 ppm (ceiling)

In higher concentrations hydrogen sulfide gas is a rapidly acting systemic poison which causes respiratory paralysis, leading to unconsciousness and death from asphyxiation. Inhalation of lower concentrations may cause headache, dizziness, and upset stomach. Hydrogen sulfide can also irritate the eyes, nose and throat. Eye effects may occur at concentrations beginning slightly above the PEL. Hydrogen sulfide has a strong rotten egg odor. Although the mean air-odor threshold is 0.008 ppm, the nose may lose its ability to detect elevated levels above the PEL, notably in the range where acute systemic toxic effects occur. Because of this inadequate warning property, air monitoring is required to prevent exposure to elevated levels of H₂S. H₂S can also pose a significant fire/ explosion hazard in concentrations well above the PEL. Its LEL is 4.3 percent and UEL is 46 percent. H₂S has a very high vapor pressure (20 atmospheres) and an ionization potential of 10.46 eV.

Trichloroethylene (Trichloroethene; TCE)

Cal/OSHA PEL = 25 ppm

STEL = 100 ppm

Ceiling = 300 ppm

TLV = 10 ppm

TLV/STEL = 25 ppm

REL = 25 ppm

TCE is a central nervous system depressant. Symptoms include headache, nausea, tremors, and fatigue, but these typically do not occur until concentrations reach 175-200 ppm. Chronic effects include liver damage and some studies indicate TCE is an animal carcinogen. Excessive skin contact can cause defatting of the skin and subsequent dermatitis. The mean air odor threshold for TCE is 82 ppm, which gives it a poor warning property. TCE's ionization potential (IP) is 9.47 eV, and its vapor pressure is 58 mm Hg. Trichloroethylene is known to the State of California to cause cancer under the criteria of Proposition 65.

Perchloroethylene (Tetrachloroethylene; PCE; Perc)

Cal/OSHA PEL = 25 ppm

Cal/OSHA STEL = 100 ppm

Ceiling = 300 ppm

TLV = 25 ppm

TLV/STEL = 100 ppm

REL = Carcinogen; Lowest Feasible Concentration

PCE is a central nervous system depressant, with symptoms such as headache, nausea, dizziness and fatigue appearing at concentrations above 200 ppm. Eye and mucous membrane irritation can occur with exposures above 100 ppm. There is potential for liver injury with chronic exposure to higher concentrations. PCE is considered to be a probable human carcinogen. Its mean odor threshold is 47 ppm. PCE's ionization potential is 9.32 eV and its vapor pressure is 14 mm Hg. Perchloroethylene is known to the State of California to cause cancer under the criteria of Proposition 65.

1,2-Dichloroethylene (Acetylene dichloride, 1,2-DCE)

PEL/TLV/REL = 200 ppm

1,2-DCE is a central nervous system depressant, with symptoms such as headache, nausea, dizziness, incoordination, and fatigue at concentrations above the PEL. Much higher concentrations produce narcosis. Lower vapor concentrations are irritating to the eyes. Unlike many other chlorinated hydrocarbon solvents, 1,2-DCE does not appear to produce liver or kidney damage. Excessive skin contact may result in defatting of the skin and subsequent dermatitis. 1,2-DCE is not considered carcinogenic. No odor threshold is available for 1,2-DCE. 1,2-DCE's ionization potential (IP) is 9.65 eV and its vapor pressure is 180-264 mm Hg.

1,1-Dichloroethylene (1,1-Dichloroethene; Vinylidene chloride; VDC; 1,1-DCE)

Cal/OSHA PEL = 1 ppm

TLV = 5 ppm

TLV/STEL = 20 ppm

REL = Carcinogen; Lowest Feasible Concentration

High level, short term exposure can cause nasal irritation. VDC can cause adverse liver and kidney effects at concentrations as low as 25 to 50 ppm. OSHA suggests that VDC is a potential occupational carcinogen. An odor threshold for VDC has not been reported; the ionization potential is 9.46 eV and its vapor pressure is 500 mm Hg.

Vinyl Chloride

PEL = 1 ppm "skin"

TLV = 1 ppm

REL = Carcinogen; Lowest Feasible Concentration

Vinyl Chloride is used in the manufacture of PVC and other resins, as a chemical intermediate and as a solvent. Vinyl chloride is a known human carcinogen and a causal agent of angiosarcoma of the liver. Excess cancer of the lung and the lymphatic and nervous systems has also been reported. It is considered to be very low in toxicity by acute (short term) inhalation. There is considerable evidence that chronic exposures to concentrations below 5 ppm do not increase the risk of liver cancer. Vinyl chloride has a very high vapor pressure (>1 atm), an odor threshold of 10-20 ppm, and an ionization potential of 10.00 eV.

Methylene Chloride (Dichloromethane)

Cal/OSHA PEL = 25 ppm

STEL = 125 ppm

TLV = 50 ppm

REL = Carcinogen; Lowest Feasible Concentration

Methylene chloride is an eye and skin irritant. At very high levels, slight narcosis can occur. Long term exposures above the TLV can cause liver injury. Methylene chloride is considered a suspected human carcinogen. The mean odor threshold is 250 ppm, which means its warning properties are inadequate for exposure prevention. Methylene chloride's ionization potential (IP)

is 11.35 eV, and its vapor pressure is 350 mm Hg. Methylene chloride is known to the State of California to cause cancer under the criteria of Proposition 65.

Trimethylbenzene (all isomers)

PEL/TLV/REL = 25 ppm

Trimethylbenzene is a clear, colorless liquid with a pleasant aromatic odor. All three isomers of trimethylbenzene are present in petroleum and coal tar. Trimethylbenzene is an eye, nose, and respiratory irritant. High concentrations can cause central nervous system depression.

Trimethylbenzene's odor threshold is reported to be 0.55 ppm. Its ionization potential (IP) is 8.27 eV and its vapor pressure is 1 mm Hg.

Lead

PEL = 0.05 mg/m³

Action Level = 0.03 mg/m³

TLV = 0.05 mg/m³

REL = <0.1 mg/m³

Acute lead poisoning usually manifests as gastroenteritis. Lead accumulates in the body; chronic lead poisoning is manifested by anemia, constipation, and abdominal pain. Accumulation in the peripheral nerves leads to wrist and ankle drop.

Lead enters the body primarily by inhalation. In the respiratory tract, most lead compounds are absorbed rapidly and stored in nerve tissue so that poisoning can develop from long-term exposure to low doses. Poisoning can also develop slowly from ingestion via lead-contaminated food, drink or tobacco products. Prevention of lead poisoning is almost entirely a matter of good personal hygiene and housekeeping.

Lead is known to the State of California to cause cancer and reproductive toxicity under the criteria of Proposition 65.

Copper

PEL/REL = 0.1 mg/m³ (fume)
1.0 mg/m³ (dust)

TLV = 0.2 mg/m³ (fume)
1.0 mg/m³ (dust)

Chronic human intoxication rarely occurs from copper exposure. Ingestion exposure of large doses of copper is limited by its emetic effect. Inhalation of copper fume from welding processes has produced upper respiratory tract irritation and metal fume fever in exposed workers. Copper is also an essential element in human nutrition; normal intake is approximately 2 mg/day.

Adverse effects have been demonstrated only at high exposure levels, and low levels of exposure are unlikely to be of concern.

Nickel Metal (Insoluble compounds)

PEL = 1 mg/m³

TLV = 0.2 mg/m³ (inorganic, inhalable)

REL = 0.015 mg/m³

Skin sensitization is the most commonly seen toxic reaction to nickel; this often results in chronic eczema "Nickel itch." Nickel is also an irritant to the eye and to the mucous membrane of the upper respiratory tract. Nickel is considered to be of a low order of oral toxicity on both an acute or chronic basis. The ACGIH has proposed to lower the TLV to 0.05 mg/m³. Some, but not all, forms of nickel "may reasonably be anticipated to be carcinogenic." Nickel and certain nickel compounds are known to the State of California to cause cancer under the criteria of Proposition 65.

Arsenic

Cal/OSHA PEL = 0.01 mg/m³ (inorganic compounds)

Action Level = 0.005 mg/m³

TLV = 0.01 mg/m³

REL = 0.002 mg/m³ (15-min TWA ceiling)

Arsenic compounds can be corrosive to the skin. Brief contact has no effect, but prolonged contact results in localized skin problems. Some compounds are capable of producing skin sensitization and contact dermatitis. Acute arsenical poisoning due to inhalation is very rare, but poisoning from chronic exposure does occur; initial symptoms include weakness, loss of appetite, nausea, vomiting, and diarrhea. The National Toxicology Program considers arsenic to be a substance that is known to be carcinogenic. Arsenic (inorganic) is known to the State of California to cause cancer under the criteria of Proposition 65.

Although not a site constituent of investigation, carbon monoxide can be expected from the operation of internal combustion equipment engines on drill rigs, portable generators, etc.

Carbon Monoxide (CO)

Cal/OSHA PEL = 25 ppm

Ceiling = 200 ppm

TLV = 25 ppm

REL = 35 ppm

Carbon Monoxide (CO) is a flammable (LEL = 12.5%), colorless, almost odorless gas. It is a chemical asphyxiant gas whose primary toxic action is a direct result of the reduction of the oxygen supply in the blood produced by a given exposure. This reduction is caused due to the CO forming a complex with hemoglobin, resulting in a significant reduction in the oxygen-carrying capacity of the blood. The typical signs and symptoms of acute CO poisoning are headache, dizziness, drowsiness, nausea, vomiting, collapse, coma and death. Carbon monoxide is known to the State of California to cause reproductive toxicity under the criteria of Proposition 65.

Ozone

Cal/OSHA PEL = 0.1 ppm

REL = 0.1 ppm

STEL = 0.3 ppm

TLV = 0.05 ppm to 0.20 ppm , depending on workloads

Ozone is a colorless to blue gas with a sharp, pungent odor. It can be extremely irritating to the eyes and respiratory system. Ozone is reactive with oxidizable materials and presents a fire and explosion risk when in contact with organic materials. Ozone has a vapor pressure of over

one atmosphere and an ionization potential of 12.52 eV. Ozone will be generated onsite for treatment purposes.

Asbestos

Cal/OSHA PEL = 0.1 f/cc REL = 0.1 f/cc

TLV = 0.1 f/cc

The OSHA definition of asbestos includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that have been chemically treated and/or altered. Excessive inhalation of asbestos fibers causes chronic inflammation of lung tissue and pleural membranes. Asbestosis fibers can cause a fibrosis of the lung and thickening of the linings of the lung resulting in impaired lung function manifested by breathlessness and increased effort in breathing. OSHA, NIOSH, and ACGIH recognize asbestos as a human carcinogen, primarily linked to lung cancer but also associated with other forms of cancer. Symptoms of asbestos exposure may not appear for many years following initial exposure. Asbestos is known to the State of California to cause cancer under the criteria of Proposition 65.

5.1.2 Chemical Injection Hazards

Chemical injection, in either pilot or full scale, may be conducted on this project – **The injection process presents physical (reactive) and chemical (strong tissue irritation) hazards from preparation of the injection solution to the actual injection process.** Only necessary personnel are to be permitted in the area. Personnel are to follow manufacturer's instructions, and don the specified PPE described in the project hazard analysis table. **Emergency flushing equipment (5 or 10 gallon portable eyewash [ANSI-approved and rated to provide 15-minutes of flushing]) in case of contact with corrosives or irritants is to be readily available (within 10 seconds of unimpeded travel) onsite.**

5.1.3 Asbestos Hazards

Asbestos containing materials, including gaskets, insulation, vinyl floor tiles, and fibrous sheets may be onsite. These materials may likely be encountered during sub-slab mitigation activities. Asbestos testing and removal will only be done by certified or licensed professionals (Certified Asbestos Consultant). Persons not trained and properly equipped to handle known or potential asbestos will keep out of affected work areas. Known or suspected asbestos-containing materials will be handled in a manner that minimizes fiber generation (wet methods, containment, etc.) and power tools such as sanders or grinders will not be used. See also SMS 8.

5.1.4 Hazard Communication Materials

Materials which are considered hazardous materials under the Cal/OSHA Hazard Communication Standard (8 CCR 5194) may be used during this project. In accordance with the AECOM Hazard Communication Program, the MSDSs (also known as Safety Data Sheets or SDSs) for the hazardous materials listed in Section 1.0 are included in Attachment E. The

SSO will make copies of these MSDSs available to any subcontractors (i.e. drillers) on this project. All containers for hazardous materials will be properly labeled.

AECOM's written Hazard Communication program is located in SMS 2, a copy of which shall be maintained on Site.

5.2 PHYSICAL HAZARDS

Physical hazards at this work Site include:

- ◆ Heat stress;
- ◆ Drill rig operation;
- ◆ Noise from the operation of Site equipment;
- ◆ Slip-trip-fall type of accidents;
- ◆ Back injuries due to improper lifting;
- ◆ Hazardous atmospheres in Confined Space;
- ◆ Heavy equipment operations;
- ◆ Laceration or bruising hazards from air knifing or concrete coring equipment;
- ◆ Being caught in or struck by moving equipment or trains;
- ◆ Electrocution or explosion hazards associated with contact with energized equipment, power line or underground pipelines, or portable generator usage;
- ◆ Potentially flammable atmospheres;
- ◆ Muscle strains from hand auger work;
- ◆ Hand and portable tools;
- ◆ Biological hazards, including encounters with animals (strays or homeowner pets);
- ◆ Poor illumination (soil vapor extraction events during the night);
- ◆ Compressed gases;
- ◆ Trenching and excavation work (collapse or fall hazards); and
- ◆ Ionizing radiation for soil density gauge use

Hazards from cold stress and ionizing radiation are not anticipated to be encountered on this project and so are not addressed in this Plan.

5.2.1 Drilling Hazards and Control

The drill rig operator has superior knowledge regarding, and is responsible for drill rig maintenance and safety. The following information, taken from the National Water Well Association's Manual of Safe Operating Procedures, provides general guidelines for safe practices onsite. See also SMS 56 and the Environmental Remediation Drilling Guidance Document which are both available on the Source.

Movement of Drill Rigs

The following safety guidelines relate to off-road movement of drill rigs:

- ◆ Before moving a drill rig, first walk the route of travel, inspecting for depressions, slumps, gullies, ruts, and similar obstacles.
- ◆ Always check the brakes of a drill rig carrier before traveling, particularly on rough, uneven, or hilly ground.
- ◆ Discharge all passengers before moving a drill rig on rough or hilly terrain.
- ◆ Engage the front axle of 4x4 or 6x6 vehicles or carriers when traveling off the highway on a hilly terrain.
- ◆ Use caution when traveling on a hillside. Conservatively evaluate the hillside capability of drill rigs, because the addition of drilling tools may raise the center of mass. When possible, travel directly uphill or downhill.
- ◆ Attempt to cross obstacles such as small logs, small erosion channels or ditches squarely, not at an angle.
- ◆ When lateral or overhead clearance is close, use the assistance of someone on the ground as a guide.

Underground utilities are as dangerous as overhead lines. Be aware and always suspect the existence of underground utilities such as electrical power, gas, petroleum, telephone, sewer, and water. Ask for assistance:

- ◆ If a sign warning of underground utilities is located on a Site boundary, do not assume that underground utilities are located on or near the boundary or property line under the sign; telephone the utility company and check it out. The underground utilities may be a considerable distance away from the warning sign.
- ◆ Always contact the owners of the utility lines or the nearest underground utility location service before drilling. The utility personnel should determine the location of underground lines and should mark and flag these locations. Determine, with the utility personnel, what specific precautions must be taken to assure safety.

Housekeeping On and Around the Drill Rig

To complete the first requirement for safe field operations, the safety supervisor of the drilling crew must understand and fulfill his responsibility for maintenance and “housekeeping” on and around the drill rig. Suitable storage locations should be provided for all tools, materials, and supplies. The locations should allow for the convenient handling of tools, materials or supplies without danger that these could fall on or hit a member of the drill crew or a visitor.

Avoid storing or transporting tools, materials, or supplies within or on the mast (derrick) of the drill rig. Pipe, drill rods, bits, casing, augers, and similar drilling tools should be stacked in an orderly manner on racks or sills to prevent spreading, rolling, or sliding.

Penetration hammers or other types of driving hammers should be placed at a safe location on the ground or secured to prevent movement when not in use. Work areas, platforms, walkways, scaffolding, and other access ways should be kept free of materials, obstructions, and substances such as ice, excess grease, or oil that could cause a surface to become slick or

otherwise hazardous. Keep controls, control linkages, and warning and operation lights and lenses free of oil, grease, and/or ice.

Do not store gasoline in any portable container other than a non-sparking, red container with a flame arrestor in the fill spout. The word “gasoline” must be clearly visible on the container.

Use of Hand Tools

There are many kinds of hand tools that can be used on or around a drill rig. The most important rule is “use the tool for its intended purpose.” The following are a few specific and general suggestions that apply to the safe use of several hand tools often used on and around drill rigs.

- ◆ When a tool becomes damaged, either repair it before using it again or discard it.
- ◆ When using a hammer, any kind of hammer, for any purpose, wear safety glasses and require all others around you to do the same.
- ◆ When using a chisel, any kind of chisel, for any purpose, wear safety glasses and require all others around you to do the same.
- ◆ Keep tools cleaned and stored in an orderly manner when not in use.
- ◆ Replace hook and heel jaws when they become visibly worn.
- ◆ When breaking tool joints on the ground or on a drilling platform, position your hands so that your fingers will not be caught between the wrench handle and the ground or the platform, should the wrench slip or the joint suddenly let go.

Use of Augers

The following general procedures should be used when advancing a boring with continuous flight or hollow-stem augers:

- ◆ Prepare to start an auger boring with the drill rig level, the clutch or hydraulic rotation control disengaged, the transmission in low gear, and the engine running at a low RPM.
- ◆ The operator and tool handler should establish a system of responsibility for the series of various activities required for auger drilling, such as connecting and disconnecting auger sections, and inserting and removing the auger fork. The operator must be sure that the tool handler is well away from the auger column and that the auger fork has been removed before starting rotation.
- ◆ Only use the manufacturer’s recommended method of securing the auger to the power coupling. Do not touch the coupling or the auger with your hands, a wrench, or any other tool during rotation.
- ◆ Whenever possible, use tool hoists to handle auger sections.
- ◆ Never place your hands or fingers under the bottom of an auger section when hoisting the auger over the top of the auger section in the ground or other hard surfaces such as the drill rig platform.
- ◆ Never allow your feet to get under the auger section that is being hoisted.
- ◆ When rotating augers, stay clear of the rotating auger and other rotating components of the drill rig. Never reach behind or around a rotating auger for any reason.

- ◆ Never use your hands or feet to remove cuttings away from auger.
- ◆ Augers should be cleaned only when the drill rig is in neutral, and the augers have stopped rotating.

Start-Up Procedures

Drill rig personnel and visitors should be instructed to “stand clear” of the drill rig immediately prior to and during and starting of an engine. Before starting a drill rig engine, make sure that all of the gear boxes are in neutral, hoist levers are disengaged, hydraulic levers are in the correct non-actuating positions, and the cathead rope is not on the cathead.

Drill Rig Operation

Safety requires the attention and cooperation of every worker and Site visitor. The following procedures are related to safety during drilling operations:

- ◆ Do not drive the drill rig from hole to hole with the mast in the raised position. Before raising the mast, look up to check for overhead obstructions.
- ◆ Before raising the mast, clear all drill rig personnel (with the exception of the operator) and visitors from the areas immediately to the rear and the sides of the mast. In addition, inform them that the mast is being raised.
- ◆ Before the mast of a drill rig is raised and drilling is commenced, the drill rig must first be leveled and stabilized with leveling jacks and/or solid cribbing. The drill rig should be re-leveled if it settles after the initial set up. Lower the mast only when leveling jacks are down, and do not raise the leveling jack pads until the mast is completely lowered. Before starting drilling operations, secure and/or lock the mast, if required by the drill manufacturer’s recommendations.
- ◆ The drill rig operator should operate a drill rig only from the position of the controls. The operator should shut down the drill engine before leaving the vicinity of the drill. “Horsing around” within the vicinity of the drill rig and tool and supply storage areas is strictly prohibited, even when the drill rig is shut down. Watch for slippery ground when mounting/dismounting the platform.
- ◆ Drilling operations should be terminated during an electrical storm.
- ◆ Consuming alcoholic beverages, depressants, stimulants, or any other chemical substance while on the job is strictly prohibited.
- ◆ All unattended boreholes must be adequately covered or otherwise protected to prevent drill rig personnel, Site visitors or animals from stepping or falling into the hole. When the drilling project has been completed, all open boreholes should be covered, protected or backfilled adequately and according to local or state regulations.

5.2.2 Heat Stress Recognition and Control

Personnel will be briefed on the signs and symptoms of heat stress, personal risk factors, and appropriate control measures. Control measures include having shaded rest areas readily accessible and at least one quart of water per employee per hour in accordance with 8 CCR 3395. Team members should also observe each other for symptoms of heat stress development. First aid/CPR trained personnel will be available onsite. Additional information

regarding AECOM's approach to Heat Stress is located in SMS 18, a copy of which shall be maintained on Site.

5.2.3 Noise Hazards

Previous surveys indicate that heavy equipment may produce continuous and impact noise at or above the action level of 85 dBA. Such equipment on this project includes drill rigs, backhoes, and soil vapor extraction equipment. Personnel within 25 feet of operating equipment, or near an operation that creates noise levels high enough to impair conversation, shall wear hearing protective devices (either muffs or plugs). AECOM personnel are in the AECOM Hearing Conservation Program and have had baseline and, where appropriate, annual audiograms. Personnel will wash their hands with soap and water prior to inserting earplugs to avoid initiating ear infections. Additional information regarding AECOM's Hearing Conservation Program is located in SMS 26, a copy of which shall be maintained on Site.

5.2.4 Slip/Trip/Fall Hazards

Workers should exercise caution when walking around the Site to avoid fall and trip hazards. If holes or uneven terrain are located in the work area which could cause Site personnel to fall or trip, they must be covered, flagged or marked to warn workers. If conditions become slippery, workers should take small steps with their feet pointed slightly outward to decrease the probability of slipping. Gravel or sand should be spread in muddy areas to reduce slipperiness. Workers should watch where they are walking and plan the route to walk in areas of good stability.

5.2.5 Lifting Hazards

The following guidelines will be followed whenever lifting equipment such as portable generators, coolers filled with samples, any other objects that are of odd size or shape, or that weigh over 50 pounds. AECOM's safe lifting procedures are described in SMS 69, a copy of which is to be available on Site.

- ◆ Get help when lifting heavy loads. Portable generators will only be lifted using a two-person lift.
- ◆ When moving heavy objects such as drums or containers, use a dolly or other means of assistance.
- ◆ Plan the lift. If lifting a heavy object, plan the route and where to place the object. In addition, plan communication signals to be used (i.e., "1, 2, 3, lift," etc.)
- ◆ Wear sturdy shoes in good condition that supply traction when performing lifts.
- ◆ Keep your back straight and head aligned during the lift and use your legs to lift the load – do not twist or bend from the waist. Keep the load in front of you – do not lift or carry objects from the side.
- ◆ Keeping the heavy part of the load close to your body will help maintain your balance.

5.2.6 Heavy Equipment and Drilling Safety

Operation of heavy equipment during Site activities presents potential physical hazards to personnel. AECOM's procedures for heavy equipment operations are located in SMS 19, a copy of which is to be maintained on Site. Drilling safety is addressed in SMS 56. Excavation safety is addressed in SMS 13.

The following precautions must be observed whenever heavy equipment is in use:

- ◆ Personal protective equipment (PPE) such as steel-toed shoes, safety glasses or goggles, and hard hats must be worn whenever such equipment is present.
- ◆ Personnel must at all times be aware of the location and operation of heavy equipment, and take precautions to avoid getting in the way of its operation. Never assume that the equipment operator sees you; make eye contact and use hand signals to inform the operator of your intent, particularly if you intend to work near or approach the equipment.
- ◆ Traffic safety vests **ARE REQUIRED** for personnel working near mobile heavy equipment, such as backhoes and other excavators.
- ◆ Never walk directly in back of or to the side of, heavy equipment without the operator's acknowledgment.
- ◆ When an equipment operator must operate in tight quarters, the equipment subcontractor should provide a person to assist in guiding the operator's movements.
- ◆ Keep non-essential personnel out of the work area.
- ◆ Any heavy equipment that is used in the exclusion zone should remain in that zone until its task is completed. The equipment subcontractor should completely decontaminate such equipment in the designated equipment decontamination area as required prior to moving the equipment outside of the EZ/CRC.

5.2.7 Utilities Clearance

The Site Manager is responsible to see that underground utility locations are identified prior to the commencement of any subsurface (> 1 ft.) activities. Resources include Site plans, utility companies, and regional utility locating services, such as the 811 "one call" service. Utilities clearances will be completed using geophysics techniques. Additionally, drilling locations will be cleared to a depth of at least 7 feet using air knifing techniques. The proper utility company personnel should certify the deactivation of utilities, and the certification should be retained in the permanent log. AECOM's procedures for activities proximal to utility locations are located in SMS 34, a copy of which is to be maintained on Site.

Excavation, drilling, crane, or similar operations adjacent to overhead lines shall not be initiated until operations are coordinated with the utility officials. Operations adjacent to overhead lines are prohibited unless one of the following conditions is satisfied:

- ◆ Power has been shut off and positive means (e.g. lockout/tagout) have been taken to prevent lines from being energized. Wherever possible, the AECOM SSO will observe power shut off and place a lock and tag on the switch. In all cases utility company personnel shall certify in writing to the Site Manager or SSO the deactivation of overhead utilities, and the certification retained in the project files. The Site Manager or

SSO must also attempt to verify power shut off by checking that power is no longer available to the affected building or equipment.

- ◆ The owner, agent, or employer responsible for the operations of equipment shall post and maintain in plain view of the operator and driver on each crane, derrick, power shovel, drilling rig, hay loader, hay stacker, pile driver, or similar apparatus, 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."**
- ◆ 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."**
- ◆ Equipment, or any part of the equipment, cannot come within the following minimum clearance from energized overhead lines:

Power Lines Nominal System (kv)	Minimum Required Clearance
600v-50	10 feet
50- 75	11 feet
75-125	13 feet
125-175	15 feet
175-250	17 feet
250-370	21 feet
370-550	27 feet
550-1000	42 feet

5.2.8 Electrical Safety/Lock-out /Tag-out (LO/TO)

Keep a safe distance from live electricity. Have all electrical equipment properly grounded. Use only three-wire grounded receptacles and extension cords. Use Ground Fault Circuit Interrupter (GFCI) outlets or circuit breakers on all 110 V outside, wet locations, or portable (5 kilowatts or greater) power sources. Test GCFI before operation. See SMS 12.

Only qualified personnel shall make electrical repairs or installations. Do not use power tools or electrical equipment while standing in water and keep cords out of liquids. Cord splices or repairs shall be electrically and mechanically equal to that cord's quality. No substandard patching is permitted.

Explosion proof fixtures and connections will be used while working in confined spaces where flammable vapors could be present.

Do not use metal ladders within 4 feet of electrical services. Inspect electrical grounding to prevent shock in case tool insulation fails. Inspect cord-supplied equipment for any ground problems before using and report damaged cords or equipment to the SSO.

Consider all wires to be live until locked and tagged out. Personnel are required to lockout and tagout any equipment on which they will be performing any kind of maintenance or work that could result in an injury in the event of an unexpected startup. "Lockout" involves physically

locking out the energy source(s) to a piece of equipment that is going to be worked on. The lockout rule applies to almost every piece of equipment that is to be worked on. The exception to this is cord-and-plug equipment if it is unplugged and the plug is in the control of the worker at all times, and if there are no other sources of energy to the equipment. The types of work activities which could require Lockout/Tagout procedures include installing a piece of equipment, modifying a piece of equipment, and adjusting, maintaining, or servicing a piece of equipment in a manner in which an unexpected movement or startup of the equipment could cause injury. See SMS 23.

The types of energy that may need to be addressed include electrical, hydraulic, pneumatic, and gravitational. Where a piece of equipment has more than a single source or type of energy, each will have to be addressed. Step-by-step procedures for the piece of equipment are to be developed as part of the THA and reviewed and discussed with all personnel. Where a confined space entry is involved, the confined space is to be addressed first, and then the Lockout provisions should be addressed.

The lockout hardware used is to be durable for the type of use it will receive, identifiable as to its purpose and owner, and individually assigned so that only the worker using the lock has the key. Workers who will be conducting work which will involve Lockout/Tagout procedures are to notify any other workers who may be affected by the Lockout. No worker is to remove the lock of another without taking the necessary precautions and receiving proper authorization.

5.2.9 Hand Tools and Portable Equipment

Only authorized trained workers will be allowed to use powered hand tools, and only after reviewing the manufacturer's safety procedures. All tools will be inspected by the operator prior to use and defective tools will be removed from service. Guards for moving parts are not to be removed. See SMS 16.

Electric-power tools will be double-insulated or grounded. All power tools not plugged directly into a building's fixed electrical system must be plugged into a ground fault circuit interrupter-protected supply (i.e. - an extension cord with a GFCI). Tools shall not be lifted or lowered by their electrical cords.

Pneumatic (air-powered) tools are to be connected to the hose in a manner which prevents accidental disconnecting. Impact tools shall have their attachments secured to prevent them from accidentally being expelled. Safety features, such as muzzle-to-work contact actuators on nail drivers, shall not be removed or overridden.

Fuel-powered tools shall be stopped while being refueled, serviced, or maintained. Regulations governing the storage and transport of flammable liquids are to be adhered to. If fuel-powered tools are operated indoors or in enclosed spaces, provisions shall be made to prevent the build-up of toxic gases.

Indoor working conditions may not have enough natural illumination. Portable generators will be used to supplement the area. Some precautions are noted below:

Portable Electric Generator

- ◆ All extension cords which supply power from a portable generator to a piece of equipment or portable power tool are to be equipped with a ground fault circuit interrupter (GFCI).
- ◆ Generators are to be off and should be cool prior to refueling.
- ◆ Electrical components are to be in sound condition with no exposed parts. Grounding continuity is to be maintained between the generator and the frame.
- ◆ Generators are not to be operated within enclosed areas.

At least one 20-lb fire extinguisher rated ABC is to be located where gasoline is stored. Only authorized trained workers will be allowed to use powered hand tools, and only after reviewing the manufacturer's safety procedures. Tools will be inspected by the operator prior to use and defective tools will be removed from service. Guards for moving parts are not to be removed.

5.2.10 Work Area Protection

As the project operations may be undertaken in a roadway or parking lot, motor vehicles may be a hazard. Consideration should be given to parking a work vehicle within the coned area between the work area and oncoming traffic. AECOM's procedures for work zone traffic control are located in SMS 32, a copy of which is to be maintained on Site as well as the procedures per SOPUS Program Guide for AECOM Appendix 11.22.

5.2.11 Confined Space Entry Hazards

A confined space is defined as a space large enough and so configured that an employee can bodily enter and perform assigned work, has limited means for entry or exit, and is not designed for continuous employee occupancy. Permit Required Confined Space work may pose additional hazards, such as chemical exposures, flammable/explosive atmospheres, electrocution, oxygen deficiency, etc. Confined spaces will be initially considered as "permit required." The Project Manager and SSO must determine if a confined space requires a permit; the ASHEM can be consulted for assistance in this determination. Only personnel properly trained in Permit Required Confined Space operations shall supervise, participate in confined space entry, or serve as standby attendants. If Permit Required Confined Space operations are required, the Project Manager and SSO must verify there are trained and currently certified confined space rescuers readily available who have practiced rescue operations on the bioreactor or similar spaces. Confined space entry activities shall be coordinated with the client site administrative and emergency response personnel. All Permit Required Confined Space documents must be completed and approved prior to operations, kept in the confined space site during operations, and filed upon completion. Additional information can be found in AECOM SMS 10.

5.2.12 Hand Augering

Muscle strains can occur with hand augering. To minimize the occurrence of injury, the following should be observed:

- ◆ Keep augers sharp – a dull auger requires more work to advance through the soil.
- ◆ Before beginning work, stretch or warm up the body as you would prior to exercising.

- ◆ Try to avoid excessive twisting or wrenching motions when using the auger.

5.2.13 Railroad Safety

Because the work will take place in the rail road right of way and, at times, in the middle of the tracks, personnel need to be aware of their surroundings and follow some basic rules while at work or when approaching the location(s):

- ◆ Notify Southern California Rail Road Authority (SCRRA) of work schedule to coordinate railroad flagging and/or protection.
- ◆ Only personnel who have completed the SCRRA safety training are allowed to work in the right of way.
- ◆ Comply with the “General Safety Regulations for Third Party Construction and Utility Workers on SCRRA Property” provided to personnel during SCRRA safety training.
- ◆ Always follow the SCRRA employee-in-charge.
- ◆ Stop and look both ways before crossing any track.
- ◆ Know that in a rail yard cars sometimes are moved by gravity, and may approach you without the noise of an engine to provide a warning.
- ◆ Expect trains or cars to move at any time, on any track, in any direction.
- ◆ Never go between moving cars.
- ◆ Give a hand signal and receive an acknowledgement before going around a standing (idling) engine.
- ◆ Never attempt to get on a moving car or engine.
- ◆ Walk to the side of tracks, where the ground is relatively smooth to get to the location of work. Step over rails when crossing tracks. Do not step, walk, or sit on any rail.
- ◆ If working in the middle of the tracks or within eight feet of the rails, arrange to have that section of the tracks shut down by the SCCRA prior to conducting the work.

See SMS 63.

5.2.14 Hand Safety/Open Blade Prohibition

Gloves must resist puncturing and tearing as well as provide the necessary chemical resistance. In many instances, particularly when protecting against concentrated source materials, gloves may have to be layered. In this case, gloves are referred to as “inner” gloves and “outer” gloves. Heavy leather gloves may be worn over chemical protective gloves when doing heavy work which could tear the chemical glove. If they become contaminated, leather gloves should be discarded because leather is difficult to decontaminate.

Open blade tools such as pocket knives, army knives, etc. are not permitted on-site. For cutting tasks, snips or other blade-protected tools must be used instead. Scissors may be used where appropriate. See also SMS 64, Hand Safety.

5.2.15 Biological Hazards

Personnel may encounter insects, snakes, poisonous plants, and animals during the course of this project. The best precaution is avoidance; do not disturb insect nests, burrows, or areas

where creatures would likely be encountered. Crawl spaces, well vaults, piles of firewood, etc. should be expected to harbor vermin.

Likewise, personnel should also avoid interacting with homeowner pets, as their temperament is unknown and the presence of strangers and equipment in their environment may be unsettling to animals.

See also SMS 47 concerning biological hazards.

5.2.16 Illumination

During night operations, a minimum of 5 foot candles illumination is needed in the work area. Illumination must be sufficient to see the walking surface and any equipment that is used. See also Section 4B of SMS 11 regarding minimum illumination requirements.

5.2.17 Safe Driving

Personnel driving automobiles shall have an appropriate and updated license and AECOM employees must have completed required driver training per SMS 57. Drivers shall demonstrate safe driving behavior at all times when operating a vehicle. Compliance with site, local, state, and federal traffic laws is required. Drivers should drive defensively at all time by continually watching for hazardous conditions, understanding how to defend against them, and taking action to avoid problems. Keep eyes and attention on the road at and adjust speed to weather and traffic conditions. Occupants shall wear seat belts. The use of portable electronic devices AND cell phones is prohibited while driving. A driver shall carefully pull off the road and properly park in a safe location prior to using a portable electric device or cell phone.

EXCEPTION: The use of a GPS device is allowed, but data entry shall be conducted only when the vehicle is stopped.

5.2.18 Excavation and Trenching

All personnel are prohibited from entering a trench or excavation until it has been inspected by a competent person in accordance with 8 CCR 1540-41. If personnel are required to enter a trench or excavation that is deeper than four feet, the following provisions must be provided prior to entry by the contractor who created the excavation:

- ◆ If hazardous atmospheres are suspected, any trench or excavation more than four feet deep must be monitored.
- ◆ Adequate shoring, sloping, or benching techniques must be employed.
- ◆ Adequate means of employee access and egress must be utilized.
- ◆ The contractor's trained, competent person must inspect the trench or excavation on a daily basis, before work commences and on an as-needed basis throughout the day.
- ◆ The contractor controlling the excavation must have a current Cal/OSHA trenching/excavation permit.

All provisions of these regulations must be complied with when working in a trench or excavation. An excavation permit must be obtained from a competent permit issuer before beginning work per SOPUS Safe System of Work 2.0. Additional guidance and information

regarding excavation requirements can be found in SMS 13. See also SMS 40 concerning fall protection requirements.

5.2.19 Ladders

Portable ladders are anticipated to be used during the course of this project. Work from stand-alone extension ladders or similar are prohibited. A-frame or multi-purpose ladders may be used provided they are properly secured and footed. Personnel will use the proper ladder for the application (no metal ladders near electrical hazards for example), check that they are in good condition, place on a level surface, and do not climb above the manufacturer's recommendations. See also SMS 28.

5.2.20 Aerial Lifts

An aerial lift may be used for remedial system installation and maintenance. Aerial lifts introduce hazards related to moving equipment and falls. Aerial lifts can only be operated by trained and qualified personnel. Fall protection (in the form of body harness and lanyard) are required for persons inside the lift basket; an exception can be made for "scissors"-type lifts that do not have articulating motion. See also SMS 7.

5.2.21 Corrosives (Acids and Caustics)

Corrosives are low pH (acids) or high pH (caustics or alkalis) substances that, by direct chemical action, are injurious to body tissue or can damage metal. Some sample preservatives, including hydrochloric acid, may be corrosive. Corrosive injury may be minor (irritation) or severe (causing burns or blindness). Caustic burns can be particularly dangerous because strong alkalis gelatinize tissue. Initial contact may not be painful, but prolonged contact or high concentrations can cause deep penetrating burns. The effects of solid corrosives (such as dusts) are largely dependent on their solubility in skin, moisture, and duration of contact. Eye, face, and skin protection should be worn whenever there may be contact with materials suspected of being contaminated with caustics. See SMS 9 for additional information.

5.2.22 Hot Work

Hot work such as welding or cutting can only be performed by a qualified person and only in vapor-free areas. Combustible materials such as paper, wood, solvents and cleaners, etc. are not to be in the area where welding or cutting takes place. Fire extinguishers must be readily accessible in the work zone. A fire-watch must be maintained for at least 30 minutes after work is completed as a precaution against a late-starting fire. A hot work permit must be obtained from a competent permit issuer before beginning work per SOPUS Safe System of Work 2.0. See SMS 20 for additional guidance.

5.2.23 Cranes and Rigging

Some operations, such as moving remediation system components and installation of excavation shoring, may require the use of a crane. Detailed requirements for the operation of such equipment are found in SMS 38. A hoisting and rigging permit must be obtained from a

competent permit issuer before beginning work per SOPUS Safe System of Work 2.0. See also SMS 41 concerning rigging requirements.

5.2.24 Powered Industrial Trucks (Forklifts)

A forklift may be used during drilling, installation of system, and excavation. Forklift trucks will only be operated by certified personnel and in accordance with the following excerpts from the OSHA standard. See also SMS 70.

Truck operations

- ◆ Trucks shall not be driven up to anyone standing in front of a bench or other fixed object.
- ◆ No person shall be allowed to stand or pass under the elevated portion of any truck, whether loaded or empty.
- ◆ Unauthorized personnel shall not be permitted to ride on powered industrial trucks. A safe place to ride shall be provided where riding of trucks is authorized.
- ◆ The employer shall prohibit arms or legs from being placed between the uprights of the mast or outside the running lines of the truck.
- ◆ When a powered industrial truck is left unattended, load engaging means shall be fully lowered, controls shall be neutralized, power shall be shut off, and brakes set. Wheels shall be blocked if the truck is parked on an incline.
- ◆ A safe distance shall be maintained from the edge of ramps or platforms while on any elevated dock, or platform or freight car. Trucks shall not be used for opening or closing freight doors.
- ◆ Brakes shall be set and wheel blocks shall be in place to prevent movement of trucks, trailers, or railroad cars while loading or unloading. Fixed jacks may be necessary to support a semitrailer during loading or unloading when the trailer is not coupled to a tractor. The flooring of trucks, trailers, and railroad cars shall be checked for breaks and weakness before they are driven onto.
- ◆ There shall be sufficient headroom under overhead installations, lights, pipes, sprinkler system, etc.
- ◆ An overhead guard shall be used as protection against falling objects. It should be noted that an overhead guard is intended to offer protection from the impact of small packages, boxes, bagged material, etc., representative of the job application, but not to withstand the impact of a falling capacity load.
- ◆ A load backrest extension shall be used whenever necessary to minimize the possibility of the load or part of it from falling rearward.
- ◆ Only approved industrial trucks shall be used in hazardous locations.
- ◆ Whenever a truck is equipped with vertical only, or vertical and horizontal controls elevatable with the lifting carriage or forks for lifting personnel, the following additional precautions shall be taken for the protection of personnel being elevated.
 - Use of a safety platform firmly secured to the lifting carriage or forks.
 - Means shall be provided whereby personnel on the platform can shut off power to the truck.

- Such protection from falling objects as indicated necessary by the operating conditions shall be provided.
- ◆ Fire aisles, access to stairways, and fire equipment shall be kept clear.

Traveling

- ◆ All traffic regulations shall be observed, including authorized plant speed limits. A safe distance shall be maintained approximately three truck lengths from the truck ahead, and the truck shall be kept under control at all times.
- ◆ The right of way shall be yielded to ambulances, fire trucks, or other vehicles in emergency situations.
- ◆ Other trucks traveling in the same direction at intersections, blind spots, or other dangerous locations shall not be passed.
- ◆ The driver shall be required to slow down and sound the horn at cross aisles and other locations where vision is obstructed. If the load being carried obstructs forward view, the driver shall be required to travel with the load trailing.
- ◆ Railroad tracks shall be crossed diagonally wherever possible. Parking closer than 8 feet from the center of railroad tracks is prohibited.
- ◆ The driver shall be required to look in the direction of, and keep a clear view of the path of travel.
- ◆ Grades shall be ascended or descended slowly.
 - When ascending or descending grades in excess of 10 percent, loaded trucks shall be driven with the load upgrade.
 - On all grades the load and load engaging means shall be tilted back if applicable, and raised only as far as necessary to clear the road surface.
- ◆ Under all travel conditions the truck shall be operated at a speed that will permit it to be brought to a stop in a safe manner.
- ◆ Stunt driving and horseplay shall not be permitted.
- ◆ The driver shall be required to slow down for wet and slippery floors.
- ◆ Dockboard or bridgeplates shall be properly secured before they are driven over. Dockboard or bridgeplates shall be driven over carefully and slowly and their rated capacity never exceeded.
- ◆ Elevators shall be approached slowly, and then entered squarely after the elevator car is properly leveled. Once on the elevator, the controls shall be neutralized, power shut off, and the brakes set.
- ◆ Motorized hand trucks must enter elevator or other confined areas with load end forward.
- ◆ Running over loose objects on the roadway surface shall be avoided.
- ◆ While negotiating turns, speed shall be reduced to a safe level by means of turning the hand steering wheel in a smooth, sweeping motion. Except when maneuvering at a very low speed, the hand steering wheel shall be turned at a moderate, even rate.

Loading

- ◆ Only stable or safely arranged loads shall be handled. Caution shall be exercised when handling off-center loads that cannot be centered.
- ◆ Only loads within the rated capacity of the truck shall be handled.
- ◆ The long or high (including multiple-tiered) loads which may affect capacity shall be adjusted.
- ◆ Trucks equipped with attachments shall be operated as partially loaded trucks when not handling a load.
- ◆ A load engaging means shall be placed under the load as far as possible; the mast shall be carefully tilted backward to stabilize the load.
- ◆ Extreme care shall be used when tilting the load forward or backward, particularly when high tiering. Tilting forward with load engaging means elevated shall be prohibited except to pick up a load. An elevated load shall not be tilted forward except when the load is in a deposit position over a rack or stack. When stacking or tiering, only enough backward tilt to stabilize the load shall be used.

Operation of the Truck

- ◆ If at any time a powered industrial truck is found to be in need of repair, defective, or in any way unsafe, the truck shall be taken out of service until it has been restored to safe operating condition.
- ◆ Fuel tanks shall not be filled while the engine is running. Spillage shall be avoided.
- ◆ Spillage of oil or fuel shall be carefully washed away or completely evaporated and the fuel tank cap replaced before restarting engine.
- ◆ No truck shall be operated with a leak in the fuel system until the leak has been corrected.
- ◆ Open flames shall not be used for checking electrolyte level in storage batteries or gasoline level in fuel tanks.

Maintenance of Industrial Trucks

- ◆ Any power-operated industrial truck not in safe operating condition shall be removed from service. All repairs shall be made by authorized personnel.
- ◆ No repairs shall be made in Class I, II, and III locations.
- ◆ Those repairs to the fuel and ignition systems of industrial trucks that involve fire hazards shall be conducted only in locations designated for such repairs.
- ◆ Trucks in need of repairs to the electrical system shall have the battery disconnected prior to such repairs.
- ◆ All parts of any such industrial truck requiring replacement shall be replaced only by parts equivalent as to safety with those used in the original design.
- ◆ Industrial trucks shall not be altered so that the relative positions of the various parts are different from what they were when originally received from the manufacturer, nor shall they be altered either by the addition of extra parts not provided by the manufacturer or by the elimination of any parts. Additional counterweighting of fork trucks shall not be done unless approved by the truck manufacturer.

- ◆ Industrial trucks shall be examined before being placed in service, and shall not be placed in service if the examination shows any condition adversely affecting the safety of the vehicle. Such examination shall be made at least daily. Where industrial trucks are used on a round-the-clock basis, they shall be examined after each shift. Defects when found shall be immediately reported and corrected.
- ◆ Water mufflers shall be filled daily or as frequently as is necessary to prevent depletion of the supply of water below 75 percent of the filled capacity. Vehicles with mufflers having screens or other parts that may become clogged shall not be operated while such screens or parts are clogged. Any vehicle that emits hazardous sparks or flames from the exhaust system shall immediately be removed from service, and not returned to service until the cause for the emission of such sparks and flames has been eliminated.
- ◆ When the temperature of any part of any truck is found to be in excess of its normal operating temperature, thus creating a hazardous condition, the vehicle shall be removed from service and not returned to service until the cause for such overheating has been eliminated.
- ◆ Industrial trucks shall be kept in a clean condition, free of lint, excess oil, and grease. Noncombustible agents should be used for cleaning trucks. Low flash point (below 100 deg. F.) solvents shall not be used. High flash point (at or above 100 deg. F.) solvents may be used. Precautions regarding toxicity, ventilation, and fire hazard shall be consonant with the agent or solvent used.
- ◆ Industrial trucks originally approved for the use of gasoline for fuel may be converted to liquefied petroleum gas fuel provided the complete conversion results in a truck that embodies the features specified for LP or LPS designated trucks. Such conversion equipment shall be approved.

5.2.25 Concrete and Cement

Concrete and cement will be used at the site during well and other construction. Those pouring and surfacing concrete are to wear safety glasses and gloves. An ANSI-approved eyewash and bottles of neutralizer are to be present in any pour area, or any area where dry Portland cement is being handled or mixed with water or aggregate. See SMS 91 for additional concrete requirements.

5.2.26 Use of Nuclear Density Gauges

Nuclear density gauges may be used for compaction testing after backfilling and compaction of excavated soil. The use, transport and storage of nuclear density gauges shall be in compliance with the guidelines set in SMS 44 and ALARA principles. Nuclear density gauges may not be stored overnight on Site or in the field office. Personnel using and transporting nuclear density gauges shall have completed an operator's radiation safety training program.

5.2.27 Ergonomic Hazards

Motor tasks such as lifting, repetitive bailing, hand augering or similar activities can lead to neuromuscular illnesses. Repetitive computer work can also lead to the same results. Persons should stretch and flex during their workday. In particular during computer work, persons should vary their tasks, take a few minutes break time from the computer every hour and

practice good computer posture. See SMS 54 also for tips on proper ergonomic work station arrangement.

5.2.28 Compressed Gas Hazards

Compressed gas cylinders and air compressors will be used onsite. Helium cylinders will be used as a tracer gas in soil gas sampling. Oxygen cylinders may be used in the generation of ozone for injection. Oxygen is non-combustible, but actively supports combustion and is a moderate fire risk. Nitrogen cylinders may be used to power pneumatic pumps during LNAPL recovery activities. Cylinders must be stored and handled appropriately. Safety measures include protecting the valve from damage (keep capped or shrouded when not in use), keeping cylinders away from heat or ignition sources, and ensuring that cylinders are prevented from damage (secured from toppling or being hit by vehicles or equipment). See also SMS 15, Flammable and Combustible Liquids and Gases, including the check sheet SMS 015-2.

Air compressors may also be used to drive pneumatic pumps used for LNAPL recovery or groundwater extraction. See SMS 87, Compressed Air Systems and Testing, for guidance on equipment testing and inspections prior to use.

6.0 STOP WORK AUTHORITY

All employees and contractors working at the Former Kast Property Project have stop work authority which gives employees the ability to stop work related to a specific activity being performed when there is an imminent danger to personnel, property, or the environment. If a AECOM employee or contractor observes a site condition or work activity which presents a safety concern, the AECOM employee or contractor may stop work. After stopping work, the AECOM employee shall immediately conduct the following:

- ◆ Notify affected employees working in the area of the situation;
- ◆ Take reasonable actions to protect workers, the public, the environment, and the property;
- ◆ Contact the onsite SSO, Site Manager and Senior Oversight;
- ◆ Contact the immediate supervisor and the contractor's representative;
- ◆ Contact the AECOM Project Manager.

The SSO, Site Manager and/or Senior Oversight will evaluate and investigate the condition and determine the corrective actions needed in order to proceed with work safely.

Employees will not receive any kind of reprisal, retribution, or discipline for exercising stop work authority.

7.0 SHELL 12 LIFE-SAVING RULES

Shell has introduced the 12 Life-Saving Rules as a guide towards the goal of zero injuries or fatalities within the workplace. The 12 Life-Saving Rules focus on activities with the greatest potential for seriously injuring or killing workers. Wilful disregard for these rules can result in penalties including the principle that ***“If you choose to break the rules, you choose not to work for Shell.”*** Shell life-saving rules apply to all persons working at Shell sites and are outline below. Personnel working for AECOM on Shell sites must provide proof of LSR training (card provided by AECOM or other Shell Primary Environmental Contractor). Training is provided to AECOM personnel through AECOM’s Learning Management System and to subcontractors through training CDs.

7.1 WORK PERMIT

“Work with a valid work permit when required”.

Personnel shall work with a valid work permit when required. A work permit describes what personnel must do to stay safe when performing permit required tasks. All persons working under the work permit should understand and follow the permit conditions. Permit issuers should be competent on the permit being issued and have completed SOPUS Safe System of Work 2.0 training. Prior to starting work, the supervisor shall ensure that the work permit is completed and valid, if required, and that it is safe to start work.

7.2 GAS TESTING

“Conduct gas tests when required”.

Personnel shall conduct gas testing when required. The work permit and Section 8.0 of this HSP define when chemical monitoring will be conducted and how often. Calibrated and certified equipment will be used for the testing. Prior to starting work, the supervisor shall ensure that gas testing has been completed and that it is safe to start work. Work should be stopped immediately if conditions change.

7.3 HAZARDOUS ENERGY ISOLATION

“Verify isolation before work begins and use the specified life protecting equipment”.

Personnel shall verify isolation before work begins and use the specified life protecting equipment. The work permit and Section 5.2.8 of this HSP define procedures for lockout/tag-out. Prior to starting work, the supervisor shall ensure that the proper isolations are in place, that all stored energy has been dissipated, and that it is safe to start work.

7.4 CONFINED SPACE ENTRY

“Obtain authorization before entering a confined space”.

Personnel shall obtain authorization before entering a confined space. The work permit and SMS 10 defines procedures for confined space entry. Prior to starting work, the supervisor shall ensure that all entrants have appropriate and up-to-date training and that a confined space

permit has been filled out accurately, signed, and procedures followed. Ensure that gas monitoring is being conducted and that an attendant is always present directly outside of the space. Prior to entry, ensure that it is safe to start work.

7.5 SAFETY CRITICAL EQUIPMENT

“Obtain authorization before overriding or disabling safety critical equipment”.

Personnel shall obtain authorization before overriding or disabling safety critical equipment. Safety critical equipment must work correctly to keep personnel safe. Safety critical equipment shall not be disabled on this project.

7.6 FALL PROTECTION, WORK FROM HEIGHTS

“Protect yourself against a fall when working at height”.

Personnel shall protect themselves against a fall when working at height. Fall Protection must be implemented when working outside of a protective structure where the worker can fall 6 feet or more. Obtain authorization for work outside protective equipment such as guardrails or stairs with handrails. The specific work requirements for fall protection shall be defined in the THA. Work from stand-alone ladders and steel mobile scaffold is not permitted on Shell worksites. A-frame or multi-purpose ladders may be used provided they are properly secured and footed.

7.7 SUSPENDED LOADS

“Do not walk under a suspended load”.

Never walk underneath a suspended load. Follow the instructions of the flagman. Place barriers in to prevent un-necessary foot traffic in work zone.

7.8 DESIGNATED SMOKING AREAS

“Do not smoke outside designated smoking areas”.

Do not smoke outside of designated areas. Smoking is banned except in designated smoking areas.

7.9 NO DRUGS OR ALCOHOL WHILE DRIVING OR WORKING

“No alcohol or drugs while working or driving”.

Alcohol and drugs are banned on Shell sites. Do not use alcohol or drugs while working or driving. Do not work while under the influence of drugs or alcohol. Remove personnel who are not fit for duty.

7.10 NO CELL PHONE WHILE DRIVING AND DO NOT EXCEED SPEED LIMITS

“While driving, do not use your phone and do not exceed speed limits”.

Do not use cell phones or other communication devices while driving. Do not use your mobile phone, pager, send or read a text message, or use a hands-free mobile phone device when driving. Do not exceed the posted or vehicle’s speed limit. Further information is detailed in Section 5.2.17 of this HSP.

7.11 SEATBELT

“Wear your seat belt”.

A three point seatbelt shall be securely fastened when you are within a moving vehicle. Further information on driving safety is detailed in Section 5.2.17 of this HSP.

7.12 JOURNEY MANAGEMENT PLAN

“Follow prescribed Journey Management Plan”.

Follow prescribed Journey Management Plan. A Journey Management Plan is not anticipated to be required for work on this site. Further information on driving safety is detailed in Section 5.2.17 of this HSP.

8.0 EXPOSURE MONITORING PLAN

Heat stress, noise, and chemical exposures may be encountered at this site. Heat stress monitoring and prevention is addressed in Section 5.2.2. Noise levels will not be monitored; personnel will wear hearing protection as described in Section 5.2.3.

8.1 CHEMICAL EXPOSURE MONITORING

The field instrumentation described in this health and safety plan has been specifically selected for the contaminants that may be reasonably anticipated to be encountered during this course of this project. Selection factors include anticipated airborne concentrations, potential interference, ionization potentials, instrument sensitivity, and occupational exposure limits. The Action Levels specified in Section 1.0 were established with the expectation that specific instruments will be used. **DO NOT SUBSTITUTE INSTRUMENTS WITHOUT THE CONSENT OF THE HSP PREPARER OR THE ASM.**

The monitoring equipment specified in Section 1.0 will be used on a regular basis to evaluate the potential for exposure to airborne contaminants, typically every five to ten minutes. Monitoring will be conducted in the immediate vicinity of the contaminant source point or work area (e.g., at the borehole and cuttings adjacent to the borehole). If readings exceed the first Action Level (>10 ppm > one minute), monitoring in the operator's breathing zone (OBZ) of the person working nearest the point of operations/contaminant source will start immediately, and Site personnel will don protective clothing.

For PID : A reading in the Site OBZ above the second Action Level (>10 ppm > one minute) will require the use of half-face respirators with appropriate cartridges. An OBZ reading above the third Action Level (>50 ppm > one minute) will require the use of full-face respirators with appropriate cartridges. If the monitoring instrument reads more than the fourth Action Level (>100 ppm > one minute or >200 ppm instantaneously), work will stop, and workers will move upwind while the airborne contaminants dissipate. If elevated levels remain for more than five minutes, local ventilation will be used or the source of the airborne contamination will be covered with clean soil, plastic sheeting, or foam, (or controlled in an appropriate manner).

For FID: Readings detected with the FID, but not on the PID or CO₂ detection device can be presumed to be from methane, which has a TLV of 1000 ppm. In addition to the LEL measurements that will be taken "downhole" while installing and testing the sub-slab sampling probes, a FID will be used to check the working area and OBZ as noted here and in the table on page 1-6. If readings > 500 ppm in the work area for more than one minute, the worker's OBZ will be monitored. If readings are > 1000 ppm in the OBZ for more than one minute, work will stop, and workers will move upwind while the airborne contaminants dissipate. If elevated levels remain for more than five minutes, local ventilation will be used or the source of the airborne contamination will be covered with clean soil, ventilation, plastic sheeting, or foam, (or controlled in an appropriate manner).

8.1.1 Personal Exposure Monitoring

In accordance with 8 CCR 5192(h), a qualified AECOM industrial hygienist will perform quantitative personal monitoring for personnel at greatest risk of exposure (i.e., those working in the exclusion zone). The industrial hygienist will determine who to sample based upon site conditions at the time of the sampling; monitoring will commence when the Second Action Level is exceeded.

Personnel will be monitored for aromatic and/or aromatic hydrocarbons in accordance with National Institutes for Occupational Safety and Health (NIOSH) Method 1501 or 1003, respectively. If approved by the industrial hygienist, validated passive samplers may be used in lieu of NIOSH Methods. Colorimetric tubes may be used to aid in decision making.

During selected soils excavation activities, personnel will be monitored to assess exposure to various constituents. Exposure to gasoline vapors will be evaluated by OSHA PV2028 (or equivalent) utilizing calibrated sampling pumps and charcoal media. Polynuclear aromatic hydrocarbons will be sampled by NIOSH Method 5506 utilizing calibrated sampling pumps with a PTFE membrane filter and XAD sampling tube. Benzene, toluene, ethyl benzene, and xylenes will be sampled by NIOSH 1501 using calibrated pumps and charcoal media or validated passive samplers. All samples will be collected by or under the direction of a professional industrial hygienist. To aid in the selection of these assessments, colorimetric sampling tubes may be used as a screening device at a given location. The methods above will be used to evaluate full-shift exposure and where indicated, short-term exposure limits. Samples will be submitted to an American Industrial Hygiene Association-accredited laboratory for analysis with chain-of-custody protocol. A laboratory accredited by the American Industrial Hygiene Association will perform analyses, and results will be reported and records maintained in accordance with OSHA criteria.

AECOM's procedures for personal monitoring are located in SMS 43, a copy of which is to be maintained on site. Exposure to certain chemicals, such as benzene, can trigger requirements of substance-specific standards. See SMS 50.

8.2 BACKGROUND READINGS

All direct-reading instrument readings will be evaluated relative to background reading, not "meter zero". Prior to the start of work at each shift, and whenever there is a significant shift in wind direction, instrument readings will be obtained upwind of the Site work zone in order to evaluate the level of "background" readings from local vehicle traffic, emissions from nearby operations unrelated to the Site, etc. Site readings will be evaluated against these background readings (i.e., if an action level is listed as 20 ppm, it is evaluated as 20 ppm above background). The SSO should consult with the ASM regarding the potential health hazards associated with background readings above 5 ppm.

8.3 DATA LOGGING

Monitoring data, including background readings, will be logged in the field log book or equivalent document. Monitoring instruments will be calibrated in accordance with the manufacturer's

instructions prior to the start of each shift. Calibration should also be performed when inconsistent or erratic readings are obtained. **IF AN INSTRUMENT CANNOT BE CALIBRATED TO SPECIFICATION, OR BECOMES OTHERWISE INOPERABLE, INVASIVE SITE WORK (I.E., DRILLING, EXCAVATING) WILL CEASE UNTIL THE INSTRUMENT IS APPROPRIATELY REPAIRED OR REPLACED;** the PM or HSP Preparer should be contacted for further guidance.

8.4 DUST CONTROL

High winds and Site operations can cause airborne dust hazards. If Site operations generate sustained visible dust, a water mist will be applied to reduce dust generation. If the mist is not effective in reducing dust generation, personnel will don respirators (half-face or full-face as appropriate for analyzer readings) with combination organic vapor-HEPA (P100) cartridges (such as MSA's GMC-H cartridges).

8.5 CARBON MONOXIDE HAZARDS AND CONTROL

The use of internal combustion equipment such as concrete cutters, power augers, generators, geoprobe drill rigs, etc. can produce carbon monoxide, a colorless, odorless, and toxic gas. Some of the site work will be conducted indoors. To minimize the chances that carbon monoxide will build up to potentially hazardous levels, the following precautions are to be taken. Equipment is not to be allowed to idle unnecessarily. The source equipment will be located outdoors and extension cords or hoses used to preclude generating carbon monoxide indoors. Windows and doors in the area are to be opened; if possible so that cross ventilation can occur.

8.6 EXPLOSIVE ATMOSPHERES

Due to the potential presence of elevated concentrations of site constituents that have a low flash point, the potential exists for explosive atmospheres at the site. Therefore, a Combustible Gas Indicator/O₂ (CGI/O₂) meter will be used to monitor ambient conditions. Decisions will be based on the levels measured using a CGI/O₂ meter (measurements are in % of the Lower Explosive Limit) as determined by the Action Level Table located on page [1-8](#).

Fire suppression equipment (at least one 20-lb fire extinguisher rated ABC or equivalent) is to be present at all times during site operations in areas where a fire potential exists.

9.0 PERSONAL PROTECTIVE EQUIPMENT

In general, the minimum Personal Protective Equipment (PPE) for Site personnel includes:

- ◆ Hardhat (with band of orange tape for SSEs)
- ◆ Safety glasses with side shields (or impact resistant goggles)
- ◆ Steel-toed boots or Chemical-resistant steel-toed boots
- ◆ Ear protection in vicinity of noisy equipment
- ◆ Work gloves and/or chemical-resistant gloves
- ◆ Traffic safety vest in the vicinity of heavy equipment

As the various monitoring Action Levels are reached, additional PPE is required. Section 1.0 provides the description of the incremental PPE requirements relative to specific Action Levels, as well as the specific kinds of PPE to be used. AECOM's procedures for use and selection of personal protective equipment are located in SMS 29, a copy of which is to be maintained on Site.

9.1 LIMITATIONS OF PROTECTIVE CLOTHING

The protective equipment ensembles selected for this project are anticipated to provide protection against the types and concentrations of hazardous materials that may potentially be encountered during field operations. However, no protective garment, glove or boot is resistant to all chemicals at any concentration; in fact, chemicals may continue to permeate or degrade a garment even after the source of the contamination is removed.

In order to obtain optimum usage from PPE, the following procedures are to be followed by all personnel:

- ◆ When using disposable coveralls, don a clean, new garment after each rest break or at the beginning of each shift
- ◆ Inspect clothing, gloves and boots both prior to and during use for:
 - Imperfect seams
 - Non-uniform coatings
 - Tears
 - Poorly functioning closures
- ◆ Inspect reusable garments, boots and gloves both prior to and during use for:
 - Visible signs of chemical permeation such as swelling, discoloration, stiffness or brittleness
 - Cracks or any signs of puncture or abrasion

Any reusable garments exhibiting any such characteristics will be discarded.

9.2 DURATION OF WORK TASKS

The duration of work tasks in which personnel use PPE ensembles that include chemical protective clothing (including uncoated Tyvek®) will be established by the SSO. Variables to be considered include ambient temperature and other weather conditions, the capacity of individual personnel to work in the required level of PPE in heat and cold, and the limitations of specific PPE ensembles. The recommended rest breaks are as follows:

- ◆ Fifteen minutes midway between shift startup and lunch
- ◆ Lunch break (30-60 minutes)
- ◆ Fifteen minutes midway between lunch and shift end

Rest breaks are to be taken in the support zone or other clean area after personnel have completed the decontamination process, including soap and water wash of hands and face.

10.0 RESPIRATORY PROTECTION

10.1 RESPIRATOR PROTECTION

Engineering controls and safe work practices (e.g. elimination of the source of contamination, ventilation equipment, working upwind, limiting exposure time, etc.) must always be the primary control for air contaminants. Respirators will be used if engineering or work practice controls are not feasible for controlling airborne exposures below acceptable concentrations and as an interim control measure while engineering or work practice controls are implemented.

Once the need for respirators has been established, the respirators will be selected on the basis of the hazards to which the worker is exposed. Only NIOSH-approved respirators will be issued. Selection criteria established in 8 CCR 5144 has been used by the HSP Preparer in evaluating respirator requirements for this project.

CAUTION: Full-face piece or half-face piece air-purifying respirators are not to be used where there is an oxygen deficiency. Only air-supplied respirators with an emergency escape cylinder or self-contained breathing apparatus will be worn when an oxygen deficiency exists.

CAUTION: A respirator does not protect against excessive heat or against hazardous substance that can attack the body through the skin.

The form of the airborne contaminants has been evaluated based upon the suspected contaminants of concern. Evaluation of the concentration of the airborne chemical hazard will be performed using direct reading instruments to evaluate what type respirator will be used. Airborne readings will be compared to Action Levels in the table in Section 1.0. See action level/respirator requirements in Section 8.1.

10.2 MEDICAL SCREENING

AECOM project employees are enrolled in the AECOM Medical Surveillance Program and are medically evaluated in compliance with the requirements of 8 CCR 5144(a) (10). Employees who are not physically or psychologically capable of wearing respirators are not assigned to this project. Subcontractor personnel who may wear respirators must be medically qualified.

The medical status of each employee is reviewed annually and as may be deemed necessary by the examining physician if the physical status of the employee changes.

10.3 FIT TESTING

A person wearing a respirator must be clean-shaven in the area of the face piece seal. Long hair, sideburns, and skullcaps that extend under the seal are not allowed. Glasses with temple pieces extending under the seal are not allowed for full-face respirators. Persons with facial conditions that prevent a proper seal are not allowed to wear a respirator until the condition is corrected. Facial conditions that may cause a seal problem include missing dentures, scars, severe acne, etc. Contact lenses can be used with air purifying, but not supplied air respirators. No individual will enter an area where the use of respiratory protective equipment is required unless the person has been fit tested within the last year. Fit testing will be performed in

accordance with accepted fit test procedures defined in SMS 42, a copy of which is maintained at the Site.

Records of fit testing will be maintained on Site or by the employee's office and/or corporate medical surveillance program.

Respirator wearers will perform a user seal check each time the respirator is put on. For air purifying respirators, the positive user seal check is performed by first removing the exhalation valve cover, then placing the palm over the respirator exhalation valve and exhaling gently. The respirator mask should puff out without noticeable leakage. The negative user seal check is performed by placing the palms over both of the respirator cartridges, inhaling gently, and holding the breath for 10 seconds. The respirator mask should remain collapsed on the face without noticeable leakage.

10.4 RESPIRATOR USE INSTRUCTIONS

Only those employees who have been properly trained and qualified on the specific type of respirator to be worn may use respirators. No individual will enter an area where the use of respiratory protective equipment is required unless the person has been trained.

All employees whose job assignment requires the use of respirators are given training in accordance with 8 CCR 5144 during initial 40-hour and annual Refresher training for hazardous waste operations.

Hands-on training on inspecting and donning a respirator, including user seal checks, was also provided at the time of fit testing. Retraining is performed annually on each type of respirator worn by the individual. In addition, Site-specific respirator training is provided during Site Safety Briefings conducted by the SSO. Training records are kept in the employee's training file.

Chemical gas or vapor respirator cartridges will be **changed out at least daily**.

The fit of a chemical gas or vapor respirator should be rechecked and the cartridges changed if the wearer detects chemical odor or feels chemical irritation on the skin, both indicators of leakage or cartridge breakthrough. Where available, an ESLI (end-of-service-life indicator) will be used on chemical respirator cartridges. Cartridges will be changed as soon as the ESLI indicates that the cartridge is saturated and no longer effective in absorbing airborne chemicals.

10.5 RESPIRATOR INSPECTION

The user will inspect respirators before and after each day's use.

Inspection procedure, air purifying respirators (full-face piece and half-face piece cartridge respirators):

Examine the face piece for:

- ◆ Excessive dirt
- ◆ Cracks, tears, holes, or distortion from improper storage
- ◆ Inflexibility
- ◆ Cracked or badly scratched lenses (full-face only)
- ◆ Incorrectly mounted eyeglass lenses or broken or missing mounting clips (full-face only)
- ◆ Cracked or broken air purifying element holder, badly worn threads, or missing gaskets

Examine the head straps or head harness for:

- ◆ Breaks or cracks
- ◆ Broken or malfunctioning buckles
- ◆ Excessively worn serration on the head straps, which may permit slippage
- ◆ Loss of elasticity

Examine the inhalation valves (2) and exhalation valve for:

- ◆ Foreign material (e.g. hairs, particles, etc.)
- ◆ Improper insertion of the valve body in the face piece
- ◆ Cracks, tears, or chips in the valve body, particularly in the sealing surface
- ◆ Missing or defective exhalation valve covers

Examine the air-purifying cartridge for:

- ◆ Missing or worn cartridge holder gasket
- ◆ Incorrect cartridge/canister for the hazard
- ◆ Incorrect cartridge installation, loose connections, or cross threading in the holder
- ◆ Cracks or dents in the outside case or threads of filter or cartridge/canister

10.6 CLEANING OF RESPIRATORS

Respirators assigned and worn by one individual must be dismantled and thoroughly cleaned and disinfected after each day's use. Visitors or multi-assigned respirators must be cleaned and disinfected after each use. A disinfectant spray or wipe is approved as a disinfectant between uses during the day but not for cleaning and sanitizing after each day's use. Care must be taken to prevent damage from rough handling during the cleaning procedure. After cleaning, respirators must be reassembled.

Respirator Cleaning Procedure

- Washing:** Disassemble and wash with a mild liquid detergent in warm water (not to exceed 110°F). A stiff bristle (not wire) brush may be used.
- Rinsing:** Rinse in clean water (110°F maximum) to remove all traces of detergent. This is very important to prevent dermatitis.
- Disinfecting:** Thoroughly rinse or immerse in a sanitizer provided by the manufacturer. Alternatively, a weak chlorine bleach solution (1 milliliter liquid bleach/liter of water) may be used.
- Final Rinsing:** Rinse thoroughly in clean water (110°F maximum) to remove traces of disinfectant. This is very important to prevent dermatitis.
- Drying:** Drain and dry hanging by the straps from racks (take care to prevent damage); or towel drying with clean soft clothes or paper towels.

10.7 MAINTENANCE OF RESPIRATORS

Routine respirator maintenance such as replacing missing valves, gaskets, nose cups etc., must only be performed by trained respirator users or a respirator manufacturer's representative. Only approved replacement parts must be used. Substitution of parts from a different brand or type of respirator is generally not possible, invalidates the technical approval of the respirator, and is not permitted. Any respirator suspected of being defective must be removed from service and replaced.

10.8 STORAGE OF RESPIRATORS

When not in use, respirators must be stored to protect them from dust, sunlight, heat, extreme cold, excessive moisture, damaging chemicals, and physical damage. Respirators must be stored in sealable (e.g. Ziploc® or twist-tie) reusable plastic bags between shifts.

The respirator storage environment must be clean, dry, and away from direct sunlight. Onsite cabinets or cases are suggested. Storing bagged respirators in vehicles is discouraged due to the potential for damage from other material or equipment.

10.9 ADDITIONAL INFORMATION

Additional information on AECOM Respiratory Protection Program is located in SMS 42, a copy of which is to be available on Site.

11.0 SITE CONTROL

11.1 GENERAL

Barricade tape and/or barricades shall be used to delineate a work zone for safety purposes around the work area. The barriers should be set in a 25-foot radius (as practical) around the work area to provide sufficient maneuvering space for personnel and equipment. A short piece of barricade tape can be affixed to a secure upright (e.g., drill rig mast or vehicle antenna) to serve as a wind direction telltale. A five-foot opening in the barricades at the support zone (upwind of the work area) will serve as the personnel and equipment entry and exit point. The personnel decontamination station will be established at this point if formal decontamination procedures are required (Section 12.0). Entry and exit from the work area will be made at this opening in order to control potential sources of contamination and leave contaminated soil and debris in the work area.

At the end of the shift, all boring/sampling holes and excavations must be covered or otherwise secured. All cuttings and decontamination fluids are to be handled in accordance with relevant regulations and instructions from the PM.

The PM, Site Manager or SSO will evaluate an upwind evacuation area prior to each shift, and personnel will be notified of its location. A horn or other signaling device will be used to signal an evacuation in the event of an emergency. Three blasts of the horn will be the signal to immediately stop work and proceed to the evacuation area.

The SSO will implement the proper traffic control procedures as outlined in SOPUS Program Guide for AECOM Appendix 11.22 and AECOM SMS 32 documents.

The SSO will see that Site visitors sign the visitors' log and that personnel and Site visitors who enter the work area do so only after presenting evidence of both their participation in a medical surveillance program and completion of health and safety training programs that fulfill the requirements of this plan.

The SSO will provide Site hazard and emergency action information to Site visitors before they enter the Site. This can be done by providing a copy of this HSP to the visitor.

11.2 WORK ZONES

Work zones must be established as described below.

- ◆ Exclusion Zone – a 25 foot (as practical) circle around the work area will be defined before work starts. The encircled area will constitute the “Exclusion Zone”. This zone is where potentially hazardous contaminants and physical hazards to the workers will be contained. Appropriate personal protection as described in Section 1.0 will be required in this area. Plastic sheeting (visqueen) and/or tarps may be used as necessary to control contaminated materials spilled to the ground during Site operations. The size of the Exclusion Zone may be altered to accommodate Site conditions and to ensure contaminant containment.
- ◆ Contamination Reduction Zone (CRZ) – a corridor leading from the Exclusion Zone will be defined, and will lead from the work area to a break area. All decontamination activities will occur in the CRZ. A waste container will be placed at the end of the

corridor so contaminated disposable equipment can be placed inside and covered. Surface/soil contamination in this area should be controlled using plastic sheeting. No AECOM/AECOM personnel or Site visitors will be permitted into the Contamination Reduction Zone or Exclusion Zone unless they are in full compliance with the requirements of this Plan.

- ◆ Support Zone – a Support Zone, the outermost part of the Site, must be defined for each field activity. Support equipment is located in this uncontaminated or clean area. Normal work clothes are appropriate within this zone. The location of this zone depends on factors such as accessibility, wind direction (upwind of work area), and resources (i.e., roads, shelter, utilities).

See also Signs, Signals, and Barricades, SMS 88.

12.0 DECONTAMINATION PROCEDURE

12.1 SANITATION

Potable water will be made available at the Site, either from a pressurized source or commercially available bottled water. Drinking cups will be supplied so personnel will neither drink directly from the source of water nor have to share drinking cups. Sources of non-potable water shall be clearly labeled as such.

Unless toilet facilities are available on Site or transportation is readily available to transport personnel to nearby (within five minutes) toilet facilities, portable toilet facilities, such as chemical toilets, will be provided on Site.

Washing facilities will be provided on Site, and will be located in the decontamination area or the support area. Soap, clean water, wash basins and single-use towels will be available for personnel use.

AECOM's procedures for Site sanitation are located in SMS 30, a copy of which is to be maintained on Site.

12.2 DECONTAMINATION OF PERSONNEL

Remove all equipment, sample containers, and notes from the CRZ. Obtain decontamination solutions and decon tools (shovels, auger flights, etc.) by brushing them under a water rinse. A high-pressure steam cleaner may also be used for decon. All waste and spent decon solutions will be properly contained

12.2.1 Decontamination Procedures for Level C PPE

1. Scrub boots with a stiff bristle brush and water. Washtubs and chairs will be provided.
2. Remove outer gloves (and boot covers, if used).
3. Remove Tyvek[®] coverall; discard in provided container.
4. Remove hardhat and eye protection.
5. Remove respirator.
6. Remove inner gloves.
7. Wash hands and face.

The decontamination area will be covered with plastic sheeting, which will be replaced when torn or heavily soiled, and at the end of each shift.

Each worker will be responsible for cleaning, sanitizing and storing their own respirator in accordance with manufacturer's guidance (i.e., washing in warm water and detergent or sanitizing solution, air drying, and storing in a plastic storage bag; see Sections 10.6 and 10.8. Cartridges will be changed in accordance with the procedures described in Section 10.4.

All spent decontamination fluids (rinse waters, etc.) shall be handled as directed by the PM and in accordance with relevant regulations.

12.2.2 Decontamination Procedures for Level B PPE

The following decontamination procedure will be used when Level B protective gear is required. A decontamination assistant, using PPE as described in Section 9.0, will be present to assist in Level B decon.

1. Remove all monitoring equipment, sample containers, and notes to the CRZ. The decontamination helper will obtain decontamination solutions and decon the equipment as necessary.
2. Scrub boots and gloves with a stiff bristle brush and decontamination solution. Rinse with water. Washtubs and chairs will be provided.
3. Remove tape from around wrist and ankles.
4. Remove outer Nitrile gloves and PVC boot covers.
5. Wash gross contamination from disposable protective suit.
6. Remove chemical protective boot.
7. Remove five-minute escape pack or SCBA backpack.
8. Remove outer disposable coverall taking care not to touch the outside of the garment; discard in provided container.
9. Remove hardhat and eye protection (place in bin to be decontaminated).
10. Rinse inner gloves.
11. Remove respirator facepiece.
12. Remove inner surgical latex gloves; discard in provided container.
13. Remove Vortex cooler (if used).
14. Wash hands and face in soapy water and rinse with potable water.

12.3 DECONTAMINATION – MEDICAL EMERGENCIES

In the event of physical injury or other serious medical concerns, immediate first aid is to be administered in lieu of further decontamination efforts.

12.4 DECONTAMINATION OF TOOLS

When work activities have been completed, contaminated tools used by personnel will be either appropriately decontaminated or properly disposed of as hazardous waste.

It is expected that tools will be constructed of non-porous, non-absorbent materials. This will aid the decontamination process. Any tool, or part of a tool, which is made of a porous/absorbent material will be discarded and disposed of as a hazardous waste if it cannot be properly decontaminated.

Tools will be placed on a decontamination pad or into a bucket and thoroughly washed using a soap solution and brushing, followed by a fresh water rinse. All visible particles are to be removed before the tool is considered clean.

12.5 DECONTAMINATION OF HEAVY EQUIPMENT

At locations where it is likely that heavy equipment will come in contact with contaminated material, such heavy equipment should be decontaminated prior to leaving the contamination reduction zone.

Partial decontamination efforts can be conducted in the exclusion zone. As much mud, dirt, rocks, etc., as possible will be mechanically removed from the tires, tracks, auger flights, or outside of the equipment.

The heavy equipment can then be moved onto a decontamination pad located in the contamination reduction zone adjacent to the exclusion zone. The pad should be constructed in a manner that will permit wash and rinse fluids to be contained and collected; heavy gauge plastic sheeting and sandbags can be used for this purpose, and a suction device used to collect liquids. A high pressure, steam cleaner may be used to wash down heavy equipment. Personnel performing this task are to wear the PPE prescribed for the Decontamination Assistant.

Following the washing, the heavy equipment can be driven into the support zone.

Under no circumstances should heavy equipment be allowed to leave the Site if it is not decontaminated.

13.0 SAFE WORK PRACTICES

13.1 GENERAL

1. Anyone at anytime is authorized to stop work, if work practices appear unsafe.
2. Eating, drinking, chewing gum or tobacco, and smoking are prohibited in the contaminated or potentially contaminated area or where the possibility for the transfer of contamination exists.
3. Personnel will enter designated work areas only through the contamination reduction zone (CRZ). Personnel leaving an exclusion/work zone must exit through the CRZ and pass through the decontamination station as described in Section 12.0.
4. Personnel will wash their hands and face thoroughly with soap and water prior to eating, drinking or smoking.
5. Avoid contact with potentially contaminated substances. Do not walk through puddles, pools, mud, etc. Avoid, whenever possible, kneeling, leaning or sitting on contaminated surfaces. Do not place monitoring equipment on potentially contaminated surfaces (i.e., ground, etc.)
6. Field crew members should make use of their senses to alert them to potentially dangerous situations in which they should not become involved (i.e., presence of strong, irritating or nauseating odors).
7. Only those vehicles and equipment required to complete work tasks should be permitted within the exclusion/work zone (drill rigs, excavators, and similar items). All non-essential vehicles should remain within the support zone.
8. Containers, such as drums, will be moved only with the proper equipment and will be secured to prevent dropping or loss of control during transport.
9. Field survey instruments, such as PIDs, should be covered with plastic or similar covering to minimize the potential for contamination.
10. No matches or lighters will be permitted in the work area/exclusion zone or contamination reduction zone.
11. Contaminated protective equipment, such as respirators, hoses, boots, and disposable protective clothing, will not be removed from the work area/exclusion zone or decontamination area until it has been cleaned, or properly packaged and labeled.
12. Prevent, to the extent possible, spills. In the event that a spill occurs, contain liquid if possible.
13. Prevent splashing of the contaminated materials.
14. Field crewmembers shall be familiar with the physical characteristics of the Site operations including:
 - Wind direction in relation to the contaminated area;
 - Accessibility to equipment and vehicles;
 - Areas of known or suspected contamination;
 - Site access; and
 - Nearest water sources.

15. The number of personnel and equipment in the exclusion zone should be minimized but only to the extent consistent with workforce requirements of safe Site operations.
16. All wastes generated during AECOM and/or subcontractor activities at the Site will be disposed of as directed by the PM.
17. All personal protective equipment will be used as specified and required.
18. The buddy system will be used at all times when performing sampling for hazardous material when the first action level criteria have been exceeded or when working in remote areas.
19. Personnel are to immediately notify the SSO or Site Manager if any indications of potential explosions or unusual conditions are observed.

13.2 SAMPLING PRACTICES

For sampling activities, the following standard safety procedures shall be employed:

1. Sampling equipment should be cleaned before proceeding to the Site.
2. At the sampling Site, sampling equipment should be cleaned after each use.
3. Work in “cleaner” areas should be conducted first where practical.
4. Unauthorized personnel will remain outside exclusion zones at all times.

13.3 SAMPLE SHIPMENT/HAZARDOUS MATERIALS SHIPMENT

If samples to be collected during the course of this project fall under the criteria that defines them as hazardous materials under DOT regulations 49 CFR Parts 171-177 (see AECOM guidelines for evaluation), then they must be shipped in accordance with those regulations by an individual who is certified as having been Function-Specific trained as required under the DOT regulations. See also SMS 48.

14.0 EMERGENCY RESPONSE PLAN

It is AECOM's policy to evacuate personnel from areas involved in hazardous material emergencies and to summon outside assistance from agencies with personnel trained to respond to the specific emergency. If such a request is made, it should be accommodated as feasible, taking care to shut down equipment as necessary. This section outlines the procedures to be followed by personnel in the event of a Site emergency. These procedures are to be reviewed during the onsite safety briefings conducted by the SSO. See SMS 3.

In the event of a fire or medical emergency, the emergency numbers identified in Section 1.0 (page 1-1) can be called for assistance.

14.1 PLACES OF REFUGE

In the event of a Site emergency requiring evacuation, all personnel will evacuate to a pre-designated area located a safe distance from any health or safety hazard (typically the Site office, unless conditions dictate otherwise) and safely away from the area of influence. The SSO will designate a primary assembly area prior to the start of work each day. The daily pre-designated assembly area may have to be re-designated by the SSO in the event of an emergency where the area of influence affects the primary assembly area. Once assembled, the SSO shall take a head count. The SSO will evaluate the assembly area to verify that the area is outside the influence of the situation; if not, the SSO will redirect the group to a new assembly area where a new head count will be taken.

During any Site evacuation, employees shall be instructed to observe wind direction indicators. During evacuation, employees will be instructed to travel upwind or crosswind of the area of influence. The SSO will provide specific evacuation instructions to Site personnel regarding the actual Site conditions.

14.2 FIRE

AECOM's fire prevention procedures are described in SMS 14, a copy of which is to be maintained on Site. To protect against fires, the following special precautions must be taken:

- ◆ Before any flame-producing devices, i.e., cutting torches or welding irons, are used in the exclusion zone, the SSO must be contacted. In some cases, the client may require to be contacted as well to evaluate if a hot work permit is required. A detailed observation of the work area will be conducted to evaluate if potential fire sources exist. The fire sources must be removed to at least 35 feet away before work can commence.
- ◆ Two full 20-lb. type ABC fire extinguishers must be located at the work area when cutting/welding is being conducted, and a fire watch will be posted.
- ◆ Upon completion of the cutting/welding activities the area will be observed for hot metal, slag, etc. The fire watch will remain on station for at least 15 minutes after the hot work is completed.

Type ABC fire extinguishers will be available on Site to contain and extinguish small fires. The local or facility fire department shall be summoned in the event of any fire on Site.

14.3 COMMUNICATION

A communication network must be set up to alert Site personnel of emergencies and to summon outside emergency assistance. Cell phone will be the primary communication means on the site. Where voice communication is not feasible an alarm system (i.e., sirens, horns, etc.) should be set up to alert employees of emergencies. Radio communication may also be used to communicate with personnel in the exclusion zone. Where phone service is not readily available, radios or portable phones should be used to communicate with outside agencies. Site personnel should be trained on the use of the Site emergency communication network. Emergency phone numbers shall be posted at the phone or radio used for outside communication. The SSO is responsible for establishing the communication network prior to the start of work, and for explaining it to all Site personnel during the Site safety briefing.

In the event of an emergency, personnel will use the following hand signals where voice communications are not feasible:

<u>Signal</u>	<u>Definition</u>
Hands clutching throat	Out of air/can't breathe
Hands on top of head	Need assistance
Thumbs up	OK/I'm alright/I understand
Thumbs down	No/negative
Arms waving upright	Send back support
Grip partner's wrist	Exit area immediately

14.4 EMERGENCY RESPONSE PROCEDURES

14.4.1 Emergency Response Team

The emergency response team will consist of employees who assume the following roles:

- ◆ Emergency Care Provider(s)
 - Provide first aid/CPR as needed.
 - Communicator: Site Manager, SSO or Senior Oversight
 - The role of the communicator is to maintain contact with appropriate emergency services, providing as much information as possible, such as the number injured, the type and extent of injuries, and the exact location of the accident scene. The communicator should be located as close to the scene as possible in order to transmit to the emergency care providers any additional instructions that may be given by emergency services personnel in route.
- ◆ Site Manager/Supervisor: Robert Ponce (Senior Oversight – alternate)
 - The Site Manager and/or SSO should survey and assess existing and potential hazards, evacuate personnel as needed, and contain the hazard. Follow up responsibilities include replacing or repairing damaged equipment, documenting the incident, and notifying appropriate personnel/agencies described under incident

reporting. It also includes reviewing and revising Site safety and contingency plans as necessary.

In the event of an emergency, notify Site personnel of the situation. Survey the scene to evaluate if the situation is safe, to evaluate what happened, and to search for other victims. The Emergency Response Checklist can be used to help remember the things to do in an emergency.

EMERGENCY RESPONSE CHECKLIST

In an Emergency	Yes	No
Confirm the reported incident	_____	_____
Evacuate and secure the area	_____	_____
Render first aid/emergency medical care	_____	_____
Notify promptly:		
Project Manager	_____	_____
Fire Department	_____	_____
Police Department	_____	_____
Nearest Hospital or Medical Care Facility	_____	_____
Start Documentation	_____	_____
If spill or leak occurs:		
Don the proper PPE	_____	_____
Stop the source	_____	_____
Contain the spill	_____	_____
Clean up the spill	_____	_____
Upon evacuating, take attendance at the assembly area	_____	_____
Authority given:		
Leave the Site	_____	_____
Restart the operations	_____	_____
Debrief and document the incident	_____	_____
A copy of the document submitted to the ASM	_____	_____

14.5 MEDICAL EMERGENCY RESPONSE PLAN

At least one AECOM employee on Site will hold a current certificate in American Red Cross Standard First Aid. This training provides six and one-half hours of Adult CPR and Basic First Aid. Persons with injuries that are not particularly serious or life threatening should be escorted to the nearest occupational health clinic or urgent care facility, if feasible. See SMS 65 for additional information. If a medical emergency exists, consult the emergency phone number list and request an ambulance immediately. Perform First Aid/CPR as necessary, stabilize the injured, decontaminate if necessary, and extricate only if the environment they are in is dangerous or unsafe and ONLY if the rescuers are appropriately protected for potential hazards they may encounter during the rescue. When emergency services personnel arrive, communicate first aid activities that have occurred. Transfer responsibility for care of the injured/ill to the emergency services personnel.

The following items and emergency response equipment will be located within easy access at all times:

- ◆ First Aid Kit and Infection Control Kit;
- ◆ Eyewash – A 15-minute eyewash (required if corrosives are present or concrete is mixed or poured) will be available on Site for flushing foreign particles or contaminants out of eyes. The SSO will demonstrate the proper operation of the unit(s) prior to the start of work;
- ◆ Emergency Phone Numbers List; and
- ◆ Portable radios for emergency communications in remote areas.

Drugs, inhalants, or medications shall not be included in the First Aid Kit.

14.6 INCIDENT/NEAR MISS REPORTING

Site injuries, illnesses, and incidents must be reported to the SSO and PM immediately following first-aid treatment. Definitions of “incidents” and initial notification requirements are described in Section 5.0 of the SOP ES Contractor HSE Program document. Work is to be stopped until the PM or SSO and ASM have evaluated the cause of the incident and have taken the appropriate action to prevent a reoccurrence. Any injury or illness, regardless of severity, is to be reported to the ASM on the incident report form (SMS 49-1). Near misses are also reported on SMS 49-1, or for AECOM reporting purposes, near misses, as well as safety observations, may also be submitted electronically via the “Near Miss/Safety Observation” database on the HSE website. .

- ◆ **Incident/Accident:** Any occupational injury or illness; or any unintentional or undesirable release of a chemical or petroleum product from its designed container, tank, pipeline, hose, dispenser, pump, or other transfer equipment that occurs on or from SOPUS owned, previously owned, leased, or contracted property or equipment; or damage to SOPUS property or equipment.
- ◆ **Lesson Learned:** Defined as an accident or incident which did not result in, but had the potential to cause an injury, illness, property damage, or other loss resulting in a regulatory warning.

14.7 OPERATION SHUTDOWN

If known or possible hazardous situations are present, or if work tasks are unclear, any project member may request that site operations be temporarily suspended while the underlying hazard is corrected or controlled. All project members are encouraged to exercise “stop work” authority as part of applying principles of the behavior based safety culture. If the situation is related to emissions, during operation shutdown, all personnel will be required to stand upwind to prevent exposure to fugitive emissions. The SSO will have ultimate authority for operations shutdown and restart.

14.8 SEVERE WEATHER SHUTDOWN

If performing outdoor activities, check for any potential severe weather that may impact the location and identify shelter areas that are available. If performing outdoor activities and thunder is heard or lightning is seen, take cover immediately in a safe location including a building or vehicle. Do not stay in (or on) convertibles, golf carts, riding mowers, open cab construction equipment or the like. Remain in the safe location until at least 30 minutes after the last thunder clap is heard. The SSO will have ultimate authority for operational shutdown and restart.

Additionally, earthquakes can trigger tsunamis; if an earthquake is felt, information should be sought concerning if there could be any site impacts.

14.9 SPILL OR HAZARDOUS MATERIALS RELEASE

Small spills are immediately reported to the SSO and are dealt with according to the chemical manufacturer’s recommended procedures found on the MSDS. Steps will be taken to contain and/or collect small spills for approved storage and disposal.

In the unlikely event of a larger release of hazardous materials as a result of Site activities, Site personnel will evacuate to the pre-designated assembly area. The local Designated Emergency Response Authority (DERA) will be notified by the SSO immediately and appropriate actions will be taken to protect the public health and mitigate the contaminant release. The DERA can be reached through the local police or fire department. The Site Safety Officer or Site Manager will make the following emergency contacts:

AECOM Project Manager

Christian Osterberg (714) 689-7316 or (714) 227-1363

SOPUS Project Contact

Douglas Weimer (310) 816-2043 or (703) 403-6790
(cell)

Cal OES (if RQ exceeded or significant release threat) (800) 852-7550

EPA Response Center (depending if RQ is exceeded) (800) 424-8802

15.0 TRAINING, MEDICAL SURVEILLANCE, SITE INSPECTIONS

15.1 TRAINING AND MEDICAL SURVEILLANCE

Site personnel will have met the requirements of 29 CFR 1910.120(e)/8 CCR 5192(e), including:

- ◆ Forty hours of initial off-Site training or its recognized equivalent
- ◆ Eight hours of annual refresher training (as required);
- ◆ Eight hours of supervisor training for personnel serving as Site Safety Officers; and
- ◆ Three days of work activity under the supervision of a trained and experienced supervisor.

AECOM Site personnel are participating in medical surveillance programs that meet the requirements of 8 CCR 5192(f). Current copies of training certificates and statements of medical program participation for AECOM personnel are maintained by the local AECOM offices. Short service employees (SSEs) will be mentored in the field by experienced personnel for a period of six months unless a variance has been granted by the employee's supervisor (see SMS 78 for additional information). Contractor personnel are to provide evidence of their training and medical clearance to the PM or SSO prior to the start of field work.

In addition, Site personnel will review this HSP and sign a copy of the Safety Plan Compliance Agreement, which is found in Attachment B. The PM will maintain these agreements at the Site, and place them in the project file at the conclusion of the operation.

Prior to the start of operations at the Site, the SSO will conduct a Site safety briefing, which will include personnel involved in Site operations. At this meeting, the SSO will discuss:

- ◆ Contents of this HSP;
- ◆ Types of hazards at the Site and means for minimizing exposure to them;
- ◆ The type of monitoring that will be performed;
- ◆ Action levels for upgrade and downgrade of personal protective equipment;
- ◆ Personal protective equipment that will be used;
- ◆ AECOM's Injury and Illness Prevention Program;
- ◆ Site-specific SOPUS procedures or requirements;
- ◆ Site-specific respiratory protection requirements;
- ◆ Decontamination protocol;
- ◆ Site control measures, including safe operating practices and communication;
- ◆ Location and use of emergency equipment; and
- ◆ Evacuation signals and procedures.

Site personnel, including subcontractor personnel, are to attend the briefings and sign the briefing form.

Subsequent Site safety briefings will be conducted at least daily, or whenever there is a change in task or significant change in task location. Briefings will also be conducted whenever new personnel report to the Site.

For each briefing, the SSO will complete a Daily Tailgate Meeting and Work Clearance Form (see Attachment C); these are to be maintained in the project file.

15.2 DAILY TASK HAZARD ANALYSIS

The AECOM Site Manager or Site Safety Officer is to conduct a daily review and update of the THAs prior to the start of each shift and document on the Daily Tailgate Meeting and Work Clearance Form found in Attachment C. The purpose of the THA process is to identify the steps in the tasks that will be performed, the respective hazards, and methods to eliminate or control the hazards. The THA will be updated during the shift if new or different tasks or unanticipated hazards are encountered, or if the control measures are inadequate.

The completed forms are to be maintained on Site until the completion of the project, at which time they are to be placed in the project files.

15.3 BEHAVIOR BASED SAFETY OBSERVATIONS

A behavior based observation is to be made at least once a week or every 200 hours (whichever results in the greater number of observations) using the form SMS 72-1. Observations may be made by the SSO, PM, other Site employees, or subcontractors. Completed forms are intended to be used to spot trends and serve as an aid for health and safety briefings to communicate both positive work practices and areas in need of improvement. See SMS 72 for additional information. Besides submittal to Shell, safety observations (as well as near misses) are to be submitted electronically to AECOM via the "Near Miss/Safety Observation" database located on the SHE website homepage.

15.4 REGULATORY INSPECTIONS

In the event of a regulatory inspection, such as Cal/OSHA, Cal/EPA RWQCB, or City Government, AECOM will verify the identification of the inspector and then notify the Office SHE Representative/ASM and Project Manager. Following the opening conference with the inspector, the inspector will be escorted to the areas of interest and notes and photographs will be taken. Answer all questions truthfully and do not speculate or admit guilt. Following the closing conference, notifications to the OSR, ASM, and Project Manager will be made. Additional detail concerning the regulatory inspection process, notifications, and AECOM policy is included in SMS 1.

16.0 RECORDKEEPING

The PM and SSO are responsible for Site recordkeeping. Prior to the start of work, they will review this plan; if there are no changes to be made, they will sign the approval form (PM) or acceptance form (SSO) and maintain in the project file.

AECOM personnel will review the HSP and sign the Safety Plan Compliance Agreement in Attachment B; copies of these forms will be maintained in the project file as noted in Section 15.0.

The SSO will conduct a Site Safety Briefing or Tailgate Meeting in accordance with Section 15.0 and have attendees sign the Daily Tailgate Meeting and Work Clearance Form in Attachment C; copies will be maintained in the project file.

Any incident, exposure, or near miss incident will be investigated (per SMS 49) and the completed form will be forwarded to incidentreport@urs.com and the ASM.

Instrument readings and calibrations, PPE use and changes, health and safety-related issues, and deviations from or problems with this HSP will be recorded in the field log.

Attachment A
Health Clinic Route Map
Hospital Route Map
Site Map

Map to US Health Works – Occupational Clinic
2499 S. Wilmington Avenue, Compton, CA 90220

Total Travel Estimate: **11 minutes** / **5.93 miles**
Hours: 7am – 7pm
Start: 24700 Neptune Ave., Carson, CA 90745



1. Start out going SOUTH on NEPTUNE AVE toward E 248TH ST. 0.2 mi



2. Turn LEFT onto E LOMITA BLVD. 0.7 mi

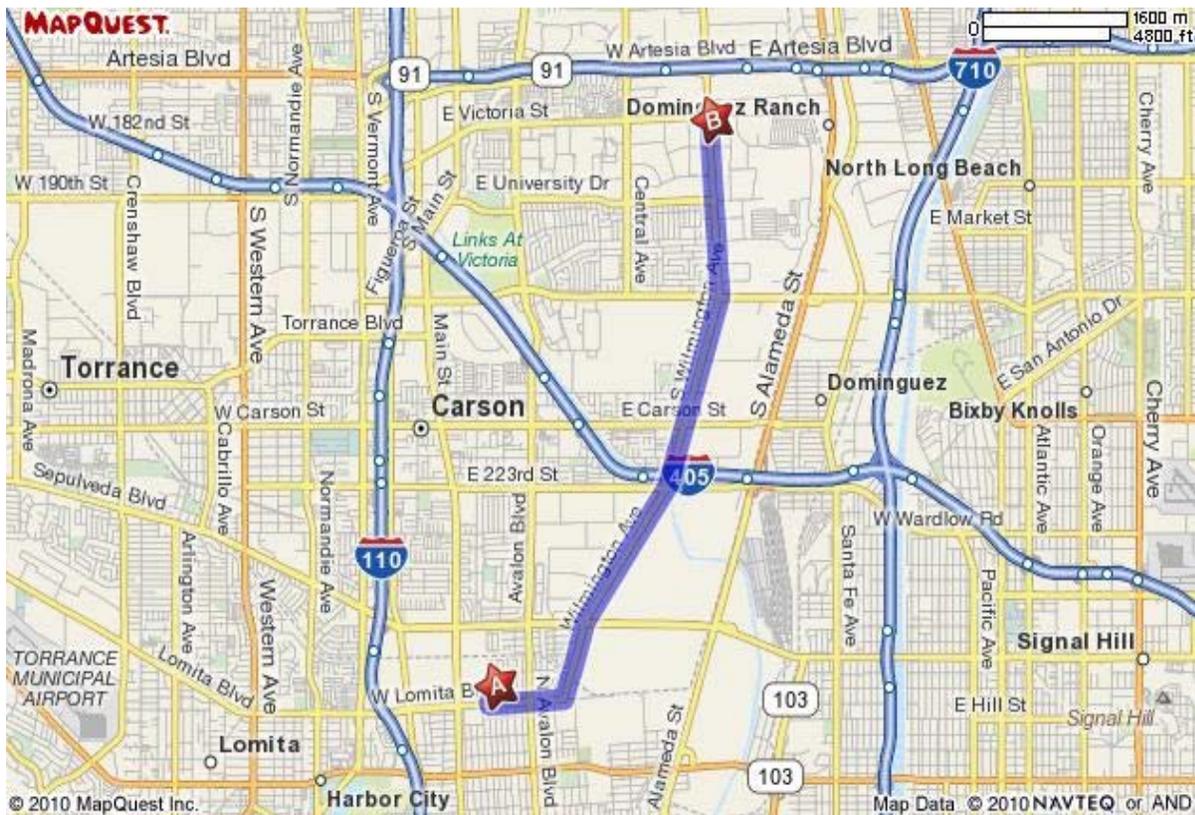


3. Turn LEFT onto WILMINGTON AVE. 5.1 mi



4. 2499 S WILMINGTON AVE. is on the LEFT

End: 2499 S Wilmington Ave, Compton, CA 90220



Map to Los Angeles County Harbor-UCLA Medical Center – Emergency Hospital
1000 W. Carson Street, Torrance, CA 90502

Total Travel Estimates: **8 minutes** / **3.57 miles**

Start: 24700 Neptune Ave., Carson, CA 90745



1. Start out going SOUTH on NEPTUNE AVE toward E 248TH ST. 0.2 mi



2. Turn RIGHT onto E LOMITA BLVD. 0.7 mi



3. Turn RIGHT onto FIGUEROA ST. 0.7 mi



4. Turn LEFT onto W SEPULVEDA BLVD. 0.4 mi



5. Turn RIGHT onto S VERMONT AVE. 1.5 mi

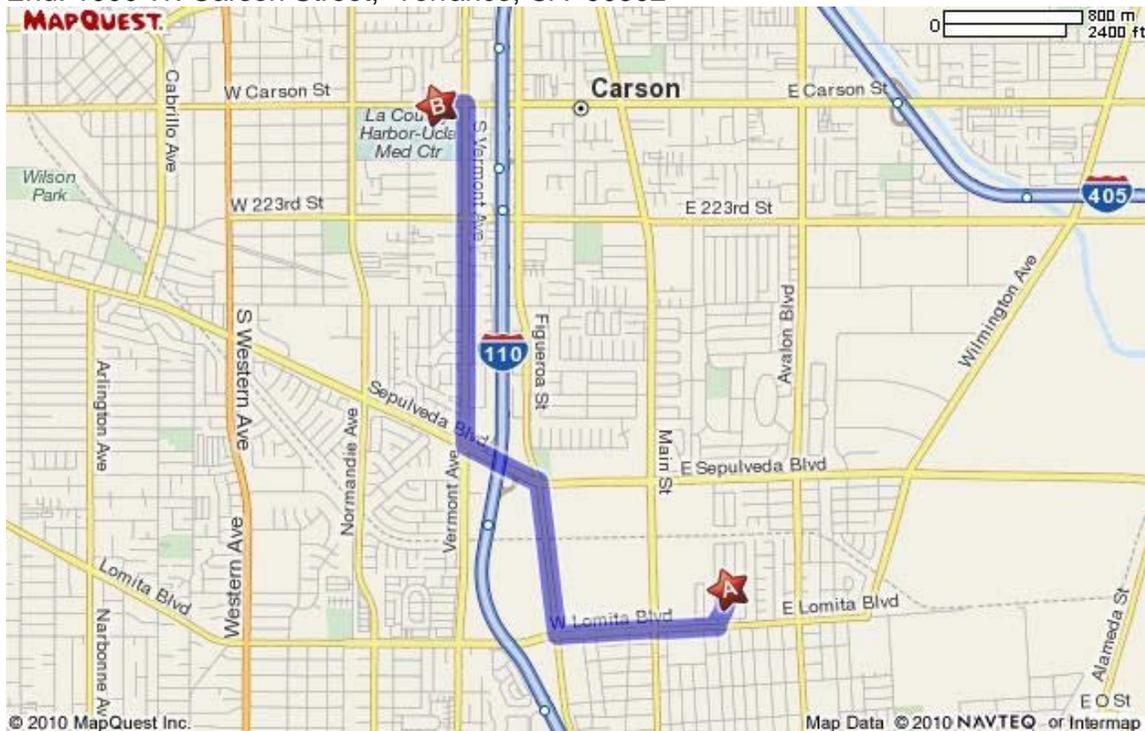


6. Turn LEFT onto W CARSON ST. 0.1 mi



7. 1000 W CARSON ST is on the LEFT.

End: 1000 W. Carson Street, Torrance, CA 90502



Attachment B
Safety Plan Compliance Agreement
(Also included in CD)

ATTACHMENT B
MEDICAL EMERGENCY CONTACT SHEET AND
SAFETY PLAN COMPLIANCE AGREEMENT FORM

FORMER KAST PROPERTY
CARSON, CALIFORNIA

I, _____ have received a copy of the Health and Safety Plan for this Project. I have reviewed the plan, understand it, and agree to comply with all of its provisions. I understand that I could be prohibited from working on the project for violating any of the health and safety requirements specified in the plan.

SIGNED: _____
Signature Date

Firm: _____

This brief Medical Emergency Contact Sheet will be kept in the Support Zone during Site operations. It is in no way a substitute for Medical Surveillance Program requirements. This data sheet will accompany injured personnel when medical assistance or transport to hospital facilities is necessary.

Emergency Contact: _____ Phone #: _____

Relationship: _____

Do you wear contact lenses? _____

Attachment C

**AECOM-Shell Daily Tailgate Meeting and Work Clearance
Form**

(Also included in CD)



AECOM Shell SGW (US)
Daily Tailgate Meeting & Job Clearance Form

Issue: January 2, 2011
Revision 9: March 4, 2014

Do NOT pre-populate any field.

Job Location:		Date:	
AECOM Site Supervisor:		AECOM Project Manager:	

List activities to be performed today:	
Permitted Activities (specific permit to be completed):	<input type="checkbox"/> Not Applicable <input type="checkbox"/> Confined Space Entry <input type="checkbox"/> Excavation/Trenching <input type="checkbox"/> Hot Work <input type="checkbox"/> Hoisting/Rigging (<u>any</u> lifting with equipment, excluding drill rigs) <input type="checkbox"/> Natural Gas System Maintenance

Muster Point:		Spill Kit Location:	
First Aid Kit Location:		Fire Extinguisher Location:	
Emergency cut-off switches:		Designated cell phone use area(s):	

Has the Site Manager/Owner been notified of our activities and/or participated in a pre-work site walk?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Is a fuel delivery scheduled for today?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Have all personnel reviewed and understand the site specific HASP?	<input type="checkbox"/> Yes <input type="checkbox"/> No*
Does each activity have a Task Hazard Analysis (THA)?	<input type="checkbox"/> Yes <input type="checkbox"/> No*
Does each subcontractor have THAs for their activities?	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A
Have THAs been reviewed by all affected personnel on-site?	<input type="checkbox"/> Yes <input type="checkbox"/> No*
Has a site walk been performed to identify additional hazards?	<input type="checkbox"/> Yes <input type="checkbox"/> No*
Have any newly identified hazards been documented on the THA?	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A
Have all members of the work team confirmed understanding of the work, hazards, and controls/ mitigation?	<input type="checkbox"/> Yes <input type="checkbox"/> No*
Has each person on the work team discussed all hazards and mitigation measures associated with any task which will require their feet to leave the ground?	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A
Have work areas been properly cordoned-off to protect workers, site staff, and the public?	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A
Have equipment checks been completed, documented, and reviewed?	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A
Have there been any equipment modifications made by subcontractor(s)? If yes, discuss modifications.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Do all members of the work team have API Safety Keys (AECOM excluded)?	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A
Do all members of the work team have a Shell "Life Saving Rules" Training card?	<input type="checkbox"/> Yes <input type="checkbox"/> No*
Do all site workers understand injury/ intervention reporting requirements including immediately notifying the AECOM Site Supervisor of any injury near miss, unsafe condition or hazard observation?	<input type="checkbox"/> Yes <input type="checkbox"/> No*
If permits are required, have they been reviewed and permit conditions understood by the Team?	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A
If drilling, did driller physically point out all pinch points to entire team (AECOM and all subs)?	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A
If drilling, has the driller & crew agreed the audible and visible signals for "all clear" prior to engaging controls?	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A

* If No, then work cannot be performed until corrective action is completed and documented.

Title of AECOM THAs reviewed today:		Title of Subcontractor's THAs reviewed today:	
-------------------------------------	--	---	--

All personnel are wearing (regardless of activity):	<input type="checkbox"/> Hard Hat <input type="checkbox"/> Safety Glasses <input type="checkbox"/> Safety Vest <input type="checkbox"/> Steel-Toed Boots <input type="checkbox"/> Gloves (appropriate for task) See THA for additional task specific PPE requirements.
---	---

Other Items Discussed Today:	Stop Work Authority & Obligation
	<p>* All employees will stop the job any time anyone is concerned or uncertain about safety.</p> <p>* All employees will stop the job if anyone identifies a hazard or additional mitigation not recorded on the THA.</p> <p>* All employees will be alerted to any changes in personnel or conditions at the worksite.</p> <p>* All employees will stop the job and reassess a task, hazards, and mitigations, and then amend the THA as needed.</p>





AECOM Shell SGW (US)
Daily Tailgate Meeting & Job Clearance Form

Issue: January 2, 2011
Revision 9: March 4, 2014

Do NOT pre-populate any field.

SITE WORKERS (including AECOM Contractors and Subcontractors): By signing here, you are stating the following:

- * You have been involved in reviewing the THAs and understand the hazards and control measures associated with each task you are about to perform.
- * You understand the permit to work requirements applicable to the work you are about to perform (if it includes permitted activities).
- * You understand the Shell Life Saving Rules and are aware that tasks or work that is not risk-assessed shall not be performed.
- * You are aware of your authority and obligation to 'Stop Work'.

I arrived and departed fit for duty:

- * You are physically and mentally fit for duty,
- * You are not under the influence of any type of medication, drugs, or alcohol that could affect your ability to work safely.
- * You are aware of your responsibility to immediately report any illness, injury (regardless of where or when it occurred), or fatigue issue you may have to the AECOM Site Supervisor.
- * You will sign-out uninjured unless you have otherwise informed the AECOM Site Supervisor.

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

(Attach additional Site Worker sign-in/out sheets if needed)

PERSONAL SAFETY COMMITMENT (Attach additional Personal Safety Commitment sheets, if needed)

Print Name	"I will personally commit to do the following to positively improve site safety today":

SITE VISITORS (attach additional Site Visitor sign-in/out sheets if needed)

Print Name	Company Name	Arrival Time	Departure Time	Signature

SITE REPRESENTATIVE Sign In/Out (operating sites only, and signature must be requested. If the operator refuses to sign, note this on the Form)

Sign In: I have discussed this Job Clearance Form with the contractor		Sign Out: I have discussed this Job Clearance Form with the contractor	
Site Representative Name	Site Representative Signature	Site Representative Name	Site Representative Signature

TWILIGHT TOOL BOX TALK (Complete the following once field activities for the day have been concluded):

Were there any Incidents, Near Misses, Potential Incidents, or Positive Interventions today?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If yes, provide details:
Were there any 'Stop Work' interventions?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If yes, provide details:
Were there any areas for improvement noted?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If yes, provide details:
Is the Site Manager/Owner happy with the way you left the site (including the location of waste drums and/or equipment)?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If no, provide details:
I certify that the above information is true and the job site is being left in a safe condition	<input type="checkbox"/> Yes <input type="checkbox"/> No	AECOM Site Supervisor Signature:

Attachment D
Shell Oil Products US Forms
(Also included in CD)

ES Pre-Construction/Pre-Job Planning Checklist

HSE Information Discussed

- _____ Environmental Services HSE Policies and Procedures
- _____ HSE Responsibilities for Contractor
- _____ Accident/Incident Reporting and Investigation Procedures and Forms
- _____ HSE Meetings
- _____ Emergency Plan & Procedure
- _____ Security and Access Procedures
- _____ Housekeeping
- _____ Powered Equipment (Trucks, Cranes, Forklifts, etc.) Inspection
- _____ HSE Inspections
- _____ Industrial Hygiene Monitoring
- _____ PPE Requirements
- _____ Work Authorization / Permitting (agency permits, building, etc.)
- _____ Substance Abuse/Drug/Alcohol/Firearm Prohibitions
- _____ Chemical & Material Hazards
- _____ Electrical Safety (Grounding plan, classification areas, tool/equipment condition, site wiring, lock out/tag out)
- _____ Traffic Control Guidelines
- _____ Excavation, Trenching and Shoring Procedures
- _____ Confined Space Entry Procedures and Permitting
- _____ Underground Services Alert
- _____ Site Specific HSE Issues
- _____ Subsurface Investigation Procedures
- _____ Health and Safety Plan Review by all employees
- _____ Advise Contractor to alert ES rep immediately about any HSE concerns

ES Traffic Control Guidelines

Your Company provides remediation work and services at Shell locations (owned and/or divested) and other associated areas (the “site” or “sites”), including without limitation work in or around the shoulder of active roadways. Pursuant to that contract, your company is required to perform the work in accordance with federal, state, and local laws and regulations and other necessary and appropriate requirements, as applicable, to safely perform the work.

Pursuant to the contract, your company is required to develop and implement a site-specific Health and Safety Plan (HASP). This HASP must cover various health and safety topics, including traffic control and safety for the site where your company's workers will be working. This document provides information that should be taken into consideration when you are developing the traffic control provisions of your HASP.

Shell Contractors perform many tasks on site (e.g., groundwater sampling, gauging and bailing monitoring wells, drilling, remediation system installation and O&M, etc.) that place field personnel at increased risk of injury from vehicular traffic, particularly on retail service station sites (active or abandoned), and in, or along the shoulder of, active roadways. Each site and well location must be assessed individually, and the appropriate traffic control measures must be implemented, in accordance with local, state, and federal rules, laws, and regulations as well as the Contractor’s internal policies and procedures. A Contractor, to help develop traffic control measures while performing work on Shell sites, may utilize the following guidelines.

Shell Sites and other “on-site” locations

As there are no lanes marked out for traffic flow through these sites, and numerous entry points onto them, Contractor field personnel (“field personnel”) are vulnerable to traffic from all sides. In order to minimize the risk of being struck by a vehicle while performing tasks on site, field personnel may consider the following guidelines when developing work site traffic control plans:

1. Review the site-specific Health and Safety Plan (“HASP”) for safety and any special traffic control details for the site you will be working on and the tasks you will be performing.
2. Verify that all necessary traffic-control devices for each site to be visited that day are loaded in the vehicles before they leave the office.
3. Wear the appropriate PPE for the work to be performed as indicated in the HASP.
4. Assess the work location for potential traffic exposure. Stay alert at all times since vehicular traffic is often continuous and uncontrolled on Shell sites. Be sure to look at all possible directions from which traffic may approach including the possibility of vehicles backing up. Never assume any potential pathway to be “safe”. Attempt to

- set up the work area on site with field personnel facing/looking toward the highest potential for traffic.
5. Conduct a site pre-job safety meeting; complete the Daily Site Checklist, if included in the HASP, and sign-off on both the checklist and the HASP.
 6. Using the traffic control devices, establish your work zone as per the specifications detailed within the HASP.
 7. Perform all work to be completed within the work zone before breaking down the traffic control system.
 8. Clear the work area and break down the traffic control system.

Work Area Traffic Control Devices/Use

Traffic control devices may consist of items such as:

- Traffic cones
- Flags
- Caution tape
- Other devices such as signs, barricades, amber flashing lights, fencing, etc.

It is recommended that each work area be cordoned off with traffic cones or other traffic control devices as appropriate to site-specific conditions. To increase visibility to vehicular traffic, it is recommended that every other cone have a flag inserted through its middle. Caution tape should be utilized to join all of the traffic control devices such that no one can easily walk through the work area. It is also recommended that work vehicles be used to shield field personnel from traffic hazards when practical.

Work in (or along the shoulder of) Active Roadways

Traffic control in these areas should be managed through development of an appropriate traffic control plan. A traffic control plan specific to the work site should be developed and included in the HASP, prior to performing work in these areas. Local and state requirements should also be consulted for possible permitting or additional traffic control requirements prior to performing any work in these areas.

ES Subsurface Investigation Procedure

While these procedures must be followed, adherence to them does not relieve Contractor of liability or modify any of Contractor's obligations in its agreement with the Company.

The following guidelines shall be followed prior to initiating any subsurface activities (i.e. excavation, trenching, and/or drilling/probing activities (including over-drilling to abandon wells)):

- A. Identify and mark either with paint and/or with stakes the proposed boring locations or the outline of the planned trench or excavation area. Contact public underground utilities locating service (i.e. DIG-TESS™, J.U.L.I.E., etc.) to locate where utilities enter and travel on property or if drilling, trenching and/or excavating offsite, locate offsite utilities. In addition, contacting a private underground utility locating service¹ to locate utilities onsite is required². Subsurface activities may only proceed without utilizing a private underground utility locating service with prior approval from the appropriate Shell Oil Products US (Shell) Environmental Services (ES) Project Manager (PM). All utilities identified by public and private utility locating services shall be illustrated by the site environmental consultant on a site plan for reference during current and/or future subsurface activities. The written consent of off-site property owners (e.g., through an access agreement or right-of-entry agreement) will be required prior to performing any work on non-Company property. Please contact the appropriate Shell ES PM prior to performing work off-site.
- B. This Subsurface investigation procedure shall be made a part of the Site Specific Health & Safety Plan. In addition, the State one call confirmation number and expiration date shall be listed.

Copies of plans or photos showing the locations of underground tanks, lines, utilities, pipelines, etc., are to be requested from facility engineer. If subsurface activities are anticipated in a CRITICAL AREA (as defined in Section F below) and as built drawings cannot be located, contact the UST system and/or leak detection installation Contractor(s) prior to initiation of site subsurface activities to assist in determining the location of onsite underground utilities.

- C. Prior to mobilization to the site, discuss planned subsurface activities with all responsible parties, noting that the exact location of all underground tanks, lines, utilities, etc. may not be known or supplied by the Company.
- D. Subsurface activities are normally **NOT** allowed in any active UST pit or within active product or vent line trenches. The only time subsurface activities are permitted in an active tank pit is during tank maintenance activities or when drilling is conducted through conductor casing that was placed in the tank pit prior to the installation of a new tank system. Other methods of sampling/well installation through an active tank pit should not be considered.

¹ Existing consultants and/or contractors may be utilized as a private utility locator service if locating private utilities is a line of service provided by that company.

² Locating of private utilities is not intended to require the use of geophysical methods (i.e. Ground Penetrating Radar, Infra Red, etc.) unless requested. Appropriate electronic and/or other equipment should be utilized to locate private utilities in proximity to the planned subsurface activities.

E. Prior to any subsurface activity, a tailgate safety meeting with all site personnel shall be conducted to provide clear direction regarding the items listed below. Acknowledgement of attendance at this tailgate meeting shall be documented with an agenda of items discussed and a signatory page.

1. Knowledge of emergency procedures, including location of fuel pumps shut-off switches;
2. No subsurface activities before investigation of subsurface activity locations are conducted as described below;
3. No subsurface activities without consulting geologist present to observe;
4. For drilling activities a slow rate of auger advancement for the initial 10-feet, removing the cutting key in silt, sand and clay soils;
5. If pea gravel or other suspected back fill material is encountered, the following should be conducted:
 - a. Subsurface activities are immediately terminated and a new location for the activity needs to be identified if possible. The same procedures need to be followed for the new location as listed above. Refer to “E” above as starting point.
 - b. Immediately contact the station manager a Shell ES PM and to check on-site Veeder Root ® (or comparable automatic leak detection system) for any detection of a possible product loss due to subsurface activities. Shell ES PM will be responsible for contacting Shell/Motiva Engineering & Maintenance, as needed.
 - c. Remove paving or surface improvement to allow clear visibility of subsurface conditions. Clear pea gravel/fill material using most effective method (e.g. vacuum digging, hand digging) to see if any underground piping or utility was impacted. The boring/excavation should be left open temporarily to observe if any subsurface impact is noticed (i.e. flowing fluids, heavy vapors etc.).
 - d. In the case in which pea gravel or other suspected backfill material cannot be avoided, the subsurface activity location should be considered within a CRITICAL AREA and proceed as described below. For flowing backfill materials such as sand and/or pea gravel, vacuum drilling or another alternative should be considered. **WIRE PROBES SHOULD NOT BE USED UNDER ANY CIRCUMSTANCES.**

F. Subsurface Activity locations are divided into **CRITICAL and NON-CRITICAL AREAS**. CRITICAL AREAS are defined as within 10-feet of the perimeter of the UST pit area, within 10-feet of the drip line of the dispenser/rack canopy³, those areas within 10-feet of product/vent/instrument lines, gas lines, electrical conduits, sewer lines, water supply lines, telecommunications lines, and all areas between the UST pit and the dispensers, between the

³ If a dispenser canopy is not present, then the CRITICAL AREA is defined as extending 10-feet from the proximal edge of a dispenser island.

dispensers/rack and the store/office building and within street utility corridors (typically within a right-of-way easement). For terminals, CRITICAL AREAS will also include any area within a dike area, any area between the above ground storage tanks and the rack and any area between the rack and the office building. Areas outside of the CRITICAL AREAS are NON-CRITICAL AREAS.

1. CRITICAL AREAS (excluding areas within 10-feet of an UST pit)

- a. Use a concrete saw followed by the use of a jackhammer to saw and break through an asphalt or concrete surface cover. The drill bit on the rig or the teeth of an excavator bucket may also be used to auger through or peel back an asphalt cover. However, the drill bit or excavator bucket are **NOT** to be used to auger through and/or provide pressure to break through a concrete cover. Do **NOT** advance bit or mechanical cutting tools beyond the bottom of an asphalt or concrete cover
- b. Use of an evacuating technology such as an air-knife, vacuum excavators, etc. is required to remove enough soil to visually inspect for subsurface utilities/improvements. The Shell ES PM must approve use of an alternative methodology.
 - 1) For soil borings, the soil in the borehole should be excavated to a diameter of at least three inches greater than the diameter of the drill bit on the lead auger or drill stem that is to be used. The borehole shall be advanced to a depth of at least 5-feet below the surface. If pea gravel, fill material, or refusal is encountered, abandon the boring and immediately contact Shell ES PM to discuss new location and follow the directions of Section E5 above. For Soil borings located within 10 feet of a natural gas supply or service line, a casing must be placed into the excavation used to clear the boring prior to advancing the augers or other mechanical drilling equipment. The casing must extend the entire depth of the clearance excavation, be of sufficient strength to prevent deflection of the drilling tools outside of the casing during completion of the soil boring, and must be of sufficient diameter to prevent binding of the drilling tools while advancing them through the casing.
 - 2) For trenching/excavation activities, remove soil in the vicinity of all marked public or private utilities and/or product/vent/instrument lines identified within 10-feet of planned trenching and/or excavation activities to visibly identify the utilities' depth and direction of travel. The depth and direction of utilities running parallel to a trench and/or excavation must be confirmed at a minimum of two locations along the line at an interval no greater than 20-feet. The depth and direction of utilities running perpendicular to a trench and/or excavation must be confirmed on both sides of the trench and/or excavation.
 - i. Exploratory excavations to locate marked utilities must extend vertically until the utility is located or to at least two feet below the depth of the planned trenching/excavation activities, whichever is less.
 - ii. If the utility is not located under the marked area to the specified depth, the clearing activities must continue in a perpendicular direction a minimum of 5-feet in both directions from the original utility mark or to a maximum distance

of 10 feet from the planned excavation area. If the utility is still not located, the utility locating service (private and/or public) must be called to relocate the utility.

- iii. For trenching/excavation activities in CRITICAL AREAS, the contractor is responsible for providing a spotter to aid the trenching/excavation equipment operator in the immediate detection of underground structures or utilities. Personnel performing this activity shall exercise extreme caution.
 - iv. If during trenching/excavation activities, unexpected pea gravel, other type of utility trench fill material, or a subsurface structure/utility is encountered, stop the excavation activity and immediately contact Shell ES PM to discuss new location and follow the directions of Section E5 above that would pertain to excavation activities.
- c. If it is not possible to perform an exploratory boring which meets the diameter requirements as stated in item “b” above, hand auger borings should be installed, to the required depth, surrounding the proposed well/boring location in such a manner that any lines/utilities passing through the proposed well/boring location will be encountered while installing the investigation borings/well. The Shell ES PM must approve the use of hand auger borings.
 - d. If soil samples are required to be collected within the 0-5 feet interval, a hand auger should be utilized only to the extent required prior to using the evacuating technology, to collect native, undisturbed soil samples. The Shell ES PM must approve the use of hand auger borings.
 - e. Drill/probe at least 5-feet away, and perpendicular to, all marked utility lines.
 - f. Following clearance of each boring location and/or confirmation of utilities depth and location, cover the hole(s) with barricades or cones and a sheet of material sufficient in strength to support a person’s weight until it is ready to be drilled or the trenching/excavation activities have been completed. Containerize cuttings as appropriate. If utility clearing for a subsurface activity is conducted the day before (or more) the subsurface activity is conducted, the borehole/utility clearance should be covered with barricades or cones and with a sheet of material sufficient in strength to support a person’s weight. If the borehole/utility clearance is of sufficient size to potentially cause damage to a vehicle if driven over, then the borehole/utility clearance should be covered with a material sufficient in strength to support vehicular weight. In lieu of barricades or cones and a material cover, boring locations may be temporarily backfilled to surface. If a backfill material is utilized, it is important for the material to be flush with the surrounding pavement. For trenching/excavation activities, all utility confirmation excavations must remain open for reference until all trenching/excavation within 10-feet of the identified utility line has been completed.

2. CRITICAL AREAS (within 10-feet of an UST pit)

Investigate and mark all subsurface activity locations before initiating subsurface activity (utility clearances should be conducted prior to drill rig/excavation equipment mobilization) as follows:

- a. Use a concrete saw followed by the use of a jackhammer to saw and break through an asphalt or concrete surface cover. The drill bit on the rig or the teeth on an excavator bucket may also be used to auger through or peel back an asphalt cover. However, the drill bit or excavator bucket are **NOT** to be used to auger through and/or provide pressure to break through a concrete cover. Do **NOT** advance bit or mechanical cutting tools beyond the bottom of an asphalt or concrete cover.
- b. Use of an evacuating technology such as an air-knife, vacuum excavators, etc. is required to remove enough soil to visually inspect for subsurface utilities/improvements. The Shell ES PM must approve the use of alternative methodologies.
 - 1) For Soil borings the soil in the borehole should be excavated to a diameter of at least three inches greater than the diameter of the drill bit on the lead auger or drill stem that is to be used. The borehole shall be advanced to a depth of at least 10-feet⁴ below the surface. If pea gravel, fill material, or refusal is encountered, abandon the boring and immediately contact Shell ES PM to discuss a new location and follow the directions of Section E5 above. For Soil borings located within 10 feet of a natural gas supply or service line, a casing must be placed into the excavation used to clear the boring prior to advancing the augers or other mechanical drilling equipment. The casing must extend the entire depth of the clearance excavation, be of sufficient strength to prevent deflection of the drilling tools outside of the casing during completion of the soil boring, and must be of sufficient diameter to prevent binding of the drilling tools while advancing them through the casing.
 - 2) For CRITICAL AREAS within 10-feet of an UST pit, excavation is not permitted except as allowed in the following:
 - i. For CRITICAL AREAS within 10-feet of an UST pit, trenching will only be allowed in a perpendicular direction between a remediation well (e.g., vapor extraction/sparge point, etc.) to a header trench that is more than 10-feet from the edge of an UST pit. Marked utilities and the potential presence of product lines, electrical conduits, or vent line trenches between the remediation well and a distance of 10-feet from the edge of the UST pit must be cleared to a depth of two feet greater than the planned trench depth with either soft digging (e.g. air knife) and/or manual techniques.

⁴ If the depth to the top of the USTs is unknown, have a fueling/maintenance contractor open a sump to make this determination. If the depth to the top of the USTs is 10 feet or greater, then depth of the utility clearing borehole shall be sufficient to encounter a side of the UST.

- ii. The utility clearance for the remainder of the trenching may follow procedures for either CRITICAL AREAS (excluding areas within 10-feet of an UST pit) or NON-CRITICAL AREAS⁵.
- c. If it is not possible to perform an exploratory boring which meets the diameter requirements as stated in item “b” above, hand auger borings should be installed, to the required depth, surrounding the proposed well/boring location in such a manner that any lines/utilities passing through the proposed well/boring location will be encountered while installing the investigation borings/well. If a UST pit backfill type material is encountered refer to item “b” above. The Shell ES PM must approve the use of hand auger borings.
- d. If soil samples are required to be collected within the 0-10 feet interval, a hand auger should be utilized only to the extent required prior to using the evacuating technology to collect native, undisturbed soil samples. The Shell ES PM must approve the use of hand auger borings.
- e. Drill/probe at least 5-feet away and perpendicular to, all marked utility lines.
- f. Following clearance of each boring location and/or confirmation of utilities depth and location, cover the hole(s) with barricades or cones and a sheet of material sufficient in strength to support a person’s weight until it is ready to be drilled or the trenching /excavation activities have been completed. Containerize cuttings as appropriate. If the utility clearing for a subsurface activity is conducted the day before (or more) the subsurface activity is conducted, the borehole/utility clearance should be covered with barricades or cones and with a sheet of material sufficient in strength to support a person’s weight. If the borehole/utility clearance is of sufficient size to potentially cause damage to a vehicle if driven over, then the borehole/utility clearance should be covered with a material sufficient in strength to support vehicular weight. In lieu of barricades or cones and a material cover, boring locations may be temporarily backfilled to surface. If a backfill material is utilized, it is important for the material to be flush with the surrounding pavement. For trenching/excavation activities, all utility confirmation excavations must remain open for reference until all trenching/excavation within 10-feet of the identified utility line has been completed.

3. NON-CRITICAL AREAS

Investigate and mark all subsurface activity locations before initiating subsurface activity (utility clearances should be conducted prior to drill rig/excavation equipment mobilization) as follows:

- a. Use a concrete saw followed by the use of a jackhammer to saw and break through an asphalt or concrete surface cover. The drill bit on the rig or the teeth of an excavator bucket may also be used to auger through or peel back an asphalt cover. However, the

⁵ If it appears that the tank pit may extend into the planned trenching area or exploratory excavation, **DO NOT REMOVE THE TANK PIT MATERIAL.** Stop the trenching/excavation activities and immediately call the Shell ES PM.

- drill bit or excavator bucket are **NOT** to be used to auger through and/or provide pressure to break through a concrete cover. Do **NOT** advance bit or mechanical cutting tools beyond the bottom of an asphalt or concrete cover.
- b. Use of an evacuating technology such as an air-knife, vacuum excavators, etc. is required to remove enough soil to visually inspect for subsurface utilities/improvements. The Shell ES PM must approve the use of alternative methodologies.
 - 1) For soil borings the soil in the borehole should be excavated to a diameter of at least three inches greater than the diameter of the drill bit on the lead auger or drill stem that is to be used. In NON-CRITICAL AREAS, the borehole shall be advanced to a depth of at least 5-feet below the surface. If pea gravel, fill material, or refusal is encountered, abandon the boring and immediately contact Shell ES PM to discuss a new location and follow the directions of Section E5 above.
 - 2) For trenching/excavation activities in Non-CRITICAL AREAS, the contractor is responsible for providing a spotter to aid the trenching/excavation equipment operator in the immediate detection of underground structures or utilities. Personnel performing this activity shall exercise extreme caution.
 - c. If it is not possible to perform an exploratory boring which meets the diameter requirements as stated in item “b” above, hand auger borings should be installed, to the required depth, surrounding the proposed well/boring location in such a manner that any lines/utilities passing through the proposed well/boring location will be encountered while installing the investigation borings/well. The Shell ES PM must approve the use of hand auger borings.
 - d. If soil samples are required to be collected within the 0-5 feet interval, a hand auger should be utilized only to the extent required prior to using the evacuating technology, to collect native, undisturbed soil samples. The Shell ES PM must approve the use of the hand borings.
 - e. Drill/probe at least 5-feet away and perpendicular to, all marked utility lines.
 - f. If piping or other structures are not encountered, cover the hole with barricades or cones and a sheet of material sufficient in strength to support a person’s weight until it is ready to be drilled. Containerize drill cuttings as appropriate. If excavation of the borehole is conducted the day before actual drilling is conducted, the borehole should be covered with barricades or cones and with a sheet of material sufficient in strength to support a person’s weight. If the borehole is of sufficient size to potentially cause damage to a vehicle if driven over, then the borehole should be covered with a material sufficient in strength to support vehicular weight. In lieu of barricades or cones and a material cover, the boring may be temporarily backfilled to surface. If a backfill material is utilized, it is important for the material to be flush with the surrounding pavement.

G. Utility clearance for chemical injection, grid drilling, trenching and/or excavation.

In order to better facilitate utility locations over a larger area, geophysical methodologies may be utilized. However, the performance of a geophysical survey must be conducted by a company, which performs this work as one of their standard lines of service. Investigate all boring locations before drilling (Utility clearances should be conducted prior to drill rig/excavation equipment mobilization) as follows:

1. Ground penetrating radar (GPR) can be used to detect potential utilities and subsurface objects at drilling locations. A Geophysical Survey Systems, Inc. (GSSI) SIR-2000® with 400 MHz antenna or equivalent should be used to conduct the survey. For each drilling location, two 20-foot perpendicular survey lines are positioned over each boring. The GPR data is to be interpreted in real-time during the survey, and suspect features shall be marked on the ground surface as well as field logs. The 400 MHz antenna or equivalent will provide approximately 10-feet of penetration⁶. In addition to the GPR survey, a Schonstedt® MAC-51B magnetic cable locator or equivalent will be used to detect near-surface metallic objects within a 10-foot radius around each boring location (the MAC-51B is not useable on pavements with rebar). Field interpretation logs are to be provided following the survey. If suspect features are detected at or immediately surrounding the boring location, the boring will be moved and resurveyed.
2. For CRITICAL AREAS (excluding areas within 10-feet of an UST pit) in addition to the GPR survey, all borings shall be explored as described above in item “G” above. Within the CRITICAL AREA, 10-feet from the edge of the UST pit, GPR data may be utilized to reduce the required exploratory boring depth from 10-feet to 5-feet.

⁶ The need for equipment to detect utilities at a greater depth will be dependent upon the UST system.

GENERIC RETAIL CRITICAL AREA EXAMPLE



"Critical Area
Drawing.xls"

GENERIC TERMINAL CRITICAL AREA EXAMPLE



"Terminal Critical
Area Example Drawin

BOREHOLE CLEARANCE CHECKLIST

Shell Oil Products US - Environmental Services

1. If "NO" is answered on any of the items below, the consultant should contact the appropriate Shell Project Management Staff (PM) and discuss the issue(s) before proceeding with the subsurface investigation.
2. Document the reason for a "NO" answer on a second sheet and attach to this form.
3. Contact your supervisor for instructions and document instructed actions and results of actions documented.

Site Address: _____ Contractor Project #: _____ Date: _____

Borehole #s Reviewed: _____ Clearance Performed By: _____
Project Manager

PRE-MOBILIZATION

YES **NO** **N/A**

- | | | | |
|--------------------------|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Does each borehole location allow for clear entry and exit, adequate workspace, and sufficient clearance (vertical and horizontal) for raising the mast and operating the drill rig and are all proposed boring locations and associated areas of pavement cutting clear of pavement joints, curbs, crash posts, or other engineered structures? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Have borehole locations been reviewed and approved by the appropriate Regulatory Agency, PM, Engineering & Maintenance personnel, fueling contractors or facility managers? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Are all of the proposed borehole locations and associated areas of pavement cutting at least 5 feet from any subsurface utilities shown on client's building plans, shown on public right-of-way street improvement or other public property engineering plans and/or identified during a geophysical survey? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Are any proposed boring locations within 10-feet of a marked natural gas line and/or a straight line from the meter to the gas main in the utility corridor? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Have all appropriate underground utility companies been notified with required lead time (typically 48 hours) and marked out their utilities in the vicinity of the borehole locations or otherwise notified us that they do not have any utilities near the proposed borehole locations? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Was a private utility locator contacted? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Are all proposed borehole locations and associated areas of pavement cutting at least 5 feet from a visual line connecting any two similar looking manhole covers and at least 5 feet from a visual line perpendicular to the street from the water, gas, and electrical meters? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Does the pavement in the vicinity of each proposed borehole location lack signs of previous excavation (e.g. no pavement subsidence, no differences in pavement texture or relief, no pavement patching)? |

PRE-DRILLING

YES **NO** **N/A**

- | | | | |
|--------------------------|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Have all underground utilities been marked by a utility locating service, or, given notification that they do not have any utilities near the proposed borehole locations? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | If a boring location is within 10-feet of a marked gas line or a straight line drawn from the meter to the gas main in a utility corridor, does the driller have a casing present for drilling? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Has the Facility/Station Manager indicated no knowledge of any subsurface utilities within 5 feet of the proposed borehole locations? (Review locations with the Facility/Station Manager). |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Has a tailgate safety meeting been conducted with all site personnel documenting the identification of potential hazards, the location of fuel shut-off valves, and the reviewing and signing of the Site Specific Health and Safety Plan? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Before drilling in a Non-Critical or Critical Area (excluding areas within 10 feet of an UST Pit), has a hole been hand dug or air knifed a hole to 5 feet below grade and is the diameter of the hole at least 3 inches greater than the outer diameter of the lead drilling auger? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Before drilling in a Critical Area (including areas within 10 feet of an UST Pit), has a hole been hand dug or air knifed a hole to 10 feet below grade and is the diameter of the hole at least 3 inches greater than the outer diameter of the lead drilling auger? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Does the soil encountered in the hand-dug or air knifed hole appear to be native material (i.e., free of clean gravel, clean sand, aggregate base [gravelly sand with ~10% fines], or other non-native looking material)? |

While this checklist must be followed, adherence to it does not relieve Contractor of liability or modify any of contractor's obligations in its agreement with the Company.

COST CENTER # _____

ADDRESS _____

DATE: _____

CITY & STATE _____

Well ID	Observations Upon Arrival														Detailed Explanation of Maintenance Recommended and Performed	Photos of Well Condition		Repair Date and PM Initials			
	Manway Cover, Type, Condition & Size					Well Labeled / Painted Properly*		Well Cap (Gripper) Condition		Well Lock Condition			Well Pad / Surface Condition								
	Standpipe	Flush	G	P	Size (inch)	Y	N	G	R	G	R	NL	G	P		Y	N				
	Standpipe	Flush	G	P	Size (inch)	Y	N	G	R	G	R	NL	G	P		Y	N				
	Standpipe	Flush	G	P	Size (inch)	Y	N	G	R	G	R	NL	G	P		Y	N				
	Standpipe	Flush	G	P	Size (inch)	Y	N	G	R	G	R	NL	G	P		Y	N				
	Standpipe	Flush	G	P	Size (inch)	Y	N	G	R	G	R	NL	G	P		Y	N				
	Standpipe	Flush	G	P	Size (inch)	Y	N	G	R	G	R	NL	G	P		Y	N				
	Standpipe	Flush	G	P	Size (inch)	Y	N	G	R	G	R	NL	G	P		Y	N				
	Standpipe	Flush	G	P	Size (inch)	Y	N	G	R	G	R	NL	G	P		Y	N				
	Standpipe	Flush	G	P	Size (inch)	Y	N	G	R	G	R	NL	G	P		Y	N				
On-site Drinking Water Well	Standpipe	Flush	G	P	Size (inch)	Y	N	G	R	G	R	NL	G	P		Y	N				
TOTAL # CAPS REPLACED =											= TOTAL # OF LOCKS REPLACED										
Condition of Soil Boring Patches or Abandoned Monitoring Wells:			G	P	N/A	If POOR, Borings/Well IDs or Location Description:										Y	N				
Remediation Compound Type (Check boxes that apply)		Condition of Enclosure			Condition of Area Inside Enclosure			Compound Security			Emergency Contact Info Visible			Cleaning / Repairs Recommended and Conducted			Photos of Condition		Repair Date and PM Initials		
NA																					
Building																					
Building w/ Fence Comp.		G			P			N/A			G			P			N/A			Y	N
Fenced Compound																					
Trailer																					
Number of Drums On-site	Does the Label Reveal the Source of the Contents			Labeled Correctly and Writing Legible			Drum Condition			Confirm Drums Related to Environmental		Drums Located to Min Business Interference			Detailed Explanation of Any Issues Resolved			Photos of Drum Condition		Date Drums Removed from Site and PM Initials	
	Y	N	N/A	Y	N	N/A	G	P	N/A	Y	N	Y	N	N/A				Y	N		

G = Good (Acceptable) R = Replaced
 P = Poor (needs attention) NL = No Lock Required

Note: All repairs other than locks and grippers require Shell PM approval prior to repair.

All environmental wells and the remediation compound were in good condition, locked, and secured upon my departure (unless otherwise noted above).

ENVIRONMENTAL WELL, REMEDIATION COMPOUND, AND SITE INSPECTION FORM

* = Groundwater monitoring well covers must be painted and labeled in accordance with applicable regulations.

Version 2.4, March 2008

Print or type Name of Field Personnel & Consultant Company

AECOM AECOM-Shell Management Safety Site Visit & Discussion Form

Before going to the site, review the Lessons Learned and Learning From Incident (LFI) on the AECOM/Shell SharePoint site which are applicable to the work being performed.

Site Name		Project Manager	
Site Address		Date	
Subcontractor(s)		Manager Completing Form	
Task observed (refer to THA)			

QUESTIONS	ANSWERS
1. What could go wrong during the work you are about to perform? What hazards have you identified?	
2. What actions have you taken or do you plan to take to eliminate these hazards?	
3. What do you do if something changes (e.g., weather, equipment, or schedule)?	
4. Name at least 3 things that could occur during this job that would cause you to stop the work immediately (stop work triggers).	
5. Who would you say has the ability to stop work at this site? (if the response given is not "everyone can stop work", explain to them that all have the ability to stop work at any time they feel unsafe).	
6. Are there any safety concerns you currently have regarding the work you are performing or are about to perform, or with any of the equipment used on this site? If so what are they?	
7. Are employees and subcontractors aware of recent lessons learned (LFIs) associated with the work they are performing?	
8. Is there evidence of L3 involvement (e.g., observations, near misses, etc.)?	
9. What would you recommend be done to improve safety or security, in any way, going forward?	
10. What was covered during the Twilight Tool Box talks ? Were they helpful in closing out items at the end of the day ?	

CORRECTIVE ACTIONS			
Identified corrective actions	By whom?	By when?	Date Completed

COMMENTS

Upload completed form to URS Near Miss/Observation database, under Safety Observation, Safety Discussion

AECOM-Shell Daily Safety Observation Form

Site Name/Address		Project Manager	
Site Address		Date	
Subcontractor		Observer	
Task(s) observed (refer to THA)			

OBSERVED ITEMS	SAFE	UNSAFE	OBSERVED ITEMS	SAFE	UNSAFE
Personal Protective Equipment			Procedures & Document		
High visibility clothes			HASP reviewed & available		
Hard hat			THA reviewed & available		
Safety shoes (steel toe)			JCF reviewed & available		
Long pants			PTW reviewed & available		
Safety glasses or goggles			MOC procedures		
Gloves			Air monitoring records		
Ear protection			Personnel behaviour		
Respiratory protection			Change attitude or posture		
Fall protection device			Stop activity		
Workplace protection			Modify activity		
Fencing, barricades, signs			Hiding		
Good housekeeping			Modify tools		
Hazards identified/removed			Lock Out / Tag Out		
Identified access/egress			Readjust PPE		
Waste management			Miscellaneous observations		
Ladders					

ITEMS DISCUSSED AND CORRECTIVE ACTIONS AGREED UPON

Identified corrective actions	By whom	When	Checked

DESCRIPTION OF EVENT OR CONVERSATION

Tips for engaging in a productive conversation:

- Tell me about hazards you recognized at this site. (Leads into actions taken to eliminate hazards, MoC.)
- Is there anything you recommend to make this task safer?
- Let's talk about stopping work, tell me about the stop work triggers for this task. (Leads to stop work signal, stop work authority.)

Distribution list

Project Manager	Program Manager	
Site Safety Supervisor	HSSE Coordinator	

AECOM-SHELL U.S. FIELD HSSE ASSESSMENT FORM

Site Name:		Project Manager:	
Site Address:		On-Site Supervisor:	
Subcontractor(s):		Assessor(s):	
Activities observed:			

ADMINISTRATIVE	
Site Control	COMPLIANT? (Y or N*) or N/A
Is work stopped when a visitor arrives?	
Do all visitors receive site orientation? <ul style="list-style-type: none"> - Is the HASP reviewed? - THAs reviewed? - Permit(s) reviewed (if applicable)? - Incident notification procedures discussed? - Nearest emergency care facility discussed? - Nearest occupational care facility discussed? - Did the visitor sign in? 	
Site security and control measures evident in the field?	
Site work zones clearly defined on-site?	
Are the following identified? <ul style="list-style-type: none"> - Muster point and Cell phone use area? - Smoking area? 	
Pre-Work Planning	COMPLIANT? (Y or N*) or N/A
Does AECOM have Task Hazard Analyses (THA) for all tasks performed?	
Does subcontractor(s) have THAs for all tasks performed?	
Daily site health and safety briefings (tailgate) held and documented?	
Was tailgate meeting effective and interactive (all personnel engaged and speaking)?	
If subcontractor(s) is being used, has a SMS 046-1 been completed within the last year?	
Training Documentation for AECOM Personnel	COMPLIANT? (Y or N*) or N/A
Documentation of specialized training for personnel who may be exposed to unique hazards to ensure their safety when performing such operations (e.g., nuclear density gauge, confined space entry)?	
Documentation of appropriate training to perform job function and responsibility as indicated by an appropriate license or certification (e.g., backhoe, forklift, crane, etc.)?	
Current LSR/Safety Passport cards present?	
If a permit has been issued, have personnel received Shell's Safety System of Work training?	

*Each non-compliant item must be noted on the Assessment Findings.

AECOM-SHELL U.S. FIELD HSSE ASSESSMENT FORM

On-Site Training Documentation for AECOM <u>subcontractors</u>	COMPLIANT? (Y or N*) or N/A
Documentation of initial health and safety training (40-hr)?	
Documentation of eight hour annual health and safety refresher training?	
Documentation of API training?	
Documentation of training received on the site specific HASP?	
Documentation of specialized training for personnel who may be exposed to unique hazards to ensure their safety when performing such operations?	
Documentation of appropriate training to perform job function and responsibility as indicated by an appropriate license or certification (e.g. backhoe, forklift, crane, etc.)?	
All personnel have a current Safety Passport?	
Health & Safety Plan (HASP)	COMPLIANT? (Y or N*) or N/A
Activities conform to description in HASP?	
Has the HASP been reviewed and signed by a Regional HSE Manager within the last year?	
Route to the nearest emergency medial treatment facility available to personnel?	
Route to nearest occupational clinic available to personnel?	
Emergency phone numbers available?	
EXPOSURE MONITORING	COMPLIANT? (Y or N*) or N/A
Health and safety instrumentation available and in use per HASP?	
Air monitoring instrumentation maintenance and calibration logs available and current?	
Is air monitoring (in breathing zone) documented?	
Air monitoring performed every time a different operation is initiated?	
Air monitoring performed any time that new contaminants are encountered that differ from those initially encountered?	
Air monitoring performed any time new work begins on a different portion of the site?	
Air monitoring log available and current?	
Does monitoring log reflect excursions above action levels?	
Has personal sampling been performed? (SMS 043)	
PERSONAL PROTECTIVE EQUIPMENT	COMPLIANT? (Y or N*) or N/A
Do all AECOM personnel and subcontractors have the minimum PPE donned, regardless of task? <ul style="list-style-type: none"> - Steel toed safety boots? - Hard hat? - Safety glasses? - Hi-visibility vest or shirt? - Gloves? 	

*Each non-compliant item must be noted on the Assessment Findings.

AECOM-SHELL U.S. FIELD HSSE ASSESSMENT FORM

If unique physical hazards are present on-site (e.g., power washing, deep or rapidly moving water) is appropriate PPE being worn to address such hazards?	
Have employees been instructed in proper use of special PPE? (SMS 029)	
Appropriate on-site personnel been fit-tested successfully for respirators? (SMS 042)	
Is there sufficient PPE available for the personnel involved in the performance of site operations?	
Is the PPE in place adequate for the chemical and physical hazards on-site?	
If ambient noise levels may be greater than or equal to 85 dBA are ear muffs or ear plugs worn by personnel on-site as required by 29 CFR 1910.95? (SMS 026)	
Is insect repellent available if necessary?	
CONFINED SPACES	COMPLIANT? (Y or N*) or N/A
Does the site require confined space entry? (If yes, continue with this section)	
Does the HASP contain a section on procedures for confined space entry? (SMS 010)	
Is entry permit present and complete?	
Are spaces properly designated (Permit or Non-Permit Required spaces)?	
Do personnel have documented confined space training?	
Are rescue personnel trained and properly equipped?	
DRILLING	COMPLIANT? (Y or N*) or N/A
Have private and public utility clearances been obtained? (SMS 034)	
Have overhead utility clearances been considered? (SMS 034)	
Are rigs inspected daily? (SMS 056)	
Are traffic control procedures used?	
Does driller maintain a reasonable distance for USTs and product lines?	
Are borings located, cleared (e.g., hand augered, air knife) before drilling is conducted?	
Drill rig emergency rig shutoff within reach of the operator? (SMS 056)	
Drill rig emergency shutoff has been tested before work activities begin?	
Is a fire extinguisher near the drill rig?	
J-hooks are prohibited from use?	
Combination manual rod separation and hydraulic power applied is prohibited?	
If auger weight exceeds 50 lbs each, is the buddy system used to lift the augers? (SMS 069)	
Walking and work areas clear of debris and equipment?	
Are soil cuttings properly contained?	
EXCAVATION	COMPLIANT? (Y or N*) or N/A
Have public and private utility clearances been obtained?	

*Each non-compliant item must be noted on the Assessment Findings.

AECOM-SHELL U.S. FIELD HSSE ASSESSMENT FORM

Has an Excavation/Trenching Permit been completed?	
Has the on-site Excavation Competent Person been identified and is present? (SMS 013)	
Are daily trench inspections (SMS 013-2) being conducted (or more frequently, as conditions warrant) by the Excavation Competent Person?	
Are trenches and excavations protected by sloping, shoring or trench boxes?	
Is the trench or excavation protected from traffic or equipment (stop logs or other barriers)?	
Is the excavated material stockpiles and personnel at least 2 feet from the edge?	
Are signs, barrier tape, or fall protection adequate for workers at the excavation/trench opening?	
Is traffic control signage and barriers adequate around the trench or excavation?	
If excavation/trench is entered, is a ladder in the trench or excavation located within 25 feet of workers?	
If excavation/trench is being entered and is greater than 4' deep, has a Permit Confined Space Permit been completed?	
Is the air monitored prior to entry (O ² , CO, H ² S, LEL, VOC), as appropriate?	
HEAVY EQUIPMENT	COMPLIANT? (Y or N*) or N/A
Are operators properly trained and licensed (must be documented)?	
Is the operator performing a daily/shift inspection on the equipment (must be documented) before equipment is used?	
Is hearing protection being worn?	
Is dust control required and properly performed?	
Are appropriate equipment speeds being maintained?	
Are horns and back-up alarms functioning?	
Are three points of contact being used when accessing/exiting equipment?	
If equipment is parked or unattended, have all implements been lowered to the ground?	
Is a fire extinguisher (inspected monthly) located on each piece of equipment?	
Are ground personnel working with the equipment operator properly located and provided with adequate communication means?	
DRIVING SAFETY	COMPLIANT? (Y or N*) or N/A
Are vehicles parked to minimize risk of collision with other vehicles/equipment?	
Are vehicles ignitions are turned off when drivers are out of vehicle?	
If pickup trucks are used, are tailgates closed at all times when the vehicle is operated?	
MISCELLANEOUS SAFETY PROCEDURES	COMPLIANT? (Y or N*) or N/A
Is food and drink prohibited in the work area?	

*Each non-compliant item must be noted on the Assessment Findings.

AECOM-SHELL U.S. FIELD HSSE ASSESSMENT FORM

<p>If 'hot work' (SMS 020) such as welding or cutting is occurring on-site, the following questions apply:</p> <ul style="list-style-type: none"> • Appropriate combustible gas indicator air monitoring conducted? • Hot Work Permit completed? • Fire Watch assigned? Has that person received annual fire extinguisher training? • Fire extinguishers present (and inspected monthly)? • Personnel wearing appropriate protective goggles and fire retardant clothing? 	
Fixed open blade knives prohibited from use onsite? (SMS 064)	
Do all employees understand Management of Change (MOC) (SMS 098) and do they know when/how to implement it?	
First aid kit available onsite and adequately stocked?	
Eye washes/kits are available?	
Have incident/near miss reports been properly completed in a timely fashion?	
Does written inventory of chemicals match those that are present and was it reviewed/updated within the last year? (SMS 002)	
Are MSDSs available for every chemical listed/used? (SMS 002)	
Are lone workers are in compliance with SMS 084?	
Are tool guards in place and being used?	
Are Ground Fault Circuit Interrupter (GFCIs) used for portable, temporary cords?	
OVERALL	COMPLIANT? (Y or N*) or N/A
Does everyone on the job understand they have the authority to stop work if an unsafe act or unsafe condition is observed?	
Are safety observations being conducted?	
Twilight Tailgate Tool Box Talks being conducted at the end of the day?	
Any unsafe deviations from HASP? If yes, have they been properly documented and investigated?	

*Each non-compliant item must be noted on the Assessment Findings.

AECOM-SHELL U.S. FIELD HSSE ASSESSMENT FORM

ASSESSMENT FINDINGS & CORRECTIVE ACTIONS

Finding (To be completed by Assessor)	Corrective Action (To be completed by Project Manager)	Corrective Action Completed By & Due Date (To be completed by Project Manager)	Corrective Action Due Date (To be completed by Project Manager)

(use additional pages if necessary)

*Each non-compliant item must be noted on the Assessment Findings.



Date: _____

AECOM Quality Control Field Audit Form

Site Location: _____ **Weather:** _____
 _____ **Temperature:** _____
Site Name: _____ **Wind:** _____
Project Manager: _____ **Humidity:** _____
Activity(s) Observed: _____
Auditor: _____ **Phone #:** _____

Personnel On-Site			Level of Personnel Protection Required in Work Plan/HASP:			
No.	Name	Affiliation	A	B	C	D
1.			Level of Personnel Protection Actually Donned:			
2.			A	B	C	D
3.			Field Survey Equipment			
4.			Instrument	Model	Calibration Check	
5.			PID			
6.			Interface probe			
7.			YSI (GWQ instrument)			
8.			Turbidity			
9.						
10.			Observations:			

Health and Safety

No.	Description	YES	NO	N/A
1	Personnel reviews health and safety plan and applicable SMSs	YES	NO	N/A
2	Personnel conducts daily H&S briefing and records attendance in logbook, HASP, or meeting record form	YES	NO	N/A
3	Personnel uses recent lessons learned or safety observations during safety briefing	YES	NO	N/A
4	Personnel has appropriate and updated task hazard analyses (THAs)	YES	NO	N/A
5	Addresses potential onsite hazards and mitigations for those hazards	YES	NO	N/A
6	Describes emergency response plan and hospital/occupational clinic route	YES	NO	N/A
7	Describes site-appropriate PPE	YES	NO	N/A
8	Designates areas for eating/drinking/smoking	YES	NO	N/A
9	Locates emergency equipment such as fire extinguisher, first-aid kits, and other safety equipment	YES	NO	N/A
10	Do personnel communicate with site owner/operator the scope and duration of activity?	YES	NO	N/A
11	Is an exclusion zone set up, and do personnel wear appropriate PPE within the exclusion zone?	YES	NO	N/A
12	Is appropriate traffic control used and maintained throughout the activity?	YES	NO	N/A
13	Is equipment inspected by a competent person, and inspection checklists completed (if necessary)?	YES	NO	N/A
14	Are emergency shut-offs, machine guards, and safety features checked prior to using any piece of equipment?	YES	NO	N/A
15	Is a muster point established in case of emergency?	YES	NO	N/A

Auditor's Comments	
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Groundwater Gauging/Sampling

1	Are accurate and updated field notes/logs maintained for all site activities?	YES	NO	N/A
2	Has an area been designated for equipment/personnel decontamination?	YES	NO	N/A
3	Does the decon area have adequate supplies and level of quarantine?	YES	NO	N/A
4	Are adequate supplies and equipment on-site to provide the level of quality demanded by the project?	YES	NO	N/A
5	Are Quality Control documents/procedures maintained and/or referenced in field notes/logbook?	YES	NO	N/A
6	Are wells inspected prior to opening?	YES	NO	N/A
7	Are well caps and seals in place to prevent surface water infiltration?	YES	NO	N/A
8	Are vaults and manways free of surface water prior to opening well?	YES	NO	N/A
9	Is there a sufficient supply of clean and dedicated tubing/bailers to complete the activity?	YES	NO	N/A
10	Is there a sufficient amount of other supplies available to complete the activity?	YES	NO	N/A
11	Are procedures in place to manage derived waste?	YES	NO	N/A
12	Do personnel seek permission to use dumpsters for disposal of untracked waste?	YES	NO	N/A
13	Are wells gauged/sampled in order of the level of contamination (if known)?	YES	NO	N/A
14	Does the technician confirm wells are labeled as indicated on the provided site map?	YES	NO	N/A
15	Does the technician collect a headspace reading shortly after initial well cap removal?	YES	NO	N/A
16	Does the technician gauge the well to a marked position or north side of the casing?	YES	NO	N/A
17	Does the technician use a gauging technique that allows for data replication within +/- 0.01 feet?	YES	NO	N/A
18	Does the technician use proper body positioning and PPE during bailing and sampling activities?	YES	NO	N/A
19	Are proper protocol followed when liquid phase hydrocarbons (LPH) are observed in wells?	YES	NO	N/A
20	Does the technician use an acceptable method to dispose of purged groundwater (drum, system, or carbon)?	YES	NO	N/A
21	Is turbidity in the well kept to a minimum (if applicable)?	YES	NO	N/A
22	Does the technician prevent surface contaminants from impacting groundwater?	YES	NO	N/A
23	Does the technician limit surface spills of purged water?	YES	NO	N/A
24	Does the technician use an acceptable method to collect water quality measurements?	YES	NO	N/A
25	Are samples collected at the appropriate time (volume of purge, stability of parameters, or no-purge)?	YES	NO	N/A
26	Are samples labeled clearly and protected to prevent smearing?	YES	NO	N/A
27	Are all requisite bottles filled as directed by the method (zero headspace VOAs) without overfilling?	YES	NO	N/A
28	Is a current Chain of Custody (COC) maintained throughout the sampling process with the following information?	YES	NO	N/A
	-sample identification	YES	NO	N/A
	-time/date of collection	YES	NO	N/A
	-sampler's initials	YES	NO	N/A
	-analysis requested	YES	NO	N/A
	-preservatives added	YES	NO	N/A
29	Is a waterproof container/cooler used to store samples prior to shipment?	YES	NO	N/A
30	Are samples packed in a way to limit breakage and/or cross-contamination?	YES	NO	N/A
31	Are samples placed on ice as they are collected (if necessary)?	YES	NO	N/A
32	Is an adequate amount of ice provided for shipment based on sample number, type, and temperature?	YES	NO	N/A
33	Are samples packed in a way to ensure they arrive at the laboratory at an acceptable temperature?	YES	NO	N/A
34	Is the COC included with the sample shipment and placed in a waterproof container (plastic bag)?	YES	NO	N/A
35	Is the samples shipment sent with signed/dated custody seals in place?	YES	NO	N/A
36	Is the sample shipment sealed with tape and/or straps to prevent unauthorized access to contents?	YES	NO	N/A
37	Is a record of samples shipped for analysis kept in the field log or a copy of the COC kept for reference?	YES	NO	N/A
38	Are consumable supplies disposed of in an acceptable manner?	YES	NO	N/A
39	Is the well sealed and protected after sampling is complete?	YES	NO	N/A
40	Is the work area clean when sampling is complete?	YES	NO	N/A
Auditor's Comments				

Auditor Signature: _____

Date: _____

Acceptance Signature: _____

Date: _____



Date: _____

AECOM Quality Control Field Audit Form

Site Location: _____ **Weather:** _____
 _____ **Temperature:** _____
Site Name: _____ **Wind:** _____
Project Manager: _____ **Humidity:** _____
Activity(s) Observed: _____
Auditor: _____ **Phone #:** _____

Personnel On-Site			Level of Personnel Protection Required in Work Plan/HASP:			
No.	Name	Affiliation	A	B	C	D
1.			Level of Personnel Protection Actually Donned:			
2.			A	B	C	D
3.			Field Survey Equipment			
4.			Instrument	Model	Calibration Check	
5.			PID			
6.			Interface probe			
7.			YSI (GWQ instrument)			
8.			Turbidity			
9.						
10.			Observations:			

Health and Safety

No.	Description	YES	NO	N/A
1	Personnel reviews health and safety plan and applicable SMSs	YES	NO	N/A
2	Personnel conducts daily H&S briefing and records attendance in logbook, HASP, or meeting record form	YES	NO	N/A
3	Personnel uses recent lessons learned or safety observations during safety briefing	YES	NO	N/A
4	Personnel has appropriate and updated task hazard analyses (THAs)	YES	NO	N/A
5	Addresses potential onsite hazards and mitigations for those hazards	YES	NO	N/A
6	Describes emergency response plan and hospital/occupational clinic route	YES	NO	N/A
7	Describes site-appropriate PPE	YES	NO	N/A
8	Designates areas for eating/drinking/smoking	YES	NO	N/A
9	Locates emergency equipment such as fire extinguisher, first-aid kits, and other safety equipment	YES	NO	N/A
10	Do personnel communicate with site owner/operator the scope and duration of activity?	YES	NO	N/A
11	Is an exclusion zone set up, and do personnel wear appropriate PPE within the exclusion zone?	YES	NO	N/A
12	Is appropriate traffic control used and maintained throughout the activity?	YES	NO	N/A
13	Is equipment inspected by a competent person, and inspection checklists completed (if necessary)?	YES	NO	N/A
14	Are emergency shut-offs, machine guards, and safety features checked prior to using any piece of equipment?	YES	NO	N/A
15	Is a muster point established in case of emergency?	YES	NO	N/A

Auditor's Comments	
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Date: _____

Subcontractor Oversight

1	Are appropriate permits, permissions, and access agreements in place to conduct the activity?	YES	NO	N/A
2	Is the subcontractor(s) authorized to conduct the activity (46-1/PICS/facility-specific training)?	YES	NO	N/A
3	Are URS personnel qualified to conduct or oversee the activity conducted?	YES	NO	N/A
4	Do the subcontractor(s) and/or URS Personnel have the appropriate equipment/personnel to conduct the activity?	YES	NO	N/A
5	Are there adequate URS personnel to supervise all subcontracted activities?	YES	NO	N/A
6	Do subcontractors follow the provided Scope of Work and regulatory guidelines?	YES	NO	N/A
7	Do subcontractors actively participate in safety discussions?	YES	NO	N/A
8	Are subcontracted personnel aware of "Stop Work Authority"?	YES	NO	N/A
9	Is all equipment clean prior to mobilizing to the site?	YES	NO	N/A
9	Is equipment kept clean and regularly decontaminated to avoid cross-contamination?	YES	NO	N/A
10	Are all tools and equipment regularly inspected?	YES	NO	N/A
11	Is a designated decontamination area established?	YES	NO	N/A
12	Is an acceptable decontamination solution available?	YES	NO	N/A
13	Are decontamination procedures followed between sampling locations?	YES	NO	N/A
14	Are augers and other tooling steam-cleaned between locations?	YES	NO	N/A
15	Are all work areas kept clean and free of potential contaminants of concern?	YES	NO	N/A
16	Is any equipment on-site leaking or discharging potential contaminants of concern?	YES	NO	N/A
17	Is equipment thoroughly cleaned at the end of the activity?	YES	NO	N/A
18	Is there a sufficient amount of supplies available to complete the activity	YES	NO	N/A
19	Are procedures in place to manage derived waste?	YES	NO	N/A
20	Do personnel seek permission to use dumpsters for disposal of untracked waste?	YES	NO	N/A
21	Do subcontractors work in a safe manner and in accordance with AECOM and client safety guidelines?	YES	NO	N/A
22	Are subcontractors supervised at all times when performing work?	YES	NO	N/A
23	Do URS personnel perform "Take 5s" or other safety discussions throughout the day?	YES	NO	N/A
24	Do subcontractors have their own QA/QC procedures?	YES	NO	N/A
25	Are subcontractor-derived data validated in any way?	YES	NO	N/A
26	Do subcontractors restore the work area to a condition as good or better than when activity started?	YES	NO	N/A
27	Do subcontractors improvise, alter established procedures, or "wing it" without discussing changes?	YES	NO	N/A
29	Do subcontractors work as a team with AECOM personnel and other to safely and efficiently complete the work?	YES	NO	N/A
30	Do URS personnel perform any activities assigned to a subcontractor?	YES	NO	N/A

Auditor's Comments	
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Auditor Signature: _____

Date: _____

Acceptance Signature: _____

Date: _____



Date: _____

AECOM Quality Control Field Audit Form

Site Location: _____ **Weather:** _____
 _____ **Temperature:** _____
Site Name: _____ **Wind:** _____
Project Manager: _____ **Humidity:** _____
Activity(s) Observed: _____
Auditor: _____ **Phone #:** _____

Personnel On-Site			Level of Personnel Protection Required in Work Plan/HASP:			
No.	Name	Affiliation	A	B	C	D
1.			Level of Personnel Protection Actually Donned:			
2.			A	B	C	D
3.			Field Survey Equipment			
4.			Instrument	Model	Calibration Check	
5.			PID			
6.			Interface probe			
7.			YSI (GWQ instrument)			
8.			Turbidity			
9.						
10.			Observations:			

Health and Safety

No.	Description	YES	NO	N/A
1	Personnel reviews health and safety plan and applicable SMSs			
2	Personnel conducts daily H&S briefing and records attendance in logbook, HASP, or meeting record form			
3	Personnel uses recent lessons learned or safety observations during safety briefing			
4	Personnel has appropriate and updated task hazard analyses (THAs)			
5	Addresses potential onsite hazards and mitigations for those hazards			
6	Describes emergency response plan and hospital/occupational clinic route			
7	Describes site-appropriate PPE			
8	Designates areas for eating/drinking/smoking			
9	Locates emergency equipment such as fire extinguisher, first-aid kits, and other safety equipment			
10	Do personnel communicate with site owner/operator the scope and duration of activity?			
11	Is an exclusion zone set up, and do personnel wear appropriate PPE within the exclusion zone?			
12	Is appropriate traffic control used and maintained throughout the activity?			
13	Is equipment inspected by a competent person, and inspection checklists completed (if necessary)?			
14	Are emergency shut-offs, machine guards, and safety features checked prior to using any piece of equipment?			
15	Is a muster point established in case of emergency?			

Auditor's Comments	
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System O&M/Sampling

1	Does the system have an up-to-date O&M Manual on-site or with the technician?	YES	NO	N/A
2	Are sample locations labeled or identified correctly?	YES	NO	N/A
3	Are samples collected from the correct locations?	YES	NO	N/A
4	Are sample media appropriate for the analysis method?	YES	NO	N/A
5	Are samples properly collected and preserved?	YES	NO	N/A
6	Are samples collected accurately (discrete/grab/composite)?	YES	NO	N/A
7	Does the technician prepare samples in a clean work area?	YES	NO	N/A
8	Are samples labeled clearly and protected to prevent smearing?	YES	NO	N/A
9	Are all requisite bottles filled as directed by the method (zero headspace VOAs) without overfilling?	YES	NO	N/A
10	Are samples immediately placed on ice after collection?	YES	NO	N/A
11	Does the technician use techniques to eliminate cross-contamination, volatilization, and homogenization (if applicable)?	YES	NO	N/A
12	Does the technician change gloves that come in contact with sample material or any potential contaminant of concern?	YES	NO	N/A
13	Are airbags shipped for overnight delivery?	YES	NO	N/A
14	Are flow/vacuum/pressure readings collected at the appropriate time and in the correct manner with clean and calibrated equipment?	YES	NO	N/A
15	Are system controls and gauges checked for proper operation?	YES	NO	N/A
16	Are data and/or samples collected in a logical and time efficient manner?	YES	NO	N/A
17	Are all data clearly recorded on data sheets or in a field logbook?	YES	NO	N/A
18	Does the technician attempt to replicate data collected or compare current data to historical data?	YES	NO	N/A
19	Does the technician know what to do if "out of range" data are collected?	YES	NO	N/A
20	Are all sample ports, valves, and caps returned to their original pre-sampling position?	YES	NO	N/A
21	Does the technician know what level of field QA/QC is required on the project?	YES	NO	N/A
22	Are all alarms and emergency equipment checked and in good working order?	YES	NO	N/A
23	Do all float switches and pressure relief valves operate as designed?	YES	NO	N/A
24	Does the technician perform leak checks on all fittings, valves, and couplings?	YES	NO	N/A
25	Are system problems repaired or noted for future repair?	YES	NO	N/A
26	Is the system compound secured prior to departure?	YES	NO	N/A
27	Is any equipment on-site leaking or discharging potential contaminants of concern?	YES	NO	N/A
28	Is the system operational upon departure?	YES	NO	N/A
29	Are lockout/tagout procedures followed when conducting system maintenance?	YES	NO	N/A
30	Are consumable supplies disposed of in an acceptable manner?	YES	NO	N/A

Auditor's Comments	
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Auditor Signature: _____ **Date:** _____

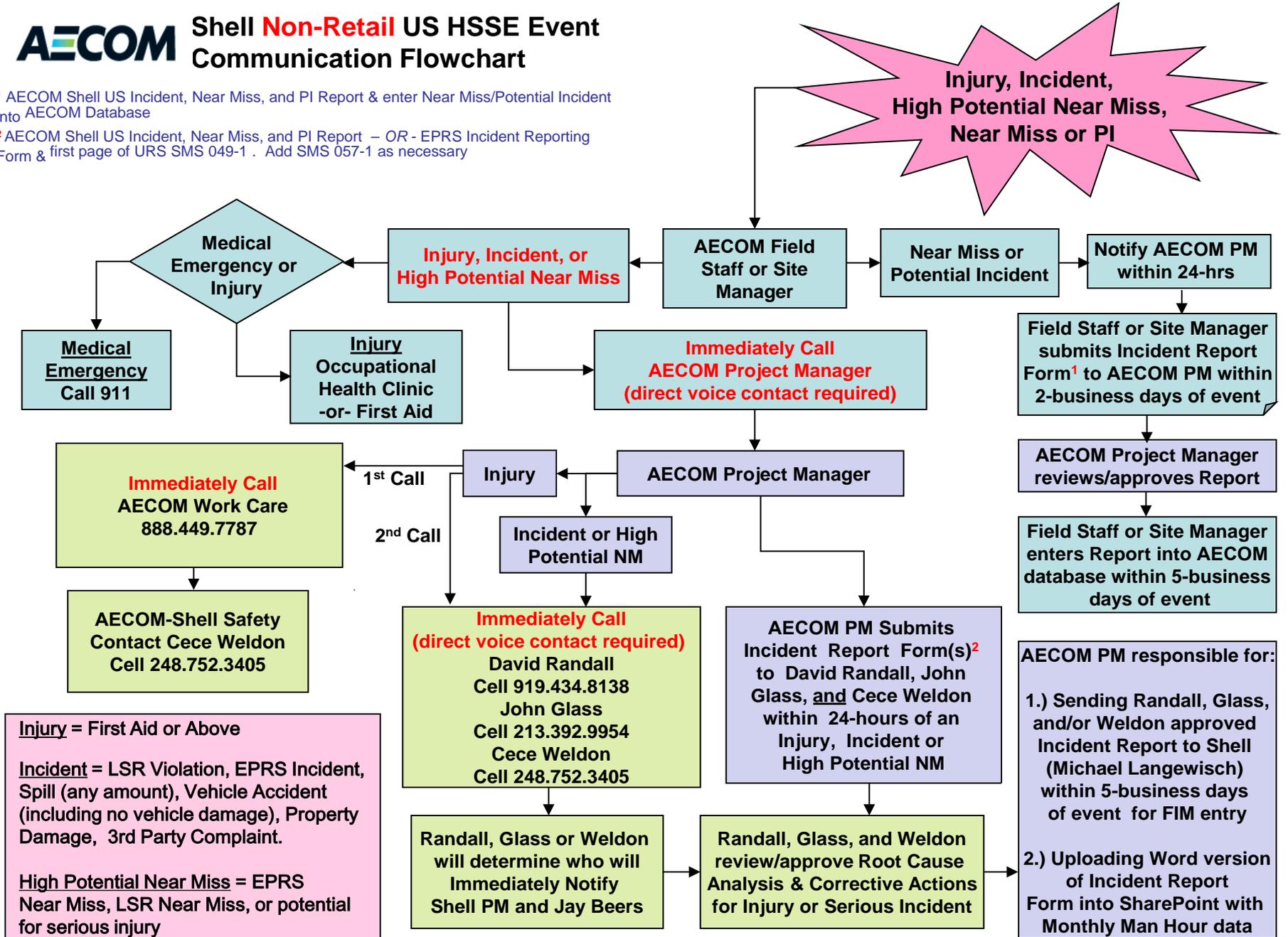
Acceptance Signature: _____ **Date:** _____



Shell **Non-Retail** US HSSE Event Communication Flowchart

¹ AECOM Shell US Incident, Near Miss, and PI Report & enter Near Miss/Potential Incident into AECOM Database

² AECOM Shell US Incident, Near Miss, and PI Report – OR - EPRS Incident Reporting Form & first page of URS SMS 049-1 . Add SMS 057-1 as necessary



Injury = First Aid or Above

Incident = LSR Violation, EPRS Incident, Spill (any amount), Vehicle Accident (including no vehicle damage), Property Damage, 3rd Party Complaint.

High Potential Near Miss = EPRS Near Miss, LSR Near Miss, or potential for serious injury

AECOM / Shell – Soil and Groundwater – U.S.

Incident/Near Miss/Potential Incident Investigation Report

(Upload all FIM Event Incident Reports to SharePoint and enter on Monthly Man Hours spreadsheet)

AECOM or Teaming Partner Project Manager		Teaming Partner/Subcontractor Involved in Event, if applicable:	
SHORT DESCRIPTION OF EVENT (MAX 60 CHARACTERS):			
Date & Time of Event:		Date & Time Reported to Shell PM:	
Shell SGW PM Name:		Specific Location: (eTIM Location, SAP# or NPS ID #)	
FIM Event: (Send report to David Randall, John Glass and Cece Weldon within 24-hours of event)	<input type="checkbox"/> Total Recordable Case Incident <input type="checkbox"/> Life Saving Rule Violation <input type="checkbox"/> Motor Vehicle Incident (\$0 threshold) <input type="checkbox"/> Loss of Primary Containment (any volume) <input type="checkbox"/> EPRS Incident (Spills to the Environment, Environmental Non-Compliance, Fines, Penalties, Compensation, or Complaints)– also complete EPRS REPORTING FORM		
Non-FIM Event: (Send report to David Randall, John Glass and Cece Weldon and within 5-days of event, and enter into URS Safety Database)	<input type="checkbox"/> Incident with Consequences (excluding FIM Events, above) <input type="checkbox"/> Third Party Incident <input type="checkbox"/> Near Miss <input type="checkbox"/> Positive Intervention /Observation <input type="checkbox"/> Unsafe Act <input type="checkbox"/> Unsafe Condition		
Non-FIM Event “Incident with Consequences” Sub Type: (check 1)	<input type="checkbox"/> Incident – People Illness <input type="checkbox"/> Incident – People Injury		
DESCRIPTION OF EVENT– BEGIN WITH SITE ADDRESS (MAX 1,900 CHARACTERS):			
IMMEDIATE CORRECTIVE ACTIONS TAKEN (MAX 1,900 CHARACTERS):			
FIM Incident ID (provided by Shell):			

AECOM / Shell – Soil and Groundwater – U.S. Incident/Near Miss/Potential Incident Investigation Report

INJURY/ILLNESS INFORMATION						
Describe the specific injury or illness (e.g., cut, strain, fracture, etc.):						
Body part(s) affected (e.g., back, left wrist, right eye, etc.):						
Name, address, phone of treatment provider (e.g., physician or clinic):						
Type of treatment received (e.g., first aid, stitches, prescription received):						
If hospitalized, name, address, phone of hospital:						
Date of injury or onset of illness:		Time Employee began work:		<input type="checkbox"/> AM <input type="checkbox"/> PM		
Did Employee lose at least one full shift's work due to incident?			<input type="checkbox"/> Yes <input type="checkbox"/> No		1st date absent:	
Has Employee returned to work?		<input type="checkbox"/> N/A - No work time missed <input type="checkbox"/> No, still off work as of:		<input type="checkbox"/> Yes, date returned:		<input type="checkbox"/> Regular work
<input type="checkbox"/> Restricted work						
MOTOR VEHICLE ACCIDENT (MVA) DESCRIPTION						
Accident Location (street, cross street, city, state):				Company Vehicle?		<input type="checkbox"/> Yes <input type="checkbox"/> No
Hazardous Material Released?			<input type="checkbox"/> Yes (fill out Spill/Leak section below) <input type="checkbox"/> No		Recordable?	
<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No				
# of Vehicles Involved:		# of Vehicles Towed:		# of Injuries:		# of Fatalities:
Other Party Name:			Company:			
Phone #:		Insurance Company:			Policy #:	
SPILL/LEAK ASSOCIATED WITH MVA						
Material Spilled:		Quantity:		Cost of Incident:		
Agency Notifications:						
THIRD PARTY INCIDENTS						
Name of Owner:		Address:			Phone:	
Description of Damage:						
Witness Name:		Address:			Phone:	
Witness Name:		Address:			Phone:	
ROOT CAUSE AND CONTRIBUTING FACTORS: CONCLUSION						
(Describe in Detail Why Incident/Near Miss Occurred)						
1						
2						
3						
4						
5						
Root Cause(s) Analysis (RCA):						
<i>1 - Lack of skill or knowledge</i>			<i>5 - Short-cutting standard procedures is positively reinforced or tolerated</i>			
<i>2 - Lack of or inadequate operational procedures or work standards</i>			<i>6 - Inadequate communication of expectations regarding procedures or work standard</i>			
<i>3 - Inadequate tools or equipment</i>			<i>7 - Person thinks there is no personal benefit to always doing the job to standard</i>			
<i>4 - Correct way takes more time and/or requires more effort</i>			<i>8 - Uncontrollable</i>			
#	RCA #	Solution(s): How to Prevent Incident / Near Miss From Reoccurring	Person Responsible	Date Assigned	Due Date	Closure Date
1						
2						
3						
4						
5						
Investigation Team Members Name:			Title & Employer Name:		Date:	

AECOM / Shell – Soil and Groundwater – U.S.
Incident/Near Miss/Potential Incident Investigation Report
PHOTOGRAPHS (If Applicable)

Attachment E

**Material Safety Data Sheets/Safety Data
Sheets (Also included in CD)**



AIR LIQUIDE

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: NON-FLAMMABLE GAS MIXTURE

Containing One or More of the Following Components in a Nitrogen Balance Gas: Oxygen, 0.0015-23.5%; Methane, 0.0005-2.5%; Carbon Monoxide, 0.0005-1.0%; Hydrogen Sulfide, 0.001-0.025%

SYNONYMS: Not Applicable CHEMICAL FAMILY NAME: Not Applicable FORMULA: Not Applicable

Document Number: 50018

Note: The Material Safety Data Sheet is for this gas mixture supplied in cylinders with 33 cubic feet (935 liters) or less gas capacity (DOT - 39 cylinders). This MSDS has been developed for various gas mixtures with the composition of components within the ranges listed in Section 2 (Composition and Information on Ingredients). Refer to the product label for information on the actual composition of the product.

Table with 2 columns: Field (PRODUCT USE, U.S. SUPPLIER/MANUFACTURER'S NAME, ADDRESS, BUSINESS PHONE, EMERGENCY PHONE) and Value (Calibration of Monitoring and Research Equipment, CALGAZ, 821 Chesapeake Drive, Cambridge, MD 21613, etc.)

2. COMPOSITION and INFORMATION ON INGREDIENTS

Table with 4 columns: CHEMICAL NAME, CAS #, mole %, and EXPOSURE LIMITS IN AIR (ACGH, OSHA, NIOSH, OTHER). Rows include Oxygen, Methane, Hydrogen Sulfide, Carbon Monoxide, and Nitrogen.

NE = Not Established. NIC = Notice of Intended Change. See Section 16 for Definitions of Terms Used. NOTE (1): ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. This gas mixture has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This gas mixture is a colorless gas which has a rotten-egg odor (due to the presence of Hydrogen Sulfide). The odor cannot be relied on as an adequate warning of the presence of this gas mixture, because olfactory fatigue occurs after over-exposure to Hydrogen Sulfide. Hydrogen Sulfide and Carbon Monoxide (another component of this gas mixture) are toxic to humans in relatively low concentrations. Over-exposure to this gas mixture can cause skin or eye irritation, nausea, dizziness, headaches, collapse, unconsciousness, coma, and death. Additionally, releases of this gas mixture may produce oxygen-deficient atmospheres (especially in small confined spaces or other poorly-ventilated environments); individuals in such atmospheres may be asphyxiated.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of over-exposure for this gas mixture is by inhalation.

INHALATION: Due to the small size of an individual cylinder of this gas mixture, no unusual health effects from over-exposure to the product are anticipated under routine circumstances of use. A potential health hazard associated with this gas mixture is the potential of inhalation of Hydrogen Sulfide, a component of this gas mixture. Such over-exposures may occur if this gas mixture is used in a confined space or other poorly-ventilated area. Over-exposures to Hydrogen Sulfide can cause dizziness, headache, and nausea. Over-exposure to this gas could result in respiratory arrest, coma, or unconsciousness, due to the presence of Hydrogen Sulfide. Continuous inhalation of low concentrations of Hydrogen Sulfide may cause olfactory fatigue, so that the odor is no longer an effective warning of the presence of this gas. A summary of exposure concentrations and observed effects are as follows:

Table with 2 columns: CONCENTRATION OF HYDROGEN SULFIDE (0.3-30 ppm, 50 ppm, etc.) and OBSERVED EFFECT (Odor is unpleasant, Eye irritation, Dryness and irritation of nose, throat, etc.)

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3. HAZARD IDENTIFICATION (continued)

Inhalation over-exposures to atmospheres containing more than the Threshold Limit Value of Carbon Monoxide (25 ppm), another component of this gas mixture, can result in serious health consequences. Carbon Monoxide is classified as a chemical asphyxiant; producing a toxic action by combining with the hemoglobin of the blood and replacing the available oxygen. Through this replacement, the body is deprived of the required oxygen, and asphyxiation occurs. Since the affinity of Carbon Monoxide for hemoglobin is about 200-300 times that of oxygen, only a small amount of Carbon Monoxide will cause a toxic reaction to occur. Carbon Monoxide exposures in excess of 50 ppm will produce symptoms of poisoning if breathed for a sufficiently long time. If this gas mixture is released in a small, poorly ventilated area (i.e. an enclosed or confined space), symptoms which may develop include the following:

Table with 2 columns: CONCENTRATION OF CARBON MONOXIDE (200 ppm, 400 ppm, etc.) and OBSERVED EFFECT (Over-exposure to Carbon Monoxide can be indicated by the lips and fingernails turning bright red, Slight symptoms (i.e. headache) after several hours of exposure, etc.)

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Over-exposure to this gas mixture may cause the following health effects: ACUTE: Due to the small size of the individual cylinder of this gas mixture, no unusual health effects from exposure to the product are anticipated under routine circumstances of use. However the Hydrogen Sulfide and Carbon Monoxide components of this gas mixture are toxic to humans. Over-exposure to this gas mixture can cause nausea, dizziness, headaches, collapse, unconsciousness, coma, and death. Due to the presence of Hydrogen Sulfide, over-exposures to this gas mixture can also irritate the skin and eyes; severe eye contamination can result in blindness. CHRONIC: Severe over-exposures to the Hydrogen Sulfide component of this gas mixture, which do not result in death, may cause long-term symptoms such as memory loss, paralysis of facial muscles, or nerve tissue damage. In serious cases of over-exposure, the eyes can be permanently damaged. Skin disorders and respiratory conditions may be aggravated by repeated over-exposures to this gas product. Refer to Section 11 (Toxicology Information) for additional information on the components of this gas mixture. Chronic exposure to oxygen-deficient atmospheres (below 18% oxygen in air) may affect the heart and nervous system. TARGET ORGANS: ACUTE: Respiratory system, blood system, central nervous system effects, cardiovascular system, skin, eyes. CHRONIC: Neurological system, reproductive system, eyes.

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS GAS MIXTURE WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus must be worn. Victim(s) who experience any adverse effect after over-exposure to this gas mixture must be taken for medical attention. Rescuers should be taken for medical attention if necessary. Take a copy of the label and the MSDS to physician or other health professional with victim(s). No unusual health effects are anticipated after exposure to this gas mixture, due to the small cylinder size. If any adverse symptom develops after over-exposure to this gas mixture, remove victim(s) to fresh air as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation if necessary. SKIN EXPOSURE: If irritation of the skin develops after exposure to this gas mixture, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek immediate medical attention. EYE EXPOSURE: If irritation of the eye develops after exposure to this gas mixture, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Seek medical assistance immediately, preferably an ophthalmologist. MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing respiratory conditions may be aggravated by over-exposure to this gas mixture. Carbon Monoxide, a component of this gas mixture, can aggravate some diseases of the cardiovascular system, such as coronary artery disease and angina pectoris. Because of the presence of Hydrogen Sulfide, eye disorders or skin problems may be aggravated by over-exposure to this gas mixture. RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate over-exposure. Hyperbaric oxygen is the most efficient antidote to Carbon Monoxide poisoning, the optimum range being 2-2.5 atm. A special mask, or, preferably, a compression chamber to utilize oxygen at these pressures is required. Avoid administering stimulant drugs. Be observant for initial signs of pulmonary edema in the event of severe inhalation over-exposures.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable. AUTOIGNITION TEMPERATURE: Not applicable. FLAMMABLE LIMITS (in air by volume, %): Lower (LEL): Not applicable. Upper (UEL): Not applicable. NFPA RATING: A diamond-shaped hazard rating symbol with 0 in the center, 3 in the left point (HEALTH), and 0 in the right point (REACTIVITY). FIRE EXTINGUISHING MATERIALS: Non-flammable gas mixture. Use extinguishing media appropriate for surrounding fire. UNUSUAL FIRE AND EXPLOSION HAZARDS: This gas mixture contains toxic gases, Hydrogen Sulfide and Carbon Monoxide, and presents an health hazard to firefighters. This gas mixture is not flammable; however, containers, when involved in fire, may rupture or burst in the heat of the fire. SPECIAL FIRE-FIGHTING PROCEDURES: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment.

6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Due to the small size and content of the cylinder, an accidental release of this gas mixture presents significantly less risk of over-exposure to Hydrogen Sulfide and Carbon Monoxide, the toxic components of this gas mixture, and other safety hazards related to the remaining components of this gas mixture, than a similar release from a larger cylinder. However, as with any chemical release, extreme caution must be used during emergency response procedures. In the event of a release in which the atmosphere is unknown, and in which other chemicals are potentially involved, evacuate immediate area. Such releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a leak, clear the affected area, protect people, and respond with trained personnel. For emergency disposal.

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6. ACCIDENTAL RELEASE MEASURES (continued)

secure the cylinder and slowly discharge the gas to the atmosphere in a well-ventilated area or outdoors. Allow the gas mixture to dissipate. If necessary, monitor the surrounding area (and the original area of the release) for Hydrogen Sulfide, Carbon Monoxide, and Oxygen. Hydrogen Sulfide and Carbon Monoxide level must be below exposure level listed in Section 2 (Composition and Information on Ingredients) and Oxygen levels must be above 19.5% before non-emergency personnel are allowed to re-enter area. If leaking incidentally from the cylinder, contact your supplier.

7. HANDLING and USE

WORK PRACTICES AND HYGIENE PRACTICES: Be aware of any signs of dizziness or fatigue, especially if work is done in a poorly ventilated area; exposures to fatal concentrations of this gas mixture could occur without any significant warning symptoms, due to olfactory fatigue or oxygen deficiency. Do not attempt to repair, adjust, or in any other way modify cylinders containing a gas mixture with Hydrogen Sulfide or Carbon Monoxide. If there is a malfunction or another type of operational problem, contact nearest distributor immediately. Eye wash stations/safety showers should be near areas where this gas mixture is used or stored. All work operations should be monitored in such a way that emergency personnel can be immediately contacted in the event of a release. All work practices should minimize releases of Hydrogen Sulfide and Carbon Monoxide-containing gas mixtures.

STORAGE AND HANDLING PRACTICES: Cylinders should be firmly secured to prevent falling or being knocked-over. Cylinders must be protected from the environment, and preferably kept at room temperature (approximately 21°C (70°F)). Cylinders should be stored in dry, well-ventilated areas, away from sources of heat, ignition, and direct sunlight. Protect cylinders against physical damage. Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. These cylinders are not refillable. **WARNING!** Do not refill DOT 39 cylinders. To do so may cause personal injury or property damage.

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: **WARNING!** Compressed gases can present significant safety hazards. During cylinder use, use equipment designed for these specific cylinders. Ensure all lines and equipment are rated for proper service pressure.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Always use product in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: No special ventilation systems or engineering controls are needed under normal circumstances of use. As with all chemicals, use this gas mixture in well-ventilated areas. If this gas mixture is used in a poorly-ventilated area, install automatic monitoring equipment to detect the levels of Oxygen, Hydrogen Sulfide, and Carbon Monoxide.

RESPIRATORY PROTECTION: No special respiratory protection is required under normal circumstances of use. Use supplied air respiratory protection if the levels of components exceeds exposure limits presented in Section 2 (Composition and Information of Ingredients) and Oxygen levels are below 19.5%, or unknown, during emergency response to a release of this gas mixture. If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, or the Canadian CSA Standard Z94.4-93 and applicable standards of Canadian Provinces. Oxygen levels below 19.16.33% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998). The following NIOSH respiratory protection recommendations for Hydrogen Sulfide and Carbon Monoxide are provided for further information.

NIOSH/OSHA RECOMMENDATIONS FOR HYDROGEN SULFIDE CONCENTRATIONS IN AIR:
Up to 100 ppm: Powered air-purifying respirator with cartridge(s) to protect against hydrogen sulfide; gas mask with canister to protect against hydrogen sulfide; or SAR; or full-facepiece SCBA.

Emergency or Planned Entry into Unknown Concentration or IDLH Conditions: Positive pressure, full-facepiece SCBA; or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.

Escape: Gas mask with canister to protect against hydrogen sulfide; or escape-type SCBA
NOTE: The IDLH concentration for Hydrogen Sulfide is 100 ppm.

NIOSH/OSHA RECOMMENDATIONS FOR CARBON MONOXIDE CONCENTRATIONS IN AIR:
Up to 350 ppm: Supplied Air Respirator (SAR)
Up to 875 ppm: Supplied Air Respirator (SAR) operated in a continuous flow mode.
Up to 1200 ppm: Gas mask with canister to protect against carbon monoxide; or full-facepiece SCBA; or full-facepiece Supplied Air Respirator (SAR).

Emergency or Planned Entry into Unknown Concentration or IDLH Conditions: Positive pressure, full-facepiece SCBA; or positive pressure, full-facepiece Supplied Air Respirator (SAR) with an auxiliary positive pressure SCBA.

Escape: Gas mask with canister to protect against carbon monoxide; or escape-type SCBA.
NOTE: End of Service Life Indicator (ESLI) required for gas masks.

NOTE: The IDLH concentration for Carbon Monoxide is 1200 ppm.

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Wear leather gloves when handling cylinders. Chemically resistant gloves should be worn when using this gas mixture. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: No special protection is needed under normal circumstances of use. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA 29 CFR 1910.136.

9. PHYSICAL and CHEMICAL PROPERTIES

The following information is for Nitrogen, the main component of this gas mixture.

GAS DENSITY @ 32°F (0°C) and 1 atm: .072 lbs/ft³ (1.153 kg/m³)

FREEZING/MELTING POINT @ 10 psig: -345.8°F (-210°C)

SPECIFIC GRAVITY (air = 1) @ 70°F (21.1°C): 0.906

SOLUBILITY IN WATER vol/vol @ 32°F (0°C) and 1 atm: 0.023

EVAPORATION RATE (nBuAc = 1): Not applicable.

VAPOR PRESSURE @ 70°F (21.1°C) (psig): Not applicable.

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

BOILING POINT: -320.4°F (-195.8°C)

pH: Not applicable.

MOLECULAR WEIGHT: 28.01

EXPANSION RATIO: Not applicable.

SPECIFIC VOLUME (ft³/lb): 13.8

The following information is for this gas mixture.

ODOR THRESHOLD: 0.13 ppm (Hydrogen Sulfide)

APPEARANCE AND COLOR: This gas mixture is a colorless gas which has an rotten egg-like odor, due to the presence of Hydrogen Sulfide.

HOW TO DETECT THIS SUBSTANCE (warning properties): Continuous inhalation of low concentrations of this gas mixture may cause olfactory fatigue, due to the presence of Hydrogen Sulfide, so the odor is not a good warning property of a release of this gas mixture. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation. Wet lead acetate paper can be used for leak detection. The paper turns black in the presence of Hydrogen Sulfide. Cadmium chloride solutions can also be used. Cadmium solutions will turn yellow upon contact with Hydrogen Sulfide.

10. STABILITY and REACTIVITY

STABILITY: Normally stable in gaseous state.

DECOMPOSITION PRODUCTS: The thermal decomposition products of Methane include carbon oxides. The decomposition products of Hydrogen Sulfide include water and sulfur oxides. The other components of this gas mixture do not decompose, per se, but can react with other compounds in the heat of a fire.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Titanium will burn in Nitrogen (the main component of this gas mixture). Lithium reacts slowly with Nitrogen at ambient temperatures. Components of this gas mixture (Hydrogen Sulfide, Methane) are also incompatible with strong oxidizers (i.e. chlorine, bromine pentafluoride, oxygen, oxygen difluoride, and nitrogen trifluoride). Carbon Monoxide is mildly corrosive to nickel and iron (especially at high temperatures and pressures). Hydrogen Sulfide is corrosive to most metals, because it reacts with these substances to form metal sulfides.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

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11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicology data are available for the components of this gas mixture:

NITROGEN:

There are no specific toxicology data for Nitrogen. Nitrogen is a simple asphyxiant, which acts to displace oxygen in the environment.

METHANE:

There are no specific toxicology data for Methane. Methane is a simple asphyxiant, which acts to displace oxygen in the environment.

CARBON MONOXIDE:

LC₅₀ (Inhalation-Rat) 1807 ppm/4 hours

LC₅₀ (Inhalation-Guinea Pig) 5718 ppm/4 hours

LC₅₀ (Inhalation-wild species) 1534 ppm

LC₅₀ (Inhalation-Human) 4 mg/m³ 12 hours:

Behavioral: coma; Vascular: BP lowering not characterized in autonomic section; Blood:

methemoglobinemia-carboxyhemoglobin

LC₀ (Inhalation-Human) 4000 ppm/30 minutes

LC₀ (Inhalation-Human) 5000 ppm/5 minutes

LC₀ (Inhalation-Dog) 4000 ppm/46 minutes

LC₀ (Inhalation-Rabbit) 4000 ppm

LC₀ (Inhalation-Mammal-species unspecified) 5000 ppm/5 minutes

LC₀ (Inhalation-Human) 600 mg/m³/10 minutes:

Behavioral: headache

TC₀ (Inhalation-Man) 650 ppm/45 minutes: Blood:

methemoglobinemia-carboxyhemoglobin;

Behavioral: changes in psychophysiological tests

TC₀ (Inhalation-Rat) 1800 ppm/1 hour/14 days-

intermittent: Cardiac: other changes

TC₀ (Inhalation-Rat) 30 mg/m³/6 hours/10 weeks-

intermittent: Brain and Coverings: other degenerative changes; Behavioral: muscle

contraction or spasticity

TC₀ (Inhalation-Rat) 90 ppm/24 hours/90 days-

continuous: Blood: pigmented or nucleated red

blood cells, other changes

TC₀ (Inhalation-Rat) 250 ppm/5 hours/20 days-

intermittent: Blood: pigmented or nucleated red

blood cells; changes in erythrocyte cell count

(unspecified), changes in erythrocyte (RBC) count

TD₀ (Subcutaneous-Rat) 5983 mg/kg/18 weeks-

intermittent: Blood: changes in serum composition

(e.g. TP, bilirubin, cholesterol)

TC₀ (Inhalation-Monkey) 200 ppm/4 hours/90

days-continuous; Blood: pigmented or nucleated

red blood cells, other changes

TC₀ (Inhalation-Rabbit) 200 mg/m³/3 hours/13

weeks-intermittent: Brain and Coverings: other

degenerative changes; Cardiac: other changes;

Blood: hemorrhage

TC₀ (Inhalation-Guinea Pig) 200 mg/m³/5 hours/30

weeks-continuous: Cardiac: arrhythmias (including

changes in conduction); EKG changes not

diagnostic of specified effects, pulse rate increase,

without fall in BP

CARBON MONOXIDE (continued):

TC₀ (Inhalation-Mouse) 50 ppm/30 days-

intermittent: Lungs, Thorax, or Respiration:

structural or functional change in trachea or

bronchi

TC₀ (Inhalation-Guinea Pig) 200 mg/m³/5 hours/4

weeks-intermittent: Endocrine: hyperglycemia

TC₀ (Inhalation-Guinea Pig) 200 ppm/24 hours/90

days-continuous: Blood: pigmented or nucleated

red blood cells, other changes

TC₀ (Inhalation-Rat) 75 ppm/24 hours: female 0-20

day(s) after conception: Reproductive: Maternal

Effects: other effects; Effects on Newborn:

behavioral

TC₀ (Inhalation-Rat) 150 ppm/24 hours: female 1-

22 day(s) after conception: Reproductive: Specific

Developmental Abnormalities: cardiovascular

(circulatory) system

TC₀ (Inhalation-Rat) 150 ppm/24 hours: female 1-

22 day(s) after conception: Reproductive: Effects

on Newborn: growth statistics (e.g.%, reduced

weight gain), behavioral

TC₀ (Inhalation-Rat) 1 mg/m³/24 hours: female 72

day(s) pre-mating: Reproductive: Maternal Effects:

menstrual cycle changes or disorders, parturition;

Fertility: female fertility index (e.g. # females

pregnant per # sperm positive females, # females

pregnant per # females mated)

TC₀ (Inhalation-Rat) 150 ppm/24 hours: female 0-20

day(s) after conception: Reproductive: Effects

on Newborn: behavioral

TC₀ (Inhalation-Rat) 75 ppm/24 hours: female 0-20

day(s) after conception: Reproductive: Specific

Developmental Abnormalities: immune and

reticuloendothelial system

TC₀ (Inhalation-Mouse) 65 ppm/24 hours: female

7-18 day(s) after conception: Reproductive:

Effects on Newborn: behavioral

TC₀ (Inhalation-Mouse) 250 ppm/7 hours: female

6-15 day(s) after conception: Reproductive:

Fertility: post-implantation mortality (e.g. dead

and/or resorbed implants per total number of

implants); Specific Developmental Abnormalities:

musculoskeletal system

TC₀ (Inhalation-Mouse) 125 ppm/24 hours: female

7-18 day(s) after conception: Reproductive:

Effects on Embryo or Fetus: fetotoxicity (except

death, e.g. stunted fetus)

TC₀ (Inhalation-Mouse) 8 ppt/1 hour: female 8

day(s) after conception: Reproductive: Fertility:

litter size (e.g. # fetuses per litter; measured

before birth); Effects on Embryo or Fetus:

fetotoxicity (except death, e.g. stunted fetus), fetal

death

SUSPECTED CANCER AGENT: The components of this gas mixture are not found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, and IARC; therefore, they are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITATION OF PRODUCT: This gas mixture is irritating to the eyes, and may be irritating to the skin.

SENSITIZATION OF PRODUCT: The components of this gas mixture are not known to be skin or respiratory sensitizers.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this gas mixture on the human reproductive system.

Mutagenicity: The components of this gas mixture are not reported to cause mutagenic effects in humans.

REPRODUCTIVE TOXICITY INFORMATION (continued):

Embryotoxicity: This gas mixture contains components that may cause embryotoxic effects in humans; however, due to the small total amount of the components, embryotoxic effects are not expected to occur.

Teratogenicity: This gas mixture is not expected to cause teratogenic effects in humans due to the small cylinder size and small total amount of all components. The Carbon Monoxide component of this gas mixture which exists up to 1%, can cause teratogenic effects in humans. Severe exposure to Carbon Monoxide during pregnancy has caused adverse effects and the death of the fetus. In general, maternal symptoms are an indicator of the potential risk to the fetus since Carbon Monoxide is toxic to the mother before it is toxic to the fetus.

Reproductive Toxicity: The components of this gas mixture are not reported to cause adverse reproductive effects in humans.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. **An embryotoxin** is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. **A teratogen** is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. **A reproductive toxin** is any substance which interferes in any way with the reproductive process.

BIOLOGICAL EXPOSURE INDICES (BEIs): Biological Exposure Indices (BEIs) have been determined for components of this gas mixture, as follows:

CHEMICAL DETERMINANT	SAMPLING TIME	BEI
CARBON MONOXIDE • Carboxyhemoglobin in blood • Carbon monoxide in end-exhaled air	• End of shift • End of shift	• 3.5% of hemoglobin • 20 ppm

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: The gas will be dissipated rapidly in well-ventilated areas. The following environmental data are applicable to the components of this gas mixture.

CARBON MONOXIDE:

Atmospheric Fate: A photochemical model was used to quantify the sensitivity of the tropospheric oxidants ozone (O₃) and OH to changes in methane (CH₄), Carbon Monoxide (CO), and NO emissions and to perturbations in climate and stratospheric chemistry. In most cases, increased CH₄ and CO emissions will suppress OH (negative coefficients) in increased O₃ (positive coefficients) except in areas where NO and O₃ influenced by pollution are sufficient to increase OH. In most regions, NO, CO, and CH₄ emission increased will suppress OH and increased O₃, but these trends may be opposed by stratospheric O₃ depletion and climate change.

HYDROGEN SULFIDE:

Water Solubility = 1 g/242 mL at 20°C.

Plant Toxicity: Continuous fumigation of plants with 300 or 3000 ppb Hydrogen Sulfide caused leaf lesions, defoliation, and reduced growth with severity of injury correlated to dose. At higher (3.25 and 5.03 ppm) Hydrogen Sulfide, significant reductions in leaf CO₂ and water vapor exchanges occurred, and stomatal openings were depressed. When Hydrogen Sulfide gas was applied to 29 species of green plants for 5 hours, young, rapidly elongating tissues were more sensitive to injury than older tissues. Symptoms included scorching of young shoots and

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12. ECOLOGICAL INFORMATION(continued)

leaves, basal and marginal scorching of older leaves. Mature leaves were unaffected. Seeds exposed to Hydrogen Sulfide gas showed delay in germination.

Persistence: Converts to elemental sulfur upon standing in water.

Major Species Threatened: Aquatic and animal life plants may be injured if exposed to 5 ppm in air over 24 hours.

Biodegradation: Microorganisms in soil and water are involved in oxidation-reduction reactions that oxidize hydrogen sulfide to elemental sulfur. Members of the genera Beggiatoa, Thioploca, and Thiotrix function in transition zones between aerobic and anaerobic conditions where both molecular oxygen and hydrogen sulfide are found. Also, some photosynthetic bacteria oxidize hydrogen sulfide to elemental sulfur. Members of the families Chlorobiaceae and Chromatiaceae (purple sulfur bacteria) are obligate aerobes and are phototrophic, and are found in waters with high H₂S concentrations. The interactions of these organisms form part of the global sulfur cycle.

Bioconcentration: Does not have bioaccumulation or food chain contamination potential.

NITROGEN: Water Solubility = 2.4 volumes Nitrogen/100 volumes water at 0°C; 1.6 volumes Nitrogen/100 volumes water at 20°C.

EFFECT OF MATERIAL ON PLANTS OR ANIMALS: No evidence is currently available on this gas mixture's effects on plant and animal life. Hydrogen Sulfide and Carbon Monoxide, components of this gas mixture, can be deadly to exposed animal life, producing symptoms similar to those experienced by humans. This gas mixture may also be harmful to plant life.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this gas mixture's effects on aquatic life. The presence of more than a trace of the Carbon Monoxide component of this gas mixture is a hazard to fish. The following aquatic toxicity data are available for the Hydrogen Sulfide component of this gas mixture:

HYDROGEN SULFIDE:	HYDROGEN SULFIDE (continued):	HYDROGEN SULFIDE (continued):
LC ₅₀ (Asellus arthropods) 96 hours = 0.111 mg/L	LC ₅₀ F (bluegill, 35-day-old fry) 96 hours = 0.0131 mg/L	LC ₅₀ F (bluegill, juveniles) 96 hours = 0.0478 mg/L
LC ₅₀ (Crangon arthropods) 96 hours = 1.07 mg/L	LC ₅₀ F (bluegill, adults) 96 hours = 0.0448 mg/L	LC ₅₀ F (fathead minnows) 96 hours = 0.0071-0.55 mg/L
LC ₅₀ (Gammarus arthropods) 96 hours = 0.84 mg/L	LC ₅₀ F (bluegill) 96 hours = 0.0090-0.0140 mg/L	LC ₅₀ F (brook trout) 96 hours = 0.0216-0.0308 mg/L
LC ₅₀ (Ephemera) 96 hours = 0.316 mg/L	LC ₅₀ F (fathead minnows) 96 hours = 0.0216-0.0308 mg/L	Toxic (goldfish) = 100 mg/L
LC ₅₀ (Inhalation-Files) > 960 minutes = 380 mg/m ³		
LC ₅₀ (Inhalation-Files) 7 minutes = 1,500 mg/m ³		
LC ₅₀ F (bluegill, eggs) 72 hours = 0.0190 mg/L		

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Cylinders with undesired residual product may be safely vented outdoors with the proper regulator. For further information, refer to Section 16 (Other Information).

14. TRANSPORTATION INFORMATION

THIS GAS MIXTURE IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Compressed gases, n.o.s. ("Oxygen, Nitrogen") or the gas component with the next highest concentration next to Nitrogen.

HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)

UN IDENTIFICATION NUMBER: UN 1956

PACKING GROUP: Not Applicable

DOT LABEL(S) REQUIRED: Non-Flammable Gas

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 126

U.S. DEPARTMENT OF TRANSPORTATION INFORMATION (continued):

MARINE POLLUTANT: The components of this gas mixture are not classified by the DOT as Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles can present serious safety hazards. If transporting these cylinders in vehicles, ensure these cylinders are not exposed to extremely high temperatures (as may occur in an enclosed vehicle on a hot day). Additionally, the vehicle should be well-ventilated during transportation.

Note: DOT 39 Cylinders ship in a strong outer carton (outer package). Pertinent shipping information goes on the outside of the outer package. DOT 39 Cylinders do not have transportation information on the cylinder itself.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This gas mixture is considered as Dangerous Goods, per regulations of Transport Canada.

PROPER SHIPPING NAME: Compressed gases, n.o.s. ("Oxygen, Nitrogen") or the gas component with the next highest concentration next to Nitrogen.

HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)

UN IDENTIFICATION NUMBER: UN 1956

PACKING GROUP: Not Applicable

HAZARD LABEL: Class 2.2 (Non-Flammable Gas)

SPECIAL PROVISIONS: None

EXPLOSIVE LIMIT AND LIMITED QUANTITY INDEX: 0.12

ERAP INDEX: 3000

PASSENGER CARRYING SHIP INDEX: Forbidden

PASSENGER CARRYING ROAD VEHICLE OR PASSENGER CARRYING RAILWAY VEHICLE INDEX: Forbidden

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 126

NOTE: Shipment of compressed gas cylinders via Public Passenger Road Vehicle is a violation of Canadian law (Transport Canada Transportation of Dangerous Goods Act, 1992).

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: This gas mixture is subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Hydrogen Sulfide	YES	YES	YES

U.S. SARA THRESHOLD PLANNING QUANTITY: Hydrogen Sulfide = 500 lb (227 kg)

U.S. TSCA INVENTORY STATUS: The components of this gas mixture are listed on the TSCA Inventory.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Hydrogen Sulfide = 100 lb (45 kg)

OTHER U.S. FEDERAL REGULATIONS:

- Hydrogen Sulfide and Carbon Monoxide are subject to the reporting requirements of CFR 29 1910.1000.
- Hydrogen Sulfide and Methane are subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for each of these gases is 10,000 pounds and so this mixture will not be affected by the regulation.
- Depending on specific operations involving the use of this gas mixture, the regulations of the Process Safety Management of Highly Hazardous Chemicals may be applicable (29 CFR 1910.119). Hydrogen Sulfide is listed in Appendix A of this regulation. The Threshold Quantity for Hydrogen Sulfide under this regulation is 1500 lbs (and so one cylinder of this gas mixture will not be affected by this regulation).
- This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82).
- Nitrogen and Oxygen are not listed Regulated Substances, per 40 CFR, Part 68, of the Risk Management for Chemical Releases. Hydrogen Sulfide is listed under this regulation in Table 1 as a Regulated Substance (Toxic Substance), in quantities of 10,000 lbs (4,553 kg) or greater.

15. REGULATORY INFORMATION(continued)

Carbon Monoxide and Methane are listed under this regulation in Table 3, as Regulated Substances (Flammable), in quantities of 10,000 lbs (4,553 kg) or greater, and so this mixture will not be affected by the regulation.

U.S. STATE REGULATORY INFORMATION: The components of this gas mixture are covered under the following specific State regulations:

Alaska - Designated Toxic and Hazardous Substances: Carbon Monoxide, Hydrogen Sulfide, Methane.	Michigan - Critical Materials Register: No.	Pennsylvania - Hazardous Substance List: Oxygen, Carbon Monoxide, Nitrogen, Hydrogen Sulfide, Methane.
California - Permissible Exposure Limits for Chemical Contaminants: Carbon Monoxide, Nitrogen, Hydrogen Sulfide, Methane.	Minnesota - List of Hazardous Substances: Carbon Monoxide, Hydrogen Sulfide, Methane.	Rhode Island - Hazardous Substance List: Oxygen, Carbon Monoxide, Nitrogen, Hydrogen Sulfide, Methane.
Florida - Substance List: Oxygen, Carbon Monoxide, Hydrogen Sulfide	Missouri - Employer Information/Toxic Substance List: Hydrogen Sulfide, Methane.	Texas - Hazardous Substance List: Hydrogen Sulfide.
Illinois - Toxic Substance List: Carbon Monoxide, Methane, Hydrogen Sulfide.	New Jersey - Right to Know Hazardous Substance List: Oxygen, Carbon Monoxide, Nitrogen, Methane.	West Virginia - Hazardous Substance List: Hydrogen Sulfide.
Kansas - Section 302/313 List: No.	North Dakota - List of Hazardous Chemicals, Reportable Quantities: Hydrogen Sulfide.	Wisconsin - Toxic and Hazardous Substances: Hydrogen Sulfide
Massachusetts - Substance List: Oxygen, Carbon Monoxide, Hydrogen Sulfide, Methane.		

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): The Carbon Monoxide component of this gas mixture is on the California Proposition 65 lists. **WARNING!** This gas mixture contains a compound known to the State of California to cause birth defects or other reproductive harm.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: The components of this gas mixture are listed on the DSL Inventory.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The components of this gas mixture are not on the CEPA Priorities Substances Lists.

CANADIAN WHMIS CLASSIFICATION: This gas mixture is categorized as a Controlled Product, Hazard Classes A and D2A, as per the Controlled Product Regulations.

16. OTHER INFORMATION

INFORMATION ABOUT DOT-39 NRC (Non-Refillable Cylinder) PRODUCTS

DOT 39 cylinders ship as hazardous materials when full. Once the cylinders are relieved of pressure (empty) they are not considered hazardous material or waste. Residual gas in this type of cylinder is not an issue because toxic gas mixtures are prohibited. Calibration gas mixtures typically packaged in these cylinders are Nonflammable n.o.s., UN 1956. A small percentage of calibration gases packaged in DOT 39 cylinders are flammable or oxidizing gas mixtures.

For disposal of used DOT-39 cylinders, it is acceptable to place them in a landfill if local laws permit. Their disposal is no different than that employed with other DOT containers such as spray paint cans, household aerosols, or disposable cylinders of propane (for camping, torch etc.). When feasible, we recommended recycling for scrap metal content. CALGASZ will do this for any customer that wishes to return cylinders to us prepaid. All that is required is a phone call to make arrangements so we may anticipate arrival. Scrapping cylinders involves some preparation before the metal dealer may accept them. We perform this operation as a service to valued customers who want to participate.

MIXTURES: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

Further information about the handling of compressed gases can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102. Telephone: (703) 412-0900.

P-1	"Safe Handling of Compressed Gases in Containers"
AV-1	"Safe Handling and Storage of Compressed Gases" "Handbook of Compressed Gases"



This Material Safety Data Sheet is offered pursuant to OSHA's Hazard Communication Standard, 29 CFR, 1910.1200. Other government regulations must be reviewed for applicability to this gas mixture. To the best of CALGASZ knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness are not guaranteed and no warranties of any type, either express or implied, are provided. The information contained herein relates only to this specific product. If this gas mixture is combined with other materials, all component properties must be considered. Data may be changed from time to time. Be sure to consult the latest edition.



MATERIAL SAFETY DATA SHEET

Commercial ABC Dry Chemical (Fire Extinguishing Agent)

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATIONS AND OF THE COMPANY UNDERTAKING

Product Name	Commercial ABC Dry Chemical (Fire Extinguishing Agent)
Other Trade Names	Multi-Purpose, Ammonium Phosphate, Monoammonium Phosphate
Product Description	Fire Extinguishing Agent
Manufacturer/Supplier	Kidde – Residential and Commercial
Address	1016 Corporate Park Drive Mebane, NC 27302 USA
Phone Number	(919) 563-5911 (919) 304-8200
Chemtrec Number (for emergencies only)	(800) 424-9300 (703) 527-3887 (International)
Revision Date:	February 28, 2011
MSDS Date:	January 15, 2007

Safety Data Sheet according to EC directive 2001/59/EC and OSHA's Hazcom Standard (29 CFR 1910.1200)

2. HAZARDS IDENTIFICATION

EU Main Hazards
Non Hazardous Powder

Routes of Entry

- Eye contact - Inhalation - Skin contact

Carcinogenic Status

See Section 11 - Toxicity

Target Organs

- Respiratory System - Skin - Eye

Health Effects - Eyes

Contact for short periods of time may cause irritation.

Health Effects - Skin

Contact may cause mild irritation.

Health Effects - Ingestion

Ingestion is not an expected route of exposure.

Health Effects - Inhalation

May irritate the respiratory tract. May cause transient cough and shortness of breath.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS#/Codes	Concentration	R Phrases	EU Classification
Monoammonium Phosphate	7722-76-1 EC#2317645	55 - 65%	None	None
Ammonium Sulfate	7783-20-2 EC#2319841	30 - 40%	None	None
Mica	12001-26-2	1 - 4%	None	None

Revision Date: February 28, 2011

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MATERIAL SAFETY DATA SHEET

Commercial ABC Dry Chemical (Fire Extinguishing Agent)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS#/Codes	Concentration	R Phrases	EU Classification
Clay	8031-18-3	<2%	None	None
Amorphous Silica	7631-86-9 EC#2315454	<2%	None	None
Dye	NA	<0.1%	None	None

4. FIRST AID MEASURES

Eyes

Immediately flood the eye with plenty of water for at least 15 minutes, holding the eye open. Obtain medical attention if soreness or redness persists.

Skin

Wash affected area with soap and water. Obtain medical attention if irritation persists.

Ingestion

Dilute by drinking large quantities of water and obtain medical attention.

Inhalation

Move victim to fresh air. Obtain medical attention immediately for any breathing difficulty.

Advice to Physicians

Treat symptomatically.

5. FIRE - FIGHTING MEASURES

Extinguishing Media

This preparation is used as an extinguishing agent and therefore is not a problem when trying to control a blaze. Use extinguishing agent appropriate to other materials involved. Keep pressurized extinguishers and surroundings cool with water spray as they may rupture or burst in the heat of a fire.

Unusual Fire and Explosion Hazards

Pressurized containers may explode in heat of fire.

Protective Equipment for Fire-Fighting

Wear full protective clothing and self-contained breathing apparatus as appropriate for specific fire conditions.

6. ACCIDENTAL RELEASE MEASURES

Sweep up or vacuum. Prevent skin and eye contact. Wear appropriate protective equipment.

7. HANDLING AND STORAGE

Pressurized extinguishers should be properly stored and secured to prevent falling or being knocked over. Do not drag, slide or roll extinguishers. Do not drop extinguishers or permit them to strike against each other. Never apply flame or localized heat directly to any part of the extinguisher or plastic container. Store pressurized extinguishers and plastic containers away from high heat sources. Storage area should be: - cool - dry - well ventilated - under cover - out of direct sunlight

Revision Date: February 28, 2011

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MATERIAL SAFETY DATA SHEET

Commercial ABC Dry Chemical
(Fire Extinguishing Agent)

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational Exposure Standards

Occupational exposure limits are listed below, if they exist.

Mica

ACGIH TLV: 3 mg/m³ TWA, measured as respirable fraction of the aerosol.

OSHA PEL: 20 mppcf, <1% crystalline silica

Nuisance Dust Limit

OSHA PEL: 50 mppcf or 15 mg/m³ TWA, total dust
15 mppcf or 5 mg/m³ TWA, respirable fraction

Engineering Control Measures

Use with adequate ventilation. There should be local procedures for the selection, training, inspection and maintenance of this equipment. When used in large volumes, use local exhaust ventilation.

Respiratory Protection

Not normally required. Use dust mask where dustiness is prevalent, or TLV is exceeded.

Hand Protection

Not normally needed when used as a portable fire extinguisher. Use gloves if irritation occurs.

Eye Protection

Chemical goggles or safety glasses with side shields.

Body Protection

Normal work wear.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Powder
Color	Pale Yellow
Odor	Odorless
Specific Gravity	Not available
Boiling Range/Point (°C/F)	Not applicable
Flash Point (PMCC) (°C/F)	Not Flammable
Solubility in Water	Not applicable
Vapor Density (Air = 1)	Heavier than air.
Vapor Pressure	Not applicable
Evaporation Rate	Not applicable

10. STABILITY AND REACTIVITY

Stability

Stable under normal conditions.

Conditions to Avoid

- Heat - High temperatures - Exposure to direct sunlight

Materials to Avoid

- Strong oxidizing agents - strong acids - sodium hypochlorite

Hazardous Polymerization

Will not occur.



MATERIAL SAFETY DATA SHEET

Commercial ABC Dry Chemical
(Fire Extinguishing Agent)

10. STABILITY AND REACTIVITY

Hazardous Decomposition Products

- oxides of carbon - ammonia - oxides of phosphorus - nitrogen oxides

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Low order of acute toxicity.

Chronic Toxicity/Carcinogenicity

This product is not expected to cause long term adverse health effects.

Mica and clay may contain small quantities of quartz (crystalline silica) as an impurity. Prolonged exposure to respirable crystalline silica dust at concentrations exceeding the occupational exposure limits may increase the risk of developing a disabling lung disease known as silicosis. IARC found limited evidence for pulmonary carcinogenicity of crystalline silica in humans.

Genotoxicity

This product is not expected to cause any mutagenic effects.

Reproductive/Developmental Toxicity

This product is not expected to cause adverse reproductive effects.

12. ECOLOGICAL INFORMATION

Mobility

No relevant studies identified.

Persistence/Degradability

No relevant studies identified.

Bio-accumulation

No relevant studies identified.

Ecotoxicity

No relevant studies identified.

13. DISPOSAL CONSIDERATIONS

Dispose of container in accordance with all applicable local and national regulations. Do not cut, puncture or weld on or near to the container. No harm to the environment is expected from this preparation.

14. TRANSPORT INFORMATION

DOT CFR 172.101 Data	Not regulated
UN Proper Shipping Name	Not regulated
UN Class	None
UN Number	None
UN Packaging Group	None

NOTE: For additional HAZMAT shipping information related to shipping pressurized fire extinguishers, refer to Badger Technical Bulletin #123-1201 available for download at www.badgerfire.com.



MATERIAL SAFETY DATA SHEET

Commercial ABC Dry Chemical
(Fire Extinguishing Agent)



MATERIAL SAFETY DATA SHEET

Commercial ABC Dry Chemical
(Fire Extinguishing Agent)

15. REGULATORY INFORMATION

EU Label Information

Classification and labelling have been performed according to EU directives 67/548/EEC and 99/45/EC including amendments(2001/60/EC and 2006/8/EC)

EU Hazard Symbol and Indication of Danger.

This preparation is not classified as dangerous.

R phrases

None

S phrases

None.

US REGULATIONS (Federal, State) and INTERNATIONAL CHEMICAL REGISTRATION LAWS

TSCA Listing

This product contains ingredients that are listed on or exempt from listing on the EPA Toxic Substance Control Act Chemical Substance Inventory.

EINECS Listing

All ingredients in this product have not been verified for listing on the European Inventory of Existing Commercial Chemical Substances (EINECS) or the European List of New Chemical Substances (ELINCS).

DSL/NDSL (Canadian) Listing

All ingredients in this product are listed on the Domestic Substance List (DSL) or the Non-Domestic Substance List (NDSL) or are exempt from listing.

WHMIS Classification

D2B

This product was classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations and the MSDS contains all the information required by these regulations.

MA Right To Know Law

All components have been checked for inclusion on the Massachusetts Substance List (MSL). Those components present at or above the de minimis concentration include: - Mica (12001-26-2) 1-4% - Amorphous Silica (7631-86-9) <2% - Ammonium Sulfate (7783-20-2) 30 - 40%

PA Right To Know Law

This product contains the following chemicals found on the Pennsylvania Hazardous Substance List: - Mica (12001-26-2) 1-4% - Amorphous Silica (7631-86-9) <2% - Ammonium Sulfate (7783-20-2) 30 - 40%

NJ Right To Know Law

This product contains the following chemicals found on the NJ Right To Know Hazardous Substance List: - Mica (12001-26-2) 1-4% - Amorphous Silica (7631-86-9) <2%

California Proposition 65

This product does not contain materials which the State of California has found to cause cancer, birth defects or other reproductive harm.

SARA Title III Sect. 302 (EHS)

This product does not contain any chemicals subject to SARA Title III Section 302.

SARA Title III Sect. 304

This product does not contain any chemicals subject to SARA Title III Section 304.

15. REGULATORY INFORMATION

SARA Title III Sect. 311/312 Categorization

- Immediate (Acute) Health Hazard

SARA Title III Sect. 313

This product does not contain any chemicals that are listed in Section 313 at or above de minimis concentrations.

16. OTHER INFORMATION

NFPA Ratings

NFPA Code for Health - 1

NFPA Code for Flammability - 0

NFPA Code for Reactivity - 0

NFPA Code for Special Hazards - None

HMIS Ratings

HMIS Code for Health - 1

HMIS Code for Flammability - 0

HMIS Code for Reactivity - 0

HMIS Code for Personal Protection - See Section 8

Abbreviations

N/A: Denotes no applicable information found or available

CAS#: Chemical Abstracts Service Number

ACGIH: American Conference of Governmental Industrial Hygienists

OSHA: Occupational Safety and Health Administration

TLV: Threshold Limit Value

PEL: Permissible Exposure Limit

STEL: Short Term Exposure Limit

NTP: National Toxicology Program

IARC: International Agency for Research on Cancer

R: Risk

S: Safety

Prepared By:

EnviroNet LLC.

The information contained herein is based on data believed to be accurate. However, no representation, warranty, or guarantee is made to its accuracy, reliability or completeness. It is the user's responsibility to satisfy himself as to the suitability and completeness of such information for its own particular use. Kidde – Residential and Commercial assumes no responsibility for personal injury or property damage resulting from use, handling or from contact with this product.

Material Safety Data Sheet



Acetylene

Section 1. Chemical product and company identification

Product name : Acetylene
Supplier : AIRGAS INC., on behalf of its subsidiaries
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

Product use : Synthetic/Analytical chemistry.
Synonym : acetylen; acetylene ; ethine; ethyne; narcylen
MSDS # : 001001
Date of Preparation/Revision : 5/11/2011.
In case of emergency : 1-866-734-3438

Section 2. Hazards identification

Physical state : Gas.
Emergency overview : WARNING!
FLAMMABLE GAS.
MAY CAUSE FLASH FIRE.
MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
CONTENTS UNDER PRESSURE.
Keep away from heat, sparks and flame. Do not puncture or incinerate container. May cause target organ damage, based on animal data. Use only with adequate ventilation. Keep container closed.
Contact with rapidly expanding gases can cause frostbite.

Target organs : May cause damage to the following organs: lungs, upper respiratory tract, central nervous system (CNS).
Routes of entry : Inhalation
Potential acute health effects
Eyes : Contact with rapidly expanding gas may cause burns or frostbite.
Skin : Contact with rapidly expanding gas may cause burns or frostbite.
Inhalation : Acts as a simple asphyxiant.
Ingestion : Ingestion is not a normal route of exposure for gases
Potential chronic health effects
Chronic effects : May cause target organ damage, based on animal data.
Target organs : May cause damage to the following organs: lungs, upper respiratory tract, central nervous system (CNS).
Medical conditions aggravated by over-exposure : Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (Section 11)

Section 3. Composition, Information on Ingredients

Name	CAS number	% Volume	Exposure limits
Acetylene	74-86-2	100	NIOSH REL (United States, 6/2009). CEIL: 2662 mg/m ³ CEIL: 2500 ppm

Acetylene

Section 4. First aid measures

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.

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Frostbite : Try to warm up the frozen tissues and seek medical attention.
Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

Flammability of the product : Flammable.
Auto-ignition temperature : 305°C (581°F)
Flash point : Closed cup: -18.15°C (-0.7°F).
Flammable limits : Lower: 2.5% Upper: 100%
Products of combustion : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Fire hazards in the presence of various substances : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge, heat and oxidizing materials.
Fire-fighting media and instructions : In case of fire, use water spray (fog), foam or dry chemical.

In case of fire, allow gas to burn if flow cannot be shut off immediately. Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.

Contains gas under pressure. Flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

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 : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Acetylene

Section 7. Handling and storage

Handling : Use only with adequate ventilation. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Keep container closed. Keep away from heat, sparks and flame. To avoid fire, eliminate ignition sources. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Storage : Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Segregate from oxidizing materials. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

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.

Personal protection

Eyes : 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 or dusts.

Skin : 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.

Respiratory : Use a properly fitted, air-purifying or air-fed 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.

The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93

Hands : 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.

Personal protection in case of a large spill : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.

Product name

Ethyne **NIOSH REL (United States, 6/2009).**
CEIL: 2662 mg/m³
CEIL: 2500 ppm

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

Molecular weight : 26.04 g/mole
Molecular formula : C₂H₂
Melting/freezing point : Sublimation temperature: -81.8°C (-115.2 to °F)
Critical temperature : 35.3°C (95.5°F)
Vapor pressure : 635 (psig)
Vapor density : 0.907 (Air = 1)
Specific Volume (ft³/lb) : 14.7058
Gas Density (lb/ft³) : 0.0691 (-80°C / -112 to °F)

Acetylene

Section 10. Stability and reactivity

Stability and reactivity : The product is stable.
Incompatibility with various substances : Extremely reactive or incompatible with the following materials: oxidizing materials.
Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data
Chronic effects on humans : May cause damage to the following organs: lungs, upper respiratory tract, central nervous system (CNS).
Other toxic effects on humans : No specific information is available in our database regarding the other toxic effects of this material to humans.
Specific effects
Carcinogenic effects : No known significant effects or critical hazards.
Mutagenic effects : No known significant effects or critical hazards.
Reproduction toxicity : No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity
Not available.
Products of degradation : Products of degradation: carbon oxides (CO, CO₂) and water.
Environmental fate : Not available.
Environmental hazards : This product shows a low bioaccumulation potential.
Toxicity to the environment : Not available.

Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation. Return cylinders with residual product to Airgas, Inc. Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1001	ACETYLENE, DISSOLVED	2.1	Not applicable (gas).		Limited quantity Yes. Packaging instruction Passenger aircraft Quantity limitation: Forbidden. Cargo aircraft Quantity limitation: 15 kg

Acetylene						
TDG Classification	UN1001	ACETYLENE, DISSOLVED	2.1	Not applicable (gas).		Explosive Limit and Limited Quantity Index 0 Passenger Carrying Ship Index 75 Passenger Carrying Road or Rail Index Forbidden Special provisions 38, 42
Mexico Classification	UN1001	ACETYLENE, DISSOLVED	2.1	Not applicable (gas).		-

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Section 15. Regulatory information

United States

- U.S. Federal regulations** :
- TSCA 8(a) IUR:** Partial exemption
 - United States inventory (TSCA 8b):** This material is listed or exempted.
 - SARA 302/304/311/312 extremely hazardous substances:** No products were found.
 - SARA 302/304 emergency planning and notification:** No products were found.
 - SARA 302/304/311/312 hazardous chemicals:** Ethyne
 - SARA 311/312 MSDS distribution - chemical inventory - hazard identification:** Ethyne: Fire hazard, reactive, Sudden release of pressure, Immediate (acute) health hazard
 - Clean Air Act (CAA) 112 accidental release prevention - Flammable Substances:** Acetylene

Clean Air Act (CAA) 112 regulated flammable substances: Ethyne

State regulations

- Connecticut Carcinogen Reporting:** This material is not listed.
- Connecticut Hazardous Material Survey:** This material is not listed.
- Florida substances:** This material is not listed.
- Illinois Chemical Safety Act:** This material is not listed.
- Illinois Toxic Substances Disclosure to Employee Act:** This material is not listed.
- Louisiana Reporting:** This material is not listed.
- Louisiana Spill:** This material is not listed.
- Massachusetts Spill:** This material is not listed.
- Massachusetts Substances:** This material is listed.
- Michigan Critical Material:** This material is not listed.
- Minnesota Hazardous Substances:** This material is not listed.
- New Jersey Hazardous Substances:** This material is listed.
- New Jersey Spill:** This material is not listed.
- New Jersey Toxic Catastrophe Prevention Act:** This material is not listed.
- New York Acutely Hazardous Substances:** This material is not listed.
- New York Toxic Chemical Release Reporting:** This material is not listed.
- Pennsylvania RTK Hazardous Substances:** This material is listed.

Acetylene

Rhode Island Hazardous Substances: This material is not listed.

Canada

WHMIS (Canada)

- Class A: Compressed gas.
- Class B-1: Flammable gas.
- Class F: Dangerously reactive material.
- CEPA Toxic substances:** This material is not listed.
- Canadian ARET:** This material is not listed.
- Canadian NPRI:** This material is listed.
- Alberta Designated Substances:** This material is not listed.
- Ontario Designated Substances:** This material is not listed.
- Quebec Designated Substances:** This material is not listed.

Section 16. Other information

United States

Label requirements

- FLAMMABLE GAS.
- MAY CAUSE FLASH FIRE.
- MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
- CONTENTS UNDER PRESSURE.

Canada

Label requirements

- Class A: Compressed gas.
- Class B-1: Flammable gas.
- Class F: Dangerously reactive material.

Hazardous Material Information System (U.S.A.)

Health	*	1
Flammability		4
Physical hazards		2

National Fire Protection Association (U.S.A.)



Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

MATERIAL SAFETY DATA SHEET

ALCONOX®

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Union REACH Regulations



SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: **ALCONOX®**
 CHEMICAL FAMILY NAME: Detergent.
 PRODUCT USE: Critical-cleaning detergent for laboratory, healthcare and industrial applications
 U.N. NUMBER: Not Applicable
 U.N. DANGEROUS GOODS CLASS: Non-Regulated Material
 SUPPLIER/MANUFACTURER'S NAME: Alconox, Inc.
 ADDRESS: 30 Glenn St., Suite 309, White Plains, NY 10603. USA
EMERGENCY PHONE: **TOLL-FREE in USA/Canada** 800-255-3924
International calls 813-248-0585
 BUSINESS PHONE: 914-948-4040
 DATE OF PREPARATION: May 2011
 DATE OF LAST REVISION: February 2008

SECTION 2 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This product is a white granular powder with little or no odor. Exposure can be irritating to eyes, respiratory system and skin. It is a non-flammable solid. The Environmental effects of this product have not been investigated.

US DOT SYMBOLS

CANADA (WHMIS) SYMBOLS

EUROPEAN and (GHS) Hazard Symbols

Non-Regulated



Signal Word: **Warning!**

EU LABELING AND CLASSIFICATION:

Classification of the substance or mixture according to Regulation (EC) No1272/2008 Annex 1
EC# 205-633-8 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 268-356-1 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 231-838-7 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 231-767-1 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 207-638-8 Index# 011-005-00-2
EC# 205-788-1 This substance is not classified in the Annex I of Directive 67/548/EEC

GHS Hazard Classification(s):

Eye Irritant Category 2A

Hazard Statement(s):

H319: Causes serious eye irritation

Precautionary Statement(s):

P260: Do not breath dust/fume/gas/mist/vapors/spray
 P264: Wash hands thoroughly after handling
 P271: Use only in well ventilated area.
 P280: Wear protective gloves/protective clothing/eye protection/face protection/

Hazard Symbol(s):

[Xi] Irritant

MATERIAL SAFETY DATA SHEET

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Risk Phrases:

R20: Harmful by inhalation
 R36/37/38: Irritating to eyes, respiratory system and skin

Safety Phrases:

S8: Keep container dry
 S22: Do not breath dust
 S24/25: Avoid contact with skin and eyes

HEALTH HAZARDS OR RISKS FROM EXPOSURE:

ACUTE: Exposure to this product may cause irritation of the eyes, respiratory system and skin. Ingestion may cause gastrointestinal irritation including pain, vomiting or diarrhea.

CHRONIC: This product contains an ingredient which may be corrosive.

TARGET ORGANS: ACUTE: Eye, respiratory System, Skin CHRONIC: None Known

SECTION 3 - COMPOSITION and INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENTS:	CAS #	EINECS #	ICSC #	WT %	HAZARD CLASSIFICATION; RISK PHRASES
Sodium Bicarbonate	144-55-8	205-633-8	1044	33 - 43%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium (C10 - C16) Alkylbenzene Sulfonate	68081-81-2	268-356-1	Not Listed	10 - 20%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Tripolyphosphate	7758-29-4	231-838-7	1469	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Tetrasodium Pyrophosphate	7722-88-5	231-767-1	1140	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Carbonate	497-19-8	207-638-8	1135	1 - 10%	HAZARD CLASSIFICATION: [Xi] Irritant RISK PHRASES: R36
Sodium Alcohol Sulfate	151-21-3	205-788-1	0502	1 - 5%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Balance of other ingredients are non-hazardous or less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).					

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard JIS Z 7250: 2000.

SECTION 4 - FIRST-AID MEASURES

Contaminated individuals of chemical exposure must be taken for medical attention if any adverse effect occurs. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to health professional with contaminated individual.

EYE CONTACT: If product enters the eyes, open eyes while under gentle running water for at least 15 minutes. Seek medical attention if irritation persists.

SKIN CONTACT: Wash skin thoroughly after handling. Seek medical attention if irritation develops and persists. Remove contaminated clothing. Launder before re-use.

INHALATION: If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention if breathing difficulty continues.

INGESTION: If product is swallowed, call physician or poison control center for most current information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek medical advice. Take a copy of the label and/or MSDS with the victim to the health professional.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing skin, or eye problems may be aggravated by prolonged contact.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and reduce over-exposure.

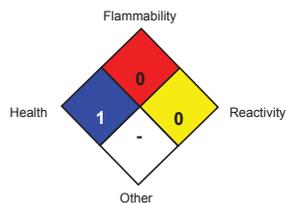
MATERIAL SAFETY DATA SHEET

ALCONOX®

SECTION 5 - FIRE-FIGHTING MEASURES

FLASH POINT: Not Flammable
AUTOIGNITION TEMPERATURE: Not Applicable
FLAMMABLE LIMITS (in air by volume, %): Lower (LEL): NA Upper (UEL): NA
FIRE EXTINGUISHING MATERIALS: As appropriate for surrounding fire. Carbon dioxide, foam, dry chemical, halon, or water spray.
UNUSUAL FIRE AND EXPLOSION HAZARDS: This product is non-flammable and has no known explosion hazards.
Explosion Sensitivity to Mechanical Impact: Not Sensitive.
Explosion Sensitivity to Static Discharge: Not Sensitive.
SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING SYSTEM



Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe * = Chronic hazard

HMS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM	
HEALTH HAZARD (BLUE)	1
FLAMMABILITY HAZARD (RED)	0
PHYSICAL HAZARD (YELLOW)	0
PROTECTIVE EQUIPMENT	
EYES	BODY
RESPIRATORY	See Sect 8
HANDS	See Sect 8

For Routine Industrial Use and Handling Applications

SECTION 6 - ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Personnel should be trained for spill response operations.
SPILLS: Contain spill if safe to do so. Prevent entry into drains, sewers, and other waterways. Sweep, shovel or vacuum spilled material and place in an appropriate container for re-use or disposal. Avoid dust generation if possible. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations).

SECTION 7 - HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing dusts generated by this product. Use in a well-ventilated location. Remove contaminated clothing immediately.

STORAGE AND HANDLING PRACTICES: Containers of this product must be properly labeled. Store containers in a cool, dry location. Keep container tightly closed when not in use. Store away from strong acids or oxidizers.

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SECTION 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/GUIDELINES:

Chemical Name	CAS#	ACGIH TWA	OSHA TWA	SWA
Sodium Bicarbonate	144-55-8	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ Total Dust
Sodium (C10 - C16) Alkylbenzene Sulfonate	68081-81-2	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ Total Dust
Sodium Tripolyphosphate	7758-29-4	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ Total Dust
Tetrasodium Pyrophosphate	7722-88-5	5 mg/m ³	5 mg/m ³	5 mg/m ³
Sodium Carbonate	497-19-8	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ Total Dust
Sodium Alcohol Sulfate	151-21-3	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ Total Dust

Currently, International exposure limits are not established for the components of this product. Please check with competent authority in each country for the most recent limits in place.

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided below. Use local exhaust ventilation to control airborne dust. Ensure eyewash/safety shower stations are available near areas where this product is used.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Based on test data, exposure limits should not be exceeded under normal use conditions when using Alconox Detergent. Maintain airborne contaminant concentrations below guidelines listed above, if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EU member states.

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Use chemical resistant gloves to prevent skin contact. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: Use body protection appropriate to prevent contact (e.g. lab coat, overalls). If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

SECTION 9 - PHYSICAL and CHEMICAL PROPERTIES

PHYSICAL STATE:	Solid
APPEARANCE & ODOR:	White granular powder with little or no odor.
ODOR THRESHOLD (PPM):	Not Available
VAPOR PRESSURE (mmHg):	Not Applicable
VAPOR DENSITY (AIR=1):	Not Applicable.
BY WEIGHT:	Not Available
EVAPORATION RATE (nBuAc = 1):	Not Applicable.
BOILING POINT (C°):	Not Applicable.
FREEZING POINT (C°):	Not Applicable.
pH:	9.5 (1% aqueous solution)
SPECIFIC GRAVITY 20°C: (WATER =1)	0.85 - 1.1
SOLUBILITY IN WATER (%)	>10% w/w
COEFFICIENT OF WATER/OIL DIST.:	Not Available
VOC:	None
CHEMICAL FAMILY:	Detergent

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SECTION 10 - STABILITY and REACTIVITY

STABILITY: Product is stable

DECOMPOSITION PRODUCTS: When heated to decomposition this product produces Oxides of carbon (COx)

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong acids and strong oxidizing agents.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials and dust generation.

SECTION 11 - TOXICOLOGICAL INFORMATION

TOXICITY DATA: Toxicity data is available for mixture:

CAS# 497-19-8 LD50 Oral (Rat)	4090 mg/kg
CAS# 497-19-8 LD50 Oral (Mouse)	6600 mg/kg
CAS# 497-19-8 LC50 Inhalation (Rat)	2300 mg/m ³ 2H
CAS# 497-19-8 LC50 Inhalation (Mouse)	1200 mg/m ³ 2H
CAS# 7758-29-4 LD50 Oral (Rat)	3120 mg/kg
CAS# 7758-29-4 LD50 Oral (Mouse)	3100 mg/kg
CAS# 7722-88-5 LD50 Oral (Rat)	4000 mg/kg

SUSPECTED CANCER AGENT: None of the ingredients are found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, IARC and therefore is not considered to be, nor suspected to be a cancer-causing agent by these agencies.

IRRITANCY OF PRODUCT: Contact with this product can be irritating to exposed skin, eyes and respiratory system.

SENSITIZATION OF PRODUCT: This product is not considered a sensitizer.

REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

SECTION 12 - ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: No Data available at this time.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on this product's effects on plants or animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this product's effects on aquatic life.

SECTION 13 - DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan.

SECTION 14 - TRANSPORTATION INFORMATION

US DOT: IATA: IMO: ADR:

THIS PRODUCT IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Non-Regulated Material

HAZARD CLASS NUMBER and DESCRIPTION: Not Applicable

UN IDENTIFICATION NUMBER: Not Applicable

PACKING GROUP: Not Applicable.

DOT LABEL(S) REQUIRED: Not Applicable

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): Not Applicable

MARINE POLLUTANT: None of the ingredients are classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B)

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS:

This product is not classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:

This product is not classified as Dangerous Goods, per regulations of Transport Canada.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA):

This product is not classified as Dangerous Goods, by rules of IATA:

INTERNATIONAL MARITIME ORGANIZATION (IMO) DESIGNATION:

This product is not classified as Dangerous Goods by the International Maritime Organization.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR):

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This product is not classified by the United Nations Economic Commission for Europe to be dangerous goods.

SECTION 15 - REGULATORY INFORMATION

UNITED STATES REGULATIONS

SARA REPORTING REQUIREMENTS: This product is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act., as follows: None

TSCA: All components in this product are listed on the US Toxic Substances Control Act (TSCA) inventory of chemicals.

SARA 311/312:

Acute Health: Yes Chronic Health: No Fire: No Reactivity: No

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): None

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): None of the ingredients are on the California Proposition 65 lists.

CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: All of the components of this product are on the DSL Inventory

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: No component of this product is on the CEPA First Priorities Substance Lists.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: This product is categorized as a Controlled Product, Hazard Class D2B as per the Controlled Product Regulations

EUROPEAN ECONOMIC COMMUNITY INFORMATION:

EU LABELING AND CLASSIFICATION:

Classification of the mixture according to Regulation (EC) No1272/2008. See section 2 for details.

AUSTRALIAN INFORMATION FOR PRODUCT:

AUSTRALIAN INVENTORY OF CHEMICAL SUBSTANCES (AICS) STATUS: All components of this product are listed on the AICS.

STANDARD FOR THE UNIFORM SCHEDULING OF DRUGS AND POISONS: Not applicable.

JAPANESE INFORMATION FOR PRODUCT:

JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS: The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:

Asia-Pac:	Listed
Australian Inventory of Chemical Substances (AICS):	Listed
Korean Existing Chemicals List (ECL):	Listed
Japanese Existing National Inventory of Chemical Substances (ENCS):	Listed
Philippines Inventory if Chemicals and Chemical Substances (PICCS):	Listed
Swiss Giftliste List of Toxic Substances:	Listed
U.S. TSCA:	Listed

SECTION 16 - OTHER INFORMATION

PREPARED BY: Paul Eigbrett Global Safety Management, 10006 Cross Creek Blvd. Suite 440, Tampa, FL 33647

MATERIAL SAFETY DATA SHEET

ALCONOX®

Disclaimer: To the best of Alconox, Inc. knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness is not guaranteed and no warranties of any type either express or implied are provided. The information contained herein relates only to this specific product.

ANNEX:

IDENTIFIED USES OF ALCONOX® AND DIRECTIONS FOR USE

Used to clean: Healthcare instruments, laboratory ware, vacuum equipment, tissue culture ware, personal protective equipment, sampling apparatus, catheters, tubing, pipes, radioactive contaminated articles, optical parts, electronic components, pharmaceutical apparatus, cosmetics manufacturing equipment, metal castings, forgings and stampings, industrial parts, tanks and reactors. Authorized by USDA for use in federally inspected meat and poultry plants. Passes inhibitory residue test for water analysis. FDA certified.

Used to remove: Soil, grit, grime, buffing compound, slime, grease, oils, blood, tissue, salts, deposits, particulates, solvents, chemicals, radioisotopes, radioactive contaminations, silicon oils, mold release agents.

Surfaces cleaned: Corrosion inhibited formulation recommended for glass, metal, stainless steel, porcelain, ceramic, plastic, rubber and fiberglass. Can be used on soft metals such as copper, aluminum, zinc and magnesium if rinsed promptly. Corrosion testing may be advisable.

Cleaning method: Soak, brush, sponge, cloth, ultrasonic, flow through clean-in-place. Will foam—not for spray or machine use.

Directions: Make a fresh 1% solution (2 1/2 Tbsp. per gal., 1 1/4 oz. per gal. or 10 grams per liter) in cold, warm, or hot water. If available use warm water. Use cold water for blood stains. For difficult soils, raise water temperature and use more detergent. Clean by soak, circulate, wipe, or ultrasonic method. Not for spray machines, will foam. For nonabrasive scouring, make paste. Use 2% solution to soak frozen stopcocks. To remove silver tarnish, soak in 1% solution in aluminum container. RINSE THOROUGHLY—preferably with running water. For critical cleaning, do final or all rinsing in distilled, deionized, or purified water. For food contact surfaces, rinse with potable water. Used on a wide range of glass, ceramic, plastic, and metal surfaces. Corrosion testing may be advisable.



Health	2
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet Bentonite MSDS

Section 1: Chemical Product and Company Identification

Product Name: Bentonite	Contact Information:
Catalog Codes: SLB1441, SLB2935, SLB4435	Sciencelab.com, Inc. 14025 Smith Rd. Houston, Texas 77396
CAS#: 1302-78-9	US Sales: 1-800-901-7247 International Sales: 1-281-441-4400 Order Online: ScienceLab.com
RTECS: CT9450000	CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300
TSCA: TSCA 8(b) inventory: Bentonite	International CHEMTREC, call: 1-703-527-3887
C#: Not applicable.	For non-emergency assistance, call: 1-281-441-4400
Synonym: Montmorillonite;	
Chemical Name: Not available.	
Chemical Formula: (Al,Fe _{1.67} Mg _{.33})Si ₁₀ (OH) ₂ Na ⁽⁺⁾ Ca ⁽⁺⁺⁾ /2.33	

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Bentonite	1302-78-9	100

Toxicological Data on Ingredients: Bentonite LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (irritant), of ingestion.

Potential Chronic Health Effects:

Hazardous in case of inhalation. CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Do not breathe dust. Avoid contact with eyes. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 10 from ACGIH (TLV) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Odorless.

Taste: Not available.

Molecular Weight: Not available.

Color: Beige. (Light.)

pH (1% soln/water): Not available.

Boiling Point: Not available.

Melting Point: Decomposes.

Critical Temperature: Not available.

Specific Gravity: 2.5 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:

Very slightly soluble in cold water, hot water. Insoluble in methanol, diethyl ether, n-octanol, acetone.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Not available.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation.

Toxicity to Animals:

LD50: Not available. LC50: Not available.

Chronic Effects on Humans: Causes damage to the following organs: lungs.

Other Toxic Effects on Humans:

Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant), of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations: TSCA 8(b) inventory: Bentonite

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC): R36- Irritating to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:14 PM

Last Updated: 11/01/2010 12:00 PM

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MATERIAL SAFETY DATA SHEET (MSDS) FOR PORTLAND CEMENT

(Complies with OSHA and MSHA Hazard Communication Standards,
29 CFR 1910.1200 and 30 CFR Part 47)



CEMEX, INC.
CEMEX CALIFORNIA CEMENT LLC
VICTORVILLE CEMENT PLANT
16888 NORTH "E" STREET
VICTORVILLE, CALIFORNIA 92394-2999

Section 1 - IDENTIFICATION

Supplier/Manufacturer

CEMEX, Inc.
CEMEX California Cement LLC
Victorville Cement Plant
16888 North "E" Street
Victorville, California 92394-2999

Emergency Contact Information

(619) 381-7600

Chemical name and synonyms

Portland Cement (CAS #65997-15-1)

Product name

"CEMEX Type I/II"
"CEMEX Type III"
"CEMEX Type II/V"
"CEMEX Type V"
"CEMEX Block"
"CEMEX Class G"

Chemical family

Calcium salts.

Formula

3CaO.SiO₂ (CAS #12168-85-3)
2CaO.SiO₂ (CAS #10034-77-2)
3CaO.Al₂O₃ (CAS #12042-78-3)
4CaO..Al₂O₃.Fe₂O₃ (CAS #12068-35-8)
CaSO₂.2H₂O (CAS #13397-24-5)

Other salts:

Small amounts of MgO, and trace amounts of K₂SO₄ and Na₂SO₄ may also be present.

Section 2 - COMPONENTS

Hazardous Ingredients

Portland cement clinker (CAS# 65997-15- 1) - approximately - 93.5-96.0 % by weight

ACGIH TLV-TWA (2000) = 10 mg total dust/m³

OSHA PEL (8-hour TWA) = 50 million particles/ft³

Gypsum (CAS# 7778-18-9) - approximately - 4.0-6.5 % by weight

ACGIH TLV-TWA (2000) = 10 mg total dust/m³

OSHA PEL (8-hour TWA) = 15 mg total dust/m³

OSHA PEL (8-hour TWA) = 5 mg respirable dust/m³

Respirable quartz (CAS# 14808-60-7) – greater than 0.1% by weight

ACGIH TLV-TWA (2000) = 0.05 mg respirable quartz dust/m³

OSHA PEL (8-hour TWA) = (10 mg respirable dust/m³)/(percent silica + 2)

Trace Ingredients

Trace amounts of naturally occurring chemicals might be detected during chemical analysis. Trace constituents may include up to 0.75% insoluble residue, some of which may be free crystalline silica, calcium oxide (Also known as lime or quick lime), magnesium oxide, potassium sulfate, sodium sulfate, chromium compounds, and nickel compounds.

Section 3 - HAZARD IDENTIFICATION

Emergency Overview

Portland cement is a light gray powder that poses little immediate hazard. A single short-term exposure to the dry powder is not likely to cause serious harm. However, exposure of sufficient duration to wet portland cement can cause serious, potentially irreversible tissue (skin or eye) destruction in the form of chemical (caustic) burns. The same type of tissue destruction can occur if wet or moist areas of the body are exposed for sufficient duration to dry portland cement.

Potential Health Effects

Relevant Routes of Exposure:

Eye contact, skin contact, inhalation, and ingestion.

Effects Resulting from Eye Contact:

Exposure to airborne dust may cause immediate or delayed irritation or inflammation. Eye contact by large amounts of dry powder or splashes of wet portland cement may cause effects ranging from moderate eye irritation to chemical burns or blindness. Such exposures require immediate first aid (see Section 4) and medical attention to prevent significant damage to the eye.

Effects Resulting from Skin Contact:

Discomfort or pain cannot be relied upon to alert a person to hazardous skin exposure. Consequently, the only effective means of avoiding skin injury or illness involves minimizing skin contact, particularly with wet cement. Exposed persons may not feel discomfort until hours after the exposure has ended and significant injury has occurred.

Dry portland cement contacting wet skin or exposure to moist or wet portland cement may cause more severe skin effects including thickening, cracking or fissuring of the skin. Prolonged exposure can cause severe skin damage in the form of (alkali) chemical burns.

Some individuals may exhibit an allergic response upon exposure to portland cement, possibly due to trace elements of chromium. The response may appear in a variety of forms ranging from a mild rash to severe skin ulcers. Persons already sensitized may react to their first contact with the product. Other persons may first experience this effect after years of contact with portland cement products.

Effects Resulting from Inhalation:

Portland cement may contain trace amounts of free crystalline silica. Prolonged exposure to respirable free silica can aggravate other lung conditions and cause silicosis, a disabling and potentially fatal lung disease.

Exposure to portland cement may cause irritation to the moist mucous membranes of the nose, throat, and upper respiratory system. It may also leave unpleasant deposits in the nose.

Effects Resulting from Ingestion:

Although small quantities of dust are not known to be harmful, ill effects are possible if larger quantities are consumed. Portland cement should not be eaten.

Carcinogenic potential:

Portland cement is **not** listed as a carcinogen by NTP, OSHA, or IARC. It may however, contain trace amounts of substances listed as carcinogens by these organizations.

Crystalline silica, a potential trace level contaminant in Portland cement, is now classified by IARC as known human carcinogen (Group I). NTP has characterized respirable silica as "reasonably anticipated to be [a] carcinogen".

Medical conditions which may be aggravated by, inhalation or dermal exposure:

Pre-existing upper respiratory and lung diseases.

Unusual (hyper) sensitivity to hexavalent chromium (chromium⁺⁶) salts.

Section 4 - FIRST AID

Eyes

Immediately flush eyes thoroughly with water. Continue flushing eye for at least 15 minutes, including under lids, to remove all particles. Call physician immediately.

Skin

Wash skin with cool water and pH-neutral soap or a mild detergent. Seek medical treatment in all cases of prolonged exposure to wet cement, cement mixtures, liquids from fresh cement products, or prolonged wet skin exposure to dry cement.

Inhalation of Airborne Dust

Remove to fresh air. Seek medical help if coughing and other symptoms do not subside.

Ingestion

Do not induce vomiting. If conscious, have the victim drink plenty of water and call a physician immediately.

Section 5 - FIRE AND EXPLOSION DATA

Flash point	None	Lower Explosive Limit.....	None
Upper Explosive Limit.....	None	Auto ignition temperature.....	Not Combustible
Extinguishing media.....	Not Combustible	Special fire fighting Procedures.....	None
Hazardous combustion products.....	None	Unusual fire and explosion hazards...None	

Section 6 - ACCIDENTAL RELEASE MEASURES

Collect dry material using a scoop. Avoid actions that cause dust to become airborne. Avoid inhalation of dust and contact with skin. Wear appropriate personal protective equipment as described in Section 8.

Scrape up wet material and place in an appropriate container. Allow the material to "dry" before disposal. Do not attempt to wash portland cement down drains.

Dispose of waste material according to local, state and federal regulations.

Section 7 - HANDLING AND STORAGE

Keep portland cement dry until used. Normal temperatures and pressures do not affect the material.

Promptly remove dusty clothing or clothing which is wet with cement fluids and launder before reuse. Wash thoroughly after exposure to dust or wet cement mixtures or fluids.

Section 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Skin Protection

Prevention is essential to avoiding potentially severe skin injury. Avoid contact with unhardened portland cement. If contact occurs, promptly wash affected area with soap and water. Where prolonged exposure to unhardened portland cement products might occur, wear impervious clothing and gloves to eliminate skin contact. Wear sturdy boots that are impervious to water to eliminate foot and ankle exposure.

Do not rely on barrier creams: barrier creams should not be used in place of gloves.

Periodically wash areas contacted by dry portland cement or by wet cement or concrete fluids with a pH neutral soap. Wash again at the end of work. If irritation occurs, immediately wash the affected area and seek treatment. If clothing becomes saturated with wet concrete, it should be removed and replaced with clean dry clothing.

Respiratory Protection

Avoid actions that cause dust to become airborne. Use local or general exhaust ventilation to control exposures below applicable exposure limits.

Use NIOSH/MSHA approved (under 30 CFR 11) or NIOSH approved (under 42 CFR 84) respirators in poorly ventilated areas, if an applicable exposure limit is exceeded, or when dust causes discomfort or irritation. (Advisory: Respirators and filters purchased after June 10, 1998 must be certified under 42 CFR 84.)

Ventilation

Use local exhaust or general dilution ventilation to control exposure within applicable limits.

Eye Protection

Where potentially subject to splashes or puffs of cement, wear safety glasses with side shields or goggles. In extremely dusty environments and unpredictable environments wear unvented or indirectly vented goggles to avoid eye irritation or injury. Contact lenses should not be worn when working with portland cement or fresh cement products.

Section 9 - PHYSICAL AND CHEMICAL, PROPERTIES

Appearance.....	Gray Powder	Odor.....	No distinct odor
Physical state.....	Solid (powder)	pH (in water).....	12 to 13
Solubility in water...	Slightly soluble (0.1 to 1.0%)	Vapor pressure.....	Not applicable
Vapor density.....	Not applicable	Boiling point.....	Not applicable (i.e., > 1000 C)
Melting point.....	Not applicable	Specific gravity (H2O = 1.0).....	3.15
Evaporation rate.....	Not applicable		

Section 10 - STABILITY AND REACTIVITY

Stability

Stable.

Conditions to avoid

Unintentional contact with water.

Incompatibility

Wet Portland cement is alkaline. As such it is incompatible with acids, ammonium salts and phosphorous.

Hazardous decomposition

Will not spontaneously occur. Adding water produces (caustic) calcium hydroxide

Hazardous Polymerization

Will not occur.

Section 11 - TOXICOLOGICAL INFORMATION

For a description of available, more detailed toxicological information contact the supplier or manufacturer.

Section 12 - ECOLOGICAL INFORMATION

Ecotoxicity

No recognized unusual toxicity to plants or animals

Relevant physical and chemical properties

(See Sections 9 and 10.)

Section 13 - DISPOSAL

Dispose of waste material according to local, state and federal regulations. (Since portland cement is stable, uncontaminated material may be saved for future use.

Dispose of bags in an approved landfill or incinerator.

Section 14 - TRANSPORTATION DATA

Hazardous materials description/proper shipping name

Portland is cement is not hazardous under U.S. Department of Transportation (DOT) regulations.

Hazard class

Not applicable

Identification number

Not applicable.

Required label text

Not applicable.

Hazardous substances/reportable quantities (RQ)

Not applicable.

Section 15 - OTHER REGULATORY INFORMATION

Status under USDOL-OSHA Hazard Communication Rule, 29 CFR 1910.1200

Portland cement is considered a "hazardous chemical" under this regulation, and should be part of any hazard communication program.

Status under CERCLA/SUPERFUND 40 CFR 117 and 302

Not listed.

Hazard Category under SARA(Title III), Sections 311 and 312

Portland cement qualifies as a "hazardous substance" with delayed health effects.

Status under SARA (Title III), Section 313

Not subject to reporting requirements under Section 313.

Status under TSCA (as of May 1997)

Some substances in portland cement are on the TSCA inventory list.

Status under the Federal Hazardous Substances Act

Portland cement is a "hazardous substance" subject to statutes promulgated under the subject act.

Status under California Proposition 65

This product contains up to 0.05 percent of chemicals (trace elements) known to the State of California to cause cancer, birth defects or other reproductive harm. California law requires the manufacturer to give the above warning in the absence of definitive testing to prove that the defined risks do not exist.

Section 16 - OTHER INFORMATION

Prepared by

Kevin Keegan
Director - Health and Safety
CEMEX, Inc.
Houston, Texas

Approval date or Revision date

Approved: August, 1997
Revised: March, 2001

Other important information

Portland cement should only be used by knowledgeable persons. A key to using the product safely requires the user to recognize that portland cement chemically reacts with water, and that some of the intermediate products of this reaction (that is those present while a portland cement product is "setting") pose a more severe hazard than does dry portland cement itself.

While the information provided in this material safety data sheet is believed to provide a useful summary of the hazards of portland cement as it is commonly used, the sheet cannot anticipate and provide the all of the information that might be needed in every situation. Inexperienced product users should obtain proper training before using this product.

SELLER MAKES NO WARRANTY, EXPRESSED OR IMPLIED, CONCERNING THE PRODUCT OR THE MERCHANTABILITY OR FITNESS THEREOF FOR ANY PURPOSE OR CONCERNING THE ACCURACY OF ANY INFORMATION PROVIDED BY CEMEX, Inc. except that the product shall conform to contracted specifications. The information provided herein was believed by CEMEX, Inc. to be accurate at the time of preparation or prepared from sources believed to be reliable, but it is the responsibility of the user to investigate and understand other pertinent sources of information to comply with all laws and procedures applicable to the safe handling and use of product and to determine the suitability of the product for its intended use. Buyer's exclusive remedy shall be for damages and no claim of any kind, whether as to product delivered or for non-delivery of product, and whether based on contract, breach of warranty, negligence, or otherwise shall be greater in amount than the purchase price of the quantity of product in respect of which damages are claimed. In no event shall Seller be liable for incidental or consequential damages, whether Buyer's claim is based on contract, breach of warranty, negligence or otherwise.

In particular, the data furnished in this sheet do not address hazards that may be posed by other materials mixed with portland cement to produce portland cement products. Users should review other relevant material safety data sheets before working with this portland cement or working on portland cement products, for example, portland cement concrete.

1. MATERIAL AND COMPANY IDENTIFICATION

Material Name : High Sulfur Diesel - Yabucoa
Uses : Diesel Fuel.
Product Code : 9847A
Company : Shell Chemical LP
PO Box 2463
HOUSTON TX 77252-2463
USA
MSDS Request : 1-800-240-6737
Customer Service : 1-866-897-4355

Emergency Telephone Number
Chemtrec Domestic (24 hr) : 1-800-424-9300
Chemtrec International (24 hr) : 1-703-527-3887

2. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	Concentration
Distillates (Petroleum), Full-Range Straight-Run Middle	68814-87-9	100.00 %

Contains Sulphur, CAS # 7704-34-9.

3. HAZARDS IDENTIFICATION

Emergency Overview	
Appearance and Odour	: Amber or as dyed. Liquid. Strong hydrocarbon.
Health Hazards	: Harmful: may cause lung damage if swallowed. Vapours may cause drowsiness and dizziness. Causes severe skin irritation.
Safety Hazards	: Combustible liquid and vapour. Vapours are heavier than air. Vapours may travel across the ground and reach remote ignition sources causing a flashback fire danger. May form flammable/explosive vapour-air mixture. Electrostatic charges may be generated during pumping. Electrostatic discharge may cause fire.
Environmental Hazards	: Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Health Hazards
Inhalation : Slightly irritating to respiratory system. Vapours may cause drowsiness and dizziness.
Skin Contact : Causes severe skin irritation.
Eye Contact : Moderately irritating to eyes.
Ingestion : Harmful: may cause lung damage if swallowed.
Other Information :

Signs and Symptoms : Diesel exhaust from engines has been associated with cancer. Skin irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blisters. Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness and death. If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. The onset of respiratory symptoms may be delayed for several hours after exposure.
Aggravated Medical Condition : Pre-existing medical conditions of the following organ(s) or organ system(s) may be aggravated by exposure to this material: Skin.

4. FIRST AID MEASURES

Inhalation : Remove to fresh air. If rapid recovery does not occur, transport to nearest medical facility for additional treatment.
Skin Contact : Remove contaminated clothing. Immediately flush skin with large amounts of water for at least 15 minutes, and follow by washing with soap and water if available. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.
Eye Contact : Flush eye with copious quantities of water. If persistent irritation occurs, obtain medical attention.
Ingestion : If swallowed, do not induce vomiting; transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration.
Advice to Physician : Potential for chemical pneumonitis. Consider: gastric lavage with protected airway, administration of activated charcoal. Call a doctor or poison control center for guidance.

5. FIRE FIGHTING MEASURES

Clear fire area of all non-emergency personnel.
Flash point : 52 °C / 126 °F (Pensky-Martens Closed Cup)
Specific Hazards : Carbon monoxide may be evolved if incomplete combustion occurs. Will float and can be reignited on surface water. The vapour is heavier than air, spreads along the ground and distant ignition is possible.
Extinguishing Media : Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
Unsuitable Extinguishing Media : Do not use water in a jet.
Protective Equipment for Firefighters : Wear full protective clothing and self-contained breathing apparatus.
Additional Advice : Keep adjacent containers cool by spraying with water.

6. ACCIDENTAL RELEASE MEASURES

Observe all relevant local and international regulations.

- Protective measures** : Avoid contact with spilled or released material. Immediately remove all contaminated clothing. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. For guidance on disposal of spilled material see Chapter 13 of this Material Safety Data Sheet. Be ready for fire or possible exposure. Stay upwind and keep out of low areas. Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area. Use appropriate containment (of product and fire fighting water) to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Attempt to disperse the vapour or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all equipment.
- Clean Up Methods** : For small liquid spills (< 1 drum), transfer by mechanical means to a labelled, sealable container for product recovery or safe disposal. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely.
For large liquid spills (> 1 drum), transfer by mechanical means such as vacuum truck to a salvage tank for recovery or safe disposal. Do not flush away residues with water. Retain as contaminated waste. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely.
- Additional Advice** : Risk of explosion. Inform the emergency services if liquid enters surface water drains. Vapour may form an explosive mixture with air. Notify authorities if any exposure to the general public or the environment occurs or is likely to occur. Under Section 311 of the Clean Water Act (CWA) this material is considered an oil. As such, spills into surface waters must be reported to the National Response Centre at (800) 424-8802. This material is covered by EPA's Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Petroleum Exclusion. Therefore, releases to the environment may not be reportable under CERCLA.

7. HANDLING AND STORAGE

- General Precautions** : Avoid breathing vapours or contact with material. Only use in well ventilated areas. Wash thoroughly after handling. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet.
- Handling** : Avoid inhaling vapour and/or mists. Avoid contact with skin, eyes, and clothing. Electrostatic charges may be generated

- Storage** : during pumping. Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment. Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (≤ 1 m/sec until fill pipe submerged to twice its diameter, then ≤ 7 m/sec). Avoid splash filling. Do NOT use compressed air for filling, discharging, or handling operations. Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks. Handling Temperature: Ambient.
- Product Transfer** : Keep away from aerosols, flammables, oxidizing agents, corrosives and from other flammable products which are not harmful or toxic to man or to the environment. Keep container tightly closed. Must be stored in a diked (bunded) well-ventilated area, away from sunlight, ignition sources and other sources of heat. Vapours from tanks should not be released to atmosphere. Breathing losses during storage should be controlled by a suitable vapour treatment system. Storage Temperature: Ambient.
- Container Advice** : Electrostatic charges may be generated during pumping. Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment. Restrict line velocity during pumping in order to avoid generation of electrostatic discharge. Keep containers closed when not in use. Do not use compressed air for filling, discharging or handling.
- Additional Information** : Containers, even those that have been emptied, can contain explosive vapours. Do not cut, drill, grind, weld or perform similar operations on or near containers.
Ensure that all local regulations regarding handling and storage facilities are followed.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational Exposure Limits

Material	Source	Type	ppm	mg/m3	Notation
Petroleum Products, Diesel Oil	ACGIH	TWA		100 mg/m3	
as total hydrocarbons					
Vapor and aerosol.					
	ACGIH	SKIN_DES			Can be absorbed through the skin.
as total hydrocarbons					
Vapor and aerosol.					

- Additional Information** : Skin notation means that significant exposure can also occur by absorption of liquid through the skin and of vapour through the eyes or mucous membranes.
- Exposure Controls** : The level of protection and types of controls necessary will vary



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depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances.

Appropriate measures include: Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits. Eye washes and showers for emergency use.

Personal Protective Equipment : Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

Respiratory Protection : If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are unsuitable (e.g., airborne concentrations are high, risk of oxygen deficiency, confined space) use appropriate positive pressure breathing apparatus. Where respiratory protective equipment is required, use a full-face mask. If air-filtering respirators are suitable for conditions of use: Select a filter suitable for combined particulate/organic gases and vapours [boiling point >65 °C (149 °F)].

Hand Protection : Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739, AS/NZS:2161) made from the following materials may provide suitable chemical protection: Longer term protection - Viton. Incidental contact/Splash protection - Nitrile rubber. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, glove thickness, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced.

Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended.

Eye Protection : Chemical splash goggles (chemical monogoggles).

Protective Clothing : Where risk of splashing or in spillage clean up, use chemical resistant one-piece overall with integral hood and chemical resistant gloves. Otherwise use chemical resistant apron and gauntlets.

Monitoring Methods : Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate. Examples of sources of recommended air monitoring methods are given below or contact supplier. Further national methods may be available. National Institute of Occupational Safety and Health (NIOSH), USA: Manual of analytical Methods <http://www.cdc.gov/niosh/nmam/nmammenu.html> Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods <http://www.osha-slc.gov/dts/sltc/methods/toc.html>



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9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : Amber or as dyed. Liquid.
Odour : Strong hydrocarbon.
Boiling point : 232.2 °C / 450.0 °F
Flash point : 52 °C / 126 °F (Pensky-Martens Closed Cup)
Specific gravity : 0.8762
Water solubility : 0.05 g/l Negligible.
Vapour density (air=1) : > 1
Stability : Stable.
Viscosity : 32.0 - 45 sus

10. STABILITY AND REACTIVITY

Stability : Stable under normal conditions of use.
Conditions to Avoid : Heat, flames, and sparks.
Materials to Avoid : Strong oxidising agents.
Hazardous Decomposition Products : Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids, liquids and gases, including carbon monoxide, carbon dioxide and other organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.

11. TOXICOLOGICAL INFORMATION

Basis for Assessment : Information given is based on product testing.
Acute Oral Toxicity : Low toxicity: LD50 >2000 mg/kg , Rat
Aspiration into the lungs when swallowed or vomited may cause chemical pneumonitis which can be fatal.
Acute Dermal Toxicity : Low toxicity: LD50 >2000 mg/kg , Rabbit
Acute Inhalation Toxicity : High concentrations may cause central nervous system depression resulting in headaches, dizziness and nausea; continued inhalation may result in unconsciousness and/or death.
Skin Irritation : Causes severe skin irritation.
Eye Irritation : Moderately irritating to eyes (but insufficient to classify).
Respiratory Irritation : Inhalation of vapours or mists may cause irritation to the respiratory system.
Sensitisation : Not a skin sensitiser.
Mutagenicity : Not considered a mutagenic hazard.
Carcinogenicity : Limited evidence of carcinogenic effect. (Diesel Fuel)
Repeated skin contact may result in irritation and skin cancer.
Causes cancer in laboratory animals. (Diesel Engine Exhaust)

Material	Carcinogenicity Classification
Diesel Engine Exhaust	: NTP: Anticipated carcinogen.
Diesel Engine Exhaust	: IARC 2A: Probable carcinogen.
Diesel Fuel, Marine	: IARC 2B: Possible carcinogen.
Petroleum Products, Diesel Oil	: ACGIH Group A3: Confirmed animal carcinogen with unknown relevance to humans.
Petroleum Products, Diesel	: IARC 3: Classification not possible from current data.



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Oil

12. ECOLOGICAL INFORMATION

- Acute Toxicity: Information given is based on product data, a knowledge of the components and the toxicology of similar products.
Fish: Toxic: LL/EL/IL50 1-10 mg/l
Mobility: Floats on water. Adsorbs to soil and has low mobility. Large volumes may penetrate soil and could contaminate groundwater.
Persistence/degradability: Major constituents are inherently biodegradable, but contains components that are persistent in the environment. Oxidises rapidly by photo-chemical reactions in air.
Bioaccumulation: Has the potential to bioaccumulate.

13. DISPOSAL CONSIDERATIONS

- Material Disposal: Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses. Waste product should not be allowed to contaminate soil or water.
Local Legislation: Disposal should be in accordance with applicable regional, national, and local laws and regulations. Local regulations may be more stringent than regional or national requirements and must be complied with.

14. TRANSPORT INFORMATION

US Department of Transportation Classification (49CFR)

Identification number NA 1993
Proper shipping name Diesel fuel
Class / Division Combustible liquid
Packing group III
Contains OIL
Additional Information This material is not regulated under 49 CFR if in a container of 119 gallon capacity or less. This material is an 'OIL' under 49 CFR Part 130 when transported in a container of 3500 gallon capacity or greater. Reclassified as combustible liquid for land transportation within the US per 49CFR 173.120(b)(2).

IMDG

Identification number UN 1202
Proper shipping name DIESEL FUEL
Class / Division 3
Packing group III



Shell Chemicals

Material Safety Data Sheet

High Sulfur Diesel - Yabucoa
MSDS# 7086
Version 1
Effective Date 03/29/2007
According to OSHA Hazard Communication Standard, 29 CFR 1910.1200

Marine pollutant: No

IATA (Country variations may apply)

Identification number UN 1202
Proper shipping name Diesel fuel
Class / Division 3
Packing group III

15. REGULATORY INFORMATION

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

Federal Regulatory Status

Notification Status

EINECS Listed.
ENCS (JP) Listed.
KECI (KR) Listed.
INV (CN) Listed.
AICS Listed.
PICCS (PH) Listed.
TSCA Listed.
DSL Listed.

SARA Hazard Categories (311/312)

Immediate (Acute) Health Hazard. Delayed (Chronic) Health Hazard. Fire Hazard.

State Regulatory Status

California Safe Drinking Water and Toxic Enforcement Act (Proposition 65)

Known to the state of California to cause cancer.

Diesel Engine Exhaust () 100.00% Carcinogenic.

New Jersey Right-To-Know Chemical List

Sulfur (7704-34-9) 1.00% Listed.

Pennsylvania Right-To-Know Chemical List

Petroleum Products, Diesel Oil () 100.00% Listed.



Shell Chemicals

Material Safety Data Sheet

High Sulfur Diesel - Yabucoa
MSDS# 7086

Version 1.

Effective Date 03/29/2007

According to OSHA Hazard Communication Standard, 29 CFR
1910.1200

Sulfur (7704-34-9) 1.00%

Listed.

16. OTHER INFORMATION

- MSDS Version Number** : 1.
- MSDS Effective Date** : 03/29/2007
- MSDS Revisions** : A vertical bar (|) in the left margin indicates an amendment from the previous version.
- MSDS Regulation** : The content and format of this MSDS is in accordance with the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
- MSDS Distribution** : The information in this document should be made available to all who may handle the product
- Disclaimer** : The information contained herein is based on our current knowledge of the underlying data and is intended to describe the product for the purpose of health, safety and environmental requirements only. No warranty or guarantee is expressed or implied regarding the accuracy of these data or the results to be obtained from the use of the product.



Shell Chemicals

Material Safety Data Sheet

C5/C7 Gasoline
MSDS# 900269
Version 2.
Effective Date 01/24/2005
1910.1200

According to OSHA Hazard Communication Standard, 29 CFR

1. MATERIAL AND COMPANY IDENTIFICATION

Material Name : C5/C7 Gasoline
Uses : Raw material for use in the chemical industry. Chemical intermediate.
Product Code : Q9242
Company : Shell Chemical LP
PO Box 2463
HOUSTON TX 77252-2463
USA
MSDS Request : 1-800-240-6737
Customer Service : 1-866-897-4355

Emergency Telephone Number
Chemtrec Domestic (24 hr) : 1-800-424-9300
Chemtrec International (24 hr) : 1-703-527-3887

2. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	Concentration
Light aromatic distillate (petroleum)	67891-80-9	50.00 %
Naphtha, (Petroleum), Light Steam-Cracked Aromatic	68527-23-1	50.00 %

Contains Toluene, CAS # 108-88-3.
Contains Benzene, CAS # 71-43-2.
Contains 1,3-Butadiene, CAS # 106-99-0.

3. HAZARDS IDENTIFICATION

Emergency Overview	
Appearance and Odour	: Amber. Liquid. Aromatic hydrocarbon..
Health Hazards	: Vapours may cause drowsiness and dizziness. Irritating to eyes. Irritating to skin. Harmful: may cause lung damage if swallowed. May cause cancer. May cause leukaemia (AML - acute myelogenous leukaemia).
Safety Hazards	: Extremely flammable. Vapours are heavier than air. Vapours may travel across the ground and reach remote ignition sources causing a flashback fire danger. Electrostatic charges may be generated during pumping. Electrostatic discharge may cause fire.
Environmental Hazards	: Toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

Health Hazards



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Inhalation : Slightly irritating to respiratory system. Vapours may cause drowsiness and dizziness.
Skin Contact : Irritating to skin.
Eye Contact : Irritating to eyes.
Ingestion : Harmful: may cause lung damage if swallowed.
Other Information : Possibility of organ or organ system damage from prolonged exposure; see Chapter 11 for details. Target organ(s): Auditory system. Cardiovascular system. Central nervous system (CNS). Kidney. Liver. Respiratory system. Blood. Blood-forming organs. Immune system. Reproductive system. May cause cancer. May cause leukaemia (AML - acute myelogenous leukaemia).

Signs and Symptoms : Eye irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blurred vision. Skin irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blisters. If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. The onset of respiratory symptoms may be delayed for several hours after exposure. Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness and death. Auditory system effects may include temporary hearing loss and/or ringing in the ears. Kidney damage may be indicated by changes in urine output or appearance, pain upon urination or in the lower back, or general oedema (swelling from fluid retention). Liver damage may be indicated by loss of appetite, jaundice (yellowish skin and eye colour), fatigue, bleeding or easy bruising and sometimes pain and swelling in the upper right abdomen. Damage to blood-forming organs may be evidenced by: a) fatigue and anaemia (RBC), b) decreased resistance to infection, and/or excessive bruising and bleeding (platelet effect).

Aggravated Medical Condition : Pre-existing medical conditions of the following organ(s) or organ system(s) may be aggravated by exposure to this material: Auditory system. Cardiovascular system. Kidney. Liver. Respiratory system. Blood. Blood-forming organs. Immune system.

Environmental Hazards : Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

4. FIRST AID MEASURES



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- Inhalation** : Remove to fresh air. If rapid recovery does not occur, transport to nearest medical facility for additional treatment.
- Skin Contact** : Remove contaminated clothing. Immediately flush skin with large amounts of water for at least 15 minutes, and follow by washing with soap and water if available. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.
- Eye Contact** : Immediately flush eyes with large amounts of water for at least 15 minutes while holding eyelids open. Transport to the nearest medical facility for additional treatment.
- Ingestion** : If swallowed, do not induce vomiting; transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration.

5. FIRE FIGHTING MEASURES

Clear fire area of all non-emergency personnel.

- Flash point** : -7 °C / 19 °F
- Specific Hazards** : Carbon monoxide may be evolved if incomplete combustion occurs. Will float and can be reignited on surface water. The vapour is heavier than air, spreads along the ground and distant ignition is possible.
- Extinguishing Media** : Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
- Unsuitable Extinguishing Media** : Do not use water in a jet.
- Protective Equipment for Firefighters** : Wear full protective clothing and self-contained breathing apparatus.
- Additional Advice** : Keep adjacent containers cool by spraying with water.

6. ACCIDENTAL RELEASE MEASURES

Avoid contact with spilled or released material. Immediately remove all contaminated clothing. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. For guidance on disposal of spilled material see Chapter 13 of this Material Safety Data Sheet. Observe all relevant local and international regulations.

- Protective measures** : Isolate hazard area and deny entry to unnecessary or unprotected personnel. Stay upwind and keep out of low areas. Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area. Use appropriate containment to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Attempt to disperse the vapour or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all equipment. Ventilate contaminated area thoroughly.
- Clean Up Methods** : For large liquid spills (> 1 drum), transfer by mechanical means such as vacuum truck to a salvage tank for recovery or safe



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- disposal. Do not flush away residues with water. Retain as contaminated waste. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely. For small liquid spills (< 1 drum), transfer by mechanical means to a labelled, sealable container for product recovery or safe disposal. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely.

- Additional Advice** : Notify authorities if any exposure to the general public or the environment occurs or is likely to occur. Local authorities should be advised if significant spillages cannot be contained. The vapour is heavier than air, spreads along the ground and distant ignition is possible. Vapour may form an explosive mixture with air. See Chapter 13 for information on disposal. Risk of explosion. Inform the emergency services if liquid enters surface water drains. U.S. regulations may require reporting releases of this material to the environment which exceed the reportable quantity (refer to Chapter 15) to the National Response Centre at (800) 424-8802. Under Section 311 of the Clean Water Act (CWA) this material is considered an oil. As such, spills into surface waters must be reported to the National Response Centre at (800) 424-8802. This material is covered by EPA's Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Petroleum Exclusion. Therefore, releases to the environment may not be reportable under CERCLA.

7. HANDLING AND STORAGE

- General Precautions** : Avoid breathing of or contact with material. Only use in well ventilated areas. Wash thoroughly after handling. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.
- Handling** : Avoid inhaling vapour and/or mists. Avoid contact with skin, eyes, and clothing. Extinguish any naked flames. Do Not smoke. Remove ignition sources. Avoid sparks. Electrostatic charges may be generated during pumping. Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment. Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (<= 1 m/sec until fill pipe submerged to twice its diameter, then <= 7 m/sec). Avoid splash filling. Do NOT use compressed air for filling, discharging, or handling operations. Handling Temperature: Ambient.
- Storage** : Vapours from tanks should not be released to atmosphere. Breathing losses during storage should be controlled by a suitable vapour treatment system. Bulk storage tanks should be diked (bundled). The vapour is heavier than air. Beware of



accumulation in pits and confined spaces. Keep away from aerosols, flammables, oxidizing agents, corrosives and from products harmful or toxic to man or to the environment. Keep container tightly closed. Storage temperatures: Ambient.

- Product Transfer** : Electrostatic charges may be generated during pumping. Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment. Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (<= 1 m/sec until fill pipe submerged to twice its diameter, then <= 7 m/sec). Avoid splash filling. Do NOT use compressed air for filling, discharging, or handling operations. Keep containers closed when not in use.
- Recommended Materials** : For containers, or container linings use mild steel, stainless steel.
- Unsuitable Materials** : Natural, butyl, neoprene or nitrile rubbers.
- Container Advice** : Containers, even those that have been emptied, can contain explosive vapours. Do not cut, drill, grind, weld or perform similar operations on or near containers.
- Additional Information** : Ensure that all local regulations regarding handling and storage facilities are followed.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational Exposure Limits

Material	Source	Type	ppm	mg/m3	Notation
Benzene	ACGIH	TWA	0.5 ppm		
	ACGIH	STEL	2.5 ppm		
	ACGIH	SKIN_DES			Can be absorbed through the skin.
	OSHA	TWA	1 ppm		
	OSHA	STEL	5 ppm		
Butadiene	OSHA	ACTION	0.5 ppm		
	OSHA Z1A	TWA	1 ppm		
	OSHA Z1A	STEL	5 ppm		
	ACGIH	TWA	2 ppm		
	OSHA	TWA	1 ppm		
Based on Gasoline	OSHA	STEL	5 ppm		
	OSHA	ACTION	0.5 ppm		
	OSHA Z1A	TWA	1,000 ppm	2,200 mg/m3	
	ACGIH	TWA	300 ppm		
	ACGIH	STEL	500 ppm		
Toluene	OSHA Z1A	TWA	300 ppm	900 mg/m3	
	OSHA Z1A	STEL	500 ppm	1,500 mg/m3	
	ACGIH	TWA	50 ppm		
	ACGIH	SKIN_DES			Can be absorbed through the skin.
	OSHA Z1A	TWA	100 ppm	375 mg/m3	



	OSHA Z1A	STEL	150 ppm	560 mg/m3	
	SHELL IS	TWA	50 ppm		

- Additional Information** : Skin notation means that significant exposure can also occur by absorption of liquid through the skin and of vapour through the eyes or mucous membranes. Shell has adopted as Interim Standards, the OSHA PELs that were established in 1989 and later rescinded. SHELL IS is the Shell Internal Standard.
- Exposure Controls** : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Use sealed systems as far as possible. Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits. Local exhaust ventilation is recommended. Firewater monitors and deluge systems are recommended. Eye washes and showers for emergency use.
- Personal Protective Equipment** : Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers. Check with respiratory protective equipment suppliers.
- Respiratory Protection** : If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are unsuitable (e.g., airborne concentrations are high, risk of oxygen deficiency, confined space) use appropriate positive pressure breathing apparatus. Where air-filtering respirators are suitable, select an appropriate combination of mask and filter. Where respiratory protective equipment is required, use a full-face mask. Select a filter suitable for organic gases and vapours [boiling point <65 °C (149 °F)]
Respirator selection, use and maintenance should be in accordance with the requirements of the OSHA Respiratory Protection Standard, 29 CFR 1920.134.
- Hand Protection** : Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection: Longer term protection: Viton. Incidental contact/Splash protection: Nitrile rubber. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, glove thickness, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced.
- Eye Protection** : Chemical splash goggles (chemical monogoggles).
- Protective Clothing** : Chemical and cold resistant gloves/gauntlets, boots, and apron. Where risk of splashing or in spillage clean up, use chemical resistant one-piece overall with integral hood.



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C5/C7 Gasoline
MSDS# 900269

Version 2.

Effective Date 01/24/2005

According to OSHA Hazard Communication Standard, 29 CFR 1910.1200

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : Amber. Liquid.
 Odour : Aromatic hydrocarbon..
 Boiling point : < 55.6 °C / 132.1 °F
 Flash point : -7 °C / 19 °F
 Specific gravity : < 1
 Water solubility : 0.05 g/l Negligible.
 Vapour density (air=1) : > 1

10. STABILITY AND REACTIVITY

Stability : Stable under normal conditions of use. Reacts violently with strong oxidising agents.
Conditions to Avoid : Avoid heat, sparks, open flames and other ignition sources. Avoid exposure to air. Prevent vapour accumulation.
Materials to Avoid : Avoid contact with strong oxidizing agents, copper and copper alloys. Monel. Silver. Mercury. Magnesium can react violently with acetylenes, which may be present in this chemical in trace amounts.
Hazardous Decomposition Products : Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids, liquids and gases, including carbon monoxide, carbon dioxide and other organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.
Hazardous Reactions : If copper, copper alloys, monel, silver, mercury or magnesium is used during construction or maintenance, the formation of explosive acetylides can occur as a result of contact with acetylenes, which may be present at low levels in this material.

11. TOXICOLOGICAL INFORMATION

Basis for Assessment : Information given is based on data from components.
Acute Oral Toxicity : Low toxicity, LD50 > 2000 mg/kg. , Rat (Benzene)
 Aspiration into the lungs when swallowed or vomited may cause chemical pneumonitis which can be fatal.
Acute Dermal Toxicity : Low toxicity, LD50 > 2000 mg/kg. , Rabbit (Benzene)
Acute Inhalation Toxicity : Low toxicity: LC50>5000 ppm / 1 hours, Rat (Benzene)
 High concentrations may cause central nervous system depression resulting in headaches, dizziness and nausea; continued inhalation may result in unconsciousness and/or death.
Skin Irritation : Irritating to skin. (Benzene)
Eye Irritation : Irritating to eyes.(Benzene)
Respiratory Irritation : Inhalation of vapours or mists may cause irritation to the respiratory system.
Repeated Dose Toxicity : Auditory system: prolonged and repeated exposures to high concentrations have resulted in hearing loss in rats. Solvent abuse and noise interaction in the work environment may cause hearing loss. (Toluene)
 Blood: may cause haemolysis of red blood cells and/or



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anaemia. (Benzene)
 Blood-forming organs: repeated exposure affects the bone marrow. (Benzene, Butadiene)
 Cardiovascular system: chronic abuse of similar materials has been associated with irregular heart rhythms and cardiac arrest. (Benzene, Butadiene, Toluene)
 Central nervous system: repeated exposure affects the nervous system. Effects were seen at high doses only. (Toluene)
 Immune System: animal studies on this material or its components have demonstrated immunotoxicity. (Benzene)
 Repeated inhalation exposure of toluene to animals caused histological changes in the brain, degeneration of the heart tissue, and possible immune suppression.
 Kidney: can cause kidney damage. (Toluene)
 Liver: can cause liver damage. (Toluene)
 Respiratory system: repeated exposure affects the respiratory system. Effects were seen at high doses only. (Toluene)
 Intentional abuse of toluene vapours has been linked to damage of brain, liver, kidney and to death.
Mutagenicity : May cause heritable genetic damage. (Butadiene)
Carcinogenicity : Known human carcinogen. (Benzene, Butadiene)
 May cause leukaemia (AML - acute myelogenous leukaemia). (Benzene)
 OSHA has concluded that there is strong evidence that workplace exposure to butadiene poses an increased risk of death from cancers of the lymphohematopoietic (blood-forming) system. (Butadiene)

Material	Carcinogenicity Classification
Butadiene, 1,3-	: ACGIH Group A2: Suspected human carcinogen.
Butadiene, 1,3-	: NTP: Known carcinogen.
Butadiene, 1,3-	: IARC 2A: Probable carcinogen.
Butadiene, 1,3-	: OSHASP: Cancer hazard.
Based on Gasoline	: ACGIH Group A3: Confirmed animal carcinogen with unknown relevance to humans.
Based on Gasoline	: IARC 2B: Possible carcinogen.
Toluene	: ACGIH Group A4: Not classifiable as a human carcinogen.
Toluene	: IARC 3: Classification not possible from current data.
Benzene	: ACGIH Group A1: Confirmed human carcinogen.
Benzene	: NTP: Known carcinogen.
Benzene	: IARC 1: Human carcinogen.
Benzene	: OSHASP: Cancer hazard.

Reproductive and Developmental Toxicity : Causes foetotoxicity in animals at doses which are maternally toxic. (Benzene, Butadiene, Toluene)
 Many case studies involving abuse during pregnancy indicate that toluene can cause birth defects, growth retardation and learning difficulties. There are occupational studies which report an association between inhalation exposure to toluene and adverse effects on reproduction (including spontaneous abortions and birth defects). The methodology of these studies



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and the reliability of their results have been questioned. In a study in rats, inhalation of toluene did not have adverse effects on reproduction. (Toluene)

12. ECOLOGICAL INFORMATION

Acute Toxicity

- Fish : Expected to be toxic: 1 < LC/EC/IC50 <= 10 mg/l
- Aquatic Invertebrates : Expected to be toxic: 1 < LC/EC/IC50 <= 10 mg/l
- Algae : Expected to be toxic: 1 < LC/EC/IC50 <= 10 mg/l
- Microorganisms : Expected to be toxic: 1 < LC/EC/IC50 <= 10 mg/l

Mobility

- : Floats on water.
- If product enters soil, one or more constituents will be highly mobile and may contaminate groundwater.

Persistence/degradability

- : Expected to be inherently biodegradable.
- Oxidises rapidly by photo-chemical reactions in air.

Bioaccumulation

- : Contains components with the potential to bioaccumulate.

13. DISPOSAL CONSIDERATIONS

Material Disposal

- : Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations.

Local Legislation

- : Disposal should be in accordance with applicable regional, national, and local laws and regulations. Local regulations may be more stringent than regional or national requirements and must be complied with.

14. TRANSPORT INFORMATION

US Department of Transportation Classification (49CFR)

Identification number UN 1268
Proper shipping name Petroleum distillates, n.o.s.
Class / Division 3
Packing group II
Contains OIL
Emergency Response Guide No. 128

IMDG

Identification number UN 1268
Proper shipping name PETROLEUM DISTILLATES, N.O.S.
Class / Division 3
Packing group II
Marine pollutant: No

IATA (Country variations may apply)

Identification number UN 1268



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Proper shipping name Petroleum distillates, n.o.s.
Class / Division 3
Packing group II

15. REGULATORY INFORMATION

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

Federal Regulatory Status

Notification Status

TSCA Listed.
AICS Listed.
NDSL Listed.
EINECS Listed.
KECI (KR) Listed.

Comprehensive Environmental Release, Compensation & Liability Act (CERCLA)

C5/C7 Gasoline ()	Reportable quantity: 50 lbs
Benzene (71-43-2)	Reportable quantity: 10 lbs
Toluene (108-88-3)	Reportable quantity: 1,000 lbs
Butadiene, 1,3- (106-99-0)	Reportable quantity: 10 lbs

Shell classifies this material as an "oil" under the CERCLA Petroleum Exclusion, therefore releases to the environment are not reportable under CERCLA. The components with RQs are given for information.

Clean Water Act (CWA) Section 311

Benzene (71-43-2)	Reportable quantity: 10 lbs
Toluene (108-88-3)	Reportable quantity: 1,000 lbs

Under Section 311 of the Clean Water Act (CWA) this material is considered an oil. As such, spills into surface waters must be reported to the National Response Centre at (800) 424-8802. The components with RQs are given for information.

SARA Hazard Categories (311/312)

Immediate (Acute) Health Hazard. Delayed (Chronic) Health Hazard. Fire Hazard.

SARA Toxic Release Inventory (TRI) (313)

Benzene (71-43-2)	20.00%
Toluene (108-88-3)	15.00%
Butadiene, 1,3- (106-99-0)	5.00%



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1910.1200

State Regulatory Status

California Safe Drinking Water and Toxic Enforcement Act (Proposition 65)

Known to the State of California to cause birth defects or other reproductive harm.
Known to the state of California to cause cancer.

Benzene (71-43-2) 20.00%	Carcinogenic. Developmental toxin. Male reproductive toxin.
Toluene (108-88-3) 15.00%	Developmental toxin.
Butadiene, 1,3- (106-99-0) 5.00%	Carcinogenic. Developmental toxin. Female reproductive toxin. Male reproductive toxin.

New Jersey Right-To-Know Chemical List

Based on Gasoline (8006-61-9) 100.00%	Listed.
Benzene (71-43-2) 20.00%	
Toluene (108-88-3) 15.00%	
Butadiene, 1,3- (106-99-0) 5.00%	

Pennsylvania Right-To-Know Chemical List

Benzene (71-43-2) 20.00%	Special hazard. Environmental hazard. Listed.
Toluene (108-88-3) 15.00%	Environmental hazard. Listed.
Butadiene, 1,3- (106-99-0) 5.00%	Special hazard. Environmental hazard. Listed.

16. OTHER INFORMATION

- MSDS Version Number** : 2.
- MSDS Effective Date** : 01/24/2005
- MSDS Revisions** : A vertical bar (|) in the left margin indicates an amendment from the previous version.
- MSDS Regulation** : The content and format of this MSDS is in accordance with the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
- MSDS Distribution** : The information in this document should be made available to all who may handle the product
- Disclaimer** : The information contained herein is based on our current knowledge of the underlying data and is intended to describe the product for the purpose of health, safety and environmental



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requirements only. No warranty or guarantee is expressed or implied regarding the accuracy of these data or the results to be obtained from the use of the product.

MSDS Document

Product Glycolic Acid 70%

1. Chemical Product and Company Identification

Product Glycolic Acid 70%

Synonyms: Hydroxyethanoic Acid

MSDS ID 0295

Manufacturer

Phibrochem
65 Challenger Road
Ridgefield Park, NJ 07660

Phone Number

(201) 329-7300

Emergency Phone

CHEMTREC (800) 424-9300
CHEMTREC International (703) 527-3887

Revision Date 4/23/2009



2. Composition and Information on Ingredients

Ingredient	CAS Number	Weight %	ACGIH TLV	PEL	STEL
GLYCOLIC ACID	79-14-1	70 %			

3. Hazard Identification

Ingestion

Harmful if swallowed. Corrosive and may cause severe and permanent damage to mouth, throat, and stomach.

Inhalation

May cause chemical burns to nasal passages and airways.

Skin

Substance is corrosive. Causes severe skin burns.

Eye

Corrosive to the eyes and may cause severe damage including blindness.

4. First Aid Information

Eye

Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Have eyes examined and tested by medical personnel.

Skin

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Thoroughly wash (or discard) clothing and shoes before reuse.

Inhalation

Rescuers should put on appropriate protective gear. Remove from area of exposure. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Keep victim warm. Get immediate medical attention.

Ingestion

If swallowed, do NOT induce vomiting. Give victim a glass of water or milk. Call a physician or poison control center immediately. Never give anything by mouth to an unconscious person.

5. Fire Fighting Measures

Flammable Properties

This material is not considered a fire hazard. Not Flammable, but reacts with most metals to form flammable hydrogen gas.

Extinguishing Media

Use alcohol foam, carbon dioxide, or water spray when fighting fires involving this material.

Fire fighting instructions

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire.

6. Accidental Release Measures

Clean-up

Ventilate and evacuate area. Clean up spills immediately, observing precautions in Protective Equipment section. Large spills may be neutralized with dilute alkaline solutions of soda ash, or lime. Vacuum or sweep up material and place in a disposal container. Absorb spill with inert material (e.g., dry sand or earth), then place in a chemical waste container. Do not flush to sewer.

7. Handling and Storage

Handling

Wash thoroughly after handling. Use with adequate ventilation. Avoid breathing (dust, vapor,

mist, gas). Avoid contact with eyes, skin, and clothing. Follow all MSDS/label precautions even after container is emptied because they may retain product residues.

Storage

Store in a cool place in original container and protect from sunlight. Store away from incompatible materials. Keep container closed when not in use. Keep away from food and drinking water.

□ Exposure Controls and Personal Protection

Engineering controls

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Local exhaust ventilation may be necessary to control any air contaminants to within their TLVs during the use of this product.

Respirators

A NIOSH-approved air purifying respirator with the appropriate cartridge or canister for the hazards may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air purifying respirators is limited. Use a positive-pressure air-supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air-purifying respirators may not provide adequate protection.

□ Other clothing

Wear safety glasses with side shields (or goggles) and a face shield. Use gloves, and other body coverings, recommended for this material by manufacturers or suppliers based on test data showing adequate permeation and penetration resistance.

9. Physical and Chemical Properties

Physical State	Liquid
Specific Gravity	1.27
Color Appearance	White to Straw Colored
□ odor	□umt Sugar
pH	1.7 (10% Soln)
□oiling Cond. Point	113 C
Melting Freezing Point	10 C
Solubility	Soluble
Percent Volatile	30
Molecular Formula	C2H4O3
Molecular Weight	76.06
Vapor Pressure	11 □ 20 C

10. Stability and Reactivity

Thermal Stability

Stable under normal conditions of use and storage.

Incompatibility

Strong oxidizing agents. Metals. Cyanides and sulfides.

Conditions to Avoid

Incompatibles.

Hazardous Polymerization

Will not occur.

Hazardous Decomposition Products

Carbon dioxide and carbon monoxide may form when heated to decomposition. Decomposition by reaction with certain metals releases flammable and explosive hydrogen gas.

11. Toxicological Information

The toxicological properties of this material have not been thoroughly investigated.

Carcinogen

NTP □ No
IARC □ No
OSHA □ No

There is no experimental toxicity data for this product. Refer to the data listed below for relative toxicity assessment.

TOXICITY DATA (100 % GLYCOLIC ACID)

Oral Toxicity □ LD50 □1950 Mg/Kg (Rat)
LD50 □1920 Mg/Kg (Guinea pig)
Inhalation Toxicity □ LC50 □7.7 Mg/L/4H (Rat)
Eye: SEV □2 Mg/Kg (Rabbit)

12. Ecological Information

Keep out of waterways. Harmful to fish and other water organisms.

100 % GLYCOLIC ACID
LC50 □93 Mg/L/48H (□luegill/Sunfish)
LC50 □164 Mg/L/96H (Flathead Minnow)
LC50 □5,000 Mg/L/96H (□ebrafish)
EC50 □141 Mg/L/48H (Water flea Daphnia)

13. Disposal Considerations

Disposal Method

Dispose in accordance with applicable federal, state, local environmental and regulatory requirements.

14. Transportation Information

DOT Shipping Name □ Corrosive Liquid, Acidic, Organic N.O.S., (Glycolic Acid)
DOT Hazard Class □ 8
Hazardous Ingredients □ Glycolic Acid
Identification Number □ UN 3265
Packing group □ II
Label □ Corrosive

Note: During an incident involving this material, use of DOT Emergency Response Guide No. 153 is also recommended.

15. Regulatory Information

Toxic Substances Control Act (TSCA)
Chemical ingredients are on the TSCA inventory.

Superfund Reportable Quantity (RQ)
Not Regulated.

Hazardous Waste No.
D002 (Unlisted hazardous substance characteristic of corrosivity)

Sara Title III Section 313
Please check with the appropriate agency.

State Lists
This material contains ingredients that are listed for reporting or disclosure in the state of Texas. Please check with the appropriate state agencies.

For States Not Listed
Please check with the appropriate agencies.

California Proposition 65 Warning
This product may contain chemicals known to the state of California to cause cancer, or birth defects or other reproductive harm.

Canadian Lists

DSL/NDSL
The ingredients are on the Domestic Substances List.

WHMIS

Hydroxyacetic acid is item number 854 from the Ingredient Disclosure List and is subject to reporting at 1.0% threshold.

16. Other Information

All information presented herein is given in good faith and is based on sources and tests considered to be reliable, but cannot be guaranteed. It is the user's full responsibility to accept risk for the safety, toxicity, handling, storage, and use of the product, as well as to determine the suitability of the product for a specific purpose. We make no warranty as to the results to be obtained in using the product; therefore all risks must be assumed by the user.



MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

1. PRODUCT IDENTIFICATION

CHEMICAL NAME CLASS: N-FLAMMABLE GAS MIXTURE

Containing one or More of the Following Components in a Nitrogen Balance Gas:
n-Pentane 0.0-0.75% n-Hexane 0.0-1.1% Oxygen 0.0-23.5%

Signal Words: Not Applicable
Hazard Statements: Not Applicable
Precautionary Statements: Not Applicable
Environmental Precautionary Statements: Not Applicable
Other Precautionary Statements: Not Applicable

Note: The Material Safety Data Sheet is for this gas mixture supplied in both refillable and non-refillable cylinders with 33 cubic feet (935 liters) or less gas capacity (DOT - 39 cylinders). This MSDS has been developed for various gas mixtures with the composition of components within the ranges listed in Section 3 (Composition and Information on Ingredients). Refer to the product label for information on the actual composition of the product.

Table with 2 columns: Field Name and Value. Fields include: Product Use, Supplier Name, Address, Business Phone, Emergency Phone, and various contact information for Chemtrec.

NOTE: ALL Canadian WHMIS required information is included in appropriate sections based on the ANSI 1400-1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

2. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: Product Description: This is a colorless gas mixture that may be odorless or have a gasoline-like odor when the n-Hexane component is at high concentration. Health Hazards: This gas mixture may cause adverse effects to the central nervous system if released in confined space. Releases of this gas mixture may also produce oxygen-deficient atmospheres (especially in confined spaces or other poorly-ventilated environments). Individuals in such atmospheres may be asphyxiated. Rapidly released gas can cause frostbite. Flammability Hazards: This gas is not flammable. A cylinder rupture hazard exists when this gas mixture, which is under pressure, is subject to heat or flames. Reactivity Hazards: This gas mixture is not reactive. Environmental Hazards: Release of this gas mixture is not expected to cause harm to the environment or to plants and animals, except for possible frost and freezing from rapid release of a cylinder. Emergency Response Procedures: Emergency responders must wear the proper personal protective equipment suitable for the situation to which they are responding. WARNING - If rescue personnel need to enter an area suspected of having a low level of Oxygen, they should be equipped with Self-Contained Breathing Apparatus (SCBA).

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Table with 4 columns: Chemical Name, Chemical Formula, CAS, and % Composition. Rows include n-Pentane, n-Hexane, Oxygen, and Nitrogen.

4. FIRST-AID MEASURES

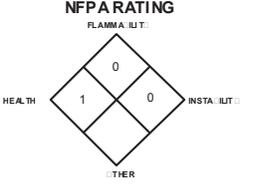
Rescuers should not attempt to retrieve victims if exposure to this gas mixture with adequate personal protective equipment. At a minimum Self-Contained Breathing Apparatus must be worn. No unusual health effects are anticipated after exposure to this gas mixture, due to the small cylinder size. If any adverse symptom develops after over-exposure to this gas mixture, remove victim(s) to fresh air as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation if necessary. Contaminated person(s) who experience any adverse effect after over-exposure to this gas mixture must be taken for medical attention. Rescuers should be taken for medical attention if necessary. Take a copy of the label and the MSDS to physician or other health professional with victim(s).

Medical Conditions Aggravated: Acute or chronic respiratory conditions or central nervous system disorders may be aggravated by over-exposure to this gas mixture.

Recommended First Aid: Administer oxygen, if necessary, treat symptoms and eliminate exposure.

5. FIRE-FIGHTING MEASURES

Flash Point: Not applicable. Autoignition Temperature: Not applicable. Flammable Limits in air by volume: Not applicable. Fire Fighting Materials: Non-flammable gas mixture. Use extinguishing media appropriate for surrounding fire. Fire Fighting Materials Not Used: None known. Special Fire-Fighting Procedures: Structural fire-fighters must wear Self-Contained Breathing Apparatus and full protective equipment. If water is not available for cooling or protection of cylinder exposures, evacuate the area.



6. ACCIDENTAL RELEASE MEASURES

Leak Response: Due to the small size and content of the cylinder, an accidental release of this gas mixture presents significantly less risk of an oxygen deficient environment and other safety hazards than a similar release from a larger cylinder. However, as with any chemical release, extreme caution must be used during emergency response procedures. In the event of a release in which the atmosphere is unknown, and in which other chemicals are potentially involved, evacuate immediate area. Such releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a leak, clear the affected area, protect people, and respond with trained personnel.

6. ACCIDENTAL RELEASE MEASURES Continued

Leak Response continued: Allow the gas mixture to dissipate. If necessary, monitor the surrounding area (and the original area of the release) for oxygen. Oxygen levels must be above 19.5% before non-emergency personnel are allowed to re-enter area. If leaking incidentally from the cylinder, contact your supplier.

7. HANDLING AND STORAGE

Work Practices and Hygiene Practices: Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this gas mixture could occur without any significant warning symptoms, due to oxygen deficiency. Do not attempt to repair, adjust, or in any other way modify the cylinders containing this gas mixture. If there is a malfunction or another type of operational problem, contact nearest distributor immediately.

Storage and Handling Practices: Cylinders should be firmly secured to prevent falling or being knocked-over. Cylinders must be protected from the environment, and preferably kept at room temperature (approximately 21 C / 70 F). Cylinders should be stored in dry, well-ventilated areas, away from sources of heat, ignition, and direct sunlight. Protect cylinders against physical damage. Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. These cylinders are not refillable. WARNING: Do not refill DOT 39 cylinders. Do so may cause personal injury or property damage.

Special Precautions for Handling Gas Cylinders: WARNING: Compressed gases can present significant safety hazards. During cylinder use, use equipment designed for these specific cylinders. Ensure all lines and equipment is rated for proper service pressure.

Specific Uses: This product is for use in various industries. Follow all industry standards for use. Protective Practices During Maintenance: Contaminated Equipment: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Always use product in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

Ventilation and Engineering Controls: No special ventilation systems or engineering controls are needed under normal circumstances of use. As with all chemicals, use this gas mixture in well-ventilated areas. If this gas mixture is used in a poorly-ventilated area, install automatic monitoring equipment to detect the levels of components and oxygen.

Table with 4 main columns: Chemical Name, CAS, Exposure Limits in Air (ACGIH-TLVs, OSHA-PELs, NIOSH-RELs, OTHER), and other details. Rows include n-Hexane, n-Pentane, Oxygen, and Nitrogen.

NE: Not Established. The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) and equivalent standards of Canada (including CSA Standard Z94.4-02 and CSA Standard Z94.3-07). Please reference applicable regulations and standards for relevant details.

Respiratory Protection: No special respiratory protection is required under normal circumstances of use. Maintain component levels below 50% of the TLVs of components (see previous page) and oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection when component levels exceed 50% of the TLV, oxygen levels are below 19.5%, or during emergency response to a release of this gas mixture. During an emergency situation, before entering the area, check the concentration of components and Oxygen. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards and Canadian CSA Standard Z94.4-02, the. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure-demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998). The following are NIOSH Respiratory Protective Equipment Guidelines for the components of this gas mixture, Hexane and Pentane:

n-HEXANE CONCENTRATION: Up to 500 ppm; Up to 1100 ppm. RESPIRATORY PROTECTION: Any Supplied-Air Respirator (SAR). Any SAR operated in a continuous-flow mode, or any Self-Contained Breathing Apparatus (SCBA) with a full facepiece, or any SAR with a full facepiece. Emergency or Planned Entry into Unknown Concentrations or IDLH Conditions: Any SCBA that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode, or any that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA operated in pressure-demand or other positive-pressure mode.

n-PENTANE CONCENTRATION: Up to 1200 ppm; Up to 1500 ppm. RESPIRATORY PROTECTION: Any Supplied-Air Respirator (SAR). Any SAR operated in a continuous-flow mode, or any Self-Contained Breathing Apparatus (SCBA) with a full facepiece, or any SAR with a full facepiece. Emergency or Planned Entry into Unknown Concentrations or IDLH Conditions: Any SCBA that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode, or any SAR that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA operated in pressure-demand or other positive-pressure mode.

Eye Protection: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or the Canadian CSA Standard Z94.3-07.

Hand Protection: Wear leather gloves when handling cylinders. Chemically resistant gloves should be worn when using this gas mixture. Use triple gloves for spill response. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

Foot Protection: No special protection is needed under normal circumstances of use. If necessary, refer to appropriate Standards of Canada. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA 29 CFR 1910.136 and the Canadian CSA Standard Z195-02, Protective Footwear.

9. PHYSICAL and CHEMICAL PROPERTIES

The following information is for the Nitrogen component of this gas mixture.
Gas Density: 0°C and 1 atm: .072 lbs/ft³ (1.153 kg/m³)
Freezing Melting Point: 0°C and 1 atm: -320.4°F (-195.8°C)
Specific Gravity: in air at 0°C and 1 atm: 0.906
Boiling Point: in water vapor at 0°C and 1 atm: 0.023
Evaporation Rate: in air at 0°C and 1 atm: Not applicable.
Vapor Pressure: at 21.1°C: Not applicable.
Efficient Water Solubility: Not applicable.

The following information is for this gas mixture.
Odor Threshold: For Hexane: Reported values vary widely and are not reliable: range of referenced values: 65-248 ppm.
Appearance: Colorless and odorless. This is a colorless gas mixture that may be odorless or have a gasoline-like odor when the n-hexane component is at high concentration.
Flammability: The odor cannot be relied upon as a method of identifying release of this gas mixture as the reported odor thresholds of n-hexane are unreliable and are above the TLV odorant may be added by supplier. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation.

10. STABILITY and REACTIVITY

Stability: Normally stable in gaseous state.
Decomposition Products: Carbon oxides. Hydrolysis: None.
Materials with which it reacts: Titanium will burn in Nitrogen (the main component of this gas mixture). Lithium reacts slowly with Nitrogen at ambient temperatures. Due to the presence of n-pentane and n-hexane, this gas mixture may be incompatible with strong oxidizers and halogens. n-hexane is also incompatible with chlorine dioxide, fluorine, nitrogen dioxide, potassium chlorate, chlorine and chlorosulfuric acid.
Hazardous Materials: Will not occur.
Containers: Contact with incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION

Significance of over-exposure: This gas mixture is via inhalation.
Inhalation: Due to the small size of an individual cylinder of this gas mixture, no unusual health effects from over-exposure to the product are anticipated under routine circumstances of use. Due to the presence of n-hexane, exposure in confined space or other instance of concentrated exposure, may lead to depression of the central nervous system and adverse effects on the peripheral nervous system. In studies with human volunteers, inhalation of 5000 ppm n-hexane for 10 minutes resulted in dizziness and giddiness. Exposure to 2000 ppm for 10 minutes caused no symptoms. Occupational exposure to 1000-25000 ppm for 30-60 minutes was reported to cause dizziness.
 The chief health hazard associated with this gas mixture is when this gas mixture contains less than 19.5% Oxygen and is released in a small, poorly-ventilated area (i.e. an enclosed or confined space). Under this circumstance, an oxygen-deficient environment may occur. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of over-exposure, death may occur. The effects associated with various levels of oxygen are as follows:
 Another significant health hazard associated with this gas mixture is when this gas mixture contains less than 19.5% Oxygen and is released in a small, poorly-ventilated area (i.e. an enclosed or confined space). Under this circumstance, an oxygen-deficient environment may occur. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of over-exposure, death may occur. The effects associated with various levels of oxygen are as follows:
Concentration:
 12-16% Oxygen: Breathing and pulse rate increased, muscular coordination slightly disturbed.
 10-14% Oxygen: Emotional upset, abnormal fatigue, disturbed respiration.
 6-10% Oxygen: Nausea, vomiting, collapse, or loss of consciousness.
 Below 6%: Convulsive movements, possible respiratory collapse, and death.

Warning: Exposure to atmospheres containing 10% or less oxygen will bring about unconsciousness without warning and so likely that individuals cannot help or protect themselves. Lack of sufficient oxygen may cause serious injury or death.
Contact with Skin or Eyes: Contact with rapidly expanding gases (which are released under high pressure) may cause frostbite. Due to the presence of n-hexane in this gas mixture, there is a risk of nerve damage of the extremities, such as the hands and feet (peripheral neuropathy) after prolonged or repeated contact.
Skin Absorption: The n-hexane component can be absorbed through intact skin. Due to the small volume of gas in this cylinder, this route of exposure is not expected to be significant.
Irritation: Prolonged contact with this gas mixture may cause irritation to the skin.
Health Effects: An explanation in Lay Terms. Over-exposure to this gas mixture may cause the following health effects:
Acute: Due to the small size of the individual cylinder of this product, no unusual health effects from exposure to the product are anticipated under routine circumstances of use. If inhalation occurs, adverse effects on the central nervous system may occur. Inhalation of high concentrations of the mixture, as may occur in a confined space, may result in an oxygen-deficient atmosphere and asphyxiation. A sudden release of pressure from the cylinder may cause frostbite to exposed tissues.
Chronic: Chronic low-level exposure to the skin may cause dermatitis. Chronic exposure to oxygen-deficient atmospheres (below 18% oxygen in air) may affect the heart and nervous system. Due to the presence of the n-hexane in this gas mixture, chronic exposure may result in damage to the nerves of the extremities.
Target Organs: ACUTE: Respiratory system, central nervous system. CHRONIC: Skin, heart, nervous system, peripheral nervous system.

Toxicity Data: Data are available for the Oxygen component, but since these data are from hyperbaric exposure to oxygen, which is an unlikely exposure to this gas mixture, the data are not presented in this MSDS. No data are applicable to the main component, Nitrogen, as it is a simple asphyxiant. The following are toxicological data for the n-hexane component, which is above 1% concentration.
HE ANE continued:
 TL₀ (Inhalation-Human) 190 ppm/8 weeks: Peripheral Nerve and Sensation: structural change in nerve
 TL₀ (Inhalation-Human) 5400 ppm/10 minutes: behavioral: headache, Lungs, Thorax, or Respiration: respiratory obstruction: Gastrointestinal: nausea or vomiting
HE ANE continued:
 TL₀ (Inhalation-Human) 190 ppm/6 years-intermittent: Peripheral Nerve and Sensation: paresthesia
 Standard Draize Test (Eye-Rabbit) 10 mg/ Mld
 LC₅₀ (Inhalation-Rat) 48,000 ppm/4 hours
 LC₅₀ (Inhalation-Rat) 627,000 ppm/3 minutes
 LC₅₀ (Inhalation-Mouse) 150,000 ppm/12 hours

11. TOXICOLOGICAL INFORMATION (Continued)

Toxicity Data continued:
HE ANE continued:
 LC₅₀ (Inhalation-Mammal-Species Unspecified) 126 gm/m³: behavioral: excitement Sense Organs and Special Senses (Eye): conjunctive irritation
 LD₅₀ (Oral-Rat) 15,840 mg/kg
 LD₅₀ (Oral-Rat) 29,700 mg/kg: behavioral: somnolence (general depressed activity): Gastrointestinal: changes in structure or function of salivary glands, hypermotility, diarrhea
 LD₅₀ (Intraperitoneal-Rat) 9100 mg/kg
 LD₅₀ (Intravenous-Mouse) 831 mg/kg: behavioral: altered sleep time (including change in righting reflex)
 LD₅₀ (Intravenous-Rabbit) 132 mg/kg
 TL₀ (Oral-Rat) 20,000 mg/kg: Reproductive: Paternal Effects: spermatogenesis (incl. genetic material, sperm morphology, motility, and count), prostate, seminal vesicle, Cowper's gland, accessory glands
 TL₀ (Oral-Rat) 40 mg/kg/4 weeks-intermittent: Nutritional and Gross Metabolic: weight loss or decreased weight gain
 TL₀ (Oral-Rat) 100,000 mg/kg/5 days-intermittent: Nutritional and Gross Metabolic: weight loss or decreased weight gain
 TL₀ (Oral-Mouse) 238 mg/kg: female 6-15 days after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus)
 TL₀ (Intraperitoneal-Rat) 18,900 mg/kg/35 days-intermittent: Peripheral Nerve and Sensation: recording from afferent nerve, recording from peripheral motor nerve: Nutritional and Gross Metabolic: weight loss or decreased weight gain
 TL₀ (Intraperitoneal-Rat) 4788 mg/kg/7 days-intermittent: Liver: other changes: food changes in serum composition (e.g. TP, bilirubin, cholesterol); isochemical: Enzyme inhibition, induction, or change in blood or tissue levels: multiple enzyme effects
 TL₀ (Intraperitoneal-Chicken) 18 gm/kg/90 days-intermittent: Peripheral Nerve and Sensation: structural change in nerve or sheath: behavioral: ataxia-Related to Chronic Dose death
 TL₀ (Subcutaneous-Rat) 7.5 mL/kg/12 weeks-intermittent: Liver: hepatitis (hepatocellular necrosis), zonal microcytosis with or without anemia; Rechemical: Enzyme inhibition, induction, or change in blood or tissue levels: multiple enzyme effects
 LC₀ (Inhalation-Mouse) 120 gm/m³: behavioral: general anesthetic: Lungs, Thorax, or Respiration: respiratory depression: Cardiac: other changes
 TL₀ (Inhalation-Rat) 5000 ppm/24 hours: Reproductive: Paternal Effects: spermatogenesis (incl. genetic material, sperm morphology, motility, and count), testes, epididymis, sperm duct
 TL₀ (Inhalation-Rat) 5000 ppm/24 hours: Peripheral Nerve and Sensation: facial paralysis without anesthesia (usually neuromuscular blockage) Reproductive: Paternal Effects: spermatogenesis (incl. genetic material, sperm morphology, motility, and count), testes, epididymis, sperm duct
 TL₀ (Inhalation-Rat) 2000 ppm/12 hours/24 weeks-intermittent: Spinal Cord: other degenerative changes: Peripheral Nerve and Sensation: recording from peripheral motor nerve: isochemical: Metabolism (intermediate): other proteins
 TL₀ (Inhalation-Rat) 100 ppm/24 hours/11 weeks-continuous: rain and Coverings: recordings from specific areas of CNS: behavioral: muscle weakness: Nutritional and Gross Metabolic: weight loss or decreased weight gain
 TL₀ (Inhalation-Rat) 1 ppHv/6 hours/13 weeks-intermittent: rain and Coverings: changes in brain weight: Nutritional and Gross Metabolic: weight loss or decreased weight gain
 TL₀ (Inhalation-Rat) 476 ppm/6 hours/4 weeks-intermittent: Lungs, Thorax, or Respiration: other changes: isochemical: Enzyme inhibition, induction, or change in blood or tissue levels: phosphatases, dehydrogenases
 TL₀ (Inhalation-Rat) 3000 ppm/6 hours/2 years-intermittent: Nutritional and Gross Metabolic: weight loss or decreased weight gain
 TL₀ (Inhalation-Rat) 500 ppm/24 hours/5 weeks-continuous: Peripheral Nerve and Sensation: spastic paralysis with or without sensory change: Nutritional and Gross Metabolic: weight loss or decreased weight gain
 TL₀ (Inhalation-Rat) 1200 ppm/12 hours/16 weeks-intermittent: Peripheral Nerve and Sensation: recording from peripheral motor nerve: Nutritional and Gross Metabolic: weight loss or decreased weight gain; isochemical: Metabolism (intermediate): other proteins
 TL₀ (Inhalation-Rat) 10,000 ppm/13 weeks-intermittent: Liver: changes in liver weight; Kidney/Ureter/ladder: changes in kidney weight: Related to Chronic Dose: changes in testicular weight

Carcinogenic Potential: The components of this product are listed by agencies tracking the carcinogenic potential of chemical compounds, as follows:
Hexane: EPA II (Inadequate Information for Assess Carcinogenic Potential)
 The remaining components of this gas mixture are not found on the following lists: U.S. EPA, U.S. NTP, U.S. OSHA, U.S. NIOSH, GERMAN MAK, IARC, or ACGIH; therefore, they are not considered to be, nor suspected to be, cancer-causing agents by these agencies.
Irritation: Contact with rapidly expanding gases can be irritating to exposed skin and eyes.
Sensitization: Chronic exposure to Pentane and Hexane may result in sensitization of the heart to epinephrine (based on animal data).
Reproductive Toxicity Information: Listed below is information concerning the effects of the components this gas mixture on the human reproductive system.
Mutagenicity: The components of this gas mixture are not reported to cause mutagenic effects in humans.
Embryotoxicity: The components of this gas mixture are not reported to cause embryotoxic effects in humans.
Teratogenicity: The components of this gas mixture are not reported to cause teratogenic effects in humans.
Reproductive Toxicity: The components of this gas mixture are not reported to cause reproductive effects in humans.
A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An embryo is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

Toxicological Exposure Indices (TEIs): Currently, the following Toxicological Exposure Indices (TEIs) have been determined for the n-hexane component of this gas mixture.

CHEMICAL DETERMINANT	SAMPLING TIME	TEI
Hexane • 2,5-Hexanedione in urine	• End of shift at end of workweek	• 0.4 mg/L

12. ECOLOGICAL INFORMATION

All Work Practices Must Be Aimed at Eliminating Environmental Contamination.
Mobility: Hexane may volatilize from dry soil surfaces based upon its vapor pressure. If released to soil, the Pentane component is expected to have high mobility based upon an estimated Koc of 80. Volatilization from moist soil surfaces is expected to be an important fate process based upon a Henry's Law constant of 1.25 atm-cu m/mole. Pentane may volatilize from dry soil surfaces based upon its vapor pressure.
Persistence and Degradability: Persistence: Nitrogen is a natural element and presents no hazard of persistence. The Hexane and Pentane components will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals. The half-life of each of these materials is as follows: Hexane: 3 days; Pentane: 4 days; biodegradation: Nitrogen does not biodegrade.

12. ECOTOXICITY INFORMATION Continued

PERSISTENCE AND DEGRADABILITY continued: Screening studies suggest that the Hexane and Pentane components will undergo biodegradation in soil and water surfaces, but volatilization is expected to be the predominant fate process in the environment.

POTENTIAL FOR ACCUMULATE: The Nitrogen component of this gas mixture will not bioaccumulate. An estimated OCF of 200 was calculated for the Hexane component, using a log Kow of 3.90 and a regression-derived equation. According to a classification scheme, this OCF suggests the potential for bioconcentration in aquatic organisms is high. An estimated OCF of 80 was calculated for the Pentane component, using a log Kow of 3.39 and a regression-derived equation. According to a classification scheme, this OCF suggests the potential for bioconcentration in aquatic organisms is moderate.

ECOTOXICITY: This gas mixture has not been tested for aquatic or animal toxicity. All release to terrestrial, atmospheric and aquatic environments should be avoided. The following aquatic toxicity data is available for the n-Hexane component.

n-HEXANE	n-HEXANE continued:
EC ₅₀ (<i>Microcystis pyrraera</i>) 96 hours: 10 mg/L	LC ₅₀ (<i>Aphnia magna</i>) 24 hours: 50 mg/L
EC ₅₀ (<i>Aphnia magna</i>) 48 hours: 2.1 mg/L	LC ₅₀ (<i>Chaetogammarus mannus</i>) 96 hours: 0.4 mg/L
LC ₅₀ (Coho salmon young) 96 hours: 200 mg/L	LC ₅₀ (<i>Mysidopsis bahia</i>) 96 hours: 0.4 mg/L
	LC ₅₀ (goldfish) 24 hours: 4 mg/L

NE-DEPLETION POTENTIAL: Components are not Class I or Class II ozone depleting chemicals (40 CFR Part 82).

ENVIRONMENTAL EFFECTS CONTROLS: Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Cylinders with undesired residual product may be safely vented outdoors with the proper regulator. For further information, refer to Section 16 (Other Information).

14. TRANSPORTATION INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION 49 CFR 172.101: This material is classified as Dangerous Goods, per regulations of the DOT.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (Nitrogen, Oxygen)
HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)
IDENTIFICATION NUMBER: UN 1956
PACKING GROUP: Not applicable.
DOT LABELS REQUIRED: Class 2.2 (Non-Flammable Gas)
NORTH AMERICAN EMERGENCY RESPONSE GUIDE NUMBER: 200
MARINE POLLUTANT: The components of this gas mixture are not classified by the DOT as Marine Pollutants (as defined by 49 CFR 172.101, Appendix A).

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles can present serious safety hazards. If transporting these cylinders in vehicles, ensure these cylinders are not exposed to extremely high temperatures (as may occur in an enclosed vehicle on a hot day). Additionally, the vehicle should be well-ventilated during transportation.

Note: DOT 39 Cylinders ship in a strong outer carton (outer package). Pertinent shipping information goes on the outside of the outer package. DOT 39 Cylinders do not have transportation information on the cylinder itself.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This gas is classified as Dangerous Goods, per regulations of Transport Canada.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (Nitrogen, Oxygen)
HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)
IDENTIFICATION NUMBER: UN 1956
PACKING GROUP: Not Applicable
HAZARD LABEL: Class 2.2 (Non-Flammable Gas)
SPECIAL PREVISIONS: None
PERMISSIVE LIMIT AND LIMITED QUANTITIES: 0.12
ERAP INDEX: None
PASSENGER CARRYING SHIP INDEX: None

PASSENGER CARRYING ROAD VEHICLE OR PASSENGER CARRYING RAILWAY VEHICLE INDEX: 75
NORTH AMERICAN EMERGENCY RESPONSE GUIDE NUMBER: 200
NOTE: Shipment of compressed gas cylinders via Public Passenger Road Vehicle is a violation of Canadian law (Transport Canada Transportation of Dangerous Goods Act, 1992).

INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION DATA: This gas mixture is classified as Dangerous Goods, per the International Air Transport Association.

IDENTIFICATION NUMBER: UN 1956
PROPER SHIPPING NAME: Compressed gases, n.o.s. (Nitrogen, Oxygen)
HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)
HAZARD LABELS REQUIRED: Class 2.2 (Non-Flammable Gas)
PACKING GROUP: None
ACCEPTED QUANTITIES: E2
PASSENGER CARGO AIRCRAFT LIMITED QUANTITY PACKING INSTRUCTIONS: None
PASSENGER CARGO AIRCRAFT LIMITED QUANTITY MAXIMUM NET QUANTITY PERG: None
PASSENGER CARGO AIRCRAFT PACKING INSTRUCTIONS: 200
PASSENGER CARGO AIRCRAFT MAXIMUM NET QUANTITY PERG: 75 kg
CARGO AIRCRAFT NON-PACKING INSTRUCTIONS: 200
CARGO AIRCRAFT NON-MAXIMUM NET QUANTITY PERG: 150 kg
SPECIAL PREVISIONS: None
ERG CODE: 2L

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:
U.S. SARA REPORTING REQUIREMENTS: The components of this gas mixture are subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

COMPOUND	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Hexane	No	No	Yes

- U.S. SARA 302 EXEMPTION HAZARD THRESHOLD PLANNING QUANTITY TRIP: Not Applicable
- U.S. SARA 304 EXEMPTION HAZARD REPORTABLE QUANTITY: Hexane 5000 lb (2270 kg)
- U.S. CERCLA REPORTABLE QUANTITY: Not Applicable
- U.S. TSCA INVENTORY STATUS: The components of this gas mixture are listed on the TSCA Inventory.
- U.S. EPA CLEAN WATER ACT SECTIONS 301, 307 AND 311: Not Applicable

15. REGULATORY INFORMATION Continued

ADDITIONAL U.S. REGULATIONS continued:

U.S. CLEAN AIR ACT SECTION 112(r) Table 3 to 6.130: Pentane is listed under this regulation in Table 3 as a Regulated Substances (Flammable Substances), in quantities of 10,000 lb (4,540 kg) or greater. Hexane is listed as a Hazardous Air Pollutant (HAP) generally known or suspected to cause serious health problems under the Clean Air Act.

U.S. EPA LIST OF REGULATED TOXIC SUBSTANCES AND THRESHOLD QUANTITIES FOR ACCIDENTAL RELEASE PREVENTION - Table 1 to 6.130: Not Applicable

U.S. EPA REGULATED SUBSTANCES PER 40 CFR PART 600 OF THE RISK MANAGEMENT FOR CHEMICAL RELEASES CLEAN AIR ACT SECTION 112(r) Table 3 to 6.130: Not Applicable

U.S. SHAH HIGHLY HAZARDOUS CHEMICALS (HHCS): Not Applicable

OTHER U.S. FEDERAL REGULATIONS:

This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82).

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT PROVISION 65: No component of this gas mixture is on the California Proposition 65 lists.

ADDITIONAL CANADIAN REGULATIONS:

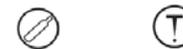
CANADIAN DSL NDSL INVENTORY STATUS: The components of this gas mixture are listed on the DSL Inventory.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The components of this gas mixture are on the CEPA Priorities Substances Lists as follows:
n-Hexane: This is a National Pollutant Release Inventory (NPRI) substance. Information about this substance must be reported to the Minister of the Environment in accordance with subsection 46(1) of the Canadian Environmental Protection Act, 1999. This substance is listed under PART 5, ISOMER GROUPS.

GREENHOUSE GASES: Not applicable.

CANADIAN WHMIS REGULATIONS: This gas mixture is categorized as a Controlled Product, Hazard Classes A and D2, as per the Controlled Product Regulations.

CANADIAN WHMIS SYMBOLS:



16. OTHER INFORMATION

INFORMATION ABOUT DOT-39 NRC Non-Refillable Cylinder PRODUCTS

DOT 39 cylinders ship as hazardous materials when full. Once the cylinders are relieved of pressure (empty) they are not considered hazardous material or waste. Residual gas in this type of cylinder is not an issue because toxic gas mixtures are prohibited. Calibration gas mixtures typically packaged in these cylinders are Non-flammable n.o.s., UN 1956. A small percentage of calibration gases packaged in DOT 39 cylinders are flammable or oxidizing gas mixtures.

For disposal of used DOT-39 cylinders, it is acceptable to place them in a landfill if local laws permit. Their disposal is no different than that employed with other DOT containers such as spray paint cans, household aerosols, or disposable cylinders of propane (for camping, torch etc.). When feasible, we recommended recycling for scrap metal content. Calgaz will do this for any customer that wishes to return cylinders to us prepaid. All that is required is a phone call to make arrangements so we may anticipate arrival. Scrapping cylinders involves some preparation before the metal dealer may accept them. We perform this operation as a service to valued customers who want to participate.

MITIGATIONS: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

Further information about the handling of compressed gases can be found in the following pamphlets published by Compressed Gas Association Inc. (CGA), 421 Walney Road, 5th Floor, Chantilly, VA 20151. Telephone: (703) 788-2700, Fax: (703) 961-1831.

- P-1 Safe Handling of Compressed Gases in Containers
- A-1 Safe Handling and Storage of Compressed Gases
- Handbook of Compressed Gases

PREPARED BY:

CHEMICAL SAFETY ASSOCIATES, Inc.
 P.O. Box 1961, Hilo, HI 96721 • 1-800-441-3365
 Fax on Demand • 1-800-231-1366



This Material Safety Data Sheet is offered pursuant to OSHA's Hazard Communication Standard, 29 CFR, 1910.1200. Other government regulations must be reviewed for applicability to this gas mixture. To the best of Calgaz knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness are not guaranteed and no warranties of any type, either express or implied, are provided. The information contained herein relates only to this specific product. If this gas mixture is combined with other materials, all component properties must be considered. Data may be changed from time to time. Be sure to consult the latest edition.



Health	3
Fire	0
Reactivity	1
Personal Protection	

Material Safety Data Sheet Hydrochloric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Hydrochloric acid	Contact Information:
Catalog Codes: SLH1462, SLH3154	Sciencelab.com, Inc. 14025 Smith Rd. Houston, Texas 77396
CAS#: Mixture.	US Sales: 1-800-901-7247 International Sales: 1-281-441-4400 Order Online: ScienceLab.com
RTECS: MW4025000	CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300
TSCA: TSCA 8(b) inventory: Hydrochloric acid	International CHEMTREC, call: 1-703-527-3887
Cif#: Not applicable.	For non-emergency assistance, call: 1-281-441-4400
Synonym: Hydrochloric Acid; Muriatic Acid	
Chemical Name: Not applicable.	
Chemical Formula: Not applicable.	

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Hydrogen chloride	7647-01-0	20-38
Water	7732-18-5	62-80

Toxicological Data on Ingredients: Hydrogen chloride: GAS (LC50): Acute: 4701 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Non-corrosive for lungs. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

Slightly hazardous in case of skin contact (sensitizer). **CARCINOGENIC EFFECTS:** Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. **MUTAGENIC EFFECTS:** Not available. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance may be toxic to kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth. Repeated or prolonged exposure to the substance can produce target

organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: of metals

Explosion Hazards in Presence of Various Substances: Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:

Non combustible. Calcium carbide reacts with hydrogen chloride gas with incandescence. Uranium phosphide reacts with hydrochloric acid to release spontaneously flammable phosphine. Rubidium acetylene carbides burns with slightly warm hydrochloric acid. Lithium silicide in contact with hydrogen chloride becomes incandescent. When dilute hydrochloric acid is used, gas spontaneously flammable in air is evolved. Magnesium boride treated with concentrated hydrochloric acid produces spontaneously flammable gas. Cesium acetylene carbide burns hydrogen chloride gas. Cesium carbide ignites in contact with hydrochloric acid unless acid is dilute. Reacts with most metals to produce flammable Hydrogen gas.

Special Remarks on Explosion Hazards:

Hydrogen chloride in contact with the following can cause an explosion, ignition on contact, or other violent/vigorous reaction: Acetic anhydride AgClO \square CCl4 Alcohols \square hydrogen cyanide, Aluminum Aluminum-titanium alloys (with HCl vapor), 2-Amino ethanol, Ammonium hydroxide, Calcium carbide Ca3P2 Chlorine \square dinitroanilines (evolves gas), Chlorosulfonic acid Cesium carbide Cesium acetylene carbide, 1,1-Difluoroethylene Ethylene diamine Ethylene imine, Fluorine, HClO4 Hexalithium disilicide H2SO4 Metal acetylides or carbides, Magnesium boride, Mercuric sulfate, Oleum, Potassium permanganate, beta-Propiolactone Propylene oxide Rubidium carbide, Rubidium, acetylene carbide Sodium (with aqueous HCl), Sodium hydroxide Sodium tetraselenium, Sulfonic acid, Tetraselenium tetranitride, U3P4 , Vinyl acetate. Silver perchlorate with carbon tetrachloride in the presence of hydrochloric acid produces trichloromethyl perchlorate which detonates at 40 deg. C.

Section 6: Accidental Release Measures

Small Spill:

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:

Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. \square Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

\square Keep locked up. \square Keep container dry. Do not ingest. Do not breathe gas/fumes/vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. \square Keep away from incompatibles such as oxidizing agents, organic materials, metals, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage: \square Keep container tightly closed. \square Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Face shield. Full suit. Vapor respirator. \square Be sure to use an approved/certified respirator or equivalent. Gloves. \square Boots.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. \square Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist \square BEFORE handling this product.

Exposure Limits:

CEIL: 5 (ppm) from OSHA (PEL) [United States] CEIL: 7 (mg/m³) from OSHA (PEL) [United States] CEIL: 5 from NIOSH CEIL: 7 (mg/m³) from NIOSH TWA: 1 STEL: 5 (ppm) [United Kingdom (UK)] TWA: 2 STEL: 8 (mg/m³) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

odor: Pungent. Irritating (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colorless to light yellow.

pH (1% solution in water): Acidic.

Boiling Point:

108.58 C \square 760 mm Hg (for 20.22 \square HCl in water) 83 C \square 760 mm Hg (for 31 \square HCl in water) 50.5 C (for 37 \square HCl in water)

Melting Point:

-62.25 C (-80 F) (20.69 \square HCl in water) -46.2 C (31.24 \square HCl in water) -25.4 C (39.17 \square HCl in water)

Critical Temperature: Not available.

Specific Gravity:

1.1- 1.19 (Water \square 1) 1.10 (20 \square and 22 \square HCl solutions) 1.12 (24 \square HCl solution) 1.15 (29.57 \square HCl solution) 1.16 (32 \square HCl solution) 1.19 (37 \square and 38 \square HCl solutions)

Vapor Pressure: 16 kPa (\square 20 C) average

Vapor Density: 1.267 (Air \square 1)

Volatility: Not available.

odor Threshold: 0.25 to 10 ppm

Water \square il Dist. Coeff.: Not available.

Ioncity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility: Soluble in cold water, hot water, diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, water

Incompatibility with various substances:

Highly reactive with metals. Reactive with oxidizing agents, organic materials, alkalis, water.

Corrosivity:

Extremely corrosive in presence of aluminum, of copper, of stainless steel(304), of stainless steel(316). Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Reacts with water especially when water is added to the product. Absorption of gaseous hydrogen chloride on mercuric sulfate becomes violent \square 125 deg. C. Sodium reacts very violently with gaseous hydrogen chloride. Calcium phosphide and hydrochloric acid undergo very energetic reaction. It reacts with oxidizers releasing chlorine gas. Incompatible with, alkali metals, carbides, borides, metal oxides, vinyl acetate, acetylides, sulphides, phosphides, cyanides, carbonates. Reacts with most metals to produce flammable Hydrogen gas. Reacts violently (moderate reaction with heat of evolution) with water especially when water is added to the product. Isolate hydrogen chloride from heat, direct sunlight, alkalies (reacts vigorously), organic materials, and oxidizers (especially nitric acid and chlorates), amines, metals, copper and alloys (e.g. brass), hydroxides, zinc (galvanized materials), lithium silicide (incandescence), sulfuric acid (increase in temperature and pressure) Hydrogen chloride gas is emitted when this product is in contact with sulfuric acid. Adsorption of Hydrochloric Acid onto silicon dioxide results in exothermic reaction. Hydrogen chloride causes aldehydes and epoxides to violently polymerize. Hydrogen chloride or Hydrochloric Acid in contact with the following can cause explosion or ignition on contact or

Special Remarks on Corrosivity:

Highly corrosive. Incompatible with copper and copper alloys. It attacks nearly all metals (mercury, gold, platinum, tantalum, silver, and certain alloys are exceptions). It is one of the most corrosive of the nonoxidizing acids in contact with copper alloys. No corrosivity data on zinc, steel. Severe Corrosive effect on brass and bronze

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:

Acute oral toxicity (LD50): 900 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 1108 ppm, 1 hours [Mouse]. Acute toxicity of the vapor (LC50): 3124 ppm, 1 hours [Rat].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. May cause damage to the following organs: kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth.

Other Toxic Effects on Humans:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of ingestion, . Hazardous in case of eye contact (corrosive), of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals:

Lowest Published Lethal Doses (LDL/LCL) LDL [Man] -Route: Oral; 2857 ug/kg LCL [Human] - Route: Inhalation; Dose: 1300 ppm:30M LCL [Rabbit] - Route: Inhalation; Dose: 4413 ppm:30M

Special Remarks on Chronic Effects on Humans:

May cause adverse reproductive effects (fetotoxicity). May affect genetic material.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Corrosive. Causes severe skin irritation and burns. Eyes: Corrosive. Causes severe eye irritation conjunctivitis, burns, corneal necrosis. Inhalation: May be fatal if inhaled. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract. Inhalation of hydrochloric acid fumes produces nose, throat, and laryngeal burning, and irritation, pain and inflammation, coughing, sneezing, choking sensation, hoarseness, laryngeal spasms, upper respiratory tract edema, chest pains, as well as headache, and palpitations. Inhalation of high concentrations can result in corrosive burns, necrosis of bronchial epithelium, constriction of the larynx and bronchi, nasospetal perforation, glottal closure, occur, particularly if exposure is prolonged. May affect the liver. Ingestion: May be fatal if swallowed. Causes irritation and burning, ulceration, or perforation of the gastrointestinal tract and resultant peritonitis, gastric hemorrhage and infection. Can also cause nausea, vomiting (with coffee ground emesis), diarrhea, thirst, difficulty swallowing, salivation, chills, fever, uneasiness, shock, strictures and stenosis (esophageal, gastric, pyloric). May affect behavior (excitement), the cardiovascular system (weak rapid pulse, tachycardia), respiration (shallow respiration), and urinary system (kidneys- renal failure, nephritis). Acute exposure via inhalation or ingestion can also cause erosion of tooth enamel. Chronic Potential Health Effects: dyspnea, bronchitis. Chemical pneumonitis and pulmonary edema can also

Section 12: Ecological Information

Ecotoxicity: Not available.

OD5 and CD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

TD Classification: Class 8: Corrosive material

Identification: : Hydrochloric acid, solution UNNA: 1789 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Connecticut hazardous material survey.: Hydrochloric acid Illinois toxic substances disclosure to employee act: Hydrochloric acid Illinois chemical safety act: Hydrochloric acid New York release reporting list: Hydrochloric acid Rhode Island RT hazardous substances: Hydrochloric acid Pennsylvania RT: Hydrochloric acid Minnesota: Hydrochloric acid Massachusetts RT: Hydrochloric acid Massachusetts spill list: Hydrochloric acid New Jersey: Hydrochloric acid New Jersey spill list: Hydrochloric acid Louisiana RT reporting list: Hydrochloric acid Louisiana spill reporting: Hydrochloric acid California Director's List of Hazardous Substances: Hydrochloric acid TSCA 8(b) inventory: Hydrochloric acid TSCA 4(a) proposed test rules: Hydrochloric acid SARA 302.304.311.312 extremely hazardous substances: Hydrochloric acid SARA 313 toxic chemical notification and release reporting: Hydrochloric acid CERCLA: Hazardous substances.: Hydrochloric acid: 5000 lbs. (2268 kg)

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):

CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):

R34- Causes burns. R37- Irritating to respiratory system. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 1

Personal Protection:

National Fire Protection Association (S.A.):

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:

Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References:

-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du r glement sur le transport des marchandises dangeureuses au canada. Centre de conformit  international Lt e. 1986.

Other Special Considerations: Not available.

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Material Safety Data Sheet



Hydrogen

Section 1. Chemical product and company identification

Product name : Hydrogen
Supplier : AIRGAS INC., on behalf of its subsidiaries
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

Product use : Synthetic/Analytical chemistry.

Synonym : Dihydrogen; o-Hydrogen; p-Hydrogen; Molecular hydrogen; H₂; UN 1049; UN 1966;
Liquid hydrogen (LH2 or LH2)

MSDS # : 001026

Date of Preparation/Revision : 4/26/2010.

In case of emergency : 1-866-734-3438

Section 2. Hazards identification

Physical state : Gas or Liquid.
Emergency overview : WARNING!
GAS:
CONTENTS UNDER PRESURE.
Extremely flammable
Do not puncture or incinerate container.
Can cause rapid suffocation.
May cause severe frostbite.
LIQUID:
Extremely flammable
Extremely cold liquid and gas under pressure.
Can cause rapid suffocation.
May cause severe frostbite.

Do not puncture or incinerate container.
Contact with rapidly expanding gases or liquids can cause frostbite.

Routes of entry : Inhalation

Potential acute health effects

Eyes : Contact with rapidly expanding gas may cause burns or frostbite. Contact with cryogenic liquid can cause frostbite and cryogenic burns.

Skin : Contact with rapidly expanding gas may cause burns or frostbite. Contact with cryogenic liquid can cause frostbite and cryogenic burns.

Inhalation : Acts as a simple asphyxiant.

Ingestion : Ingestion is not a normal route of exposure for gases Contact with cryogenic liquid can cause frostbite and cryogenic burns.

Potential chronic health effects : **CARCINOGENIC EFFECTS**: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.

Medical conditions aggravated by over-exposure : Acute or chronic respiratory conditions may be aggravated by overexposure to this gas.

See toxicological information (section 11)

Hydrogen

Section 3. Composition, Information on Ingredients

Name	CAS number	% Volume	Exposure limits
Hydrogen	1333-74-0	100	Oxygen Depletion [Asphyxiant]

Section 4. First aid measures

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.

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

Flammability of the product : Flammable.

Auto-ignition temperature : 399.85 to 573.75°C (751.7 to 1064.8°F)

Flammable limits : Lower: 4% Upper: 75%

Products of combustion : No specific data.

Fire hazards in the presence of various substances : Extremely flammable in the presence of the following materials or conditions: oxidizing materials.

Fire-fighting media and instructions : Use an extinguishing agent suitable for the surrounding fire.

Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.
Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.

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 : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up : Immediately contact emergency personnel. Stop leak if without risk. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

Handling : High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
Never allow any unprotected part of the body to touch uninsulated pipes or vessels that contain cryogenic liquids. Prevent entrapment of liquid in closed systems or piping without pressure relief devices. Some materials may become brittle at low temperatures and will easily fracture.

Hydrogen

Storage : Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).
For additional information concerning storage and handling refer to Compressed Gas Association pamphlets P-1 Safe Handling of Compressed Gases in Containers and P-12 Safe Handling of Cryogenic Liquids available from the Compressed Gas Association, Inc.

Section 8. Exposure controls/personal protection

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.

Personal protection

Eyes : 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 or dusts.

When working with cryogenic liquids, wear a full face shield.

Skin : 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.

Respiratory : Use a properly fitted, air-purifying or air-fed 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.

The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93

Hands : 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.
Insulated gloves suitable for low temperatures

Personal protection in case of a large spill : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.

Product name

hydrogen Oxygen Depletion [Asphyxiant]

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

Molecular weight : 2.02 g/mole

Molecular formula : H₂

Boiling/condensation point : -253.2°C (-423.8°F)

Melting/freezing point : -259.2°C (-434.6°F)

Critical temperature : -240.1°C (-400.2°F)

Vapor density : 0.07 (Air = 1) Liquid Density@BP: 4.43 lb/ft³ (70.96 kg/m³)

Specific Volume (ft³/lb) : 14.0845

Gas Density (lb/ft³) : 0.071

Section 10. Stability and reactivity

Stability and reactivity : The product is stable.

Incompatibility with various substances : Extremely reactive or incompatible with the following materials: oxidizing materials.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Hydrogen

Section 11. Toxicological information

Toxicity data

Other toxic effects on humans : No specific information is available in our database regarding the other toxic effects of this material to humans.

Specific effects

Carcinogenic effects : No known significant effects or critical hazards.

Mutagenic effects : No known significant effects or critical hazards.

Reproduction toxicity : No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity

Not available.

Environmental fate : Not available.

Environmental hazards : No known significant effects or critical hazards.

Toxicity to the environment : Not available.

Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation. Return cylinders with residual product to Airgas, Inc. Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1049	HYDROGEN, COMPRESSED	2.1	Not applicable (gas).		Limited quantity Yes.
	UN1966	Hydrogen, refrigerated liquid				Packaging instruction Passenger aircraft Quantity limitation: Forbidden. Cargo aircraft Quantity limitation: 150 kg
TDG Classification	UN1049	HYDROGEN, COMPRESSED	2.1	Not applicable (gas).		Explosive Limit and Limited Quantity Index 0.125
	UN1966	Hydrogen, refrigerated liquid				ERAP Index 3000 Passenger Carrying Ship Index Forbidden Passenger

Hydrogen						
						Carrying Road or Rail Index Forbidden
Mexico Classification	UN1049	HYDROGEN, COMPRESSED	2.1	Not applicable (gas).		-
	UN1966	Hydrogen, refrigerated liquid				

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Section 15. Regulatory information

United States

U.S. Federal regulations : TSCA 8(a) IUR: hydrogen
United States inventory (TSCA 8b): This material is listed or exempted.
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: hydrogen
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: hydrogen: Fire hazard, Sudden release of pressure
Clean Water Act (CWA) 307: No products were found.
Clean Water Act (CWA) 311: No products were found.
Clean Air Act (CAA) 112 accidental release prevention: hydrogen
Clean Air Act (CAA) 112 regulated flammable substances: hydrogen
Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

State regulations : **Connecticut Carcinogen Reporting**: This material is not listed.
Connecticut Hazardous Material Survey: This material is not listed.
Florida substances: This material is not listed.
Illinois Chemical Safety Act: This material is not listed.
Illinois Toxic Substances Disclosure to Employee Act: This material is not listed.
Louisiana Reporting: This material is not listed.
Louisiana Spill: This material is not listed.
Massachusetts Spill: This material is not listed.
Massachusetts Substances: This material is listed.
Michigan Critical Material: This material is not listed.
Minnesota Hazardous Substances: This material is not listed.
New Jersey Hazardous Substances: This material is listed.
New Jersey Spill: This material is not listed.
New Jersey Toxic Catastrophe Prevention Act: This material is not listed.
New York Acutely Hazardous Substances: This material is not listed.
New York Toxic Chemical Release Reporting: This material is not listed.
Pennsylvania RTK Hazardous Substances: This material is listed.
Rhode Island Hazardous Substances: This material is not listed.

Canada

WHMIS (Canada) : Class A: Compressed gas.
Class B-1: Flammable gas.
CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is not listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Hydrogen	
Section 16. Other information	

United States

Label requirements : GAS:
CONTENTS UNDER PRESURE.
Extremely flammable
Do not puncture or incinerate container.
Can cause rapid suffocation.
May cause severe frostbite.
LIQUID:
Extremely flammable
Extremely cold liquid and gas under pressure.
Can cause rapid suffocation.
May cause severe frostbite.

Canada

Label requirements : Class A: Compressed gas.
Class B-1: Flammable gas.

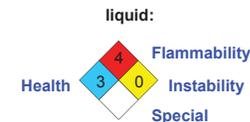
Hazardous Material Information System (U.S.A.) :

Health	0
Flammability	4
Physical hazards	0

liquid:

Health	3
Fire hazard	4
Reactivity	0
Personal protection	

National Fire Protection Association (U.S.A.)



Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.



MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, GHS, and Canadian H-1 Standards

1. PRODUCT IDENTIFICATION

CHEMICAL NAME CLASS: NONFLAMMABLE GAS MIXTURE

Containing one or More of the Following Components in a Nitrogen Balance Gas:

Oxygen 0-23.5% Isobutylene, 0.0005-0.9%

Signal Words: Not Applicable Chemical Family Name: Not Applicable Formula: Not Applicable

Document Number: 50054

Note: The Material Safety Data Sheet is for this gas mixture supplied in cylinders with 33 cubic feet (935 liters) or less gas capacity (DOT - 39 cylinders). This MSDS has been developed for various gas mixtures with the composition of components within the ranges listed in Section 2 (Composition and Information on Ingredients). Refer to the product label for information on the actual composition of the product.

Product Use:	Calibration of Monitoring and Research Equipment
Supplier Manufacturer's Name:	CALGAS
Address:	821 Chesapeake Drive Cambridge, MD 21613
Business Phone:	1-410-228-6400 (8 a.m. to 5 p.m. U.S. EST)
General MSDS Information:	1-713-868-0440
Fax on Demand:	1-800-231-1366
Emergency Phone:	
Chemtrec: United States/Canada/Puerto Rico:	1-800-424-9300 [24-hours]
Chemtrec International:	1-703-527-3887 [24-hours]

2. Composition and Information on Ingredients

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL		NIOSH IDLH ppm	OTHER ppm
			TWA ppm	STEL ppm	TWA ppm	STEL ppm		
Isobutylene	115-11-7	0.0005-0.9%	There are no specific exposure limits for Isobutylene.					
Oxygen	7782-44-7	0-23.5%	There are no specific exposure limits for Oxygen.					
Nitrogen	7727-37-9	Balance	There are no specific exposure limits for Nitrogen. Nitrogen is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					

NE: Not Established. See Section 16 for Definitions of Terms Used.
NOTE (1): ALL WHMIS required information is included in appropriate sections based on the ANSI Z39.1-1998 format. This gas mixture has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

3. Hazard Identification

Emergency Overview: This is a colorless, odorless gas mixture. Releases of this gas mixture may produce oxygen-deficient atmospheres (especially in confined spaces or other poorly-ventilated environments); individuals in such atmospheres may be asphyxiated. Isobutylene, a component of this gas mixture, may cause drowsiness and other central nervous system effects in high concentrations; however, due to its low concentration in this gas mixture, this is unlikely to occur.

Most Significant Route of Over-Exposure: The most significant route of over-exposure for this gas mixture is by inhalation.

Inhalation: Due to the small size of an individual cylinder of this gas mixture, no unusual health effects from over-exposure to the product are anticipated under routine circumstances of use. The chief health hazard associated with this gas mixture is when this gas mixture contains less than 19.5% Oxygen and is released in a small, poorly-ventilated area (i.e. an enclosed or confined space). Under this circumstance, an oxygen-deficient environment may occur. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of over-exposure, death may occur. The effects associated with various levels of oxygen are as follows:

Concentration of Oxygen	Served Effect
12-16% Oxygen:	Breathing and pulse rate increase, muscular coordination slightly disturbed.
10-14% Oxygen:	Emotional upset, abnormal fatigue, disturbed respiration.
6-10% Oxygen:	Nausea, vomiting, collapse, or loss of consciousness. Convulsive movements, possible respiratory collapse, and death.

Health Effects or Risks from Exposure: An Explanation in Lay Terms. Over-exposure to this gas mixture may cause the following health effects:

Acute: Due to the small size of the individual cylinder of this gas mixture, no unusual health effects from exposure to the product are anticipated under routine circumstances of use. The most significant hazard associated with this gas mixture when it contains less than 19.5% oxygen is the potential for exposure to oxygen-deficient atmospheres. Symptoms of oxygen deficiency include respiratory difficulty, ringing in ears, headaches, shortness of breath, wheezing, headache, dizziness, indigestion, nausea, unconsciousness, and death. The skin of a victim of over-exposure may have a blue color. Additionally, Isobutylene, a component of this gas mixture, may cause drowsiness or central nervous system effects in high concentrations; however, due to its low concentration in this gas mixture, this is unlikely to occur.

Chronic: Chronic exposure to oxygen-deficient atmospheres (below 18% oxygen in air) may affect the heart and nervous system.

Target Organs: ACUTE: Respiratory system, eyes. CHRONIC: Heart, cardiovascular system, central nervous system.

Hazardous Material Identification System

Health Hazard (Blue) 1

Flammability Hazard (Red) 0

Physical Hazard (Yellow) 0

Protective Equipment

Eyes Respiratory Hands Body

See Section 8

For Routine Industrial Use and Handling Applications

4. First-Aid Measures

Rescuers should not attempt to retrieve victims of exposure to this gas mixture without adequate personal protective equipment. At a minimum, Self-Contained Breathing Apparatus must be worn.

No unusual health effects are anticipated after exposure to this gas mixture, due to the small cylinder size. If any adverse symptom develops after over-exposure to this gas mixture, remove victim(s) to fresh air as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation if necessary. Victim(s) who experience any adverse effect after over-exposure to this gas mixture must be taken for medical attention. Rescuers should be taken for medical attention if necessary. Take a copy of the label and the MSDS to physician or other health professional with victim(s).

Medical Conditions Aggravated by Exposure: Acute or chronic respiratory conditions may be aggravated by over-exposure to this gas mixture.

Recommendations to Physicians: Administer oxygen, if necessary; treat symptoms and eliminate exposure.

5. Fire-Fighting Measures

Flash Point: Not applicable.

Autoignition Temperature: Not applicable.

Flammable Limits (in air by volume, %):

Lower (LEL): Not applicable.

Upper (UEL): Not applicable.

Fire Extinguishing Materials: Non-flammable gas mixture. Use extinguishing media appropriate for surrounding fire.

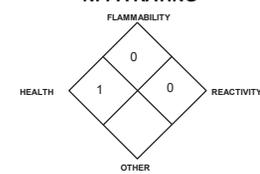
Unusual Fire and Explosion Hazards: This gas mixture is not flammable; however, containers, when involved in fire, may rupture or burst in the heat of the fire.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Not sensitive.

Special Fire-Fighting Procedures: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment.

NFPA RATING



6. Accidental Release Measures

Leak Response: Due to the small size and content of the cylinder, an accidental release of this gas mixture presents significantly less risk of an oxygen deficient environment and other safety hazards than a similar release from a larger cylinder. However, as with any chemical release, extreme caution must be used during emergency response procedures. In the event of a release in which the atmosphere is unknown, and in which other chemicals are potentially involved, evacuate immediate area. Such releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a leak, clear the affected area, protect people, and respond with trained personnel.

Allow the gas mixture to dissipate. If necessary, monitor the surrounding area (and the original area of the release) for oxygen. Oxygen levels must be above 19.5% before non-emergency personnel are allowed to re-enter area.

If leaking incidentally from the cylinder, contact your supplier.

7. Handling and Use

Work Practices and Hygiene Practices: Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this gas mixture could occur without any significant warning symptoms, due to oxygen deficiency. Do not attempt to repair, adjust, or in any other way modify the cylinders containing this gas mixture. If there is a malfunction or another type of operational problem, contact nearest distributor immediately.

Storage and Handling Practices: Cylinders should be firmly secured to prevent falling or being knocked-over. Cylinders must be protected from the environment, and preferably kept at room temperature (approximately 21°C [70°F]). Cylinders should be stored in dry, well-ventilated areas, away from sources of heat, ignition, and direct sunlight. Protect cylinders against physical damage. Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. These cylinders are not refillable. **WARNING!** Do not refill DOT 39 cylinders. To do so may cause personal injury or property damage.

Special Precautions for Handling Gas Cylinders: **WARNING!** Compressed gases can present significant safety hazards. During cylinder use, use equipment designed for these specific cylinders. Ensure all lines and equipment are rated for proper service pressure.

Protective Practices During Maintenance of Contaminated Equipment: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Always use product in areas where adequate ventilation is provided.

8. Exposure Controls - Personal Protection

Ventilation and Engineering Controls: No special ventilation systems or engineering controls are needed under normal circumstances of use. As with all chemicals, use this gas mixture in well-ventilated areas. If this gas mixture is used in a poorly-ventilated area, install automatic monitoring equipment to detect the levels of Nitrous Oxide and Oxygen.

Respiratory Protection: No special respiratory protection is required under normal circumstances of use. Maintain oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection when oxygen levels are below 19.5%, or during emergency response to a release of this gas mixture. During an emergency situation, before entering the area, check the concentration of Methane and Oxygen. If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, or the Canadian CSA Standard Z94.4-93 and applicable standards of Canadian Provinces. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998).

Eye Protection: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

Hand Protection: Wear leather gloves when handling cylinders. Chemically resistant gloves should be worn when using this gas mixture. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

Body Protection: No special protection is needed under normal circumstances of use. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA 29 CFR 1910.136.

9. Physical and Chemical Properties

The following information is for Nitrogen, a main component of this gas mixture.

Gas Density @ 32°F (0°C) and 1 atm: 0.072 lbs/ft³ (1.153 kg/m³)

Boiling Point: -195.8°C (-320.4°F)

Specific Gravity (air = 1) @ 70°F (21.1°C): 0.906

Solubility in Water vol/vol @ 32°F (0°C) and 1 atm: 0.023

Evaporation Rate (nBuAc = 1): Not applicable.

Odor Threshold: Not applicable.

Vapor Pressure @ 70°F (21.1°C) psig: Not applicable.

The following information is for Oxygen, a main component of this gas mixture.

Gas Density @ 32°F (0°C) and 1 atm: 0.083 lb/cu ft (1.326 kg/m³)

Freezing/Melting Point @ 10 psig: -218.8°C (-361.8°F)

Specific Gravity (air = 1) @ 70°F (21.1°C): 1.105

Solubility in Water vol/vol @ 32°F (0°C) and 1 atm: 0.0491

Evaporation Rate (nBuAc = 1): Not applicable.

Odor Threshold: Not applicable.

Vapor Pressure @ 70°F (21.1°C) psig: Not applicable.

The following information is for the gas mixture.

Appearance and Color: This is a colorless, odorless gas mixture.

How to Detect This Substance (warning properties): There are no unusual warning properties associated with a release of this gas mixture. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation.

10. STABILITY and REACTIVITY

STABILITY: Normally stable in gaseous state.

DECOMPOSITION PRODUCTS: The thermal decomposition products of Isobutylene include carbon oxides. The other components of this gas mixture do not decompose, per se, but can react with other compounds in the heat of a fire.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Titanium will burn in the Nitrogen component of this gas mixture. Lithium reacts slowly with Nitrogen at ambient temperatures. The Isobutylene component of this gas mixture is also incompatible with strong oxidizers (i.e. chlorine, bromine pentafluoride, oxygen difluoride, and nitrogen trifluoride).

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicology data are available for the components of this gas mixture:

ISOBUTYLENE:

LC₅₀ (inhalation, rat) □ 620,000 mg/kg/4 hours

LC₅₀ (inhalation, mouse) □ 415,000 mg/kg

NITROGEN:

There are no specific toxicology data for Nitrogen. Nitrogen is a simple asphyxiant, which acts to displace oxygen in the environment.

SUSPECTED CANCER AGENT: The components of this gas mixture are not found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, and IARC; therefore, they are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITANT OF PRODUCT: Contact with rapidly expanding gases can be irritating to exposed skin and eyes.

SENSITIZATION TO THE PRODUCT: The components of this gas mixture are not known to cause human skin or respiratory sensitization.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this gas mixture and its components on the human reproductive system.

Mutagenicity: No mutagenicity effects have been described for the components in this gas mixture.

Embryotoxicity: No embryotoxic effects have been described for the components in this gas mixture.

Teratogenicity: No teratogenicity effects have been described for the components in this gas mixture.

Reproductive Toxicity: No reproductive toxicity effects have been described for the components in this gas mixture.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) are not applicable for the components of this gas mixture.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: The components of this gas mixture occur naturally in the atmosphere. The gas will be dissipated rapidly in well-ventilated areas. The following environmental data are applicable to the components of this gas mixture.

OXYGEN: Water Solubility □ 1 volume Oxygen/32 volumes water at 20°C. Log *K_{ow}* □ -0.65

NITROGEN: Water Solubility □ 2.4 volumes Nitrogen/100 volumes water at 0°C. 1.6 volumes Nitrogen/100 volumes water at 20°C.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on the effects of this gas mixture on plant and animal life.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on the effects of this gas mixture on aquatic life.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Cylinders with undesired residual product may be safely vented outdoors with the proper regulator. For further information, refer to Section 16 (Other Information).

14. TRANSPORTATION INFORMATION

THIS GAS MIXTURE IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (Oxygen, Nitrogen) or the gas component with the next highest concentration next to Nitrogen.

HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable □ as)

UN IDENTIFICATION NUMBER: UN 1956

PACKING GROUP: Not applicable

DOT LABEL(S) REQUIRED: Class 2.2 (Non-Flammable □ as)

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 128

MARINE POLLUTANT: The components of this gas mixture are not classified by the DOT as Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles can present serious safety hazards. If transporting these cylinders in vehicles, ensure these cylinders are not exposed to extremely high temperatures (as may occur in an enclosed vehicle on a hot day). Additionally, the vehicle should be well-ventilated during transportation.

Note: DOT 39 Cylinders ship in a strong outer carton (outer package). Pertinent shipping information goes on the outside of the outer package.

DOT 39 Cylinders do not have transportation information on the cylinder itself.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This gas is considered as Dangerous □oods, per regulations of Transport Canada.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (Oxygen, Nitrogen) or the gas component with the next highest concentration next to Nitrogen.

HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable □ as)

UN IDENTIFICATION NUMBER: UN 1956

PACKING GROUP: Not Applicable

HAZARD LABEL: Class 2.2 (Non-Flammable □ as)

SPECIAL PROVISIONS: None

EXPLOSIVE LIMIT AND LIMITED QUANTITY INDEX: 0.12

ERAP INDEX: None

PASSENGER CARRYING SHIP INDEX: None

PASSENGER CARRYING ROAD VEHICLE OR PASSENGER CARRYING RAILWAY VEHICLE INDEX: 75

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 126

NOTE: Shipment of compressed gas cylinders via Public Passenger Road Vehicle is a violation of Canadian law (Transport Canada Transportation of Dangerous □oods Act, 1992).

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: The components of this gas mixture are not subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act.

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning □uantities for this gas mixture. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. TSCA INVENTORY STATUS: The components of this gas mixture are listed on the TSCA Inventory.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Not applicable.

OTHER U.S. FEDERAL REGULATIONS:

□ No component of this gas mixture is subject to the requirements of CFR 29 1910.1000 (under the 1989 PELs).

□ Isobutylene is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold □uantity for this gas is 10,000 pounds.

□ The regulations of the Process Safety Management of Highly Hazardous Chemicals are not applicable (29 CFR 1910.119).

□ This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR Part 82).

15. REGULATORY INFORMATION (continued)

□ Nitrogen and Oxygen are not listed as Regulated Substances, per 40 CFR, Part 68, of the Risk Management for Chemical Releases. Isobutylene is listed under this regulation in Table 3 as Regulated Substances (Flammable Substances), in quantities of 10,000 lbs (4,554 kg) or greater.

U.S. STATE REGULATORY INFORMATION: The components of this gas mixture are covered under the following specific State regulations:

Alas - a - Designated Toxic and Ha arduous Substances: No.

California - Permissible Exposure Limits for Chemical Contaminants: Nitrogen.

Florida - Substance List: Oxygen, Isobutylene.

Illinois - Toxic Substance List: No.

Kansas - Section 302/313 List: No.

Massachusetts - Substance List: Oxygen, Isobutylene.

Michigan - Critical Materials Register: No.

Minnesota - List of Ha arduous Substances: No.

Missouri - Employer Information/Toxic Substance List: No.

New Jersey - Right to Know Ha arduous Substance List: Oxygen, Nitrogen, Isobutylene.

North Da ota - List of Ha arduous Chemicals, Reportable Quantities: No.

Pennsylvania - Ha arduous Substance List: Oxygen, Nitrogen, Isobutylene.

Rhode Island - Ha arduous Substance List: Oxygen, Nitrogen.

Texas - Ha arduous Substance List: No.

West Virginia - Ha arduous Substance List: No.

Wisconsin - Toxic and Ha arduous Substances: : No.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): No component of this gas mixture is on the California Proposition 65 lists.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: The components of this gas mixture are listed on the DSL Inventory.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The components of this gas mixture are not on the CEPA Priorities Substances Lists.

CANADIAN WHMIS REGULATIONS: This gas mixture is categorized as a Controlled Product, Hazard Class A, as per the Controlled Product Regulations.

16. OTHER INFORMATION

INFORMATION ABOUT DOT-39 NRC (Non-Refillable Cylinder) PRODUCTS

DOT 39 cylinders ship as hazardous materials when full. Once the cylinders are relieved of pressure (empty) they are not considered hazardous material or waste. Residual gas in this type of cylinder is not an issue because toxic gas mixtures are prohibited. Calibration gas mixtures typically packaged in these cylinders are Nonflammable n.o.s., UN 1956. A small percentage of calibration gases packaged in DOT 39 cylinders are flammable or oxidizing gas mixtures.

For disposal of used DOT-39 cylinders, it is acceptable to place them in a landfill if local laws permit. Their disposal is no different than that employed with other DOT containers such as spray paint cans, household aerosols, or disposable cylinders of propane (for camping, torch etc.). When feasible, we recommended recycling for scrap metal content. CAL/AZ will do this for any customer that wishes to return cylinders to us prepaid. All that is required is a phone call to make arrangements so we may anticipate arrival. Scraping cylinders involves some preparation before the metal dealer may accept them. We perform this operation as a service to valued customers who want to participate.

MIXTURES: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

Further information about the handling of compressed gases can be found in the following pamphlets published by: Compressed □as Association Inc. (C□A), 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102. Telephone: (703) 412-0900.

P-1

AV-1

"Safe Handling of Compressed Gases in Containers"

"Safe Handling and Storage of Compressed Gases"

"Handbook of Compressed Gases"



This Material Safety Data Sheet is offered pursuant to OSHA's Hazard Communication Standard, 29 CFR, 1910.1200. Other government regulations must be reviewed for applicability to this gas mixture. To the best of CAL/AZ knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness are not guaranteed and no warranties of any type, either express or implied, are provided. The information contained herein relates only to this specific product. If this gas mixture is combined with other materials, all component properties must be considered. Data may be changed from time to time. Be sure to consult the latest edition.



Health	3
Fire	0
Reactivity	0
Personal Protection	

Material Safety Data Sheet

Nitric acid, 65% MSDS

Section 1: Chemical Product and Company Identification

Product Name: Nitric acid, 65%	Contact Information:
Catalog Codes: SLN2161	Sciencelab.com, Inc. 14025 Smith Rd. Houston, Texas 77396
CAS <input type="checkbox"/> : Mixture.	US Sales: 1-800-901-7247 International Sales: 1-281-441-4400 Order Online: ScienceLab.com
RTECS: Not applicable.	CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300
TSCA: TSCA 8(b) inventory: Water; Nitric acid, fuming	International CHEMTREC, call: 1-703-527-3887
CL <input type="checkbox"/> : Not applicable.	For non-emergency assistance, call: 1-281-441-4400
Synonym: Nitric Acid, 65%	
Chemical Name: Not applicable.	
Chemical Formula: Not applicable.	

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS <input type="checkbox"/>	% by Weight
Water	7732-18-5	35
Nitric acid, fuming	7697-37-2	65

Toxicological Data on Ingredients: Nitric acid, fuming: VAPOR (LC50): Acute: 244 ppm 0.5 hours [Rat]. 344 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion. Slightly hazardous in case of inhalation (lung sensitizer). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Prolonged exposure may result in skin burns and ulcerations. Over-exposure by inhalation may cause respiratory irritation. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to lungs, mucous membranes, upper respiratory

tract, skin, eyes, teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. et medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. et medical attention immediately.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. et medical attention immediately.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. et medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: of combustible materials

Explosion Hazards in Presence of Various Substances:

Explosive in presence of reducing materials, of organic materials, of metals, of alkalis. Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:

Flammable in presence of cellulose or other combustible materials. Phosphine, hydrogen sulfide, selenide all ignite when fuming nitric acid is dripped into gas. (Nitric Acid, fuming)

Special Remarks on Explosion Hazards:

Reacts explosively with metallic powders, carbides, cyanides, sulfides, alkalis and turpentine. Can react explosively with many reducing agents. Arsine, phosphine, tetraborane all oxidized explosively in presence of nitric acid. Cesium and rubidium

acetylides explode in contact with nitric acid. Explosive reaction with Nitric Acid □ Nitrobenzene □ water. Detonation with Nitric Acid □ 4-Methylcyclohexane. (Nitric acid, fuming)

Section 6: Accidental Release Measures

Small Spill:

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:

Corrosive liquid. Oxidizing material. Poisonous liquid. Stop leak if without risk. Absorb with DR□ earth, sand or other non-combustible material. Do not get water inside container. Avoid contact with a combustible material (wood, paper, oil, clothing...). □ Deep substance damp using water spray. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

□ Deep locked up.. □ Deep container dry. □ Deep away from heat. □ Deep away from sources of ignition. □ Deep away from combustible material.. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. □ Deep away from incompatibles such as reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage:

□ Deep container tightly closed. □ Deep container in a cool, well-ventilated area. Separate from acids, alkalies, reducing agents and combustibles. See NFPA 43A, Code for the Storage of Liquid and Solid Oxidizers. Do not store above 23°C (73.4°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. □ loves. Boots.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. □ loves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 2 STEL: 4 (ppm) from AC□IH (TLV) [United States] TWA: 2 STEL: 4 from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Acrid. Disagreeable and choking. (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colorless to light yellow.

pH (1% soln/water): Acidic.

Boiling Point: 121°C (249.8°F)

Melting Point: -41.6°C (-42.9°F)

Critical Temperature: Not available.

Specific Gravity: 1.408 (Water □ 1)

Vapor Pressure: 6 kPa (□ 20°C)

Vapor Density: 2.5 (Air □ 1)

Volatility: Not available.

Odor Threshold: 0.29 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility:

Easily soluble in cold water, hot water. Soluble in diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances:

Highly reactive with alkalis. Reactive with reducing agents, combustible materials, organic materials, metals, acids.

Corrosivity:

Extremely corrosive in presence of aluminum, of copper. Non-corrosive in presence of glass, of stainless steel(304), of stainless steel(316), of brass.

Special Remarks on Reactivity:

A strong oxidizer. Reacts violently with alcohol, organic material, turpene, charcoal. Violent reaction with Nitric acid □ Acetone and Sulfuric acid. Nitric Acid will react with water or steam to produce heat and toxic, corrosive and flammable vapors. (Nitric acid, fuming)

Special Remarks on Corrosivity:

In presence of traces of oxides, it attacks all base metals except aluminum and special chromium steels. It will attack some forms of plastics, rubber, and coatings. No corrosive effect on bronze. No corrosivity data for zinc, and steel

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

LD50: Not available. LC50: Not available.

Chronic Effects on Humans:

Contains material which may cause damage to the following organs: lungs, mucous membranes, upper respiratory tract, skin, eyes, teeth.

Other Toxic Effects on Humans:

Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

Special Remarks on Toxicity to Animals: LDL - Lowest Published Lethal Dose [Human] - Route: Oral; Dose: 430 mg/kg (Nitric acid, fuming)

Special Remarks on Chronic Effects on Humans:

May cause adverse reproductive effects (effects on newborn and fetotoxicity) based on animal data. (Nitric acid, fuming)

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Severely irritates skin. Causes skin burns and may cause deep and penetrating ulcers of the skin with a characteristic yellow to brownish discoloration. May be fatal if absorbed through skin. Eyes: Severely irritates eyes. Causes eye burns. May cause irreversible eye injury. Ingestion: May be fatal if swallowed. Causes serious gastrointestinal tract irritation or burns with nausea, vomiting, severe abdominal pain, and possible coffee grounds appearance of the vomitus. May cause perforation of the digestive tract. Inhalation: May be fatal if inhaled. Vapor is extremely hazardous. Vapor may cause nitrous gas poisoning. Effects may be delayed. May cause irritation of the mucous membranes and respiratory tract with burning pain in the nose and throat, coughing, sneezing, wheezing, shortness of breath and pulmonary edema. Other symptoms may include nausea, and vomiting. Chronic Potential Health Effects: Repeated inhalation may produce changes in pulmonary function and/or chronic bronchitis. It may also affect behavior (headache, dizziness, drowsiness, muscle contactation or spasticity, weakness, loss of coordinaton, mental confusion), and urinary system (kidney failure, decreased urinary output after several hours of

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Nitric acid UNNA: 2031 P: II

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:

New York release reporting list: Nitric acid, fuming Rhode Island RT hazardous substances: Nitric acid, fuming Pennsylvania RT: Nitric acid, fuming Florida: Nitric acid, fuming Minnesota: Nitric acid, fuming Massachusetts RT: Nitric acid, fuming

New Jersey: Nitric acid, fuming TSCA 8(b) inventory: Water; Nitric acid, fuming SARA 302/304/311/312 extremely hazardous substances: Nitric acid, fuming SARA 313 toxic chemical notification and release reporting: Nitric acid, fuming 65% CERCLA: Hazardous substances.: Nitric acid, fuming: 1000 lbs. (453.6 kg);

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):

CLASS D-1A: Material causing immediate and serious toxic effects (VER TOIC). CLASS D-2A: Material causing other toxic effects (VER TOIC). CLASS E: Corrosive liquid.

DSCL (EEC):

R8- Contact with combustible material may cause fire. R35- Causes severe burns. S23- Do not breathe gas/fumes/vapour/ spray S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S36- Wear suitable protective clothing. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 4

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:

Wear full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Last Updated: 11/01/2010 12:00 PM

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Material Safety Data Sheet



Nitrogen

Section 1. Chemical product and company identification

Product name : Nitrogen
Supplier : AIRGAS INC., on behalf of its subsidiaries
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

Product use : Synthetic/Analytical chemistry. Liquid – cryogenic coolant.

Synonym : nitrogen (dot); nitrogen gas; Nitrogen NF, LIN, Cryogenic Liquid Nitrogen, Liquid Nitrogen

MSDS # : 001040

Date of Preparation/Revision : 1/14/2011.

In case of emergency : 1-866-734-3438

Section 2. Hazards identification

Physical state : Gas. [NORMALLY A COLORLESS GAS: MAY BE A CLEAR COLORLESS LIQUID AT LOW TEMPERATURES. SOLD AS A COMPRESSED GAS OR LIQUID IN STEEL CYLINDERS.]

Emergency overview : WARNING!
GAS:
CONTENTS UNDER PRESURE.
Do not puncture or incinerate container.
Can cause rapid suffocation.
May cause severe frostbite.
LIQUID:
Extremely cold liquid and gas under pressure.
Can cause rapid suffocation.
May cause severe frostbite.

Do not puncture or incinerate container.
Contact with rapidly expanding gases or liquids can cause frostbite.

Routes of entry : Inhalation

Potential acute health effects

Eyes : Contact with rapidly expanding gas may cause burns or frostbite. Contact with cryogenic liquid can cause frostbite and cryogenic burns.

Skin : Contact with rapidly expanding gas may cause burns or frostbite. Contact with cryogenic liquid can cause frostbite and cryogenic burns.

Inhalation : Acts as a simple asphyxiant.

Ingestion : Ingestion is not a normal route of exposure for gases. Contact with cryogenic liquid can cause frostbite and cryogenic burns.

Medical conditions aggravated by over-exposure : Acute or chronic respiratory conditions may be aggravated by overexposure to this gas.

See toxicological information (Section 11)

Section 3. Composition, Information on Ingredients

Name	CAS number	% Volume	Exposure limits
Nitrogen	7727-37-9	100	Oxygen Depletion [Asphyxiant]

Nitrogen

Section 4. First aid measures

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.

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact : None expected.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

Flammability of the product : Non-flammable.

Products of combustion : Decomposition products may include the following materials:
nitrogen oxides

Fire-fighting media and instructions : Use an extinguishing agent suitable for the surrounding fire.

Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.

Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.

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 : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up : Immediately contact emergency personnel. Stop leak if without risk. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

Handling : High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
Never allow any unprotected part of the body to touch uninsulated pipes or vessels that contain cryogenic liquids. Prevent entrapment of liquid in closed systems or piping without pressure relief devices. Some materials may become brittle at low temperatures and will easily fracture.

Storage : Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).
For additional information concerning storage and handling refer to Compressed Gas Association pamphlets P-1 Safe Handling of Compressed Gases in Containers and P-12 Safe Handling of Cryogenic Liquids available from the Compressed Gas Association, Inc.

Nitrogen

Section 8. Exposure controls/personal protection

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.

Personal protection

Eyes : 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 or dusts.

Skin : 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 working with cryogenic liquids, wear a full face shield.

Respiratory : Use a properly fitted, air-purifying or air-fed 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.

Hands : The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93 : 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.

Personal protection in case of a large spill : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product. Insulated gloves suitable for low temperatures

Product name : Nitrogen Oxygen Depletion [Asphyxiant]

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

- Molecular weight : 28.02 g/mole
Molecular formula : N2
Boiling/condensation point : -195.8°C (-320.4°F)
Melting/freezing point : -210°C (-346°F)
Critical temperature : -146.9°C (-232.4°F)
Vapor density : 0.967 (Air = 1) Liquid Density@BP: 50.46 lb/ft3 (808.3 kg/m3)
Specific Volume (ft 3/lb) : 13.8889
Gas Density (lb/ft 3) : 0.072

Section 10. Stability and reactivity

- Stability and reactivity : The product is stable.
Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

- Toxicity data
Other toxic effects on humans : No specific information is available in our database regarding the other toxic effects of this material to humans.
Specific effects
Carcinogenic effects : No known significant effects or critical hazards.
Mutagenic effects : No known significant effects or critical hazards.
Reproduction toxicity : No known significant effects or critical hazards.

Nitrogen

Section 12. Ecological information

- Aquatic ecotoxicity : Not available.
Environmental hazards : No known significant effects or critical hazards.
Toxicity to the environment : Not available.

Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation. Return cylinders with residual product to Airgas, Inc. Do not dispose of locally.

Section 14. Transport information

Table with 7 columns: Regulatory information, UN number, Proper shipping name, Class, Packing group, Label, Additional information. Rows include DOT, TDG, and Mexico classifications for UN1066 and UN1977.

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Nitrogen

Section 15. Regulatory information

United States

U.S. Federal regulations : TSCA 8(a) IUR: Partial exemption
United States inventory (TSCA 8b): This material is listed or exempted.
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Nitrogen
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Nitrogen: Sudden release of pressure

State regulations : Connecticut Carcinogen Reporting: This material is not listed.
Connecticut Hazardous Material Survey: This material is not listed.
Florida substances: This material is not listed.
Illinois Chemical Safety Act: This material is not listed.
Illinois Toxic Substances Disclosure to Employee Act: This material is not listed.
Louisiana Reporting: This material is not listed.
Louisiana Spill: This material is not listed.
Massachusetts Spill: This material is not listed.
Massachusetts Substances: This material is listed.
Michigan Critical Material: This material is not listed.
Minnesota Hazardous Substances: This material is not listed.
New Jersey Hazardous Substances: This material is listed.
New Jersey Spill: This material is not listed.
New Jersey Toxic Catastrophe Prevention Act: This material is not listed.
New York Acutely Hazardous Substances: This material is not listed.
New York Toxic Chemical Release Reporting: This material is not listed.
Pennsylvania RTK Hazardous Substances: This material is listed.
Rhode Island Hazardous Substances: This material is not listed.

Canada

WHMIS (Canada) : Class A: Compressed gas.

CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is not listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

United States

Label requirements : GAS: CONTENTS UNDER PRESURE. Do not puncture or incinerate container. Can cause rapid suffocation. May cause severe frostbite. LIQUID: Extremely cold liquid and gas under pressure. Can cause rapid suffocation. May cause severe frostbite.

Canada

Label requirements : Class A: Compressed gas.

Nitrogen

Hazardous Material Information System (U.S.A.)

Table with 2 columns: Hazard type (Health, Flammability, Physical hazards) and Value (0).

Liquid:

Table with 2 columns: Hazard type (Health, Fire hazard, Reactivity, Personal protection) and Value (3, 0, 0).

National Fire Protection Association (U.S.A.)



Liquid:



Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet



Oxygen

Section 1. Chemical product and company identification

Product name	: Oxygen
Supplier	: AIRGAS INC., on behalf of its subsidiaries 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
Product use	: Synthetic/Analytical chemistry.
Synonym	: Molecular oxygen; Oxygen molecule; Pure oxygen; O ₂ ; Liquid-oxygen-; UN 1072; UN 1073; Dioxygen; Oxygen USP, Aviator's Breathing Oxygen (ABO)
MSDS #	: 001043
Date of Preparation/Revision	: 6/16/2011.
In case of emergency	: 1-866-734-3438

Section 2. Hazards identification

Physical state	: Gas.
Emergency overview	: DANGER! GAS: OXIDIZER. CONTACT WITH COMBUSTIBLE MATERIAL MAY CAUSE FIRE. CONTENTS UNDER PRESURE. Do not puncture or incinerate container. May cause severe frostbite. LIQUID: OXIDIZER. CONTACT WITH COMBUSTIBLE MATERIAL MAY CAUSE FIRE. Extremely cold liquid and gas under pressure. May cause severe frostbite. Do not puncture or incinerate container. Store in tightly-closed container. Avoid contact with combustible materials. Contact with rapidly expanding gases or liquids can cause frostbite.
Routes of entry	: Inhalation
Potential acute health effects	
Eyes	: May cause eye irritation. Contact with rapidly expanding gas may cause burns or frostbite. Contact with cryogenic liquid can cause frostbite and cryogenic burns.
Skin	: May cause skin irritation. Contact with rapidly expanding gas may cause burns or frostbite. Contact with cryogenic liquid can cause frostbite and cryogenic burns.
Inhalation	: Respiratory system irritation after overexposure to high oxygen concentrations.
Ingestion	: Ingestion is not a normal route of exposure for gases. Contact with cryogenic liquid can cause frostbite and cryogenic burns.
Medical conditions aggravated by over-exposure	: Acute or chronic respiratory conditions may be aggravated by overexposure to this gas.

See toxicological information (Section 11)

Oxygen

Section 3. Composition, Information on Ingredients

Name	CAS number	% Volume	Exposure limits
Oxygen	7782-44-7	100	

Section 4. First aid measures

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.

Eye contact	: Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
Skin contact	: None expected.
Frostbite	: Try to warm up the frozen tissues and seek medical attention.
Inhalation	: If inhaled, remove to fresh air. If not breathing, give artificial respiration. Get medical attention.
Ingestion	: As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

Flammability of the product	: Non-flammable.
Products of combustion	: No specific data.
Fire hazards in the presence of various substances	: Extremely flammable in the presence of the following materials or conditions: reducing materials, combustible materials and organic materials.
Fire-fighting media and instructions	: Use an extinguishing agent suitable for the surrounding fire. Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk. Contains gas under pressure. Contact with combustible material may cause fire. This material increases the risk of fire and may aid combustion. In a fire or if heated, a pressure increase will occur and the container may burst or explode.
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	: Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Eliminate all ignition sources if safe to do so. Do not touch or walk through spilled material. Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.
Environmental precautions	: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
Methods for cleaning up	: Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

Handling	: High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Store in tightly-closed container. Avoid contact with combustible materials. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement. Never allow any unprotected part of the body to touch uninsulated pipes or vessels that contain cryogenic liquids. Prevent entrapment of liquid in closed systems or piping without pressure relief devices. Some materials may become brittle at low temperatures and will easily fracture.
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Oxygen

Storage : Keep container tightly closed. Keep container in a cool, well-ventilated area. Separate from acids, alkalis, reducing agents and combustibles. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F). For additional information concerning storage and handling refer to Compressed Gas Association pamphlets P-1 Safe Handling of Compressed Gases in Containers and P-12 Safe Handling of Cryogenic Liquids available from the Compressed Gas Association, Inc.

Section 8. Exposure controls/personal protection

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.

Personal protection

Eyes : 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 or dusts.

When working with cryogenic liquids, wear a full face shield.

Skin : 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.

Respiratory : Use a properly fitted, air-purifying or air-fed 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.

The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93

Hands : 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.

Insulated gloves suitable for low temperatures

Personal protection in case of a large spill : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.

Product name

Oxygen

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

Molecular weight : 32 g/mole
Molecular formula : O₂
Boiling/condensation point : -183°C (-297.4°F)
Melting/freezing point : -218.4°C (-361.1°F)
Critical temperature : -118.6°C (-181.5°F)
Vapor density : 1.105 (Air = 1) Liquid Density@BP: 71.23 lb/ft³ (1141 kg/m³)
Specific Volume (ft³/lb) : 12.0482
Gas Density (lb/ft³) : 0.083

Section 10. Stability and reactivity

Stability and reactivity : The product is stable.

Incompatibility with various substances : Extremely reactive or incompatible with the following materials: oxidizing materials, reducing materials and combustible materials.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Oxygen

Section 11. Toxicological information

Toxicity data

Other toxic effects on humans : No specific information is available in our database regarding the other toxic effects of this material to humans.

Specific effects

Carcinogenic effects : No known significant effects or critical hazards.

Mutagenic effects : No known significant effects or critical hazards.

Reproduction toxicity : No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity

Not available.

Environmental fate : Not available.

Environmental hazards : This product shows a low bioaccumulation potential.

Toxicity to the environment : Not available.

Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation. Return cylinders with residual product to Airgas, Inc. Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1072	OXYGEN, COMPRESSED	2.2	Not applicable (gas).		Limited quantity Yes.
	UN1073	Oxygen, refrigerated liquid				Packaging instruction Passenger aircraft Quantity limitation: 75 kg Cargo aircraft Quantity limitation: 150 kg Special provisions A52
TDG Classification	UN1072	OXYGEN, COMPRESSED	2.2	Not applicable (gas).		Explosive Limit and Limited Quantity Index 0.125
	UN1073	Oxygen, refrigerated liquid				ERAP Index 3000 Passenger Carrying Ship

Oxygen						
						Index 50 <u>Passenger Carrying Road or Rail Index</u> 75 <u>Special provisions</u> 42
Mexico Classification	UN1072	OXYGEN, COMPRESSED	2.2	Not applicable (gas).		-
	UN1073	Oxygen, refrigerated liquid				

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Section 15. Regulatory information

United States

U.S. Federal regulations : **TSCA 8(a) IUR:** Partial exemption
United States inventory (TSCA 8b): This material is listed or exempted.
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Oxygen
SARA 311/312 MSDS distribution - chemical inventory - hazard identification:
 Oxygen: Fire hazard, Sudden release of pressure, Delayed (chronic) health hazard

State regulations : **Connecticut Carcinogen Reporting:** This material is not listed.
Connecticut Hazardous Material Survey: This material is not listed.
Florida substances: This material is not listed.
Illinois Chemical Safety Act: This material is not listed.
Illinois Toxic Substances Disclosure to Employee Act: This material is not listed.
Louisiana Reporting: This material is not listed.
Louisiana Spill: This material is not listed.
Massachusetts Spill: This material is not listed.
Massachusetts Substances: This material is listed.
Michigan Critical Material: This material is not listed.
Minnesota Hazardous Substances: This material is not listed.
New Jersey Hazardous Substances: This material is listed.
New Jersey Spill: This material is not listed.
New Jersey Toxic Catastrophe Prevention Act: This material is not listed.
New York Acutely Hazardous Substances: This material is not listed.
New York Toxic Chemical Release Reporting: This material is not listed.
Pennsylvania RTK Hazardous Substances: This material is listed.
Rhode Island Hazardous Substances: This material is not listed.

Canada

WHMIS (Canada) : Class A: Compressed gas.
 Class C: Oxidizing material.

Oxygen	
	<p>CEPA Toxic substances: This material is not listed. Canadian ARET: This material is not listed. Canadian NPRI: This material is not listed. Alberta Designated Substances: This material is not listed. Ontario Designated Substances: This material is not listed. Quebec Designated Substances: This material is not listed.</p>

Section 16. Other information

United States

Label requirements : GAS:
 OXIDIZER.
 CONTACT WITH COMBUSTIBLE MATERIAL MAY CAUSE FIRE.
 CONTENTS UNDER PRESURE.
 Do not puncture or incinerate container.
 May cause severe frostbite.
 LIQUID:
 OXIDIZER.
 CONTACT WITH COMBUSTIBLE MATERIAL MAY CAUSE FIRE.
 Extremely cold liquid and gas under pressure.
 May cause severe frostbite.

Canada

Label requirements : Class A: Compressed gas.
 Class C: Oxidizing material.

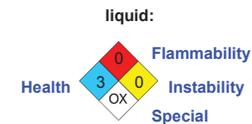
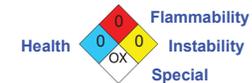
Hazardous Material Information System (U.S.A.) :

Health	0
Flammability	0
Physical hazards	0

liquid:

Health	3
Fire hazard	0
Reactivity	0
Personal protection	

National Fire Protection Association (U.S.A.)



Notice to reader

Oxygen

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GHS SAFETY DATA SHEET

WELD-ON® 711™ Low VOC PVC Plastic Pipe Cements

Date Revised: FEB 2010
Supersedes: SEP 2009

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: WELD-ON® 711™ Low VOC PVC Plastic Pipe Cements
PRODUCT USE: Low VOC Solvent Cement for PVC Plastic Pipe
SUPPLIER:

MANUFACTURER: IPS Corporation
17109 South Main Street, Carson, CA 90248-3127
P.O. Box 379, Gardena, CA 90247-0379
Tel. 1-310-898-3300

EMERGENCY: Transportation: Tel. 800.424.9300, 703.527.3887 CHEMTREC (International) **Medical:** Tel. 800.451.8346, 760.602.8703 3E Company (International)

SECTION 2 - HAZARDS IDENTIFICATION

GHS CLASSIFICATION:

Health		Environmental		Physical	
Acute Toxicity:	Category 4	Acute Toxicity:	None Known	Flammable Liquid	Category 2
Skin Irritation:	Category 3	Chronic Toxicity:	None Known		
Skin Sensitization:	NO				
Eye:	Category 2B				

GHS LABEL: OR **Signal Word:** Danger **WHMIS CLASSIFICATION:** CLASS B, DIVISION 2

Hazard Statements

H225: Highly flammable liquid and vapor
H319: Causes serious eye irritation
H332: Harmful if inhaled
H335: May cause respiratory irritation
H336: May cause drowsiness or dizziness
EUH019: May form explosive peroxides

Precautionary Statements

P210: Keep away from heat/sparks/open flames/hot surfaces - No smoking
P261: Avoid breathing dust/fume/gas/mist/vapors/spray
P280: Wear protective gloves/protective clothing/eye protection/face protection
P304-P340: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P403-P233: Store in a well ventilated place. Keep container tightly closed
P501: Dispose of contents/container in accordance with local regulation

SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

CAS#	EINECS #	REACH		CONCENTRATION % by Weight
		Pre-registration Number		
Tetrahydrofuran (THF)	109-99-9	203-726-8	05-2116297729-22-0000	40 - 50
Methyl Ethyl Ketone (MEK)	78-93-3	201-159-0	05-2116297728-24-0000	5 - 15
Cyclohexanone	108-94-1	203-631-1	05-2116297718-25-0000	9 - 18
Acetone	67-64-1	200-662-2	05-2116297713-35-0000	3 - 11

All of the constituents of this adhesive product are listed on the TSCA inventory of chemical substances maintained by the US EPA, or are exempt from that listing. * Indicates this chemical is subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (40CFR372).

SECTION 4 - FIRST AID MEASURES

Contact with eyes: Flush eyes immediately with plenty of water for 15 minutes and seek medical advice immediately.
Skin contact: Remove contaminated clothing and shoes. Wash skin thoroughly with soap and water. If irritation develops, seek medical advice.
Inhalation: Remove to fresh air. If breathing is stopped, give artificial respiration. If breathing is difficult, give oxygen. Seek medical advice.
Ingestion: Rinse mouth with water. Give 1 or 2 glasses of water or milk to dilute. Do not induce vomiting. Seek medical advice immediately.

SECTION 5 - FIREFIGHTING MEASURES

Suitable Extinguishing Media: Dry chemical powder, carbon dioxide gas, foam, Halon, water fog.
Unsuitable Extinguishing Media: Water spray or stream.
Exposure Hazards: Inhalation and dermal contact
Combustion Products: Oxides of carbon, hydrogen chloride and smoke
Protection for Firefighters: Self-contained breathing apparatus or full-face positive pressure airline masks.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Personal precautions: Keep away from heat, sparks and open flame.
Provide sufficient ventilation, use explosion-proof exhaust ventilation equipment or wear suitable respiratory protective equipment.
Prevent contact with skin or eyes (see section 8).
Environmental Precautions: Prevent product or liquids contaminated with product from entering sewers, drains, soil or open water course.
Methods for Cleaning up: Clean up with sand or other inert absorbent material. Transfer to a closable steel vessel.
Materials not to be used for clean up: Aluminum or plastic containers

SECTION 7 - HANDLING AND STORAGE

Handling: Avoid breathing of vapor, avoid contact with eyes, skin and clothing.
Keep away from ignition sources, use only electrically grounded handling equipment and ensure adequate ventilation/fume exhaust hoods.
Do not eat, drink or smoke while handling.
Storage: Store in ventilated room or shade below 44°C (110°F) and away from direct sunlight.
Keep away from ignition sources and incompatible materials: caustics, ammonia, inorganic acids, chlorinated compounds, strong oxidizers and isocyanates.
Follow all precautionary information on container label, product bulletins and solvent cementing literature.

SECTION 8 - PRECAUTIONS TO CONTROL EXPOSURE / PERSONAL PROTECTION

EXPOSURE LIMITS:	Component	ACGIH TLV / ACGIH STEL / OSHA PEL / OSHA STEL:			
		ACGIH TLV	ACGIH STEL	OSHA PEL	OSHA STEL
	Tetrahydrofuran (THF)	50 ppm	100 ppm	200 ppm	
	Methyl Ethyl Ketone (MEK)	200 ppm	300 ppm	200 ppm	
	Cyclohexanone	20 ppm	50 ppm	50 ppm	
	Acetone	500 ppm	750 ppm	1000 ppm	

Engineering Controls: Use local exhaust as needed.
Monitoring: Maintain breathing zone airborne concentrations below exposure limits.
Personal Protective Equipment (PPE): Avoid contact with eyes, wear splash-proof chemical goggles, face shield, safety glasses (spectacles) with brow guards and side shields, etc. as may be appropriate for the exposure.
Eye Protection: Prevent contact with the skin as much as possible. Butyl rubber gloves should be used for frequent immersion.
Skin Protection: Use of solvent-resistant gloves or solvent-resistant barrier cream should provide adequate protection when normal adhesive application practices and procedures are used for making structural bonds.
Respiratory Protection: Prevent inhalation of the solvents. Use in a well-ventilated room. Open doors and/or windows to ensure airflow and air changes. Use local exhaust ventilation to remove airborne contaminants from employee breathing zone and to keep contaminants below levels listed above. With normal use, the Exposure Limit Value will not usually be reached. When limits approached, use respiratory protection equipment.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Gray, heavy syrupy liquid
Odor: Ketone
pH: Not Applicable
Melting/Freezing Point: -108.5°C (-163.3°F) Based on first melting component: THF
Boiling Point: 56°C (133°F) Based on first boiling component: Acetone
Flash Point: -20°C (-4°F) TOC based on Acetone
Specific Gravity: 0.966 @23°C (73°F)
Solubility: Solvent portion soluble in water. Resin portion separates out.
Partition Coefficient n-octanol/water: Not Available
Auto-ignition Temperature: 321°C (610°F) based on THF
Decomposition Temperature: Not Applicable
VOC Content: When applied as directed, per SCAQMD Rule 1168, Test Method 316A, VOC content is: ≤ 510 g/l.

Odor Threshold: 0.88 ppm (Cyclohexanone)
Boiling Range: 56°C (133°F) to 156°C (313°F)
Evaporation Rate: > 1.0 (BUAC = 1)
Flammability: Category 2
Flammability Limits: LEL: 1.1% based on Cyclohexanone
UEL: 12.8% based on Acetone
Vapor Pressure: 190 mm Hg @ 20°C (68°F) Acetone
Vapor Density: >2.0 (Air = 1)
Other Data: Viscosity: Heavy bodied

SECTION 10 - STABILITY AND REACTIVITY

Stability: Stable
Hazardous decomposition products: None in normal use. When forced to burn, this product gives off oxides of carbon, hydrogen chloride and smoke.
Conditions to avoid: Keep away from heat, sparks, open flame and other ignition sources.
Incompatible Materials: Oxidizers, strong acids and bases, amines, ammonia

SECTION 11 - TOXICOLOGICAL INFORMATION

Likely Routes of Exposure: Inhalation, Eye and Skin Contact
Acute symptoms and effects:
Inhalation: Severe overexposure may result in nausea, dizziness, headache. Can cause drowsiness, irritation of eyes and nasal passages.
Eye Contact: Vapors slightly uncomfortable. Overexposure may result in severe eye injury with corneal or conjunctival inflammation on contact with the liquid.
Skin Contact: Liquid contact may remove natural skin oils resulting in skin irritation. Dermatitis may occur with prolonged contact.
Ingestion: May cause nausea, vomiting, diarrhea and mental sluggishness.

Chronic (long-term) effects: None known to humans
Toxicity: LD50 LC50
Tetrahydrofuran (THF) Oral: 2842 mg/kg (rat) Inhalation 3 hrs. 21,000 mg/m³ (rat)
Methyl Ethyl Ketone (MEK) Oral: 2737 mg/kg (rat), Dermal: 6480 mg/kg (rabbit) Inhalation 8 hrs. 23,500 mg/m³ (rat)
Cyclohexanone Oral: 1535 mg/kg (rat), Dermal: 948 mg/kg (rabbit) Inhalation 4 hrs. 8,000 PPM (rat)
Acetone Oral: 5800 mg/kg (rat) Inhalation 50,100 mg/m³ (rat)

Reproductive Effects	Teratogenicity	Mutagenicity	Embryotoxicity	Sensitization to Product	Synergistic Products
Not Established	Not Established	Not Established	Not Established	Not Established	Not Established

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicity: None Known
Mobility: In normal use, emission of volatile organic compounds (VOC's) to the air takes place, typically at a rate of ≤ 510 g/l.
Degradability: Biodegradable
Bioaccumulation: Minimal to none.

SECTION 13 - WASTE DISPOSAL CONSIDERATIONS

Follow local and national regulations. Consult disposal expert.

SECTION 14 - TRANSPORT INFORMATION

Proper Shipping Name: Adhesives
Hazard Class: 3
Secondary Risk: None
Identification Number: UN 1133
Packing Group: PG II
Label Required: Class 3 Flammable Liquid
Marine Pollutant: NO

EXCEPTION for Ground Shipping

DOT Limited Quantity: Up to 5L per inner packaging, 30 kg gross weight per package.
Consumer Commodity: Depending on packaging, these quantities may qualify under DOT as "ORM-D".

TDG INFORMATION

TDG CLASS: FLAMMABLE LIQUID 3
SHIPPING NAME: ADHESIVES
UN NUMBER/PACKING GROUP: UN 1133, PG II

SECTION 15 - REGULATORY INFORMATION

Precautionary Label Information: Highly Flammable, Irritant
Symbols: F, Xi
Risk Phrases: R11: Highly flammable.
R20: Harmful by inhalation.
R36/37: Irritating to eyes and respiratory system.
Safety Phrases: S9: Keep container in a well-ventilated place.
S16: Keep away from sources of ignition - No smoking.
S25: Avoid contact with eyes.
Ingredient Listings: USA TSCA, Europe EINECS, Canada DSL, Australia AICS, Korea ECL/TCCL, Japan MITI (ENCS)
R66: Repeated exposure may cause skin dryness or cracking
R67: Vapors may cause drowsiness and dizziness
S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S33: Take precautionary measures against static discharges.
S46: If swallowed, seek medical advice immediately and show this container or label.

SECTION 16 - OTHER INFORMATION

Specification Information:
Department issuing data sheet: IPS, Safety Health & Environmental Affairs
E-mail address: <EHSinfo@ipscorp.com>
Training necessary: Yes, training in practices and procedures contained in product literature.
Reissue date / reason for reissue: 2/23/10 / Updated GHS Standard Format
Intended Use of Product: Solvent Cement for PVC Plastic Pipe

This product is intended for use by skilled individuals at their own risk. The information contained herein is based on data considered accurate based on current state of knowledge and experience. However, no warranty is expressed or implied regarding the accuracy of this data or the results to be obtained from the use thereof.



GHS SAFETY DATA SHEET

WELD-ON® P-70™ Low VOC Primer for PVC and CPVC Plastic Pipe

Date Revised: OCT 2010
Supersedes: FEB 2010

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: WELD-ON® P-70™ Low VOC Primer for PVC and CPVC Plastic Pipe
PRODUCT USE: Low VOC Primer for PVC and CPVC Plastic Pipe
SUPPLIER:

MANUFACTURER: IPS Corporation
17109 South Main Street, Carson, CA 90248-3127
P.O. Box 379, Gardena, CA 90247-0379
Tel. 1-310-898-3300
Medical: Tel. 800.451.8346, 760.602.8703 3E Company (International)

EMERGENCY: Transportation: Tel. 800.424.9300, 703.527.3887 CHEMTREC (International)

SECTION 2 - HAZARDS IDENTIFICATION

GHS CLASSIFICATION:

Health	Environmental	Physical
Acute Toxicity: Category 4 Skin Irritation: Category 3 Skin Sensitization: NO Eye: Category 2B	Acute Toxicity: None Known Chronic Toxicity: None Known	Flammable Liquid Category 2

GHS LABEL: **Signal Word:** Danger **WHMIS CLASSIFICATION:** CLASS B, DIVISION 2

Hazard Statements

H225: Highly flammable liquid and vapor
H319: Causes serious eye irritation
H332: Harmful if inhaled
H335: May cause respiratory irritation
H336: May cause drowsiness or dizziness
EUH019: May form explosive peroxides

Precautionary Statements

P210: Keep away from heat/sparks/open flames/hot surfaces – No smoking
P261: Avoid breathing dust/fume/gas/mist/vapors/spray
P280: Wear protective gloves/protective clothing/eye protection/face protection
P304-P340: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P403-P233: Store in a well ventilated place. Keep container tightly closed
P501: Dispose of contents/container in accordance with local regulation

SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

CAS#	EINECS #	REACH Pre-registration Number	CONCENTRATION % by Weight	
			REACH	CONCENTRATION
Tetrahydrofuran (THF)	109-99-9	203-726-8	05-2116297729-22-0000	45 - 59
Methyl Ethyl Ketone (MEK)	78-93-3	201-159-0	05-2116297728-24-0000	19 - 29
Cyclohexanone	108-94-1	203-631-1	05-2116297718-25-0000	5 - 15
Acetone	67-64-1	200-662-2	05-2116297713-35-0000	5 - 20

All of the constituents of this adhesive product are listed on the TSCA Inventory of chemical substances maintained by the US EPA, or are exempt from that listing. * Indicates this chemical is subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (40CFR372).

SECTION 4 - FIRST AID MEASURES

Contact with eyes: Flush eyes immediately with plenty of water for 15 minutes and seek medical advice immediately.
Skin contact: Remove contaminated clothing and shoes. Wash skin thoroughly with soap and water. If irritation develops, seek medical advice.
Inhalation: Remove to fresh air. If breathing is stopped, give artificial respiration. If breathing is difficult, give oxygen. Seek medical advice.
Ingestion: Rinse mouth with water. Give 1 or 2 glasses of water or milk to dilute. Do not induce vomiting. Seek medical advice immediately.

SECTION 5 - FIREFIGHTING MEASURES

Suitable Extinguishing Media: Dry chemical powder, carbon dioxide gas, foam, Halon, water fog.
Unsuitable Extinguishing Media: Water spray or stream.
Exposure Hazards: Inhalation and dermal contact
Combustion Products: Oxides of carbon and smoke
Protection for Firefighters: Self-contained breathing apparatus or full-face positive pressure airline masks.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Personal precautions: Keep away from heat, sparks and open flame. Provide sufficient ventilation, use explosion-proof exhaust ventilation equipment or wear suitable respiratory protective equipment. Prevent contact with skin or eyes (see section 8).
Environmental Precautions: Prevent product or liquids contaminated with product from entering sewers, drains, soil or open water course.
Methods for Cleaning up: Clean up with sand or other inert absorbent material. Transfer to a closable steel vessel.
Materials not to be used for clean up: Aluminum or plastic containers

SECTION 7 - HANDLING AND STORAGE

Handling: Avoid breathing of vapor, avoid contact with eyes, skin and clothing. Keep away from ignition sources, use only electrically grounded handling equipment and ensure adequate ventilation/fume exhaust hoods. Do not eat, drink or smoke while handling.
Storage: Store in ventilated room or shade below 44 °C (110 °F) and away from direct sunlight. Keep away from ignition sources and incompatible materials: caustics, ammonia, inorganic acids, chlorinated compounds, strong oxidizers and isocyanates. Follow all precautionary information on container label, product bulletins and solvent cementing literature.

SECTION 8 - CONTROLS TO CONTROL EXPOSURE / PERSONAL PROTECTION

Component	ACGIH TLV		ACGIH STEL		OSHA PEL		OSHA STEL	
	TLV	STEL	TLV	STEL	TLV	STEL	TLV	STEL
Tetrahydrofuran (THF)	50 ppm	100 ppm	200 ppm	200 ppm	200 ppm	200 ppm	200 ppm	200 ppm
Methyl Ethyl Ketone (MEK)	200 ppm	300 ppm	200 ppm	200 ppm	200 ppm	200 ppm	200 ppm	200 ppm
Cyclohexanone	20 ppm	50 ppm	50 ppm	50 ppm	50 ppm	50 ppm	50 ppm	50 ppm
Acetone	500 ppm	750 ppm	1000 ppm	1000 ppm	1000 ppm	1000 ppm	1000 ppm	1000 ppm

Engineering Controls: Use local exhaust as needed.
Monitoring: Maintain breathing zone airborne concentrations below exposure limits.
Personal Protective Equipment (PPE):
Eye Protection: Avoid contact with eyes, wear splash-proof chemical goggles, face shield, safety glasses (spectacles) with bow guards and side shields, etc. as may be appropriate for the exposure.
Skin Protection: Prevent contact with the skin as much as possible. Butyl rubber gloves should be used for frequent immersion. Use of solvent-resistant gloves or solvent-resistant barrier cream should provide adequate protection when normal adhesive application practices and procedures are used for making structural bonds.
Respiratory Protection: Prevent inhalation of the solvents. Use in a well-ventilated room. Open doors and/or windows to ensure airflow and air changes. Use local exhaust ventilation to remove airborne contaminants from employee breathing zone and to keep contaminants below levels listed above. With normal use, the Exposure Limit Value will not usually be reached. When limits approached, use respiratory protection equipment.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Clear or purple, thin liquid
Odor: Ethereal
pH: Not Applicable
Melting/Freezing Point: -108.5 °C (-163.3 °F) Based on first melting component: THF
Boiling Point: 56 °C (133 °F) Based on first boiling component: Acetone
Flash Point: -20 °C (-4 °F) TOC based on Acetone
Specific Gravity: 0.858 @23°C (73 °F)
Solubility: Solvent portion soluble in water. Resin portion separates out.
Partition Coefficient n-octanol/water: Not Available
Auto-ignition Temperature: 321 °C (610 °F) based on THF
Decomposition Temperature: Not Applicable
VOC Content: When applied as directed, per SCAQMD Rule 1168, Test Method 316A, VOC content is: ≤ 550 g/l.
Odor Threshold: 0.88 ppm (Cyclohexanone)
Boiling Range: 56 °C (133 °F) to 156 °C (313 °F)
Evaporation Rate: > 1.0 (BUAC = 1)
Flammability: Category 2
Flammability Limits: LEL: 1.1% based on Cyclohexanone
UEL: 12.8% based on Acetone
Vapor Pressure: 190 mm Hg @ 20 °C (68 °F) Acetone
Vapor Density: >2.0 (Air = 1)
Other Data: Viscosity: Water thin

SECTION 10 - STABILITY AND REACTIVITY

Stability: Stable
Hazardous decomposition products: None in normal use. When forced to burn, this product gives off oxides of carbon and smoke.
Conditions to avoid: Keep away from heat, sparks, open flame and other ignition sources.
Incompatible Materials: Oxidizers, strong acids and bases, amines, ammonia

SECTION 11 - TOXICOLOGICAL INFORMATION

Likely Routes of Exposure: Inhalation, Eye and Skin Contact
Acute symptoms and effects:
Inhalation: Severe overexposure may result in nausea, dizziness, headache. Can cause drowsiness, irritation of eyes and nasal passages.
Eye Contact: Vapors slightly uncomfortable. Overexposure may result in severe eye injury with corneal or conjunctival inflammation on contact with the liquid.
Skin Contact: Liquid contact may remove natural skin oils resulting in skin irritation. Dermatitis may occur with prolonged contact.
Ingestion: May cause nausea, vomiting, diarrhea and mental sluggishness.
Chronic (long-term) effects: None known to humans
Toxicity: LD50
LC50
Tetrahydrofuran (THF) Oral: 2842 mg/kg (rat) Inhalation 3 hrs. 21,000 mg/m³ (rat)
Methyl Ethyl Ketone (MEK) Oral: 2737 mg/kg (rat), Dermal: 6480 mg/kg (rabbit) Inhalation 8 hrs. 23,500 mg/m³ (rat)
Cyclohexanone Oral: 1535 mg/kg (rat), Dermal: 948 mg/kg (rabbit) Inhalation 4 hrs. 8,000 PPM (rat)
Acetone Oral: 5800 mg/kg (rat) Inhalation 50,100 mg/m³ (rat)

Reproductive Effects	Teratogenicity	Mutagenicity	Embryotoxicity	Sensitization to Product	Synergistic Products
Not Established	Not Established	Not Established	Not Established	Not Established	Not Established

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicity: None Known
Mobility: In normal use, emission of volatile organic compounds (VOC's) to the air takes place, typically at a rate of ≤ 550 g/l.
Degradability: Biodegradable
Bioaccumulation: Minimal to none.

SECTION 13 - WASTE DISPOSAL CONSIDERATIONS

Follow local and national regulations. Consult disposal expert.

SECTION 14 - TRANSPORT INFORMATION

Proper Shipping Name: Flammable Liquid, n.o.s. (Acetone, Tetrahydrofuran)
Hazard Class: 3
Secondary Risk: None
Identification Number: UN 1993
Packing Group: PG II
Label Required: Class 3 Flammable Liquid
Marine Pollutant: NO
EXCEPTION for Ground Shipping
DOT Limited Quantity: Up to 1L per inner packaging, 30 kg gross weight per package.
Consumer Commodity: Depending on packaging, these quantities may qualify under DOT as "ORM-D".
TDG INFORMATION
TDG CLASS: FLAMMABLE LIQUID 3
SHIPPING NAME: Flammable Liquid, n.o.s. (Acetone, Tetrahydrofuran)
UN NUMBER/PACKING GROUP: UN 1993, PG II

SECTION 15 - REGULATORY INFORMATION

Precautionary Label Information: Highly Flammable, Irritant
Symbols: F, Xi
Risk Phrases: R11: Highly flammable.
R20: Harmful by inhalation.
R36/37: Irritating to eyes and respiratory system.
Safety Phrases: S9: Keep container in a well-ventilated place.
S16: Keep away from sources of ignition - No smoking.
S25: Avoid contact with eyes.
Ingredient Listings: USA TSCA, Europe EINECS, Canada DSL, Australia AICS, Korea ECL/TCCL, Japan MITI (ENCS)
R66: Repeated exposure may cause skin dryness or cracking
R67: Vapors may cause drowsiness and dizziness
S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S33: Take precautionary measures against static discharges.
S46: If swallowed, seek medical advice immediately and show this container or label.

SECTION 16 - OTHER INFORMATION

Specification Information:
Department issuing data sheet: IPS, Safety Health & Environmental Affairs
E-mail address: <EHSinfo@ipscorp.com>
Training necessary: Yes, training in practices and procedures contained in product literature.
Reissue date / reason for reissue: 10/19/2010 / Updated GHS Standard Format
Intended Use of Product: Primer for PVC and CPVC Plastic Pipe
All ingredients are compliant with the requirements of the European Directive on RoHS (Restriction of Hazardous Substances).

This product is intended for use by skilled individuals at their own risk. The information contained herein is based on data considered accurate based on current state of knowledge and experience. However, no warranty is expressed or implied regarding the accuracy of this data or the results to be obtained from the use thereof.

I. PRODUCT AND COMPANY IDENTIFICATION

Company: Simpson Strong-Tie Company, Inc.
Address: 5956 W. Las Positas Blvd.
 Pleasanton, CA 94588

Product Name: Cartridges: SET22, SET56, SETPAC10, SETPAC-EZ, SET1.7KT, SET1.7KTA
 Single Packaging: SET010R, SET020R, SET050R, SETR

Product Description: High Strength Epoxy-Tie® Anchoring Adhesive – Epoxy Resin

Emergency Contact No.: 1-800-535-5053 USA
 1-352-323-3500 International

Date Prepared or Revised: September 2009
Supersedes: March 2008
 For most current MSDS, please visit our web site at www.simpsonanchors.com.

II. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Names	CAS Numbers
BisPhenolA/Epichlorohydrin (Epoxy Resin)	25068-38-6
N-butyl glycidyl ether	2426-08-06
Silica, crystalline quartz	14808-60-7
Titanium dioxide	1317-80-2

The remaining ingredients are designated as "trade secret".

III. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW

Non-corrosive.
 May cause eye and skin irritation.
 May cause skin sensitization.

POTENTIAL HEALTH EFFECTS

ACUTE

Eye Contact: May cause eye irritation, swelling, tearing, redness or cornea damage.
Skin Contact: Moderate irritation. May cause skin sensitization, evidenced by rashes and hives.
Inhalation: Moderate irritation to the nose and respiratory tract. May cause Central Nervous System depression, evidenced by headache, dizziness, and nausea.
Ingestion: May cause irritation to the gastrointestinal tract. May cause Central Nervous System depression or other systemic effects.
Systemic Effects: Lungs, eyes, and skin.

IV. FIRST AID MEASURES

Eye Contact: Immediately flush eyes with plenty of cool water for at least 15 minutes while holding the eyes open. If redness, burning, blurred vision, or swelling persists, **CONSULT A PHYSICIAN**.

Skin Contact: Remove product and immediately wash affected area with soap and water. Do not apply greases or ointments. Remove contaminated clothing. Wash clothing with soap and water before reuse. If redness, burning, or swelling persists, **CONSULT A PHYSICIAN**.

Ingestion: **DO NOT INDUCE VOMITING.** Never administer anything by mouth to an unconscious person. Rinse out mouth with water, then drink sips of water to remove taste from mouth. **CONSULT A PHYSICIAN** if vomiting occurs spontaneously, keep head below hips to prevent aspiration.

Inhalation: Remove patient to fresh air. If patient continues to experience difficulty breathing, **CONSULT A PHYSICIAN**.

V. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media: Water fog, carbon dioxide or dry chemical, aqueous foam.
Fire And Explosion Hazard: Hazardous decomposition products may occur when materials polymerize at temperatures above 500°F. Do not allow run-off from fire fighting to enter drains or water courses.
Fire Fighting Equipment and Procedures: Wear full protective clothing and self-contained breathing apparatus for fire fighting. Isolate fuel supply from fire. Clear fire area of all non-emergency personnel. Use water spray to cool fire-exposed surfaces and containers.

VI. ACCIDENTAL RELEASE MEASURES

Personal Precautions: Use cautious judgment when cleaning up spill. Shut off leaks, if possible without personal risk. Wear suitable protective clothing, gloves and eye/face protection. Evacuate personnel to safe areas.
Environmental Precautions: Construct a dike to prevent spreading. Keep out of sewers, storm drains, surface waters, and soils.
Clean-up Methods: **Small spills:** Soak up with absorbent material such as clay, sand or other suitable non-reactive material. Place in leak-proof containers. Seal tightly for proper disposal. **Large spills:** Approach suspected leak areas with caution. Create a dike or trench to contain material. Soak up with absorbent material such as clay, sand or other suitable non-reactive material. Place in leak-proof containers. Seal tightly for proper disposal. Notify authorities if any exposures to the general public or environment occur or are likely to occur. Dispose in accordance with federal, state, and local regulations.
Additional Information:

VII. STORAGE AND HANDLING

Storage: Keep away from: acids, oxidizers, heat, or flames. Keep in cool, dry, well-ventilated area in closed containers. Protect containers from physical damage.
Handling: To prevent skin and eye contact under the foreseeable conditions of use, wear appropriate protective clothing and safety eyewear. When handling, do not eat, drink, or smoke. Wash thoroughly after handling. Avoid breathing fumes. Handle in a well-ventilated work area.

VIII. EXPOSURE CONTROLS / PERSONAL PROTECTION

Protective Measure: Wear appropriate personal protective equipment.
Eye Protection: Avoid contact with eyes. Wear chemical splash goggles or safety glasses with side shield.
Hand Protection: Wear chemical-resistant gloves such as: Nitrile, neoprene, butyl.
Skin and Body Protection: Wear chemical-resistant gloves and other clothing as required to minimize contact.
Respirator Protection: Not required for properly ventilated areas.
Exposure Limits:

COMPONENT	ACGIH (TLV)	OSHA (PEL)
BisPhenolA/Epichlorohydrin (Epoxy Resin)	N/E	N/E
N-butyl glycidyl ether	25 ppm	25 ppm
Silica, crystalline quartz (airborne particulates of respirable size)	0.1 mg/m ³	0.4 mg/m ³
Titanium dioxide (total dust)	10 mg/m ³	15 mg/m ³

IX. PHYSICAL AND CHEMICAL PROPERTIES

Form: Paste
Color: White
Odor: Sweet
Vapor Pressure: Not Volatile
Boiling Point: >500°F (> 260°C)
Freezing Point: N/E
Flash Point: >250°F (Open Cup)

Specific Gravity: 1.21 @ 72°F
Solubility In Water: Insoluble

X. REACTIVITY DATA

Stability: Stable under normal storage conditions.
Conditions To Avoid: Incompatible chemicals, high heat and open flame.
Materials To Avoid: Oxidizing agents, acids, organic bases, and amines.
Hazardous Decomposition Products: Combustion may produce carbon monoxide, carbon dioxide, aldehydes, acids and other organic substances.
Hazardous Polymerization: Will not occur.

XI. TOXICOLOGICAL PROPERTIES

Acute Oral (LD₅₀, Rat): Non toxic
Acute Dermal (LD₅₀, Rabbit): N/E
Acute Inhalation (LC₅₀, Rat): N/E
Chronic Health Hazard The Diglycidyl Ether of Bisphenol A has shown weak carcinogenicity in 2-year mice bioassays. This material has shown activity in-vitro microbial mutagenicity screening and has produced chromosomal aberrations in cultured rat liver cells. No activity when tested by vivo mutagenicity assays.

XII. DISPOSAL CONSIDERATIONS

Waste From Residues / Unused Products: This material is not a hazardous waste by RCRA criteria (40 CFR 261). Dispose of container and unused contents in accordance with federal, state, and local requirements.

XIII. TRANSPORTATION

US DOT: Not Regulated For Transport.
IATA: Not Regulated For Transport.
IMO: Not Regulated For Transport.

XIV. REGULATORY INFORMATION

Country	Regulatory List
USA	TSCA

EPA SARA Title III Section 312 (40 CFR 370) Hazardous Classification:

Acute/Chronic Health Hazard.

EPA SARA Title III Section 313 (40 CFR 372) Component(s) above 'de minimus' level:

None.

US, California "Safe Drinking Water and Toxic Enforcement Act" (Proposition 65):

This product contains small traces of the following chemicals that are known to the State of California to cause cancer and/or reproductive toxicity and other harm.

Component	Regulation	Concentration	Remarks
Phenylglycidyl ether*	ACGIH	Trace	Carcinogenic
Epichlorohydrin*	ACGIH	Trace	Carcinogenic

* May be absorbed through skin.

XV. OTHER INFORMATION**HMSIS RATING**

Health	Flammability	Physical Hazard
2	1	0

N/E - Not Established

This Material Safety Data Sheet (MSDS) is prepared by Simpson Strong-Tie Co. in compliance with the requirements of OSHA 29 CFR Part 1910.1200. The information it contains is offered in good faith as accurate as of the date of this MSDS. This MSDS is provided solely for the purpose of conveying health, safety, and environmental information. No warranty, expressed or implied, is given. Health and Safety precautions may not be adequate for all individuals and/or situations. It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations.

I. PRODUCT AND COMPANY IDENTIFICATION

Company: Simpson Strong-Tie Company, Inc.
Address: 5956 W. Las Positas Blvd.
Pleasanton, CA 94588
Product Name: Cartridges: SET22, SET56, SETPAC10, SETPAC-EZ, SET1.7KT, SET1.7KTA
Single Packaging: SET010H, SET020H, SET050H, SETH
Product Description: High Strength Epoxy-Tie® Anchoring Adhesive – Epoxy Hardener
Emergency Contact No.: 1-800-535-5053 USA
1-352-323-3500 International
Date Prepared or Revised: September 2009
Supersedes: March 2008
For most current MSDS, please visit our web site at www.simpsonanchors.com.

II. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Names	CAS Numbers
N-aminoethylpiperazine	140-31-8
Nonylphenol	25154-52-3
Phenol, 4,4-(1-methylethylidene)bis	80-05-7
Silica, crystalline quartz	14808-60-7

The remaining ingredients are designated as "trade secret".

III. HAZARD IDENTIFICATION**EMERGENCY OVERVIEW**

Corrosive.
Severe irritation to eyes and skin.
May cause skin sensitization.
Components of the product may affect the nervous system.

POTENTIAL HEALTH EFFECTS**ACUTE**

Eye Contact: Severe irritation, swelling, tearing, redness or cornea damage. May cause burns and tissue damage.
Skin Contact: Severe irritation. May cause burns and tissue damage. May cause skin sensitization evidenced by rashes and hives.
Inhalation: Moderate irritation to the nose and respiratory tract. May cause Central Nervous System depression, evidenced by giddiness, headache, dizziness, and nausea.
Ingestion: May cause irritation to the gastrointestinal tract. May cause headache nausea. May cause Central Nervous System depression or other systemic effects.
Systemic Effects: Lungs, eyes, and skin.

IV. FIRST AID MEASURES

Eye Contact: Immediately flush eyes with plenty of cool water for at least 15 minutes while holding the eyes open. If redness, burning, blurred vision, or swelling persists, **CONSULT A PHYSICIAN**.
Skin Contact: Remove product and immediately wash affected area with soap and water. Do not apply greases or ointments. Remove contaminated clothing. Wash clothing with soap and water before reuse. If redness, burning, or swelling persists, **CONSULT A PHYSICIAN**.
Ingestion: **DO NOT INDUCE VOMITING.** Never administer anything by mouth to an unconscious person. Rinse out mouth with water, then drink sips of water to remove taste from mouth. **CONSULT A PHYSICIAN** if vomiting occurs spontaneously, keep head below hips to prevent aspiration.
Inhalation: Remove patient to fresh air. If patient continues to experience difficulty breathing, **CONSULT A PHYSICIAN**.

V. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media: Water spray, fog or foam, carbon dioxide, dry chemical, limestone powder.
Fire And Explosion Hazard: Irritating and toxic fumes may be produced at high temperature. In a fire, may produce carbon monoxide, toxic nitrogen oxide, ammonia, and carbon dioxide. Use of water may result in the formation of very toxic aqueous solution. Do not allow run-off from fire fighting to enter drains or water courses.
Fire Fighting Equipment and Procedures: Wear full protective clothing and self-contained breathing apparatus for fire fighting. Isolate fuel supply from fire. Clear fire area of all non-emergency personnel.

VI. ACCIDENTAL RELEASE MEASURES

Personal Precautions: Use cautious judgment when cleaning up spill. Shut off leaks, if possible without personal risk. Wear suitable protective clothing, gloves and eye/face protection. Evacuate personnel to safe areas.
Environmental Precautions: Construct a dike to prevent spreading. Keep out of sewers, storm drains, surface waters, and soils.
Clean-up Methods: **Small spills:** Soak up with absorbent material such as clay, sand or other suitable non-reactive material. Place in leak-proof containers. Seal tightly for proper disposal. **Large spills:** Approach suspected leak areas with caution. Create a dike or trench to contain material. Soak up with absorbent material such as clay, sand or other suitable non-reactive material. Place in leak-proof containers. Seal tightly for proper disposal. Notify authorities if any exposures to the general public or environment occur or are likely to occur. Dispose in accordance with federal, state, and local regulations.
Additional Information:

VII. STORAGE AND HANDLING

Storage: Keep away from: acids, oxidizers, heat, or flames. Keep in cool, dry, well-ventilated area in closed containers. Protect containers from physical damage.
Handling: To prevent skin and eye contact under the foreseeable conditions of use, wear appropriate protective clothing and safety eyewear. When handling, do not eat, drink, or smoke. Wash thoroughly after handling. Avoid breathing fumes. Handle in a well ventilated work area.

VIII. EXPOSURE CONTROLS / PERSONAL PROTECTION

Protective Measure: Wear appropriate personal protective equipment.
Eye Protection: Avoid contact with eyes. Wear chemical splash goggles or safety glasses with side shield.
Hand Protection: Wear chemical-resistant gloves such as: Nitrile, neoprene, butyl.
Skin and Body Protection: Wear chemical-resistant gloves and other clothing as required to minimize contact.
Respirator Protection: Not required for properly ventilated areas.
Exposure Limits:

Chemical Names	ACGIH (TLV)	OSHA (PEL)
N-aminoethylpiperazine	N/E	N/E
Nonylphenol	N/E	N/E
Phenol, 4,4-(1-methylethylidene)bis	N/E	N/E
Silica, crystalline quartz (airborne particulates of respirable size)	0.1mg/m ³	0.4mg/m ³

IX. PHYSICAL PROPERTIES

Form: Paste
Color: Black
Odor: Ammonia
Boiling Point: N/E
Freezing Point: N/E
Vapor Pressure: N/E
Flash Point: 198°F (Open cup)

Specific Gravity: 1.23@ 72°F
Solubility in Water: Slight

X. REACTIVITY DATA

Stability: Stable under normal storage conditions.
Conditions To Avoid: Incompatible chemicals, high heat, and open flame.
Materials To Avoid: Oxidizing agents and acids.
Hazardous Decomposition Products: Combustion may produce carbon monoxide, carbon dioxide, and nitrogen oxide, and other organic substances.
Hazardous Polymerization: Will not occur.

XI. TOXICOLOGICAL PROPERTIES

Acute Oral (LD₅₀, Rat): Non toxic
Acute Dermal (LD₅₀, Rabbit): N/E
Acute Inhalation (LC₅₀, Rat): N/E
Chronic Health Hazard Components of this product are not listed as carcinogens in concentrations of 0.1% or greater. Repeated or prolonged exposure may cause allergic reaction and/or limited sensitization.

XII. DISPOSAL CONSIDERATIONS

Waste From Residues / Unused Products: Dispose of container and unused contents in accordance with federal, state, and local requirements.

XIII. TRANSPORTATION

US DOT: Cartridges: Consumer Commodity, ORM-D
Single Packaging: UN2735, Amines, Liquid, Corrosive, n.o.s. (Aminoethylpiperazine), 8, III
IATA: UN2735, Amines, Liquid, Corrosive, n.o.s. (Aminoethylpiperazine), 8, III
IMO: UN2735, Amines, Liquid, Corrosive, n.o.s. (Aminoethylpiperazine), 8, III

XIV. REGULATORY INFORMATION

Country	Regulatory List
USA	TSCA

EPA SARA Title III Section 312 (40 CFR 370) Hazardous Classification: Acute/Chronic Health Hazard.

EPA SARA Title III Section 313 (40 CFR 372) Component(s) above 'de minimus' level: Phenol, 4,4-(1-methylethylidene)bis.

US, California "Safe Drinking Water and Toxic Enforcement Act" (Proposition 65): This product contains small traces of the following chemicals that are known to the State of California to cause cancer and/or reproductive toxicity and other harm.

Component	Regulation	Concentration	Remarks
Carbon Black	ACGIH	Trace	Carcinogenic
Silica Quartz	ACGIH	Trace	Carcinogenic
Toluene *	OSHA	Trace	Toxic

* May be absorbed through skin.

XV. OTHER INFORMATION

HMIS RATING

Health	Flammability	Physical Hazard
3	2	0

N/E - Not Established

This Material Safety Data Sheet (MSDS) is prepared by Simpson Strong-Tie Co. in compliance with the requirements of OSHA 29 CFR Part 1910.1200. The information it contains is offered in good faith as accurate as of the date of this MSDS. This MSDS is provided solely for the purpose of conveying health, safety, and environmental information. No warranty, expressed or implied, is given. Health and Safety precautions may not be adequate for all individuals and/or situations. It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations.

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Material Safety Data Sheet (MSDS)

Revised October 8, 1999

For additional copies call 1-800-237-SAN

I. Product Identification

Trade Name: Silica Sand - All Grades
Manufacturer's Name: Manley Bros. of Indiana, Inc.
Manufacturer's Address: P.O. Box 80, Vermillion Road
Troy Grove, IL 61372
Manufacturer's Telephone: (815) 539-7486
Date Revised: 10/99

II. Hazardous Ingredients

Chemical Names	CAS Number	14808-60-7
Silica, Quartz, SiO ₂	Exposure Limits in Air	ACGIH-TLV 0.1 mg/cubic meter
Percentage >95		OSHA-PEL 0.1 mg/cubic meter
		NIOSH * 0.05 mg/cubic meter
		(* Recommended Standard)

Exposure Limits refer to the respirable fraction

III. Physical Properties

Vapor Density: Not Applicable
Specific Gravity: 2.65 Crystalline
Solubility in Water: Insoluble
Vapor Pressure, mmHg at 20° C: Essentially Zero
Melting Point or Range, °F: Above 2000 °F
Boiling Point or Range, °F: Above 3500 °F
Evaporation Rate: None
Appearance and Odor: Light Buff to White Sand, No Odor
How to Detect This Substance: Detect sand by appearance. The dangerous respirable dust may only be detected using special measuring equipment. It should be assumed that wherever silica sand is re-handled some dust will be generated and routine measuring performed to detect and determine the level.

Manley Bros. Silica Sand MSDS 10/99 Page 1 of 4

IV. Fire and Explosion

Flash Point: None
Auto Ignition Temperature: None
Flammable Limits in Air: Not Combustible
Special Fire Fighting Procedures: None, may be used to extinguish fire
Unusual Fire and Explosion Hazards: None

V. Health Hazard Information

Health Effects or Risks from Exposure

Silicosis PROLONGED INHALATION OF RESPIRABLE SILICA (DUST) WILL RESULT IN PERMANENT LUNG DAMAGE. A Condition known as Silicosis. To prevent its occurrence, dust levels must be monitored and personnel exposed to respirable silica at or above the Permitted Exposure Level, MUST wear OSHA approved respirators.

Cancer Agent: YES NTP: Yes IARC: Yes Federal OSHA: No

NTP: Respirable crystalline silica has been listed by The National Toxicology Program in the 6th Annual Report on Carcinogens to Humans (1992) as an anticipated carcinogen. IARC: The International Agency for Research on Cancer Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Humans, in Vol. 68, concludes that there is sufficient evidence of the carcinogenicity of inhaled crystalline silica to humans.

EXPOSURE TO RESPIRABLE SILICA CAN CAUSE CANCER. Personnel exposed to respirable silica MUST wear OSHA approved respirators.

Symptoms of Overexposure

Inhaled: Coughing, shortness of breath, reduced pulmonary function. Effects may be delayed, the disease usually being contracted over an extended period of exposure.
Contact with Skin or Eyes: Irritation
Absorbed through Skin: Not Applicable
Swallowed: May Cause Nausea

First Aid - Emergency Procedures

Eye Contact: Flush with water for 15 minutes. Seek medical attention.
Skin Contact: Wash with soap and water. If irritation persists seek medical attention.
Inhaled: Remove to fresh air at once. Apply artificial respiration if breathing has stopped. Seek immediate medical attention.
Swallowed: If discomfort persists seek medical attention.

All other pulmonary medical conditions are aggravated by exposure to respirable quartz.

Manley Bros. Silica Sand MSDS 10/99 Page 2 of 4

VI. Reactivity Data

Stability:	Stable
Incompatibility (materials to avoid):	Strong Oxidizing Agents
Hazardous Decomposition Products (Including combustion products):	None
Hazardous Polymerization:	Will not occur

VII. Spill/Leak and Disposal Procedures

Spill Response Procedures:	Clean up using approved dustless methods (flush with water, or vacuum) to minimize generation of airborne respirable dust.
Waste Disposal:	Dispose of all waste in accordance with federal, state and local regulations in a facility approved for silica disposal.

VIII. Special Handling Information

Ventilation and Engineering Controls:	Local mechanical ventilation where necessary to keep below safe levels (PEL) Use NIOSH approved respiratory equipment for respirable quartz (<u>supplied air types are strongly recommended</u>)
Eye Protection:	Safety goggles
Gloves:	Not normally necessary
Other Clothing and Equipment:	Provide eye wash
Work Practices, Hygienic Practices:	Minimize dust generation. Clean up spills promptly. Monitor respirable quartz in workplace on a frequent regular basis.
Other Handling and Storage Requirements:	Avoid dust generation during handling. Clean up spills. Practice good housekeeping. No special storage requirements. Train all employees in all aspects of this MSDS <u>before</u> they work with this product.

See OSHA Hazard Communication Rule CFR 1910.1200, 1915.99, 1917.28, 1918.90, 1926.59, 1928.21, state and local worker or community right to know laws and regulations. Familiarize and train your employees with the requirements of the MSDS. **WARN YOUR EMPLOYEES, AND YOUR CUSTOMERS IF YOU MERCHANT OR RE-SELL THE PRODUCTS, OF THE HAZARD AND THE OSHA PRECAUTIONS TO BE USED.**

IX. Other Information

H.M.I.S. Rating:	
Health Hazard Rating:	1 Chronic exposure to respirable silica will result in silicosis exposure to respirable silica can cause cancer
Flammability Hazard Rating:	0
Reactivity Hazard Rating:	0
Personal Protective Equipment	E Comply with special OSHA respiratory protection if sandblasting
D.O.T.	Not Regulated
SARA Title III.	Not Listed

X. Prolonged Inhalation of Respirable Quartz Will Cause Lung Damage. A Condition Known as Silicosis.

PROLONGED INHALATION OF RESPIRABLE QUARTZ WILL CAUSE LUNG DAMAGE. A CONDITION KNOWN AS SILICOSIS.

Silica sands may generate respirable dust during use. Examples of conditions which promote the generation of respirable dust include, thermal shock, sandblasting, grinding, machining or operations were abrasion with silica takes place.

Monitor work area on a frequent regular basis for respirable quartz (silica). Use appropriate ventilation and/or respiratory protection unless exposure levels are known to be below permitted exposure levels.

INHALATION OF RESPIRABLE QUARTZ CAN CAUSE CANCER

The International Agency for Research on Cancer (IARC) has determined that there is evidence for the carcinogenicity of crystalline silica to humans.

The department of Health and Human Services: National Toxicology Program (NTP), in its Sixth Annual Report on Carcinogens, has listed respirable crystalline silica in a category of substances which may 'reasonably be anticipated to be carcinogenous.' Such substances are defined as those for which there is limited evidence of carcinogenicity in experimental animals.

Monitor work area on a frequent regular basis for respirable quartz (silica). Use appropriate ventilation and/or respiratory protection unless exposure levels are known to be below permitted exposure levels.

It is extremely important that your company follow OSHA standards for respiratory protection as they exist or are hereafter modified or amended. As part of your training program, please distribute this information to all employees

Manley Bros. of Indiana Inc.

300 South Vermillion Street, Troy Grove, IL 61302
Phone: (800) 231-SAND Fax: (815) 539-0041

Section 1: PRODUCT & COMPANY IDENTIFICATION

Product Name: Simple Green® Pro Grade All-in-One Cleaner
 Additional Names:

Manufacturer's Part Number: 18217 – 160 oz bottle

Company: Sunshine Makers, Inc.
 15922 Pacific Coast Highway
 Huntington Beach, CA 92649 USA

Telephone: 800-228-0709 • 562-795-6000 Fax: 562-592-3830
 Emergency Phone: Chem-Tel 24-Hour Emergency Service: 800-255-3924

Section 2: HAZARDS IDENTIFICATION

Emergency Overview: CAUTION. Irritant. This is a turquoise liquid with a chemical/detergent odor.



NFPA/HMIS Rating:
 Health = 1 = slight
 Fire, Reactivity, and Special = 0 = minimal

Potential Health Effects

Eye Contact: Mildly irritating.
Skin Contact: No adverse effects expected under typical use conditions. Prolonged exposure may cause dryness. Chemically sensitive individuals may experience mild irritation.
Ingestion: May cause stomach or intestinal irritation if swallowed.
Inhalation: No adverse effects expected under typical use conditions. Adequate ventilation should be present for prolonged usage in small enclosed areas.

Section 3: COMPOSITION/INFORMATION ON INGREDIENTS

<u>Ingredient</u>	<u>CAS Number</u>	<u>Percent Range</u>
Water	7732-18-5	≥ 77%
Ethoxylated Alcohol Mixture	Proprietary	≤ 5%
Didecyl Dimethyl Ammonium Chloride	7173-51-5	≤ 5%
Sodium Citrate	6132-04-3	≤ 1%
Soda Ash	497-19-8	≤ 1%
Ethanol	64-17-5	≤ 1%
Colorant	Proprietary	≤ 1%

Section 4: FIRST AID MEASURES

If Inhaled: If adverse effect occurs, move to fresh air.
If on skin: If adverse effect occurs, rinse skin with water.
If in eyes: Flush with plenty of water. After 5 minutes of flushing, remove contact lenses, if present. Continue flushing for at least 10 more minutes. If irritation persists seek medical attention.
If ingested: Drink plenty of water to dilute.

Section 5: FIRE FIGHTING MEASURES

This formula is stable, non-flammable, and will not burn. No special procedures necessary

Flammability: Non-flammable
Flash Point: Non-flammable

Suitable Extinguishing Media: Use Dry chemical, CO2, water spray or “alcohol” foam.
Extinguishing Media to Avoid: High volume jet water.
Special Exposure Hazards: In event of fire created carbon oxides.
Special Protective Equipment: Wear positive pressure self-contained breathing apparatus; Wear full protective clothing.

Section 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions: See section 8 – personal protection.
Environmental Precautions: Do not allow into open waterways and ground water systems.
Method for Clean Up: Dilute with water and rinse into sanitary sewer system or soak up with inert absorbent material.

Section 7: HANDLING AND STORAGE

Handling: Keep container tightly closed. Ensure adequate ventilation.
Storage: Keep in cool dry area.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

<u>Exposure Limit Values:</u>	<u>OSHA PEL</u>	<u>ACGIH TLV</u>
No reportable ingredients	-	-

Exposure Controls:
Eye Contact: Use protective glasses if splashing or spray-back is likely.
Respiratory: Use in well ventilated areas.
Skin Contact: Prolonged exposure or dermal sensitive individuals should use protective gloves.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Turquoise Liquid	Vapor Pressure:	TBD
Odor:	Detergent odor; no added fragrance	Density:	8.546 lb/gal; 1.024 g/L
Specific Gravity:	TBD	Water Solubility:	100%
pH:	8.0 -10.0	VOC Composite Partial Pressure:	TBD
Boiling Point:	~210°F (98 °C)	VOC:	CARB Method 310 < 0.5%
Freezing Point:	~ 32°F (0 °C)		

Section 10: STABILITY AND REACTIVITY

Stability: Stable
 Materials to Avoid: None known
 Hazardous Decomposition Products: Normal products of combustion - CO, CO₂;

Section 11: TOXICOLOGICAL INFORMATION

Acute Toxicity: Oral LD₅₀ (rat) > 5 g/kg body weight
 Dermal LD₅₀ (rabbit) > 5 g/kg body weight
 Toxicity calculated from ingredients using OECD SERIES ON TESTING AND ASSESSMENT Number 33

Carcinogens: No ingredients are listed by OSHA, IARC, or NTP as known or suspected carcinogens.

Section 12: ECOLOGICAL INFORMATION

Hazard to wild mammals: Low, based on toxicology profile

Hazard to avian species: Low, based on toxicology profile

Hazard to aquatic organisms: Low, based on toxicology profile

Chemical Fate Information: Biodegradable based on the biodegradable profile of ingredients

Section 13: DISPOSAL CONSIDERATIONS

Appropriate Method for Disposal:

- Unused Product: *Dilute with water to use concentration and dispose by sanitary sewer.
- Used Product: *This product can enter into clarifiers and oil/water separators. Used product may be hazardous depending on the cleaning application and resulting contaminants.
- Empty Containers: *Triple-rinse with water and offer for recycling if available in your area. Otherwise, dispose as non-hazardous waste.

*Dispose of used or unused product, and empty containers in accordance with the local, State, Provincial, and Federal regulations for your location. Never dispose of used degreasing rinsates into lakes, streams, and open bodies of water or storm drains.

Section 14: TRANSPORT INFORMATION

U.S. Department of Transportation (DOT) / Canadian TDG: Not Regulated
 IMO / IDMG: Not classified as Dangerous
 ICAO/ IATA: Not classified as Dangerous
 ADR/RID: Not classified as Dangerous

U.N. Number: Not Required
 Hazard Class: Non-Hazardous
 Proper Shipping Name: Detergent Solution
 Marine Pollutant: No

Section 15: REGULATORY INFORMATION

All components are listed on: TSCA, DSL and AICS Inventory.
No components listed under: Clean Air Act Section 112; Clean Water Act 307 & 311

SARA Title III 311/312: Didecyl Dimethyl ammonium chloride & Ethanol
RCRA Status: Not a hazardous waste CERCLA Status: No components listed
State Right To Know Lists
 Didecyl Dimethyl ammonium chloride New Jersey
 Ethanol Pennsylvania, Massachusetts

WHMIS Classification – Category D, subcategory 2B, eye irritant

Name	Toxic Substances List – Schedule 1 – CEPA (Canadian Environmental Protection Act)	NPRI Inventory
None	None	None

This product has been classified according to the hazard criteria of the CPR and the MSDS contains all the information required by Canada's Controlled Products Regulation.

Section 16: OTHER INFORMATION

Questions about the information found on this MSDS should be directed to:

SUNSHINE MAKERS, INC. – TECHNICAL DEPARTMENT

15922 Pacific Coast Hwy. Huntington Beach, CA 92649

Phone: 800/228-0709 [8am-5pm Pacific time, Mon-Fri] Fax: 562/592-3830 Email: infoweb@simplegreen.com

DISCLAIMER: The information provided with this MSDS is furnished in good faith and without warranty of any kind. Personnel handling this material must make independent determinations of the suitability and completeness of information from all sources to assure proper use and disposal of this material and the safety and health of employees and customers. Sunshine Makers, Inc. assumes no additional liability or responsibility resulting from the use of, or reliance on this information.



Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet

Sodium bicarbonate MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium bicarbonate
Catalog Codes: SLS3241, SLS2446, SLS3868
CAS#: 144-55-8
RTECS: VZ0950000
TSCA: TSCA 8(b) inventory: Sodium bicarbonate
C#: Not available.
Synonym: Baking Soda; Bicarbonate of soda; Sodium acid carbonate; Monosodium carbonate; Sodium hydrogen carbonate; Carbonic acid monosodium salt
Chemical Name: Sodium Bicarbonate
Chemical Formula: NaHCO₃

Contact Information:
Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396
US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**
Order Online: ScienceLab.com
CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300
International CHEMTREC, call: 1-703-527-3887
For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium bicarbonate	144-55-8	100

Toxicological Data on Ingredients: Not applicable.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention if irritation occurs.

Skin Contact:

Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops. Cold water may be used.

Serious Skin Contact: Not available.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: When heated to decomposition it emits acrid smoke and irritating fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:

Do not ingest. Do not breathe dust. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as acids.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Odorless.

Taste: Saline. Alkaline.

Molecular Weight: 84.01g/mole

Color: White.

pH (1% solution in water): Not available.

Boiling Point: Not available.

Melting Point: Not available.

Critical Temperature: Not available.

Specific Gravity: Density: 2.159 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionocity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:

Soluble in cold water. Slightly soluble in alcohol. Solubility in Water: 6.4, 7.6, 8.7, 10.0, 11.3, 12.7, 14.2, 16.5, 19.1 g/100 solution at 0, 10, 20, 30, 40, 50, 60, 80, and 100 deg. C, respectively. Solubility in Water: 6.9, 8.2, 9.6, 11.1, 12.7, 14.5, 16.5, 19.7, and 23.6 g/100g water at 0, 10, 20, 30, 40, 50, 60, 80, 100 deg. C, respectively.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, Moisture. Stable in dry air, but slowly decomposes in moist air.

Incompatibility with various substances: Reactive with acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Reacts with acids to form carbon dioxide. Dangerous reaction with monoammonium phosphate or a sodium-potassium alloy.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 3360 mg/kg (Mouse)

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

Sodium Bicarbonate as produced genetic effects in rats (unscheduled DNA synthesis). However, no effects have been found in humans.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: May cause mild skin irritation. Eyes: May cause mild eye irritation. Inhalation: May cause respiratory tract irritation. Symptoms may include coughing and sneezing. Ingestion: Symptoms of overexposure to Sodium Bicarbonate include thirst, abdominal pain, gastroenteritis, and inflammation of the digestive tract. Chronic Potential Health Effects: Skin: Repeated or prolonged skin contact may cause irritation, drying or cracking of the skin. Ingestion and Inhalation: Chronic toxicity usually occurs within 4 to 10 days following ingestion of very large amounts. Repeated or prolonged ingestion or inhalation of large amounts may cause metabolic abnormalities, and sodium retention. Metabolic abnormalities such as acidosis, hypernatremia, hypochloremia, alkalosis, hypocalcemia, or sodium retention may affect the blood, kidneys, respiration (cyanosis, apnea secondary to metabolic acidosis or pulmonary edema), and cardiovascular system (tachycardia, hypotension). Severe toxicity may also affect behavior central nervous system. Neurological changes may result from metabolic abnormalities. These may include fatigue, irritability, dizziness, mental confusion, paresthesia, seizures, tetany, cerebral edema. Medical Conditions Aggravated by Exposure: Persons with pre-existing skin conditions might have increased sensitivity. Predisposing conditions that contribute to a mild alkali syndrome include, renal disease, dehydration, and electrolyte imbalance, hypertension, sarcoidosis, congestive heart failure, edema, or other sodium retaining conditions.

Section 12: Ecological Information

Ecotoxicity: Not available.

D5 and C/D: Not available.

Products of biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of biodegradation: Not available.

Section 13: Disposal Considerations**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations: TSCA 8(b) inventory: Sodium bicarbonate

Other Regulations: Not available.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):

This product is not classified according to the EU regulations. Not applicable.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Last updated: 11/01/2010 12:00 PM

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Health	2
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet Sodium bisulfite MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium bisulfite
Catalog Codes: SLS3526, SLS1309
CAS#: 7631-90-5
RTECS: VZ2000000
TSCA: TSCA 8(b) inventory: Sodium bisulfite
C#: Not available.
Synonym: Sulfurous acid, monosodium salt; Sulfurous acid, monosodium salt; Sodium sulhydrate; Sodium hydrogen sulfite; Sodium acid sulfite; Monosodium sulfite; Hydrogen sulfite sodium
Chemical Name: Sodium Bisulfite
Chemical Formula: NaHSO₃

Contact Information:
Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396
US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**
Order Online: ScienceLab.com
CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300
International CHEMTREC, call: 1-703-527-3887
For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium bisulfite	7631-90-5	100

Toxicological Data on Ingredients: Sodium bisulfite: ORAL (LD50): Acute: 2000 mg/kg [Rat]

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:

Slightly hazardous in case of inhalation (lung irritant). CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to lungs, skin. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.

Skin Contact:

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection**Engineering Controls:**

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 5 (mg/m³) from OSHA (PEL) United States Inhalation TWA: 5 (mg/m³) from ACGIH (TLV) United States Inhalation TWA: 5 (mg/m³) United States Inhalation TWA: 5 (mg/m³) United Kingdom (UK) Inhalation TWA: 5 (mg/m³) Canada Inhalation Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Sulfurous. (Slight.)

Taste: Disagreeable.

Molecular Weight: 104.07 g/mole

Color: White. Off-white.

pH (1% solution): Not available.

Boiling Point: Not available.

Melting Point: Decomposes.

Critical Temperature: Not available.

Specific Gravity: 1.48 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:

Easily soluble in hot water. Soluble in cold water. Soluble in 3.5 parts cold water. Soluble in 2 parts boiling water. Soluble in 70 parts alcohol Insoluble in liquid chloride, ammonia.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Slowly oxidized to sulfate on exposure to air.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 2000 mg/kg (Rat)

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: lungs, skin.

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May affect genetic material (mutagenic). May cause cancer based on animal test data. No human data found.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Causes skin irritation. Eyes: Causes eye irritation. Inhalation: Can cause respiratory tract irritation with cough, wheezing, and shortness of breath. It can produce anaphylaxis or other hypersensitivity reactions in some sensitized individuals. Ingestion: May be harmful if swallowed. It may cause nausea, vomiting, diarrhea, abdominal pain, gastric hemorrhage. Extremely large amounts may affect behavior/central nervous system and may produce central nervous system stimulation, irritation, seizures and may also cause, cyanosis, respiratory depression, apnea, circulatory disturbances, hypotension and cardiovascular collapse. May cause asthmatic reaction in sensitized individuals. Chronic Potential Health Effects: Inhalation: Prolonged or repeated inhalation may cause bronchitis to develop with cough, phlegm, and/or shortness of breath. It can cause an asthma-like allergy or other hypersensitivity reactions such as anaphylaxis, angioedema, bronchoconstriction, flushing, diaphoresis, urticaria, tachycardia, and hypotension in sensitized individuals. Future exposures may cause shortness of breath, wheezing, cough, and or chest tightness. Skin: Prolonged or repeated skin contact can cause dermatitis. Ingestion: Prolonged or repeated ingestion may affect the liver, and blood

Section 12: Ecological Information

Ecotoxicity: Not available.

Biodegradability and Persistence: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of iodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:

Connecticut hazardous material survey.: Sodium bisulfite Illinois toxic substances disclosure to employee act: Sodium bisulfite Illinois chemical safety act: Sodium bisulfite New York release reporting list: Sodium bisulfite Pennsylvania RTK: Sodium bisulfite Minnesota: Sodium bisulfite Massachusetts RTK: Sodium bisulfite Massachusetts spill list: Sodium bisulfite New Jersey: Sodium bisulfite New Jersey spill list: Sodium bisulfite Louisiana spill reporting: Sodium bisulfite California Director's List of Hazardous Substances: Sodium bisulfite TSCA 8(b) inventory: Sodium bisulfite TSCA 8(a) PAIR: Sodium bisulfite TSCA 8(d) H and S data reporting: Sodium bisulfite: Effective date: 1/26/94; Sunset date: 6/30/98 CERCLA: Hazardous substances.: Sodium bisulfite: 5000 lbs. (2268 kg)

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):

R22- Harmful if swallowed. R31- Contact with acids liberates toxic gas. S25- Avoid contact with eyes. S46- If swallowed, seek medical advice immediately and show this container or label.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/11/2005 12:32 PM

Last updated: 11/01/2010 12:00 PM

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Material Safety Data Sheet

1 - Chemical Product and Company Identification

Manufacturer: WD-40 Company Address: 1061 Cudahy Place (92110) P.O. Box 80607 San Diego, California, USA 92138 -0607	Chemical Name: Organic Mixture Trade Name: WD-40 Aerosol
Telephone: Emergency only: 1-888-324-7596 (PR/SAR) Information: 1-888-324-7596 Chemical Spills: 1-800-424-9300 (Chemtrec) 1-703-527-3887 (International Calls)	Product Use: Lubricant, Penetrant, Dries Out Moisture, Removes and Protects Surfaces From Corrosion MSDS Date of Preparation: 3/11/10

2 - Hazards Identification

Emergency Overview: DANGER: Flammable aerosol. Contents under pressure. Harmful or fatal if swallowed. If swallowed, may be aspirated and cause lung damage. May cause eye irritation. Avoid eye contact. Use with adequate ventilation. Keep away from heat, sparks and all other sources of ignition.
Symptoms of Overexposure: Inhalation: High concentrations may cause nasal and respiratory irritation and central nervous system effects such as headache, dizziness and nausea. Intentional abuse may be harmful or fatal. Skin Contact: Prolonged and/or repeated contact may produce mild irritation and defatting with possible dermatitis. Eye Contact: Contact may be irritating to eyes. May cause redness and tearing. Ingestion: This product has low oral toxicity. Swallowing may cause gastrointestinal irritation, nausea, vomiting and diarrhea. This product is an aspiration hazard. If swallowed, can enter the lungs and may cause chemical pneumonitis, severe lung damage and death. Chronic Effects: None expected. Medical Conditions Aggravated by Exposure: Preexisting eye, skin and respiratory conditions may be aggravated by exposure.
Suspected Cancer Agent: Yes No X

3 - Composition/Information on Ingredients

Ingredient	CAS #	Weight Percent
Aliphatic Hydrocarbon	64742-47-8	45-50
Petroleum Base Oil	64742-58-1 64742-53-6 64742-56-9 64742-65-0	25
LVP Aliphatic Hydrocarbon	64742-47-8	12-18
Carbon Dioxide	124-38-9	2-3
Surfactant	Proprietary	2
Non-Hazardous Ingredients	Mixture	10

4 - First Aid Measures

Ingestion (Swallowed): Aspiration Hazard. DO NOT induce vomiting. Call physician, poison control center or the WD-40 Safety Hotline at 1-888-324-7596 immediately. Eye Contact: Flush thoroughly with water. Remove contact lenses if present after the first 5 minutes and continue flushing for several more minutes. Get medical attention if irritation persists.
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Skin Contact: Wash with soap and water. If irritation develops and persists, get medical attention. Inhalation (Breathing): If irritation is experienced, move to fresh air. Get medical attention if irritation or other symptoms develop and persist.
--

5 - Fire Fighting Measures

Extinguishing Media: Use water fog, dry chemical, carbon dioxide or foam. Do not use water jet or flooding amounts of water. Burning product will float on the surface and spread fire. Special Fire Fighting Procedures: Firefighters should always wear positive pressure self-contained breathing apparatus and full protective clothing. Cool fire-exposed containers with water. Use shielding to protect against bursting containers. Unusual Fire and Explosion Hazards: Contents under pressure. Keep away from ignition sources and open flames. Exposure of containers to extreme heat and flames can cause them to rupture often with violent force. Vapors are heavier than air and may travel along surfaces to remote ignition sources and flash back.

6 - Accidental Release Measures

Wear appropriate protective clothing (see Section 8). Eliminate all sources of ignition and ventilate area. Leaking cans should be placed in a plastic bag or open pail until the pressure has dissipated. Contain and collect liquid with an inert absorbent and place in a container for disposal. Clean spill area thoroughly. Report spills to authorities as required.

7 - Handling and Storage

Handling: Avoid contact with eyes. Avoid prolonged contact with skin. Avoid breathing vapors or aerosols. Use only with adequate ventilation. Keep away from heat, sparks, pilot lights, hot surfaces and open flames. Unplug electrical tools, motors and appliances before spraying or bringing the can near any source of electricity. Electricity can burn a hole in the can and cause contents to burst into flames. To avoid serious burn injury, do not let the can touch battery terminals, electrical connections on motors or appliances or any other source of electricity. Wash thoroughly with soap and water after handling. Keep containers closed when not in use. Keep out of the reach of children. Do not puncture, crush or incinerate containers, even when empty. Storage: Store in a cool, well-ventilated area, away from incompatible materials Do not store above 120°F or in direct sunlight. U.F.C (NFPA 30B) Level 3 Aerosol.

8 - Exposure Controls/Personal Protection

Chemical	Occupational Exposure Limits
Aliphatic Hydrocarbon	1200 mg/m ³ TWA (manufacturer recommended)
Petroleum Base Oil	5 mg/m ³ TWA, 10 mg/m ³ STEL ACGIH TLV 5 mg/m ³ TWA OSHA PEL
LVP Aliphatic Hydrocarbon	1200 mg/m ³ TWA (manufacturer recommended)
Carbon Dioxide	5000 ppm TWA (OSHA/ACGIH), 30,000 ppm STEL (ACGIH)
Surfactant	None Established
Non-Hazardous Ingredients	None Established

The Following Controls are Recommended for Normal Consumer Use of this Product Engineering Controls: Use in a well-ventilated area. Personal Protection: Eye Protection: Avoid eye contact. Always spray away from your face. Skin Protection: Avoid prolonged skin contact. Chemical resistant gloves recommended for operations where skin contact is likely. Respiratory Protection: None needed for normal use with adequate ventilation.
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For Bulk Processing or Workplace Use the Following Controls are Recommended Engineering Controls: Use adequate general and local exhaust ventilation to maintain exposure levels below that occupational exposure limits.
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Personal Protection:
Eye Protection: Safety goggles recommended where eye contact is possible.
Skin Protection: Wear chemical resistant gloves.
Respiratory Protection: None required if ventilation is adequate. If the occupational exposure limits are exceeded, wear a NIOSH approved respirator. Respirator selection and use should be based on contaminant type, form and concentration. Follow OSHA 1910.134, ANSI Z88.2 and good Industrial Hygiene practice.
Work/Hygiene Practices: Wash with soap and water after handling.

9 – Physical and Chemical Properties

Boiling Point:	361 - 369°F (183 - 187 °C)	Specific Gravity:	0.8 – 0.82 @ 60°F
Solubility in Water:	Insoluble	pH:	Not Applicable
Vapor Pressure:	95-115 PSI @ 70°F	Vapor Density:	Greater than 1
Percent Volatile:	70-75%	VOC:	412 grams/liter (49.5%)
Coefficient of Water:Oil Distribution:	Not Determined	Appearance/Odor	Light amber liquid/mild odor
Flash Point:	122°F (49 °C) Tag Open Cup (concentrate)	Flammable Limits: (Solvent Portion)	LEL: 0.6% UEL: 8.0%
Pour Point:	-63°C (-81.4°F) ASTM D-97	Kinematic Viscosity:	2.79-2.96cSt @ 100°F

10 – Stability and Reactivity

Stability: Stable
Hazardous Polymerization: Will not occur.
Conditions to Avoid: Avoid heat, sparks, flames and other sources of ignition. Do not puncture or incinerate containers.
Incompatibilities: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide and carbon dioxide.

11 – Toxicological Information

The oral toxicity of this product is estimated to be greater than 5,000 mg/kg based on an assessment of the ingredients. This product is not classified as toxic by established criteria. It is an aspiration hazard. None of the components of this product is listed as a carcinogen or suspected carcinogen or is considered a reproductive hazard.

12 – Ecological Information

No data is currently available.

13 - Disposal Considerations

If this product becomes a waste, it would be expected to meet the criteria of a RCRA ignitable hazardous waste (D001). However, it is the responsibility of the generator to determine at the time of disposal the proper classification and method of disposal. Dispose in accordance with federal, state, and local regulations.

14 – Transportation Information

DOT Surface Shipping Description: Consumer Commodity, ORM-D
 IMDG Shipping Description: Un1950, Aerosols, 2.1, LTD TYPE

15 – Regulatory Information

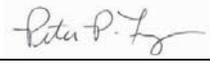
U.S. Federal Regulations:

□□□□□□

CERCLA 103 Reportable Quantity: This product is not subject to CERCLA reporting requirements, however, oil spills are reportable to the National Response Center under the Clean Water Act and many states have more stringent release reporting requirements. Report spills required under federal, state and local regulations.
SARA TITLE III:
Hazard Category For Section 311/312: Acute Health, Fire Hazard, Sudden Release of Pressure
Section 313 Toxic Chemicals: This product contains the following chemicals subject to SARA Title III Section 313 Reporting requirements: None
 Section 302 Extremely Hazardous Substances (TEHS): None
EPA Toxic Substances Control Act (TSCA) Status: All of the components of this product are listed on the TSCA inventory.
California Safe Drinking Water and Toxic Enforcement Act (Proposition 65): This product does not contain chemicals regulated under California Proposition 65.
VOC Regulations: This product complies with the consumer product VOC limits of CARB, the US EPA and states adopting the OTC VOC rules.
Canadian Environmental Protection Act: One of the components is listed on the NDSL. All of the other ingredients are listed on the Canadian Domestic Substances List or exempt from notification.
Canadian WHMIS Classification: Class B-5 (Flammable Aerosol)
 This MSDS has been prepared according to the criteria of the Controlled Products Regulation (CPR) and the MSDS contains all of the information required by the CPR.

16 – Other Information:

HMIS Hazard Rating:
Health – 1 (slight hazard), Fire Hazard – 4 (severe hazard), Reactivity – 0 (minimal hazard)

SIGNATURE:  TITLE: Director of Global Quality Assurance
 REVISION DATE: March 2010 SUPERSEDES: August 2009

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Attachment F
Behavior Based Safety Checklist
(Also included in CD)



**Health, Safety and Environment
BEHAVIOR BASED SAFETY
CHECKLIST**

Attachment 072-1 NA

Issue Date: September 2003
Revision 2: February 2009

Job Location: _____

Date: _____

Task/Work _____

Observer: _____

Observed: _____

	<u>Safe</u>	<u>Unsafe</u>	<u>Comments *</u>
Personal Protective Equipment			
Head	<input type="checkbox"/>	<input type="checkbox"/>	_____
Hand	<input type="checkbox"/>	<input type="checkbox"/>	_____
Feet	<input type="checkbox"/>	<input type="checkbox"/>	_____
Eyes/Face	<input type="checkbox"/>	<input type="checkbox"/>	_____
Skin	<input type="checkbox"/>	<input type="checkbox"/>	_____
Hearing	<input type="checkbox"/>	<input type="checkbox"/>	_____
Fall Protection	<input type="checkbox"/>	<input type="checkbox"/>	_____
Equipment / Tools			
Proper tool for the job	<input type="checkbox"/>	<input type="checkbox"/>	_____
Condition	<input type="checkbox"/>	<input type="checkbox"/>	_____
Proper Use	<input type="checkbox"/>	<input type="checkbox"/>	_____
Body Use / Position			
Lifting	<input type="checkbox"/>	<input type="checkbox"/>	_____
Pinch Point	<input type="checkbox"/>	<input type="checkbox"/>	_____
Ladder / stairs	<input type="checkbox"/>	<input type="checkbox"/>	_____
Hand placement	<input type="checkbox"/>	<input type="checkbox"/>	_____
Travel path / speed	<input type="checkbox"/>	<input type="checkbox"/>	_____
Body position	<input type="checkbox"/>	<input type="checkbox"/>	_____
Work Practices			
Follow Safety Plan / Procedures	<input type="checkbox"/>	<input type="checkbox"/>	_____
Housekeeping	<input type="checkbox"/>	<input type="checkbox"/>	_____
Other			
_____	<input type="checkbox"/>	<input type="checkbox"/>	_____
_____	<input type="checkbox"/>	<input type="checkbox"/>	_____
_____	<input type="checkbox"/>	<input type="checkbox"/>	_____

* Use comment column when unsafe behavior / conditions were observed. Describe what was observed and why this occurred.

Attachment G

AECOM Safety Management Standards (SMS)

(Also included in CD)

URS SAFETY MANAGEMENT STANDARD

Inspections by Regulatory Agencies

1. Applicability

This standard applies to the operations of URS Corporation and its subsidiary companies.

2. Purpose and Scope

Representatives of regulatory agencies may have statutory authority to evaluate URS operations for compliance with health, safety, and environmental regulations. URS personnel are to cooperate with all such inspections. This standard provides guidelines for responding to the inspector and for documenting inspection activities.

Once an agency enforcement action (e.g., Notice of non-compliance, notice of violation, citation, notice of employee complaint) is received, URS Legal must be contacted immediately. URS Safety and URS Legal will work together when addressing the allegations. Regulatory citations have the potential to impact the entire Company, not just the local operation. These potential impacts include "repeat", "serious", or "willful" violations because of multiple sites and multiple citations and compromised ability to compete for work in all divisions of the Company.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility, site, or project location.

4. Requirements

A. Obtain Positive Identification

Request formal identification (photo identification card) from any regulatory agency representative. Confirm with the agency if there is any question regarding the identity of the individual (independently obtain the agency's number; do not use a number provided by the representative); explain to the representative that this is a precautionary security measure. Obtain a business card from the inspector for URS records.

B. Warrants

An outside agency is not required to obtain a warrant prior to an inspection. Before a URS location requires an outside agency to obtain a warrant for an inspection, the site manager or safety manager shall

URS SAFETY MANAGEMENT STANDARD

Inspections by Regulatory Agencies

consult with the Regional Safety Manager/Director and legal for authorization to deny access to the agency.

C. Safety Notification

Contact the local safety representative and/or applicable safety manager immediately upon confirming the identification of the representative. If the representative is from an Environmental/Public Health agency, also contact the local environmental group leader and Office Manager.

D. Opening Conference

1. Request an opening conference if one is not initiated by the inspector.
2. Introduce members of the management team.
3. Use the opening conference to determine the reason for and type of inspection. If the inspection is the result of a formal complaint, ask for a copy (the name of the employee may be withheld).
4. Determine the intended scope and duration of the inspection. If the inspection will be lengthy, provide office space, equipment, and clerical support for the inspection team (as available).
5. Work with the inspector to determine the following: inclusion of representatives of other employers on site, inclusion of representatives of employees, and the number of inspection teams to be used.
6. Ensure that each inspector or inspection team is accompanied by a management team representative at all times.
7. Establish a method of document production. It is preferable that requests for documents be in writing and be presented to a document controller, who will screen them for privileges that require withholding (e.g., attorney-client privileged) or determine if the regulatory agency must give them special handling (e.g., trade secret or business confidential information). A log should be kept of all documentation provided to the inspector.
8. Work with the inspector to agree that any photos he/she produces will be shared with URS and screened prior to the inspector departing the site for trade secrets or business confidential information.

URS SAFETY MANAGEMENT STANDARD

Inspections by Regulatory Agencies

9. Determine if the inspector will be using videotape or digital video. Negotiate use of the video in the same manner as photographs.
10. Determine if any industrial hygiene sampling or other monitoring will be completed. Arrange for side-by-side testing. Note that inspectors will usually provide 24-hour advance notice regarding sampling or monitoring activities during an inspection.
11. Establish a procedure for conducting employee interviews.
12. Take detailed meeting notes during the conference.

E. Inspection Activities

1. Escort the inspector at all times, taking him/her *directly* to the area of interest. Select inspection routes that will take the inspectors past as few work areas as possible.
2. Answer all questions honestly, but do not volunteer information. Be courteous and business-like.
3. Do not argue with or attempt to mislead the inspector.
4. Resolve conditions while the representative is on site, if possible.
5. Make sure the inspector has appropriate qualifications to enter high hazard areas.
6. Take detailed notes during the inspection (e.g., what areas were inspected, what equipment was inspected, which employees were interviewed, questions and remarks made by the inspector, photos and videos taken by the inspector and duplicated by management).
7. Replicate or share any pictures or video the inspector takes.
8. Duplicate any monitoring or industrial hygiene sampling.
9. Inspectors generally have the right to interview employees if they do not interrupt operations. Employees do have the right to refuse to be interviewed. Employees may also request a union or management representative be present during the interview.
10. If the inspection is lengthy, arrange a daily end-of-day meeting to determine the next day's events, employee interviews to schedule, and industrial hygiene or monitoring equipment to have ready (if

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Inspections by Regulatory Agencies

any). Review any concerns they have as a result of the day's inspection activities.

11. If the inspection is lengthy, debrief the walk-around team members on a daily basis.

F. Closing Conference

1. Request a closing conference if one is not initiated by the inspector.
2. Use the closing conference to determine what regulatory violations the representative found, if any. This is also the opportunity to correct any errors and misunderstandings before any citation is closed.
3. Ask the inspector to specify any citations that will probably be issued and how the violations will be characterized.
4. Do not try to negotiate during the closing conference, and guard against damaging admissions.
5. Take detailed meeting notes during the conference.

G. Post-Inspection Activities

1. Immediately contact the appropriate safety manager and communicate the results of the inspection. The safety manager will provide additional instructions regarding the inspection.
2. All follow-up activities associated with the inspection will be coordinated by the safety manager, the Vice President of Safety (or designee), and appropriate Legal Counsel. Local URS employees are not to conduct any follow-up activities without the express consent of the Vice President of Safety (or designee).

5. Documentation Summary

Provide the following documents to the Vice President of Safety (or designee):

- A. Inspector's business card
- B. All materials provided to or from the inspector
- C. All meeting notes relating to the inspection, opening conference, closing conference, and debriefings

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Inspections by Regulatory Agencies

D. All photos and/or video from the inspection, with explanatory notes

6. Resources

A. U.S. Occupational Safety and Health Administration (OSHA) – [Field Inspection Reference Manual](#) -
http://www.osha.gov/OshDoc/Directive_pdf/CPL_02-00-150.pdf

URS SAFETY MANAGEMENT STANDARD

Hazard Communication (Worker Right-to-Know)

1. Applicability

This standard applies to the operations of URS Corporation and its subsidiary companies.

This standard is not applicable to chemical laboratory operations that are covered under 29 Code of Federal Regulations (CFR) 1910.1450 (Occupational Exposure to Chemicals in Laboratories).

2. Purpose and Scope

The purpose of this Hazard Communication standard (also known as worker right-to-know program) is to provide URS personnel with information and training about safety and health hazards associated with the chemicals they may encounter in the workplace. This procedure describes how chemical safety hazards are communicated to URS personnel and how information is to be provided to employees of other companies working at the location. The requirements include steps to acquire this information, maintain the information, and train personnel in the hazard communication program.

3. Implementation

Implementation of this standard is the responsibility of the URS manager who directs activities at the facility, site, or project location. For office locations and large projects, this program may be incorporated into the general site orientation and training program or administered by project management.

Note: Manufacturers are permitted to ship chemicals under existing classification systems until December of 2015. As such, many of the requirements listed here may be gradually phased in by the manufacturers until that time. Where noted within the SMS, deviations from the existing procedure are allowed until December 2015 or until otherwise noted by URS.

4. Requirements

A. Hazardous Material Inventory

Maintain a hazardous material inventory that lists all of the hazardous materials used at each workplace (i.e., office, field location). Use chemical identifiers consistent with and referenced on the applicable safety data sheet (SDS). (Note that the terms material safety data sheet (MSDS) and SDS may be used interchangeably until December 2015.)

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Hazard Communication (Worker Right-to-Know)

B. Site-Specific Written Program

A site-specific written program may be prepared as a stand-alone document or included within a site-specific health and safety plan. The program must cover hazardous materials in all physical forms (liquids, solids, gases, vapors, fumes, and mists), regardless of whether they are “contained.”

C. Safety Data Sheets (SDSs)

1. The safety representative will obtain an SDS for each chemical before it is used. SDSs will generally be received by the person ordering the product. SDSs for products frequently used should be kept on file because additional copies may not be included in repeat shipments.
2. The safety representative will review each SDS when it is received to evaluate whether the information is complete and to determine whether existing protective measures are adequate.
3. Each office or project location will assign a responsible person or department to maintain a collection of all applicable and relevant SDSs in an area that is accessible by all employees at all times. An electronic database is an acceptable method of maintaining the SDSs.
4. The assigned person or department will replace SDSs when updated sheets are received and will communicate any significant changes to those who work with the chemical.
5. SDSs are required for all hazardous materials brought on site by project personnel.
6. General consumer products to be used for their specific purpose, as well as food, drugs, cosmetics, and tobacco products brought into the workplace for employee consumption, are exempt, as are supplies in the first aid kit, such as isopropyl alcohol and antibacterial wipes.
7. Subcontractors bringing hazardous materials onto a site or project must submit SDSs to the safety representative. The safety representative may restrict the use of certain hazardous materials on a site or project due to occupational health risk, hazardous

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Hazard Communication (Worker Right-to-Know)

physical properties of the material, or potential employee sensitivity to odor or irritating properties of the material.

D. Labels

Unless each container has appropriate labeling, label all chemical containers with the following information:

1. Product identifiers (codes or product names matching those on the SDS).
2. Signal word (key words used to emphasize hazards and indicate the relative severity of the hazard).
3. Appropriate hazard statements (standard phrases assigned to a hazard class and category which describe the nature of the hazard).
4. Pictograms (graphic elements intended to convey specific information about the hazard).
5. Precautionary statements (supplement the hazard statements by briefly providing measures to be taken to minimize or prevent adverse effects from the hazard).
6. Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party.

Labels on incoming containers of hazardous materials will not be removed or defaced.

Labels are also required when a hazardous substance is transferred from a primary container to a secondary container. Labels on secondary containers must indicate the product identifier, as well as words, pictures, or symbols, or combination thereof, which will provide general information about the hazards of the chemical, including the physical and health hazards.

Note that until December 2015, manufacturers will be in a transitional period as they gradually meet the requirements of the Globally Harmonized System of Classification and Labeling of Chemicals (GHS). As such, the labels on incoming containers from the manufacturer are only required to indicate product names and identities of the hazardous chemicals, appropriate hazard warnings, and the name and address of the manufacturer, importer, or other responsible party, rather than the items

URS SAFETY MANAGEMENT STANDARD
Hazard Communication (Worker Right-to-Know)

listed above in D.1 through D.6. Labels may incorporate words, pictures, symbols, or combinations thereof to ensure the appropriate information is provided to the end user. Examples of acceptable labeling systems include the National Fire Protection Association (NFPA) Diamond, the Hazardous Materials Identification System (HMIS), the Chemical Hazard Identification and Training (CHIT) system, or similar.

E. Hazardous Non-routine Tasks

Periodically, employees are required to perform hazardous non-routine tasks. Prior to starting work on such projects, each employee must be provided with information about hazards to which they may be exposed, as follows:

1. Specific chemical and physical hazards.
2. Protective/safety measures that must be taken.
3. Measures that have been taken to lessen the hazards, including ventilation, respirators, presence of another employee, and emergency procedures.

F. Informing Contractors/Subcontractors

Provide other contractors/subcontractors working in the same area with the following information on chemicals used by or provided to URS personnel:

1. Identification of hazardous chemicals to which they may be exposed while on the jobsite.
2. Precautionary measures the contractors/subcontractors need to take to protect their employees during both normal operating conditions and foreseeable emergencies.
3. Location of SDSs.
4. Applicable labeling systems in use in the workplace.

G. Training

1. Provide training to all employees who have the potential to be exposed to hazardous materials, on the following schedule:
 - a. At the time of the initial task assignment,

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Hazard Communication (Worker Right-to-Know)

- b. Whenever new chemicals are introduced into the workplace,
or
 - c. More frequently where required by site-specific conditions or
client-specific requirements.
2. This training will include the following:
- a. Applicable regulatory requirements.
 - b. Any operations in the work area where hazardous chemicals
are present.
 - c. Location of the program, inventory, and SDS.
 - d. Site-specific chemicals used and their hazards (chemical,
physical, and health), including:
 - 1. General characteristics of chemicals
 - 2. Signs and symptoms of exposure
 - e. How to detect the presence or release of chemicals including
the location, types, and usage of any portable and fixed
monitoring or detection equipment and their associated
alarms, where applicable.
 - f. Safe work practices and methods employees can take to
protect themselves from chemical hazards, including work
practices, emergency procedures, and the use of personal
protective equipment.
 - g. How to read an SDS.
 - h. Site- or project-specific information on hazard warnings and
labels in use at the location, if applicable.
 - i. Site-specific evacuation and rescue procedures in the event
of chemical release, including the location of staging areas
and personnel accounting procedures.
3. Document the training.
4. Arrange provisions for training in the language of the user.
International Chemical Safety Cards (see Section 6, ILO) may be

URS SAFETY MANAGEMENT STANDARD

Hazard Communication (Worker Right-to-Know)

used in conjunction with SDS information to provide non-English-language information. SDSs are required to be on site, but there is no requirement for the SDSs to be in a language other than English.

5. Documentation Summary

The following documentation will be maintained in the project file:

- A. Hazardous Material Inventory.
- B. SDSs.
- C. Training records.
- D. Contractor/Subcontractor notifications.

6. Resources

- A. U.S. Occupational Safety and Health Administration (OSHA) General Industry Standards – Hazard Communication – 29 Code of Federal Regulations (CFR) [1910.1200](#)
- B. U.S. OSHA Construction Standards – Hazard Communication – [29 CFR 1926.59](#)
- C. Mine Safety and Health Administration – Hazard Communication – [30 CFR 47](#)
- D. OSHA Administration Technical Links – <http://www.osha.gov/dsg/hazcom/index.html>
- E. International Labour Organization (ILO) – International Chemical Safety Cards (information about 1613 chemicals in 18 languages). <http://www.ilo.org/public/english/protection/safework/cis/products/icsc/index.htm>
- F. Agency for Toxic Substances and Disease Registry (ATSDR) – Tox FAQs and Tox FAQs en Espanol, 2003. <http://www.atsdr.cdc.gov/toxfaqs/index.asp>
- G. United Nations – Globally Harmonized System of Classification and Labeling of Chemicals (GHS). http://www.unece.org/trans/danger/publi/ghs/ghs_rev04/04files_e.html

URS SAFETY MANAGEMENT STANDARD
Hazard Communication (Worker Right-to-Know)

7. Supplemental Information

- A. [Hazard Communication Program – Template](#)
- B. [Hazard Communication Employee Training Program](#)



HAZARD COMMUNICATION PROGRAM

Table of Contents

- A. Purpose
- B. Identification of Hazardous Substances
- C. Container Labeling
- D. Safety Data Sheets (SDS)
- E. Employee Training and Information
- F. Non-Routine Task Training
- G. Access to Information by Other Employees

Appendices

- I. Hazard Communication Checklist
- II. Potentially Hazardous Substances
- III. List of Jobsite Hazardous Substances
- IV. Sample Letter to Suppliers to Obtain SDS

A. PURPOSE

A-1 To protect the health and safety of our employees, URS Corporation has developed this Hazard Communication program.

1. As an organization we intend to provide information about chemical hazards and other hazardous substances, and the control of hazards via our comprehensive Hazard Communication Program, which includes container labeling, Safety Data Sheets (SDS), and training.
2. This written Hazard Communication Program applies to all operations that MAY expose employees to hazardous substances because of normal work conditions (including non-routine tasks) or as the result of a reasonably foreseeable emergency.
3. This written Hazard Communication Program is available, upon request, to employees, their designated representatives and to appropriate representatives of state and/or federal safety and health agencies.

A-2 Scope

This program is part of URS Corporation's comprehensive health and safety program and shall be applied in conjunction with that overall program.

A-3 Responsibilities

1. The Project Manager is responsible for implementing and ensuring compliance with this written hazard communication program. The Hazard Communication checklist found in Appendix I is provided to assist the Project Manager in carrying out this responsibility.
2. The designated Project Safety Representative is responsible for coordinating and administering the program, in developing and assisting in the presentation of training materials and in providing technical assistance to project supervision.
3. Each Project Supervisor shall become familiar with the hazard communication procedures and shall supervise the application of these procedures to tasks for which they are responsible.
4. The Safety Manager is the designated safety professional for the project or office location and is responsible for providing technical assistance to the Project Supervisor or Safety Representative to implement the hazard communication program.

B. IDENTIFICATION OF HAZARDOUS SUBSTANCES

- B-1 “Hazardous Substances” are materials or mixtures that are or have physical or health hazards (See Appendix II for examples of potentially hazardous materials).
- B-2 “Exposure” is any situation arising from work conditions where an employee may ingest, inhale, absorb or otherwise come in contact with a hazardous substance.
- B-3 An inventory of all hazardous substances to which employees may be exposed on this jobsite, as well as an accompanying SDS, shall be maintained in the project office (see Appendix III).

C. CONTAINER LABELING

- C-1 When hazardous substances are received, the Project Safety Representative shall examine the containers to determine if the labels provide the following information (primary containers):
1. A product identifier;
 2. Signal words;
 3. Appropriate hazard statements;
 4. Pictograms;
 5. Precautionary statements; and
 3. The name, address, and telephone number of the chemical manufacturer, importer, or other responsible party.
- C-2 When hazardous substances are transferred into portable or secondary containers, the responsible Project Supervisor shall ensure that these containers are labeled with an extra copy of the manufacturer’s label or with a printed label that includes the information above.

EXCEPTION: When an employee transfers a hazardous substance into a portable container for his/her own immediate use, the portable container need not be labeled.

- C-3 Each Project Supervisor shall ensure that the labels on containers of hazardous substances are not removed or defaced, unless the containers are immediately relabeled with the information in C-1 above. The labels shall be written legibly in English. However, for non-English speaking employees information may be presented in their native language as well.

- C-4 Containers without complete labels or with defaced labels will not be used on the job.
- C-5 The Project Supervisor or Safety Representative shall review the jobsite labeling procedure at least quarterly and update as required.

D. SAFETY DATA SHEETS (SDS)

- D-1 Safety Data Sheets (SDSs) are documents that supply information about a particular hazardous substance or mixture. Manufacturers are required to provide SDSs when the hazardous substances are sold to distributors or purchasers. In most cases, SDSs are sent to the purchaser of the project (e.g., the procurement department or Project Supervisor), not the safety department.
- D-2 The Safety Manager / Project Safety Representative or Project Supervisor in coordination with the purchasing agent or project business manager, will be responsible for obtaining and maintaining the master sets of SDSs and other information on all hazardous substances used (see sample letter in Appendix IV).
- D-3 The Project Safety Representative will review SDSs for completeness. If an SDS is missing or obviously incomplete, a new SDS will be requested from the manufacturer. In some cases, SDSs may be obtained on-line through the manufacturer's web site. The Project Safety Representative should review products for highly toxic or dangerous constituents prior to use and consult with the Safety Manager for any items considered hazardous or toxic.
- D-4 SDSs are available to all employees in their work area for review during each work shift. If SDSs are not available or new hazardous substance(s) in use do not have SDSs, contact the Project Safety Representative immediately. Additional information such as chemical safety cards and the NIOSH Pocket Guide to Chemical Hazards may be used for additional information.
- D-5 Project Supervisors shall be alert to other employees (such as subcontractors) whose work on the jobsite may expose employees to additional hazardous substances. When it appears such exposure will occur, SDSs for the substances must be obtained.
- D-6 When doing renovation or remodeling work, the Project Supervisor shall coordinate SDSs of hazardous materials used by contractors. Contractors bringing hazardous materials on to a site or project must submit SDSs to the Project Supervisor. The Project Supervisor should consult with the Safety Manager if there are any questions regarding hazardous constituents of products.

E. EMPLOYEE TRAINING AND INFORMATION**E-1 Initial Orientation**

Before starting work, each new employee must attend a health and safety orientation. URS Corporation's on-line training program on Hazard Communication may be used as a component of the initial training but employees still require site specific information on hazards of chemicals in use, site specific spill and emergency procedures, and site specific labeling systems as described below.

E-2 Training shall be provided before employees are assigned duties that may cause exposure to hazardous substances. Training shall also be given when new hazardous substances are introduced into the work area or when an SDS is changed. In general, this training shall include:

1. Information on which hazardous substances are in the work area.
2. How to read and interpret information on SDSs and labels.
3. Any physical or health hazards associated with the use of a hazardous substance or mixture being used in the work area.
4. Proper precautions for handling hazardous substances, including specific procedures the company has implemented to protect workers from exposure such as personal protective equipment and work practices.
5. Proper procedures for reporting of releases or threatened releases of hazardous substances.
6. Emergency procedures for spills, fires, disposal and first aid.
7. The methods and observations that can be used to detect the presence of a hazardous substance in the work place (odor, visual appearance or monitoring).
8. The right of employees, their physicians or their collective bargaining agents to receive information on hazardous substances to which they may be exposed.
9. The right against discharge or discrimination due to an employee's exercise of the rights afforded by law.
10. The details of this written Hazard Communication Program; the availability and location of this written Hazard Communication Program and of SDSs or other information.

E-3 Hazard communication training must be documented.

E-4 Additional training shall be provided as needed during the weekly safety and health training ("toolbox") meetings in order to emphasize the safe handling, use and storage of onsite hazardous substances.

F. NON-ROUTINE TASK TRAINING

- F-1 When employees are assigned to a non-routine task that may expose them to a hazardous substance for which they have not been trained, they shall be trained in the manner required by Section E.
- F-2 Some examples of non-routine tasks are:
- Confined space entry.
 - Tank cleaning.
 - Repair of pipes or tanks containing hazardous substances.

Prior to starting work on such projects, each affected employee will be given information about the hazardous substances he or she may encounter during such activity. This information will include specific chemical hazards, protective and safety measures the employee can use, and steps the jobsite is using to reduce the hazards, including ventilation, respirators, presence of another employee and emergency procedures including site specific warnings, evacuation routes, and assembly points.

G. ACCESS TO INFORMATION BY OTHER EMPLOYERS

- G-1 It is the responsibility of the Project Safety Representative or Project Supervisor to provide contractors and subcontractors with information about hazardous chemicals their employees may be exposed to on a jobsite and suggested precautions for the contractor's employees to follow to avoid exposure to hazardous conditions.
- G-2 Contractors and subcontractors on the job site with potential exposure or risk will be contacted before work is started, to gather and distribute information concerning any chemical hazard that they may bring or be exposed to, in areas that are under URS Corporation control.

APPENDIX I**HAZARD COMMUNICATION CHECKLIST**

- _____ 1. Have we prepared a list of all the hazardous substances in our workplace?
- _____ 2. Are we prepared to update our hazardous substance list?
- _____ 3. Have we obtained or developed a safety data sheet for each hazardous substance we use?
- _____ 4. Have we developed a system to ensure that all incoming hazardous substances are checked for proper labels and data sheets?
- _____ 5. Do we have procedures to ensure proper labeling or warning signs for containers that hold hazardous substances?
- _____ 6. Are our employees aware of the specific information and training requirements of the Hazard Communication Standard?
- _____ 7. Are our employees familiar with the different types of chemicals and the hazards associated with them?
- _____ 8. Have our employees been informed of the hazards associated with performing non-routine tasks?
- _____ 9. Do our employees understand how to detect the presence or release of hazardous substances in the workplace?
- _____ 10. Are employees trained about proper work practices and personal protective equipment in relation to the hazardous substances in their work area?
- _____ 11. Does our training program provide information on appropriate first aid, emergency procedures and the likely symptoms of overexposure?
- _____ 12. Does our training program include an explanation of labels and warnings that are used in each work area?
- _____ 13. Does the training describe where to obtain safety data sheets and how employees may use them?
- _____ 14. Have we worked out a system to ensure that new employees are trained before beginning work?
- _____ 15. Have we developed a system to identify new hazardous substances before they are introduced into a work area?
- _____ 16. Do we have a system for informing employees when we learn of new hazards associated with a chemical we use?
- _____ 17. Have the employees been advised of the consequences for failure to follow established procedures?
- _____ 18. Do we have a system to ensure subcontractors are sharing information with one another, concerning the hazardous substances they have brought to the site?

APPENDIX II**EXAMPLES OF POTENTIALLY HAZARDOUS MATERIALS THAT MAY BE
FOUND ON URS CORPORATION CONSTRUCTION/GENERAL INDUSTRY
PROJECTS**

Acetone	Kerosene
Acetylene gas	Lead
Adhesives	Lime (calcium oxide)
Aluminum etching agent	Limestone
Ammonia	Lubricating oils
Anti-freeze	Lye (sodium hydroxide, potassium hydroxide)
Arsenic compounds	Magnesium
Asbestos	Metals (aluminum, nickel, copper, zinc, cadmium, iron, etc.)
Asphalt (Petroleum) fumes	Methanol (methyl alcohol)
Battery Fluids	Methyl ethyl ketone (2-butanone)
Benzene (and derivatives)	Motor oil additives
Bleaching agents	Muriatic acid (hydrochloric acid)
Carbon black	Naptha (coal tar)
Carbon monoxide (in cylinders)	Nitroglycerin
Caulking, sealant agents	Oxalic acid
Caustic soda (sodium hydroxide)	Ozone
Chromate salts	Paint remover
Chromium	Paint stripper
Cleaners	Paints/lacquers
Cleaning agents	Particle board
Coal tar pitch	Pentachlorophenol
Coal tar epoxy	Pesticides
Coatings	Photographic developers and fixers
Cobalt	Photogravure ink (copy machine)
Concrete curing compounds	Plastics
Creosol	Polishes for metal floors
Cutting oil (oil mist)	Propanol
De-emulsifier for oil	Putty Resins, epoxy/synthetics
Diesel gas, diesel oil	Sealers
Drywall	Shellac
Dusts (brick, cement block)	Solder, flux (zinc chloride, fluorides, etc.)
Enamel	Solder, soft (lead, tin)
Etching agents	Solvents
Ethyl alcohol	Sulfuric acid
Fiberglass, mineral wool	Thinner, paint/lacquer
Foam insulation	Tin
Freon 20, R20 (and others)	Transite
Gasoline (petrol, ethyl)	Turpentine, gum spirit, oil of turpentine
Glues	Varnishes
Graphite	Waterproofing agents
Greases	Waxes
Helium (in cylinders)	Welding Rods
Hydraulic brake fluid	Wood alcohol (methanol)
Hydrochloric acid	Wood preservative
Hydrogen (in cylinders)	Xylene
Inks	Zinc
Insulations	
Iron	

	<p style="text-align: center;">Health, Safety and Environment HAZARD COMMUNICATION PROGRAM - TEMPLATE</p>	<p style="text-align: right;">SMS 002 NA Supplemental Information A Issue Date: February 2009 Revision 3: September 2012</p>
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APPENDIX III

LIST OF PROJECT SPECIFIC HAZARDOUS SUBSTANCES

On the following page(s) is a current list of the specific hazardous substances, along with the manufacturer's product identifier, known to be present at this jobsite.

This list uses the product identifier referenced on the SDS. Specific information on each substance may be found on the SDSs located in the project office.

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APPENDIX IV

(PROJECT LETTERHEAD)

Date

Product Manufacturer's (Importer/Distributor/Responsible Party) Name
Product Manufacturer's (Importer/Distributor/Responsible Party) Address

Subject: Safety Data Sheet Requisition

Dear Manufacturer (Importer/Distributor/Responsible Party):

Please provide the following safety data sheet(s):

Thank you for your support and assistance in this matter.

Sincerely,

Requestor's Name
Requestor's Address

This document presents information that can be used for hazard communication training.

This information has been developed based on groups (types) of hazardous substance(s) used and the common hazards associated with them.

For specific hazard information on each brand of material the Safety Data Sheets (SDS) must be reviewed.

OVERVIEW OF THE HAZARD COMMUNICATION REGULATION

The Hazard Communication Regulation is intended to ensure that both employers and employees are aware of the dangers associated with hazardous substances in their workplaces. The following information is a review of the specific requirements of a hazard communication program, including container labeling, SDS and training.

WRITTEN HAZARD COMMUNICATION PROGRAM

We have a written program that outlines how we will provide information and control your exposure to hazardous substances. This plan is available for your review during our training and at the project office for review during your work shift.

HAZARDOUS SUBSTANCES USED IN OUR WORKPLACE

On this job, we use a variety of products. Many of these products contain one or more hazardous substances. Let's review the hazardous substance inventory in your work area.

READING LABELS AND SDS

LABELS: A product label on both the original and secondary containers should be reviewed prior to working with the material. Each label will have several important pieces of information you should be familiar with:

1. Product identifier (codes or product names matching those on the SDS).
2. Signal word (key words used to emphasize hazards and indicate the relative severity of the hazard).
3. Appropriate hazard statements (standard phrases assigned to a hazard class and category which describe the nature of the hazard).
4. Pictograms (graphic elements intended to convey specific information about the hazard).
5. Precautionary statements (supplement the hazard statements by briefly providing measures to be taken to minimize or prevent adverse effects from the hazard).

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6. Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party.

The label should act as a visual reminder of the information we have presented in this training session and of the information found in more detail on the SDS. It is essential for your safety that you read the label only use the hazardous substance(s) within the guidelines prescribed. Questions concerning the label should be directed to your supervisor/foreman.

SAFETY DATA SHEETS (SDS): The SDS is the primary means we will use to convey the necessary information about the hazards of the substances we use. The manufacturers and importers are responsible for providing us with the SDS. The manufacturer must provide us with adequate information to use the substance safely.

PHYSICAL AND HEALTH HAZARDS OF THE HAZARDOUS SUBSTANCE(S) USED

Employees are to be trained specifically about the hazards of the substances in their work areas. This may be done by specific hazardous substances or by categories of hazards, but in any case, the employee is to be aware that information is available on the specific hazards of individual hazardous substances through SDSs.

Employees may be trained using the common type or generic chemical group or by reviewing the specific SDS as long as the training includes the following information:

1. Measures to protect employee from the hazards (i.e., work practices, engineering controls and the use of personal protective equipment).
2. The physical and health hazards of the hazardous substances.
3. Detection of release of the substance; emergency and first aid procedures.

EXAMPLE OF GENERAL HAZARDOUS SUBSTANCE GROUP TYPE TRAINING

Product/Chemical Group: Hydrocarbon Solvents.

Health Effects – Effect of Overexposure: High concentrations of solvent vapors are irritating to the eyes, nose, throat and lungs, may cause headaches and dizziness and sleepiness. Even higher levels may cause unconsciousness and may have other brain and central nervous system effects.

Prolonged or repeated liquid contact with the skin may cause defatting of the skin, leading to dryness, possible irritation and dermatitis (reddening and inflamed skin). Some solvents are absorbed right through the skin and the health effects are just as if the solvent vapor was inhaled.

Each organic solvent's possible long term health effects will vary; however, prolonged solvent exposures are related to possible liver, kidney and central

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nervous system and brain damage (Note: The variety of solvent types should be reviewed).

Physical Hazards: Hydrocarbon solvents are flammable and combustible and represent fire and explosion hazards if the materials are not handled correctly. Hydrocarbon solvents are generally stable and will not react violently with water. Review the SDS section on Physical and Chemical Properties. Most solvents will vaporize rapidly and become airborne.

Detection of Release: Odor – Solvent vapor may produce an odor or cause your nose or eyes to be irritated, but do not depend on odor to warn you. Odor thresholds (lowest level that can be detected) for most solvents vary widely from person to person. Also, some solvents produce “olfactory fatigue” - the rapid loss of ability to smell the odor. However, odor can warn you of exposure to some solvents (confirm this with industrial hygiene monitoring).

Appearance – Most solvent vapors are invisible so do not rely on appearance to warn you for exposure.

Instrumentation – A variety of industrial hygiene instruments can be used to measure employee exposure. This equipment should be operated only by qualified personnel.

Emergency Response – For Flammable Solvents: If the material is spilled or leaks, shut-off and eliminate all sources of ignition. Recover the free product by adding absorbents to the spill. Minimize breathing vapors and skin contact. Ventilate the area by opening windows and doors. Follow the established hazardous waste disposal procedures.

Exposure Control: Protective Equipment, Engineering Controls and Proper Work Practices:

- Protective Equipment – Use chemical-resistant gloves, aprons or clothing if prolonged or repeated skin contact may occur. Use splash goggles and face shield when eye or face contact may occur. Use approved respiratory protective equipment as established by our Safety Program (Note: If needed, a review of the respiratory protective program may be appropriate).
- Engineering Controls/Work Practices – Ventilation is to be used when it is necessary to prevent build-up of vapors from both a health or fire and explosion concern. Keep containers closed when not in use. Do not handle or store near heat or sources of ignition or strong oxidants. No smoking, burning or welding is permitted near the flammable vapors. Use the bonding and/or grounding system when transferring materials. Most solvents will vaporize rapidly and become airborne.

APPROPRIATE EMERGENCY AND FIRST AID PROCEDURES

Eye contact – If splashed into the eyes, flush with water for 15 minutes or until irritation subsides. If irritation continues, call a physician.

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Skin contact – In case of skin contact, remove any contaminated clothing and wash skin thoroughly with water and soap.

Inhalation – If overcome by vapors, remove from exposure and call a physician immediately. If breathing is irregular or has stopped, start resuscitation.

Ingestion – If ingested, DO NOT induce vomiting, call emergency medical aid immediately.

HAZARDOUS PROPERTIES OF CHEMICALS TRAINING

Chemicals are a part of every aspect of our lives. A minute does not go by that we do not use something that contains chemicals, or chemicals were used in the manufacturing process. The chemicals you use in the work place only present potential health and physical hazards when they are mishandled, improperly used, incompatible mixtures combined, improperly stored or labeled.

Depending upon the chemical and the level of exposure, health hazards can vary from minor skin irritations to serious chemical burns, nerve damage, different forms of cancer and even death. Physical damage may include fires, explosions, property and environmental damage.

Hazard awareness is recognizing and understanding the potential injuries and illnesses or physical damage the chemicals can cause. The communication of this information is essential for your being aware of, understanding and respecting the potential hazards. This knowledge is important for the decisions you make concerning how you use the chemicals and the safe work practices you follow.

Remedial action response personnel may be exposed to a number of substances that are hazardous because of their properties. These properties can be summarized into three broad categories:

- a. Physical/chemical
- b. Biological
- c. Radiological

It should be noted that many hazards may be present at any one time. It is important to understand the fundamentals of each of these properties and their relationships so that effective safety practices may be employed to reduce the risk to the public and remedial response personnel. Some hazards that may be encountered at this work site are toxic substances, flammable materials, explosive materials, corrosive materials, biological agents, excessive noise, heat or cold stress, oxygen deficient work areas, and radioactive materials.

PHYSICAL/CHEMICAL PROPERTIES

Physical hazards. Chemical compounds possess inherent properties, which determine the type and degree of the hazard they represent. Evaluating risks of an incident depends on understanding these properties and their relationship to the environment.

- a. Solubility. The ability of a solid, liquid, gas or vapor to dissolve in a solvent is solubility. An insoluble substance can be physically mixed or blended in a

solvent for a short time but is unchanged when it finally separates. The solubility of a material is important when determining its reactivity, dispersion, mitigation and treatment.

- b. Density. The density of a substance is its mass per unit volume, commonly expressed in g/cc.
- c. Specific gravity. Specific gravity is the ratio of the density of a substance to the density of water. If the specific gravity of a substance is greater than 1 it will sink in water. The substance will float in water if its specific gravity is less than 1.
- d. Vapor density. The vapor density is the density of a gas compared to the density of air. If the density of a gas is greater than that of air then the gas will tend to pocket and settle into the lowest points. If the vapor density is close to air or lower than air then the gas will disperse. If the vapor or gas displaces oxygen in the low spots then it can become an asphyxiant problem. If the gas or vapor is an explosive, when it pockets it will become an explosive hazard.
- e. Flashpoint. If the ambient temperature in relation to the material of concern is right, then it may give off enough vapor at its surface to allow ignition by an open flame or spark. The minimum temperature at which a substance produces sufficient flammable vapors to ignite is its flashpoint. If the vapor does ignite, combustion can continue as long as the temperature remains at or above the flashpoint. The relative flammability of a substance is based on its flashpoint. An accepted relation between the two is:

Highly flammable:	Flashpoint <100°F
Moderately flammable:	Flashpoint >100°F & <200°F
Relatively inflammable:	Flashpoint >200°F
- f. Chemical Hazards. Hazardous conditions that may exist because of the chemical nature of substances may be summarized as fire hazards, explosive hazards, corrosive hazards, and chemical reactivity.

Fire Hazards

- a. Combustibility: Combustibility is the ability of a material to act as a fuel, that is, to burn. Materials that can be readily ignited and sustain a fire are considered to be combustible, while those that cannot are called noncombustible. Three elements are required for combustion to occur: fuel, oxygen, and heat. The concentration of the fuel and the oxygen must be high enough to allow ignition and maintain the burning process. Combustion is a chemical reaction that requires heat to proceed. Heat is supplied by the

ignition source and is maintained by the combustion, or it must be supplied from an external source. The relationship of these three fire components can form a triangle. If one leg of the triangle is removed, then the fire can be extinguished. For example, water applied to a fire removes the heat, thereby extinguishing the fire. When a material generates enough heat by itself to self-ignite and combust, spontaneous combustion occurs, either as a fire or explosion (e.g., diesel greater than 140 degrees Fahrenheit is combustible.)

- b. **Flammability:** Flammability is the ability of a material (liquid or gas) to generate a sufficient concentration of combustible vapors under normal conditions to be ignited and produce a flame. It is necessary to have a proper fuel-to-oxygen (oxygen) ratio (% fuel in air) to allow combustion. A flammable material is considered highly combustible if it can burn at ambient temperatures. However, a combustible material is not necessarily flammable because it may not be easily ignited or the ignition maintained. Pyrophoric materials will ignite at room temperature in the presence of a gas or vapor or when a slight friction or shock is applied.

The substances listed below are easily ignited (pyrophorics), require little oxygen to support combustion, have low flammability limits and explosive limits and a wide flammable and explosive range.

Flammable liquids

Aldehydes
Ketones
Amines
Ethers
Aliphatic Hydrocarbons
Aromatic Hydrocarbons
Alcohols
Nitroaliphatics

Flammable solids

Phosphorus
Magnesium Dust
Zirconium Dust
Titanium Dust
Aluminum Dust
Zinc Dust

Water Reactive Flammable Solids

Potassium
Sodium
Lithium

Pyrophoric Liquids

Organometallic compounds
Dimethyl Zinc
Tributyl Aluminum

Some of the hazards related to fires and explosions can cause physical destruction due to shock waves, heat, and flying objects. Secondary fires can be created as well as other flammable conditions. Toxic or corrosive compounds may also be released to the surrounding environment as well.

Explosives

An explosive is a substance, which undergoes a very rapid chemical transformation producing large amounts of gases and heat. The gases

produced, for example, nitrogen, oxygen, carbon monoxide, carbon dioxide, and steam, due to the heat produced, rapidly expand to velocities exceeding the speed of sound. This creates both a shockwave (high pressure front) and noise. The main categories of explosives are listed below.

High or detonating – produces a shock wave followed by combustion.

Primary high explosive – detonation occurs in a short time. Examples: lead azide, mercury fulminate, and lead styphnate.

Secondary high explosive – needs a booster to detonate. Examples: Tetryl, cyclonite, dynamite and TNT

Low or deflagrating – Explosive rate very fast. Combustion followed by a shock wave. Examples: smokeless powder, magnesium, and molotov cocktail.

Corrosive Hazards

Corrosion is a process of material degradation. Upon contact, a corrosive material may destroy body tissues, metals, plastics, and other materials. Corrosivity is the ability of material to increase the hydrogen ion concentration of a material or to transfer electron pairs of or from itself or another material. A corrosive material is a reactive compound or element that produces a destructive chemical change in the material it is acting on. Common corrosives are:

Halogens

Bromine
Chlorine
Fluorine
Iodine

Acids

Acetic acid
Hydrochloric acid
Hydrofluoric acid
Nitric acid
Sulfuric acid

Bases (Caustics)

Potassium Hydroxide
Sodium Hydroxide

Skin irritation and burns are typical results when the body contacts an acidic or basic corrosive material.

The measure of an acid or a base is the pH scale. The pH scale ranges from 0 to 14 with a pH <7 being acidic and a pH >7 being basic. The lower the pH of the acid the more acidic is the material, and the higher the pH of the base the more basic the material. A pH of 7 is considered neutral.

Chemical Reactivity

- a. Reactivity hazards. A reactive material is one that undergoes a chemical reaction under specified conditions. Generally, the term “reactive hazard” is used to refer to a substance that undergoes a violent or abnormal reaction in

the presence of water or under normal ambient atmospheric conditions. Among this type of hazard are the pyrophoric liquids that will ignite in air at or below normal room temperature in the absence of added heat, shock, or friction, and the water-reactive flammable solids that will spontaneously combust upon contact with water.

The most common reactive mixture in construction is found in gas welding or brazing. Acetylene gas mixes with oxygen to provide an extremely powerful reaction in the form of a very intense flame.

- b. Compatibility. If two or more hazardous materials remain in contact indefinitely without reaction, they are compatible. Incompatibility, however, does not necessarily indicate a hazard. For example, acids and bases (both corrosive) react to form salts and water, which may not be corrosive.

The compatibility of materials must be determined before the materials are used or stored. Some examples of incompatibilities are sulfuric acid and plastics (toxic gas or vapor is produced), acids and metal (flammable gas or vapor is produced), chlorine and ammonia (chlorine gas is created, toxic gas). There are many other incompatibilities that may be found. Check to make sure that the materials used for a project are compatible.

All of the hazards listed above will be found on the safety data sheet (SDS). The SDS is a short technical report that provides you with the known hazards of a specific material. The SDS explains how to properly use the material, handle any problems related to the material and how to store the material. Know what the SDS says for the materials that you work with.

All materials should have a label on them. This is the first and easiest place to look to see if a material is hazardous. Labels should tell you any precautions that must be taken when handling the material. Read the label on the materials that you use and abide with the cautions and warnings. If a material is not properly labeled, notify your supervisor so that the problem is corrected.

BIOLOGICAL HAZARDS

Biological agents are living organisms that can cause sickness or death to exposed individuals. Biological hazards can cause infection or disease to persons who are exposed.

Biological hazards may involve plants or animals including microorganisms. Biological hazards, such as disease causing agents, may be present at a hazardous waste site or involved in a spill. Like chemical hazards, they can be dispersed throughout the environment via wind and water.

Many biological agents require a carrier to inoculate a person. For instance, rabid rodents at a landfill may be a biological hazard. Deer carry ticks may have Rocky Mountain Spotted fever; prairie dogs will not.

The same personnel protective requirements for a response to a chemical hazard apply to biological hazards. Body coverings and respiratory protective equipment might have to be utilized. Especially important is the need to maintain personnel cleanliness. Before eating, drinking or smoking residual contamination should be washed off.

BIOHAZARDS

Biohazard training will be provided to employees as per the blood borne pathogen program (SMS 051).

HAZARDOUS MATERIAL PROTECTION

The routes of exposure for hazardous materials include the following:

- Inhalation – Breathing contaminated air (e.g., welding fumes.)
- Skin Absorption – Contact with harmful liquids, gases, solids or contaminated clothing, equipment, medications, cosmetics, etc. A good example is solvents. Materials can also enter through an open wound.
- Ingestion – Eating or drinking contaminated foods, water or medications. (Remember food and cigarettes can become contaminated by your unwashed hands, gloves, equipment. Good hygiene practices are very important.)
- Injection – A contaminated material can be injected into some part of the body.

Protection from potentially hazardous materials includes the following:

- Use good personal hygiene. This is the simplest control measure to chemical hazards.
- Know what protective equipment is required for the specific job you are doing. Ask your supervisor what risks you might encounter and what hazardous substances you are working with.
- Know what potential explosive and or flammable conditions may exist with the job you are doing.
- Have all confined spaces checked for explosives, hydrogen sulfide, carbon monoxide, and oxygen deficiency. Know what hazards are involved with confined spaces.
- Know where emergency equipment is located and how to use it. For example, know where the nearest fire extinguisher is from your work area.

- Know the standard operating procedures for rescue and emergency situations.
- Know the proper method for decontamination when working with hazardous materials.
- Use the buddy system when at all possible. Keep communication lines open when working with hazardous materials.
- Stay out of contaminated areas if you are not properly trained, equipped, or authorized to enter. Do not take chances with life-threatening materials or situations.

PERSONAL PROTECTIVE EQUIPMENT

Different types of protective equipment will be required depending on the substances to be handled, the existing conditions, and the particular situation. Personal protective equipment includes a variety of special suits, hard hats, goggles, face shields, aprons, boots, gloves, and respirators. Each is designed to protect you from certain hazards. It is important for you to know the advantages and disadvantages of all the equipment you may use or need. Use all equipment as instructed and follow all written procedures for the specific equipment.

STANDARD OPERATING PROCEDURES FOR EMERGENCY SITUATIONS

Standard operating procedures exist for any unexpected event such as an accident, fire, explosion, etc.

If you know or suspect that you have been contaminated with a hazardous substance, **TELL YOUR SUPERVISOR**. You should know the general symptoms of over-exposure to toxic substances. These include:

- Irritation of skin, eyes, nose, throat, or respiratory tract
- Changes in complexion or skin discoloration
- Headache
- Difficulty in breathing
- Nausea
- Dizziness or light-headedness
- Excessive salivation (drooling)
- Lack of coordination
- Blurred vision
- Cramps and/or diarrhea
- Changes in behavior patterns

You should know the location of emergency eyewash and shower facilities.

Before you enter, and periodically while you are working in confined spaces such as tanks, crawl spaces, ditches, etc., the air in the space should be tested by a qualified individual for oxygen content, explosive levels, toxic gases, and other hazardous materials.

Understand the site emergency response procedures and know the locations of response equipment before the need arises. If you must rescue someone, use proper precautions and protective equipment. **DO NOT BECOME A CASUALTY YOURSELF**. Move the affected person from the hazardous exposure if possible. Get help and follow emergency rescue procedures.

For spills and leaks of hazardous materials limit the leak or spill as quickly as possible. Small spills should be cleaned up immediately. If a valve must be closed to prevent a spill from continuing then do so. If the spill is large, or your skin, eyes or clothing are contaminated, leave the work area immediately. Wash eyes, skin, and clothes off with lots of water to remove the material. Get to fresh air. Notify your foreman or supervisor as soon as it is safe for you to do so. Unless you have special training and the proper protective equipment, do not try to clean up large spills yourself.

If a corrosive material is splashed in your eyes or on your skin and clothes, deal with it immediately. Wash the affected area with plenty of water (at least 15 minutes with a continuous stream). Remove any contaminated clothing. Get to fresh air if you feel burning in the nose, throat or lungs. Do not vomit if you have swallowed a corrosive material. Drink large quantities of water to dilute the material, and seek immediate medical attention.

EXAMPLES OF HAZARDOUS MATERIALS POSSIBLY FOUND ON SITE

SOLVENTS

Solvents are among the most common toxic materials in the workplace. Many processes, mixing and cleaning, use or give off solvent vapors. They are also used as thinners in paints and adhesives. Solvents vary in their toxicity from practically non-toxic materials such as the alcohols, ketones, halogenated solvents, to the very toxic such as dimethyl acetamide, methyl acrylate and other materials. Some solvents are also flammable or reactive.

Solvents can cause irritations to the eyes and skin when in high concentrations. Most will dissolve the protective layer of oils on the skin and leave it looking white in the small cracks. They should never be used to clean the skin; if there is a problem with contamination, some form of glove or barrier cream should be used to protect the skin. The early signs of overexposure often include headaches, dizziness, nausea and other related symptoms.

METALS AND SOLID PARTICULATES

Examples: Babbitt metal, cadmium, galvanized metal, lead, manganese, nickel, zinc

Metals and other particulate solids can be toxic and are usually given off when welding or grinding. Some, like gypsum dust are only nuisance dusts, while others, like zinc fume from welding cause flu-like symptoms. Others, like asbestos have been linked to cancer and other chronic diseases. Dusts can irritate the skin and be ingested with food, drinks or smoking materials if they aren't washed off the hands and removed from clothing. They may also be carried home to family members and cause problems there if they are not washed off before leaving the work area.

When the welding, brazing, grinding or cutting of metal is performed, care should be taken to avoid breathing the fumes or dusts. Local exhaust ventilation should be used to reduce your exposure. If fumes and dust cannot be controlled with exhaust ventilation, appropriate approved respirators should be used. Approved safety goggles and gloves should be worn when working with metals. Gloves may be necessary to prevent skin sensitization and dermatitis.

ACIDS

Examples of acids found on URS Corporation sites are sulfuric acid (used in water treatment plants and found in batteries), hydrochloric acid, and nitric acid. Acids are considered corrosives and cause material degradation. Acids destroy tissues, metals and other materials. Acids can cause skin irritations in the form of rashes or other types of dermatitis, and more severe problems such as skin or eye burns. When working with acids proper eye and face protection should be worn as well as hand protection.

LUBRICANTS, COOLANTS AND MACHINE OILS

Lubricants, coolants and machine oils are common in construction sites. There are three types: petroleum based (straight oils), water based, and synthetic fluids that contain no oils. Many cutting oils contain additives to inhibit corrosion, prevent bacterial growth and permit high temperature operation. The fumes and mist from cutting operations can be irritating to the eyes and lungs. Skin exposure can result in acne-like conditions and can cause other problems. Avoid breathing mist and fumes and use gloves and aprons to minimize contact with materials.

GASES

Examples: Acetylene, ammonia, carbon dioxide, carbon monoxide, freon, oxygen, hydrogen, liquefied petroleum gas, propane

Gases present a range of problems. Some, like nitrogen, are simple asphyxiates. They prevent the body from getting enough oxygen by displacing it from the air stream. Some are chemically hazardous, like carbon monoxide, or nitrous oxide, which cause poisoning of the body systems. Some are very toxic, like arsine and phosphine. Some are very reactive and should be dealt with in very careful manners. Other gases, like hydrogen, oxygen and acetylene are explosives and must be treated with great care. Chains and stands should secure all compressed gas cylinders at all times, and only the proper fittings should be used. Liquefied and petroleum gases are extremely flammable and considered simple asphyxiates.

PLASTICS, EPOXIES AND POLYMERS

Plastics, epoxies and polymers are a growing group of industrial chemicals. Materials such as polystyrene, polypropylene, acrylates, vinyl, and polyurethane are but a few. Although most of these materials are not toxic in their final form, where they are being molded, extruded, laid up, there can be significant hazards. When burned, these materials can be very hazardous.

CLEANERS

Cleaners contain acid, alkalis, aromatics, surfactants, petroleum products, ammonia and hypochlorite. Because of these ingredients these materials are considered to be irritants, and can be harmful to you if swallowed or inhaled. Many may cause eye, nose, throat, and skin and lung irritation. Some cleaners are flammable and burn easily. Others may be caustic or corrosive and cause severe skin burns. Because many cleaners used in the job area are consumer products commonly found in our homes, you may underestimate the hazard they pose. Protect yourself from these hazards by reading the labels and following the recommended precautions. Wear gloves and eye protection. Avoid inhaling the vapors and mists. Wash your hands and face thoroughly before eating, drinking or smoking.

Specific emergency procedures for each chemical will be detailed on that cleaner's safety data sheet. In general, if a cleaning chemical gets into your eyes, flush the eyes with clean running water for at least 15 minutes, then seek medical attention. If the chemical gets on your skin, wash the area of contact and seek medical attention.

Do not mix two cleaning chemicals together, unless specifically told to do so by your supervisor. For example, the dangerous gas, chlorine, will be created if you mix bleach and ammonia or bleach and drain cleaner together.

Examples: Abrasive cleaners, bleach, drain cleaner, general purpose cleaning spray, germicide, and glass cleaner, metal cleaner, rug and upholstery cleaners, stain remover.

FUELS

Examples: Diesel oil, gasoline, propane, kerosene

The primary hazard posed by fuels is obviously, fire. Fuels are either flammable or combustible. Whether flammable (a material which is easily ignited and burns with extreme rapidity) or combustible (a material capable of fueling a fire), they should be handled with care.

Proper storage and transport of fuels in approved, self-closing, safety containers is extremely important and should be strictly adhered to at all times. When filling portable containers with flammable materials they should be properly grounded and bonded to the container to prevent ignition from static electricity.

Store gasoline in containers marked "gasoline". Store kerosene in containers marked "kerosene". Never use kerosene containers for the transport or storage of gasoline.

Excessive skin contact with fuels can result in dermatitis. Some petroleum products have been shown to cause skin tumors. Inhalation of fuel vapors over a long period of time can cause central nervous system depression, and may aggravate any existing respiratory problems that may exist. Ingestion of fuels can cause poisoning. Do not induce vomiting. If fuels get in your eyes, rinse with clean water for at least 15 minutes and seek medical attention.

LABELING

Proper labeling of all chemical containers is another excellent control measure to chemical hazards. Container labels give a code or name identifying the chemical in the container, the name, address, and telephone number of the manufacturer, importer, or distributor; and symbols, signal words, and hazard statements that warn you of possible dangers. Read the label on all materials with which you work.

Examples of signal words and hazard statements:

- Danger, fatal if swallowed
- Danger, toxic if swallowed
- Warning, may be harmful if swallowed

Labels and their warnings should be taken seriously since they provide you with the first clue to the hazards posed to your health and safety. They also give information on personal protective equipment required, emergency response and first-aid steps in case of an exposure, proper procedures in case of a spill and emergency phone numbers.

	<p style="text-align: center;">Health, Safety and Environment</p> <p style="text-align: center;">HAZARD COMMUNICATION EMPLOYEE TRAINING PROGRAM</p>	<p style="text-align: right;">SMS 002 NA Supplemental Information B</p> <p style="text-align: right;">Issue Date: February 2009 Revision 3: September 2012</p>
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SDS

Safety data sheets, if read and followed, are a powerful means of controlling chemical exposures. Chemical manufacturers are required to provide SDSs for the chemicals they produce or import. The purpose of the SDS is to communicate information on the recommended safe use and handling procedures for that chemical.

All SDS must provide certain categories of information about the chemical substance or mixture:

- Identification of the substance or mixture and of the supplier
- Hazards identification
- Composition/information on ingredients
- First aid measures
- Firefighting measures
- Accidental release measures
- Handling and storage
- Exposure controls/personal protection
- Physical and chemical properties
- Stability and reactivity
- Toxicological information
- Ecological information
- Disposal considerations
- Transport information
- Regulatory information
- Other information including information on preparation and revision of the SDS



HAZARD COMMUNICATION TRAINING QUESTIONS

NAME: _____ LOCATION: _____

1. Container labels must:
 - A. Give directions to the manufacturing plant.
 - B. Give price of the product.
 - C. Notify the user of the physical and health hazards.
 - D. Provide translation in Spanish.
2. What is an SDS?
 - A. Main Statistical Data Service.
 - B. Safety Data Sheet.
 - C. New accident reporting system.
 - D. Both A and C.
3. What are the requirements of the Hazard Communication Standard?
 - A. Chemical inventories.
 - B. Container labeling.
 - C. Negotiations for purchase price of chemicals.
 - D. SDSs.
 - E. Employee Training.
 - F. All of the above except C.
4. What is one way to determine if a chemical has been spilled or released in your work area?
 - A. When you smell something out of the ordinary.
 - B. By reading the SDS and being knowledgeable of the chemical appearance and odor.
 - C. Call somebody.
 - D. Both A & B.
5. How can you protect yourself from chemical exposures?
 - A. Personal protective equipment and proper work practices.
 - B. Stay upwind of vapors and gases.
 - C. Use proper ventilation.
 - D. All of the above.
6. What are the main examples of chemicals found on site?
 - A. Solvent, fuel, metals, lubricants, gases.
 - B. Toxic, flammable, corrosive, reactive, pressurized.
 - C. Physical properties and health effects.
 - D. The good, the bad and the ugly.
7. New and transferred employees must be trained on the hazards of their new work area.
 - A. True
 - B. False

8. An SDS provides what?
 - A. Supervisor guide to acid unloading.
 - B. Engineering data.
 - C. Health, safety and first-aid information.
 - D. Chemical process checklist.

9. Where is your site-specific Hazard Communication program located?
 - A. Accident Prevention Manual.
 - B. Employee Handbook.
 - C. Budget Manual.
 - D. SDS Book.

10. A new chemical used in your area is always considered a new hazard.
 - A. True
 - B. False

11. If an SDS is not available for the chemical you are using, you should?
 - A. Notify your supervisor.
 - B. Call the manufacturer.
 - C. Contact the Safety Department.
 - D. Nothing, most chemicals are safe.
 - E. Both A & C.

12. Labeling systems use words, graphics, geometric shapes, and colors to warn you of any possible danger to your health and safety, and to tell you about safe work practices you need to follow when handling chemicals.
 - A. True
 - B. False

13. A flammable liquid is a liquid with a flashpoint:
 - A. Of 2,000 degrees Fahrenheit
 - B. Below 200 degrees Fahrenheit
 - C. At freezing
 - D. All of the above

14. Which Signal Word represents the most serious hazard?
 - A. Caution
 - B. Warning
 - C. Danger
 - D. Beware

15. Chemicals can enter the body through:
 - A. Breathing them in
 - B. Contact with body openings
 - C. Both A and B
 - D. None of the Above

16. If you are not familiar with a chemical, you should check the Safety Data Sheets.
- A. True
 - B. False
17. A primary/original container label for a chemical must include:
- A. A code or name identifying the chemical
 - B. The chemical manufacturers or importer's name, address, and telephone number
 - C. Warnings of its hazardous content
 - D. All of the above
18. A container label should be checked only if you do not know the contents of the container.
- A. True
 - B. False
19. If a label is torn or missing, you should report it right away to the proper personnel at your facility.
- A. True
 - B. False
20. The Hazard Communication Standard is also referred to as the Right to Know Standard.
- A. True
 - B. False
21. A Safety Data Sheet is required for all hazardous materials in your facility.
- A. True
 - B. False
22. Safe work practices require a complete understanding and respect for the potential hazards.
- A. True
 - B. False
23. The written emergency response plan contains the procedures to take in the event of an emergency.
- A. True
 - B. False

**HAZARD COMMUNICATION TRAINING QUESTIONS
ANSWER SHEET**

1. Container labels must:
 - A. Give directions to the manufacturing plant.
 - B. Give price of the product.
 - C. Notify the user of the physical and health hazards.**
 - D. Provide translation in Spanish.

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 - A. Main Statistical Data Service.
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- A. True**
 - B. False
13. A flammable liquid is a liquid with a flashpoint:
- A. Of 2,000 degrees Fahrenheit
 - B. Below 200 degrees Fahrenheit**
 - C. At freezing
 - D. All of the above
14. Which Signal Word represents the most serious hazard?
- A. Caution (note not a signal word for HAZCOM but is used by EPA)
 - B. Warning
 - C. Danger**
 - D. Beware (note not a signal word for HAZCOM)
15. Chemicals can enter the body through:
- A. Breathing them in
 - B. Contact with body openings
 - C. Both A and B**
 - D. None of the Above

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- A. **True**
 - B. **False**
23. The written emergency response plan contains the procedures to take in the event of an emergency.
- A. **True**
 - B. **False**

URS SAFETY MANAGEMENT STANDARD

Emergency Preparedness & Crisis Management Plans

1. Applicability

This standard applies to URS Corporation and its subsidiary companies. Each location shall establish a site-specific emergency preparedness/incident management plan. In addition, each division will maintain a Crisis Management Plan to operate under the organizational structure and manage emergency operations.

2. Purpose and Scope

This standard establishes policy, assigns responsibilities, and provides guidance to URS offices/field projects regarding emergency preparedness. It includes general information on actions to be taken by URS management and employees in the event of an emergency that may endanger life or property.

The objectives of this standard are as follows:

- A. Promote a fast, effective reaction in coping with emergencies.
- B. Save lives, and avoid injuries and panic.
- C. Restore order and conditions to normal levels with a minimum of confusion and as promptly as possible.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility or project location. For EC projects and offices the EC Crisis Management Team is responsible for the overall management of Emergency Planning and the local Incident Management Team Leader is responsible for local implementation and management of the program.

4. Requirements

- A. Emergency Preparedness Plan (also known as Emergency Action Plan) Development

- 1. Gather Information

- Each URS office and field office must develop an Emergency Preparedness Plan (EPP) tailored to its specific location. Office Managers will check with their building manager or landlord regarding evacuation procedures they may have in place and incorporate these procedures into the EPP. Field office EPPs must

URS SAFETY MANAGEMENT STANDARD
Emergency Preparedness & Crisis Management Plans

comply with client requirements and specifications. The EPP must contain the following:

a. Reporting Procedures for Fires and Other Emergencies

Describe the procedures that personnel should follow to report emergencies (fires, hazardous substance release, etc.). List emergency telephone numbers for fire, paramedics, and police. Include local prefixes on emergency numbers, if required, such as 9-911.

b. Alarm System and Security Measures

Describe the emergency alarm system and security measures for the building/site as applicable. Include the description and location of fire alarm pull boxes and visual and audible alarms, security personnel, and secured access points. If a public address (PA) system is used to notify occupants of emergencies, include the procedures to activate the PA system, such as calling the receptionist or building manager's office, and a description of the announcements that will be made.

c. Evacuation Routes and Procedures

Develop a map or description of the evacuation routes and emergency exits to be used. A description of the building emergency lighting system, exit signs, and available fire suppression systems may also be included. Evacuation route maps may be posted in the offices. There should be a primary and alternate evacuation route and exit from each work area.

Describe procedures regarding the use of elevators, if applicable. In most cases, elevator use is prohibited during an emergency. The building manager should be consulted for these procedures.

Include procedures to determine that no employees have been inadvertently left behind.

d. Severe Weather Planning

URS SAFETY MANAGEMENT STANDARD
Emergency Preparedness & Crisis Management Plans

Describe potential severe weather that may impact the location and shelter areas that are available. Shelter areas should be designated on evacuation route maps.

If performing outdoor activities and thunder is heard, lightning is seen, or dark threatening clouds are observed overhead, take cover immediately in a safe location including a building or vehicle. Do not stay in (or on) convertibles, golf carts, riding mowers, open cab construction equipment or boats without cabins. Remain in the safe location until at least 30 minutes after the last thunder clap is heard.

e. Critical Equipment/Operations Procedures

Designate personnel responsible for shutting down and restarting critical equipment and the procedures for doing so, if applicable. Refer to SMS 098 - Management of Change prior to restarting operations.

f. Assisting Disabled Personnel

Describe the provisions that have been made for notifying and assisting personnel with disabilities during an emergency. Such provisions are to accommodate personnel in wheelchairs, those who are temporarily disabled (such as personnel on crutches), and those with impaired vision or hearing.

g. Personnel Accounting Procedures

Designate a primary and alternate assembly area for personnel who are evacuating. Require sufficient distance so that personnel will not be exposed to fire, debris, or traffic, nor interfere with emergency responders.

Designate an individual and an alternate to be responsible for taking a headcount in the assembly area and reporting missing personnel to emergency responders.

Define procedures on how employees will be informed that it is safe to re-enter the building or to leave for home.

Define emergency procedures for employees who remain on site.

URS SAFETY MANAGEMENT STANDARD

Emergency Preparedness & Crisis Management Plans

h. Rescue and Medical Duties

In some situations, URS personnel are in job positions that require the employees to engage in firefighting, medical treatment, rescue or other emergency response. Employees must be properly trained to perform these functions and must be identified in the EPP.

When applicable, include the following statement: "URS does not expect or encourage its employees to engage in firefighting, medical treatment, rescue, or other emergency response. Such activities should only be performed by properly equipped and trained emergency responders. URS recognizes that some of its personnel may have received training in first aid and cardiopulmonary resuscitation (CPR) and may wish to perform these duties on injured personnel."

Require that no employees leave the facility until all employees are accounted for.

i. Resources

The location or project/site specific EPP must include the name/title of staff who can respond to questions about the plan and/or the expectations of the individual employees in an emergency situation.

2. Develop EPPs based on the information gathered as described previously. EPPs may be stand-alone documents for office locations or may be included within site-specific health and safety plans.

B. Posting

1. Post the Emergency Preparedness Plan where it is available to all site employees.
2. Post evacuation maps at all exits and points of egress.

C. Training

1. Train all employees regarding the requirements of the Emergency Preparedness Plan for their office or facility location and his/her role in an emergency situation.

URS SAFETY MANAGEMENT STANDARD

Emergency Preparedness & Crisis Management Plans

2. Conduct evacuations drills and, where required, rescue procedures at office and facility locations at least annually.
3. Training will be conducted initially and as needed due to changes in procedures.

D. Coordination

During development and after implementation, it is critical to work with and coordinate emergency preparedness plan activities with local authorities, clients, representatives, building managers, property managers, security personnel, and designated office or project safety staff, and with local rescue and medical facilities.

E. Visitor and Crowd Control

When an emergency occurs at URS offices or field offices, it is important to ensure the safety of visitors or members of the public. Remember that visitors and members of the public are probably not familiar with the emergency procedures and may need to be escorted by URS personnel during the emergency.

F. Security

1. Keep visitors and unnecessary personnel from entering an office or jobsite after an emergency has occurred.
2. Safeguard property, equipment, and/or materials during an emergency. The in-house or contract security personnel should be integrated into the emergency preparedness plan and their expected response and areas of responsibility in response to emergencies should be designated. If not, it may be necessary to assign company employees to act as watchmen during and after the emergency.

G. Community Relations

If an emergency at a URS office, field office, or jobsite may place a community at risk, the appropriate local and/or community emergency response personnel should be notified and given pertinent information on the occurrence.

H. Division Emergency Preparedness/Crisis Management Plans

The division-specific Emergency Preparedness and Crisis Management Plan (CMP) is established for the purpose of protecting employees,

URS SAFETY MANAGEMENT STANDARD

Emergency Preparedness & Crisis Management Plans

property, assets, reputation, the general public, the environment, and the communities in which URS operates. The CMP provides an overview of emergency preparedness and its importance to URS. This CMP provides guidance to division management regarding roles and responsibilities in the event of a crisis requiring coordinated corporate and/or division response. This CMP also provides guidance for making decisions during natural or man-made emergencies or crises. The FS and IE CMPs are included in Attachment 003-1. Contact the EC Security Department regarding the EC CMP.

5. Documentation Summary

The following documentation will be maintained in the office/project files:

- A. Emergency Preparedness Plan.
- B. Evacuation maps.
- C. Training records.

6. Resources

- A. U.S. Occupational Safety and Health Administration (OSHA) Standard – [Emergency Action Plans](#) – 29 Code of Federal Regulations (CFR) 1910.38
- B. U.S. OSHA – [Emergency Exit Routes Fact Sheet](#)
- C. [Attachment 003-1 FS](#) – Federal Services Emergency Preparedness and Crisis Management Plan
- D. [Attachment 003-1 IE](#) – Infrastructure & Environment Emergency Preparedness and Crisis Management Plan
- E. Energy & Construction Crisis Management Plan (contact Security)

7. Supplemental Information

- A. Federal Services - [Emergency Preparedness and Incident Management Plan Template](#)



Safety Management Standard

Attachment 003-1 IE

**EMERGENCY PREPAREDNESS &
CRISIS MANAGEMENT PLANS**

Issue Date: September 2012

URS Infrastructure & Environment

Emergency Preparedness & Crisis Management Plan

URS INFRASTRUCTURE & ENVIRONMENT
Emergency Preparedness & Crisis Management Plan

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Emergency Preparedness & Crisis Management Plan

LIST OF ACRONYMS AND ABBREVIATIONS

ACCC	Alternate Crisis Command Center
CCC	Crisis Command Center
CMP	Emergency Preparedness and Crisis Management Plan
CMT	Crisis Management Team
EP/CM	Emergency Preparedness and Crisis Management
EPP	Emergency Preparedness Plan
HR	Human Resources
ICC	Incident Command Center
IMT	Incident Management Team
IE	URS Infrastructure & Environment
IT	Information Technology
POC	Point of Contact
SMS	Safety Management Standard

URS INFRASTRUCTURE & ENVIRONMENT

Emergency Preparedness & Crisis Management Plan

1.0 GENERAL INFORMATION

1.1 Introduction

The URS Infrastructure & Environment (IE) Emergency Preparedness and Crisis Management Plan (CMP) is established for the purpose of protecting employees, property, assets, reputation, the general public, the environment, and the communities in which URS IE operates. The CMP provides an overview of emergency preparedness and its importance to URS IE. This CMP provides guidance to IE management regarding roles and responsibilities in the event of a crisis requiring coordinated corporate and/or IE response. This CMP also provides guidance regarding decisions during natural or man-made emergencies, and addresses the approach to providing assistance to employees and their families following a crisis that results in an employee fatality.

1.2 Approach Summary

Most IE incidents are properly managed at the Project, Office, or Regional level. These incidents may involve property damage, temporary office closure due to weather, employee injuries, project performance concerns, or similar events. Although managed locally/regionally, these events are to be communicated to IE management through the appropriate channels.

Certain events have the potential for creating a crisis situation, with significant impacts on employee or public safety, continuity of IE operations, or URS reputation. The activation of the IE Crisis Management Team (CMT) is designated for those events that are at the crisis level, or have the potential to reach the crisis level.

1.3 Document Control

The IE Vice President for Safety will maintain responsibility for consistency and currency of the CMP, and notify the appropriate level of managers to ensure proper dissemination to all the stakeholders. This CMP will be reviewed at least annually, and updated as necessary.

1.4 Applicability

This CMP applies to all URS IE operations, and as guidance for the IE CMT for its use in directing activities in preparing for and responding to emergency and crisis situations.

1.5 Scope

This document describes IE emergency preparedness policies and procedures, and covers crisis management organization and responsibilities.

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2.0 DEFINITIONS

Crisis: Any global, regional, or local natural or human-caused event or business interruption that runs the risk of (1) escalating in intensity; (2) causing wide-scale harm to people, property, or the environment; (3) adversely impacting shareholder value or the organization's financial position; (4) falling under close media or government scrutiny; (5) interfering with a company critical function; (6) jeopardizing the organization's reputation, products, or offices, therefore negatively impacting its future.

Crisis Management: Intervention and coordination by individuals or teams before, during, and after an event to resolve the crisis, minimize loss, and otherwise protect the organization.

Incident Command Center (ICC): A specific room or facility staffed by IE CMT personnel charged with commanding, controlling, and coordinating the use of resources and personnel in response to a crisis. Not all crises require the use of the ICC.

Crisis Management Team: A group identified by IE senior management and comprised of personnel from such functions as Operations, Human Resources (HR), Information Technology (IT), Facilities, Security, Legal, Administration, Communications, Safety, as well as other business-critical support functions that will lead crisis response efforts when the incident is of such magnitude that it requires senior management involvement. The duties and responsibilities of the CMT are considered collateral duties.

Critical Function: Business activity or process that cannot be interrupted or unavailable for several business days without having a significant negative impact on the organization or its ability to meet contractual deliverables.

Damage Assessment: The process used to appraise or determine the number of injuries and human loss, damage to public and private property, and the status of key facilities and services resulting from a natural or human-caused disaster.

Disaster: An unanticipated occurrence that causes widespread destruction, loss, or distress to an organization, including natural catastrophes, technological accidents, or human-caused events that may result in injuries or fatalities to employees or the public, or significant property damage.

Disaster Recovery: Immediate intervention taken by an organization to minimize further losses brought on by a disaster; and beginning the process of recovery, including activities and programs designed to restore critical business functions, and return the organization to an acceptable condition.

Emergency: An unforeseen occurrence or situation that happens unexpectedly and demands immediate action and intervention to minimize potential injury, loss of life, property, or profitability.

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Evacuation: Organized, phased, and supervised dispersal of people from dangerous or potentially dangerous areas.

Incident Management Team (IMT): A Regional, Country, Office, or Project-level group directed by the IE CMT who will lead incident response for incidents occurring in their respective offices or projects, domestically or internationally. The IMT is comprised of personnel from such functions as HR, IT, Facilities, Security, Legal, Administration, Safety, and other business-critical support functions at the office or project level.

Mitigation Strategies: Implementation of measures to lessen or eliminate the occurrence or impact of a crisis event or incident.

Point of Contact (POC): A person or team that has been designated by the URS IE office or business groups to be contacted any time an incident occurs.

Recovery/Resumption: Plans and processes to bring an organization out of a crisis that resulted in an interruption. Recovery/resumption steps should include damage and impact assessments, prioritization of critical processes to be resumed, and return to normal operations, or to reconstitute operations to a new condition.

Response: Executing the CMP and resources identified to perform those duties and services to preserve and protect life and property, as well as provide services to the surviving population. Response steps should include potential crisis recognition, notification, situation assessment, and crisis declaration, CMP execution, communications, and resource management.

Tabletop Exercise: A test method in which participants review, discuss, and practice the actions they will take in the event of CMP activation.

3.0 CRISIS MANAGEMENT ORGANIZATION

3.1 Purpose

The IE President will designate and assign a CMT to conduct and manage Emergency Preparation and Crisis Management activities. The CMT is the central POC for information collection, support, and distribution for official correspondence and information during all hours of operation, and is typically comprised of members of the Executive Management Team or their designees. The CMT will communicate with and provide support to all domestic and international offices and projects on all matters related to an emergency crisis situation in their respective areas. Operations may be called upon by the CMT to assist, support, and respond as necessary.

3.2 CM Roles and Responsibilities

3.2.1 IE President

The outcomes of incidents and problems encountered by the CMT and the IMT may influence future policies and strategies. Therefore, the IE President will be kept informed and updated at all times in the

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event of any significant incidents. The IE President should be updated daily at pre-determined times on the progress of response efforts in the event of an incident activating the requirements of this CMP. The CMT Lead will keep the IE President informed, and coordinate communications internal to URS Corporate.

3.2.2 Crisis Management Team

The CMT is led by the designated Crisis Management Team Leader. The CMT Lead manages IE incidents falling under the purview of this CMP, and reports to the IE President.

Responsibilities include:

- Monitoring and managing any incident reported to them.
- Ensuring implementation of IE policies consistent with this CMP.
- Reporting to the IE President on a daily basis, or at a frequency warranted by the situation throughout the incident.
- Maintaining accurate records of CMT proceedings.
- Providing and/or directing crisis management training, in coordination with Human Resources and Safety.

3.3 CMT Purpose and Scope

The CMT has overall responsibility for overseeing the development, maintenance, and implementation of the CMP. All CMT members ensure that current copies of the CMP are kept in secure locations, and that all authorized CMT personnel are trained to use and implement it as needed. The responsibilities of the CMT are:

- Establish, define, and implement IE policies, plans, and procedures.
- Distribute EP/CM policies, plans, procedures, and guidance to domestic and international offices/projects.
- Activate the IE Incident Command Center and implement the CMP when necessary.
- Manage emergencies to resolution.
- Authorize/implement domestic and international support as required.
- Assist offices/project with necessary resources for incident response.

3.3.1 CMT Leader

The CMT Leader will:

- Oversee the IE Crisis Management program.
- Direct the implementation of EP/CM policy decisions.
- Activate the CMT when warranted.
- Identify and assign CMT members with concurrence from the IE President.
- Convene CMT meetings as required.

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- Establish primary objectives for the CMT in management of the incident.
- Establish communications and meeting schedules for the CMT.
- Maintain situational awareness of the incident for use in planning, operational support, and briefings.
- Respond and track responsiveness to resource needs from the IMT members.
- Identify costs for incident management and potential impacts.
- Require that all offices and projects conduct emergency preparedness and response training and exercises.
- Release approval for communicating emergency announcements to employees, in coordination with Corporate Communications.
- Release approval for communicating with the media or general public in an emergency.
- Review and approve debriefing meeting minutes and critique emergency response reports following an emergency drill or actual incident.
- Oversee lessons-learned reports of drills or incidents, and implement correction actions.
- Establish and communicate the location/time for CMT meetings to key personnel.
- Brief individual CMT members as needed.
- Keep the IE President informed and coordinate communications internally between IE and URS Corporate.

3.3.2 Group General Managers/Vice Presidents

The Group Vice Presidents will:

- Ensure that each Office, Region, and Country has implemented an emergency/crisis notification system; the notification system will provide for reporting of significant incidents from offices/project sites through to the Regional Managers and Group Vice President.
- Notify the CMT Leader and IE President as appropriate of significant incidents.
- Ensure that all operations have an effective system for informing employees regarding emergencies/crises, and the status of the employees' work location.

3.3.3 Communications

The Communications Lead will perform the following tasks through the CMT or Incident Command Center:

- Assess and identify communication needs.
- Establish and control communications between the CMT and the projects.
- Identify and establish a liaison with influential members of the local communities and media personalities who may help control incident coverage, and assist in releasing public statements.
- Monitor national and international media coverage.
- Control media responses related to any emergency/crisis.

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- Discuss and approve media-release information with the IE President.
- Prepare press release(s), media advisories, and statement(s).
- Manage release of information to internal and external sources.
- Ensure confidentiality and verify accuracy of sensitive information before dissemination.
- Monitor and record external and third-party media coverage.
- Maintain records of any/all notifications of media, government representatives, and internal sources.

3.3.4 Security

The security role will vary with the type of crisis. Security will provide primary support in regard to crises involving political instability, personnel evacuation, and kidnap/hostage situations. The Security Lead will perform the following tasks as a member of the CMT:

- Provide information regarding the ongoing security situation at the crisis location.
- Recommend best practices in minimizing security risks to employees/subcontractors.
- Serve a lead role in communications with local law enforcement.
- Coordinate/obtain crisis location security contractors (if needed).
- Provide evacuation options for crises involving political unrest.

3.3.5 Safety

The Safety Lead will:

- Provide assistance and support to the CMT Leader for all health, safety, and/or environmental-related activities.
- Review the safety plan for incident response activities involving IE staff or subcontractors.
- Coordinate with the IE Occupational Health Nurse and workers' compensation provider regarding the management of injured IE employees.
- Lead or assist in incident investigations/root-cause analyses of incidents involving serious employee injuries or fatalities.
- Lead the communications with safety or environmental regulatory agencies (e.g., U.S. Occupational Safety and Health Administration, UK HSE Executive) in coordination with IE Legal and Operations.

3.3.6 Finance and Administration

The Administration Lead reports to the CMT Leader, and will:

- Provide financial support to the CMT Leader.
- Provide financial impact data to the CMT Leader.
- Provide logistical support to the CMT Leader.
- Provide facilities, space, and infrastructure (telephone, computer network, power, water, food, etc.) for emergency operations.

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- Maintain records of all costs associated with a crisis.

3.3.7 Human Resources

HR is responsible for:

- Providing HR support to the CMT Leader.
- Providing access to the employee database.
- Obtaining additional internal or external HR resources.
- Managing family notifications.
- Maintaining POC for impacted employees/families.
- Coordinating employee benefits (e.g., medical, life insurance).
- Coordinating and activating the Employee Assistance Program.

3.3.8 Legal

The Legal Lead will provide legal counsel to the CMT Leader, including:

- Assessing the legal impact of the actions to be taken by the CMT.
- Providing a legal review of communications related to the crisis.
- Arranging external legal support as needed.
- Coordinating notification of insurance broker and insurer of possible claims.
- Managing any legal proceedings resulting from the incident.

3.3.9 Information Technology

The IT Lead will:

- Provide IT support to the CMT Leader.
- Oversee continuity of IT operations.
- Ensure the IT Disaster Recovery Plan is developed and tested.

3.4 Crisis Management Team Meetings

- The CMT Leader will initiate meetings with members of the team when it is determined there is a crisis or potential crisis.
- Due to the physical locations of team members, the CMT meetings will typically be held via conference call or video conference. For many crisis situations, daily calls or twice-daily calls are effective.
- The Central Command Center (CCC) will be activated for longer-term crisis situations, incidents with extensive media attention, and crises managed most effectively from one location.
- The meeting content will change as the crisis progresses. Initially, the focus will be on basic incident information (listed in Attachment A).

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4.0 TRAINING

All IE employees involved in emergency and/or crisis management will be trained for their specific responsibilities. Annual exercises will be conducted to ensure our ability to respond appropriately to emergencies/crises that affect our employees, customers, and property.

5.0 CENTRAL COMMAND CENTER

The CCC is a centralized management center for emergency operations. The CCC will be established in an area with sufficient workspace for the CMT to operate.

5.1 Primary Location

The primary CCC is at the URS Corporate office in San Francisco, California.

5.2 Alternate Location

The Alternate Crisis Command Center (ACCC) is at the URS New York City office, in the event that the primary CCC is impacted by the crisis event.

5.3 CCC Requirements

The Command Centers will have the following capabilities:

- Communications – an emergency communications system that will not be incapacitated by internal or external system demands. The center will have backup communications (e.g., Blackberry, cellular telephones, satellite telephones, etc.).
- Adequate Displays.
- Cable or satellite TV connection.
- Workstations – enough computer laptops to accommodate the CMT. CMT members should bring laptops to the CCC or ACCC to support response operations.
- Personnel – at least three support personnel to update displays, prepare reports, and provide messenger services. One support person per 8-hour shift is adequate.

6.0 INCIDENT RESPONSE

6.1 Planning

6.1.1 Office Locations

Each IE office will maintain a current Emergency Preparedness Plan (EPP), in compliance with URS Safety Management Standard (SMS) 003. The EPP will include the alarm system, reporting procedures for fire and medical emergencies, evacuation routes, personnel assembly points, and coordination with the building operator. The EPP will also include procedures for the most likely natural disasters in the area (e.g., earthquake, hurricane, flooding).

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The site-specific EPP will provide details on the communication of incidents to on-site management, including incidents that occur in the office, during travel, or on field projects. The EPP will also provide the plan for management communication to employees in case of temporary office closure, or other critical communication.

6.1.2 Field Projects

Emergency planning will be incorporated into all field project Health and Safety Plans/Safe Work Plans. The level of emergency planning will vary with the project scope, but must include basic incident notification procedures, including contact phone numbers of the appropriate URS supervisor/project manager. The emergency plan will also contain phone numbers for the appropriate emergency response organizations (e.g., fire department, ambulance, spill response).

6.1.3 International Regions

Each International Region will maintain an Incident Management Plan outlining the local role for response to significant incidents within the region or country.

6.1.4 International Travel Security Plan

If an employee is planning to travel to any country not listed in the "Low Risk" countries, an International Travel Security Plan must be prepared in compliance with Policies and Procedures Policy 074.021.

6.2 Incident Notification

URS SMS 049 "Incident Reporting, Notifications & Investigation" provides the initial steps to be taken by employees and line management in regard to incidents, including notifications.

Significant incidents (potential crisis situations) require immediate notification up through the management organization to the CMT Leader. Initial notification of potential crisis-level incidents must include direct voice contact (not voicemail or email); alternates must be contacted if the primary contact is not reached.

6.3 Response Procedures

Response procedures are part of the protocols for each type of emergency. The procedures spell out how the facility will respond to emergencies. Whenever possible, these procedures are bulleted so they can be quickly accessed by senior management, department heads, response personnel, and employees. The procedures describe the actions necessary to:

- Assess the situation.
- Establish objectives, strategies, and tactics to protect employees, customers, visitors, equipment, vital records, and other assets, particularly during the first 3 days.
- Plan for the management of the incident, and the return to normal operations.

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Also included in the procedures are the following instructions:

- Warn employees and customers.
- Conduct an evacuation and account for all persons in the facility.
- Manage response activities.
- Activate and operate an ICC.
- Only fight fires if they are small enough to be handled with a fire extinguisher.
- Sound alarm.
- Shut down operations.
- Protect vital records.
- Restore operations.

7.0 COMMUNICATIONS

The Communications Lead will perform the following tasks through the CMT or ICC.

- Ensure that each operating unit has implemented an emergency/crisis notification system to ensure that all employees are informed of emergencies/crisis, and provide for notification of supervisors, managers, and senior IE Management.
- Prepare and maintain current IE profile, history, and historical incident information.
- Plan for and implement the communications systems necessary for the incident response and management.
- Organize internal emergency communications within IE.
- Assess and identify communication needs.
- Establish and control communications between the CMT and IE Operations.
- Identify and establish a liaison with influential members of the local communities and media personalities who may help control incident coverage, and assist in releasing public statements.
- Monitor national and international media coverage.
- Control media responses related to any emergency/crisis.
- Discuss and approve media-release information with the IE President and URS Corporate Communications.
- Prepare press release(s), media advisories, and statement(s).
- Manage release of information to internal and external sources.
- Ensure confidentiality and verify accuracy of sensitive information before dissemination.
- Monitor and record external and third-party media coverage.
- Establish a diary of events and take minutes of CMT meetings through a recorder (administrative employee).
- Maintain records of any/all notifications of media, government representatives, and internal sources.

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8.0 POST-INCIDENT RECOVERY

8.1 Resuming Operations

The recovery of facility operations and services will depend on the extent of damage suffered by the operating unit or facility. The IMT will need to prioritize activities that can be accomplished with available staff and resources. Immediately following the emergency phase of the incident, the IMT and facility management will begin the implementation of the facility-specific business continuity/recovery plan.

8.1.1 Documentation Requirements

Documentation of emergency activities is of critical importance following the emergency situation. All records and forms used during the incident to document activities must be retained for future reference.

8.1.2 Responsibility for Incident Documentation

Following an emergency situation, the IMT will have the responsibility for collecting all records and forms used during the incident. The emergency situation must be investigated as soon as possible following its occurrence. The investigation is designed to determine why the incident occurred, and what precautions can be taken to prevent a recurrence.

8.2 Investigation Responsibilities

Each IMT Leader is responsible for ensuring that an incident investigation is conducted following emergency situations that occur at their facility.

8.2.1 Damage Assessment

Following the incident, an assessment of damage to facility properties and equipment must be conducted. The major goal of this assessment will be to determine the extent of damage to facilities, safety hazards resulting from the incident, and repairs that must be initiated to minimize further damage and restore the facility for operational use. The IMT Leader will have the primary responsibility for conducting the damage assessment following an incident.

8.2.2 Critique

The critique of the incident is a review of what actions took place during the incident—both good and bad. A critique is not designed to place blame, but rather to allow for the flow of ideas and recommendations to improve the emergency action plan and the facility policies and procedures. After a crisis, an IMT meeting is required to ensure all necessary actions have been taken to control, resolve, and end the crisis. The IMT members will identify additional actions required to eliminate/minimize the development of a similar future crisis. The IMT members will prepare a full report of the crisis, which will include:

- A listing of incidents and activities.
- Incident response activities.
- Major decisions.
- Overall summary of activities and critique of the total operation.

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- Recommendations for reducing the risk of a repeat event.

The incident report will be shared with senior management in URS IE.

The critique should serve to improve the ability of IE to plan for and respond to emergency situations. "Lessons Learned" should be considered in planning and practice simulations by the CMT and IMTs.

9.0 EMPLOYEE/FAMILY SUPPORT

Some employees and family members may be profoundly impacted by the events surrounding the incident, especially those involving injuries or loss of life. It may be necessary to provide critical-incident stress-debriefing sessions following such incidents, using services provided by either our Emergency Assistance Program provider, or another qualified subcontractor. The CMT will determine if a requirement exists to activate the ACCC in Las Vegas, Nevada, from which trained Family Assistance personnel can respond. The ACCC will coordinate with Human Resources and provide or arrange for:

- Services to aid in the resolution of personnel problems and emergency situations as they arise (i.e., suicide and homicide threats, hostile expressions, demonstrations of irrational behavior).
- Establishing counseling services for employees, family members, and groups affected by the crisis.
- Arranging transportation for employees/family members as necessary to hospitals where injured family members may be hospitalized.
- Repatriation of remains.
- Return of personal property to family members.
- Restoration and return of personal effects to family members.

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ATTACHMENT A – INITIAL RESPONSE CHECKLIST

- Briefly assess the magnitude of the incident (e.g., injuries, fire, environmental spill, earthquake).
- Follow the available Emergency Preparedness Plan; contact needed emergency services: (e.g., police, fire, ambulance).
- Initiate site control as appropriate: shutting down operations/evacuation from hazardous areas.
- Provide first aid to injured.
- Make certain all employees are accounted for.
- Ensure that any incident evidence is protected.
- Communicate situation to Operations Management and Safety.
- Contact URS support organization as needed: HR, Corporate Communications, Legal, Security, Safety, IT, Occupational Nurse.
- Project Manager/Client Account Manager to notify client (as appropriate).
- Assure Regional Manager is aware of significant incidents.
- Incident documentation (i.e., witness statements, photos).
- Update employees: incident status, return to work schedule, not communicating with the media, employee questions.
- Recovery/Restore Operations.

NOTES:

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ATTACHMENT B – TELEPHONE THREAT CHECKLIST

Exact time of call: _____ AM PM
 Date of call: _____
 Exact words of caller _____
 (use back if necessary): _____

How long did the conversation take? _____
 Did they say they would call back? _____
 When? _____
 On what number? _____
 Questions to ask if for a bomb threat:
 When is the bomb going to explode? _____
 Where is the bomb? _____
 What does it look like? _____
 What kind of bomb is it? _____
 What will cause it to explode? _____
 Did you place the bomb? _____
 Why? _____
 Where are you calling from? _____
 What is your address? _____
 What is your name? _____

Caller's Voice (check box)

Calm	<input type="checkbox"/>	Disguised	<input type="checkbox"/>	Nasal	<input type="checkbox"/>	Angry	<input type="checkbox"/>
Broken	<input type="checkbox"/>	Stutter	<input type="checkbox"/>	Slow	<input type="checkbox"/>	Sincere	<input type="checkbox"/>
Lisp	<input type="checkbox"/>	Rapid	<input type="checkbox"/>	Giggling	<input type="checkbox"/>	Deep	<input type="checkbox"/>
Crying	<input type="checkbox"/>	Squeaky	<input type="checkbox"/>	Excited	<input type="checkbox"/>	Stressed	<input type="checkbox"/>
Accent	<input type="checkbox"/>	Loud	<input type="checkbox"/>	Slurred	<input type="checkbox"/>	Normal	<input type="checkbox"/>

If the voice is familiar, who does it sound like? _____
 Describe background noises: _____
 Remarks: _____
 Person receiving call: _____
 Telephone number call received at: _____
 Incoming telephone number (if available): _____

Report call immediately to the Incident Management Team (IMT) Leader

Building evacuated? : YES NO
 Police notified? : YES NO

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ATTACHMENT C – IE CRISIS MANAGEMENT TEAM CONTACT LIST

[Contact List maintained by Vice President Safety]

URS SAFETY MANAGEMENT STANDARD

Injury and Illness Prevention Program (California)

1. Applicability

This standard applies to the operations of URS Corporation, its subsidiary companies, and its offices and field operations located in the State of California. These facilities are required to comply with the State regulations regarding an effective Injury and Illness Prevention Program (IIPP).

2. Purpose and Scope

The purpose of the IIPP is to minimize the incidence and severity of workplace injuries and illnesses. This standard complies with California Code of Regulations (CCR) Title 8, Sections 1509 and 3203. This IIPP compliments URS' behavior-based safety culture.

3. Implementation

Implementation of this standard is the responsibility of the manager directing activities of the affected facility, site, or project location. Each office or facility impacted by this standard must designate a local Health, Safety, and Environment (HSE) representative to serve as the responsible person for the IIPP. Additionally, IIPP administrators for this program who can provide guidance regarding this program include:

Mark Litzinger (Infrastructure & Environment; 206-438-2199)

Jeffrey Treffinger (Federal Services; 301-944-3257)

Brad Giles (Energy & Construction; 208-386-7899)

4. Requirements

A. Program Implementation. In addition to designating a person responsible for local IIPP implementation, management must ensure that the following 6 (six) elements described in paragraphs B. through G. are adequately addressed.

B. Communication

Occupational health and safety issues and programs will be communicated in a manner that is readily understood by all employees. A HSE newsletter is periodically distributed electronically employees. Additionally, each office will:

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Injury and Illness Prevention Program (California)

1. Verify that all new employees complete New Employee Safety Orientation within 1 week of starting work (see SMS 025 – New Employee Health and Safety Orientation). New employees should meet with the HSE Manager/Representative (or his/her designee) when possible.
2. Require that job-specific health and safety training courses are provided to employees in a timely manner.
3. Verify that employees have access to the URS HSE Program and Management System on the URS intranet site.
4. Establish an office-wide communication system for health and safety information. The communication system must allow all workers to inform management of health and safety issues without fear of reprisal. The precise method of communication may vary with the needs of the office or work site; communication may consist of one or more of the following elements:
 - a. An office health and safety committee. The committee should meet at regular intervals (e.g., once per month, but not less than quarterly). The committee membership must represent labor and management and should consist of the office manager and/or line managers, the local HSE representative, and employees from operations and administrative functions. Employees can inform any committee member of alleged hazardous conditions. Committee meetings may be conducted as part of other currently established meetings (such as routine line manager meetings). Each meeting must be documented and communicated to office employees.
 - b. An employee suggestion box. Office management is responsible for responding to suggestions in a timely manner. The system must allow for employees to provide suggestions anonymously if they choose to do so.
 - c. An office-wide newsletter. The newsletter should be published at regular intervals, and include information such as program updates, training schedules, health and safety tips, etc.

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- d. A HSE bulletin board. For large locations or offices with multiple floors, several bulletin boards should be utilized. Bulletin boards are centralized locations for posting office health and safety committee business, training schedules, HSE policy updates, and other topical/seasonal information.
5. Conduct regular field briefings and job safety analysis (JSA)/job hazard analysis (JHA) reviews for all employees on a project.
6. Encourage employees to identify health and safety issues as they are observed by immediately reporting the issues to a supervisor/line management. Inform employees that they may communicate health and safety concerns anonymously without fear of reprisal. Anonymous reporting methods include, but are not limited to, suggestion box, submission to a health and safety committee member, or contact to the Division, Regional, or Business HSE Manager or Director.

C. Compliance

All employees are responsible for complying with safe and healthful work practices. Methods of ensuring compliance include:

1. Informing employees of the provisions of the IIPP.
2. Encouraging employees to apply the principles of “4sight” and emphasizing that everyone has stop work authority if known or suspected hazards are present or if tasks are unclear.
3. Evaluating the safety performance of all employees during performance evaluations and by periodic behavior-based safety observations (see SMS 072, Behavior Based Safety).
4. Recognizing employees that perform safe and healthful work practices via personal evaluation, or awards that may be connected to a specific project or location initiative, or other URS recognition programs.
5. Providing an anti-reprisal policy for employees reporting safety and health concerns.
6. Providing training or mentoring to employees whose safety performance is deficient.

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7. Disciplining employees for failure to comply with safe and healthful work practices.

D. Hazard Assessment

1. For each field project, develop a written Health and Safety Plan (HASP) or Safe Work Plan (SWP) incorporating this standard and relevant SMSs and inspection protocols. Each of these documents contains a hazard assessment section and receives appropriate review prior to implementation. Before hazards can be controlled, they must be identified. Identification of hazards is an important step in controlling or eliminating the hazards. Hazard evaluation is the process of examining human, situational, and environmental factors in order to anticipate possible failures during completion of project work tasks.

SMS 086, Managing Health, Safety, and Environment-Related Risks, describes risk management strategies, including event probability/severity ranking, the principles of 4sight, and JSAs. SMS 098, Management of Change, addresses protection of employees from hazards due to changes in the working environment.

2. Conduct periodic hazard assessments in accordance with the procedures outlined in SMS 068 – Health, Safety and Environment Compliance Assurance.
3. Conduct hazard assessments:
 - a. Initially, as a new project or office is established.
 - b. When new substances, processes, procedures, or equipment that present potential new hazards are introduced into the workplace. Contact the local URS HSE Representative/Manager if you are not certain that an assessment should be initiated.
 - c. When new, previously unidentified hazards are recognized, either through an employee report or a workplace inspection.
 - d. In conjunction with an incident investigation.
 - e. When workplace conditions warrant an assessment.

URS SAFETY MANAGEMENT STANDARD
Injury and Illness Prevention Program (California)

- f. As directed by the Division, Regional, or Business HSE Manager or Director, or as required by contractual requirements.

E. Incident Investigations

1. Encourage employees to immediately report any incidents, near misses, unsafe acts or conditions, or risky behaviors by fellow employees. Incidents will be defined as fatalities, injuries, illnesses, property damage events, fires, flashes, explosions, and environmental releases or as described by SMS 049.
2. Conduct investigations of incidents, near misses, unsafe acts or conditions, or risky behaviors in accordance with SMS 049 – Injury/Illness/Incident Reporting and Notifications or as be required per contractual requirements. Investigation procedures will include:
 - a. Interviewing injured workers and witnesses;
 - b. Examining the workplace for factors associated with the incident;
 - c. Determining the cause of the incident;
 - d. Taking corrective action to prevent the incident from recurring; and
 - e. Recording the findings and actions taken.
3. For incidents that meet the criteria of “significant”, the procedures of SMS 066, Incident Investigation, will be followed

F. Hazard Correction

1. Encourage employees to report any work conditions, practices, or procedures that could pose potential workplace hazards. Unsafe acts or unsafe conditions should be reported to the local operational level for resolution.
2. Require that unsafe work conditions, practices, or procedures are corrected in a timely manner, based on the severity of the hazards.

URS SAFETY MANAGEMENT STANDARD
Injury and Illness Prevention Program (California)

3. Hazards discovered during a formal audit (SMS 068) or client audit protocol must be abated in accordance with the timetable provided in the audit report.
4. Correct imminent hazards either:
 - a. Immediately; or
 - b. If immediate correction cannot be accomplished without endangering employees and/or property, remove employees from the hazard area until the hazard can be safely abated.
5. Document hazard corrections to the project or office safety file.

G. Training and Instruction

Provide training:

1. On the IIPP when the IIPP is first established or undergoes significant revision. Training can be accomplished by URS online module for this purpose or equivalent live instruction.
2. To all new employees.
3. To employees with new job assignments for which training has not been previously accomplished.
4. Whenever new substances, processes, procedures, or equipment are introduced to the workplace and may represent a new hazard not addressed by previous training.
5. To employees whose project roles require regular refresher training.
6. To supervisory employees to familiarize them with the safety and health hazards to which workers under their supervision may be exposed.
7. Specific to an employee's job assignment as required by Cal-OSHA. (Contact your local HSE Representative or Regional HSE Manager for guidance.)
8. As indicated per the requirements of SMS 055, Health, Safety, and Environment Training.

URS SAFETY MANAGEMENT STANDARD
Injury and Illness Prevention Program (California)

H. Program Evaluation

Evaluate and document the IIPP for each location on an annual basis using the checklist in Attachment 005-1 – IIPP Evaluation Checklist.

5. Documentation Summary

A. Maintain the following documentation in the office safety file:

1. Employee training records
2. Office hazard assessments and corrective actions
3. Incident reports and records
4. Communication records (i.e., Safety Committee notes, employee suggestions and resolutions, newsletters, etc.)
5. A copy of this Program

B. Maintain the following documentation in the project safety file:

1. Copies of employee training certificates
2. Safe Work Plan or Health and Safety Plan
3. Job Safety Analyses
4. Completed inspections/check sheets per applicable SMSs
5. Incident reports and records

6. Resources

- A. Cal/OSHA Standard – [Injury and Illness Prevention Program](#) – 8 CCR 3203
- B. [SMS 025](#) – New Employee Health and Safety Orientation
- C. [SMS 049](#) – Injury / Illness / Incident Reporting and Notifications
- D. [SMS 055](#) – Health, Safety, and Environment
- E. [SMS 066](#) – Incident Investigation

URS SAFETY MANAGEMENT STANDARD
Injury and Illness Prevention Program (California)

- F. [SMS 068](#) – Health, Safety, and Environment Compliance Assurance
 - G. [SMS 072](#) – Behavior Based Safety
 - H. [SMS 086](#) – Managing Health, Safety, and Environment-Related Risks
 - I. [SMS 098](#) – Management of Change
 - J. [Attachment 005-1NA](#) – IIPP Evaluation Checklist
- 7. Supplemental Information**
- A. [Model Injury and Illness Prevention Program for High-Hazard Employers](#)



Health, Safety and Environment
IIPP EVALUATION CHECKLIST

Attachment 005-1 NA
Issue Date: July 2000
Revision 6: September 2011

Location: _____ Date Evaluated: _____

Name of Evaluator: _____

Responsibility

1. Has the office identified a local Health, Safety, and Environment (HSE) Representative? Yes No
2. Have the employees been briefed on the URS HSE Program and do they know the name of the local HSE Representative? Yes No

Compliance

3. Are employees evaluated for health and safety compliance? Yes No
4. Are employees disciplined for failure to comply with the Program? Yes No
5. Is retraining provided to employees who fail to comply? Yes No
6. Provide documentation for all items in this section answered "yes." Yes No

Communication

7. Does the office have a Health and Safety Committee? Yes No
If yes, are meetings documented?
8. Is health and safety information forwarded to employees? Yes No
9. Have employees been instructed to report health and safety issues and concerns? Yes No
10. Does the office have a current OSHA poster? Yes No

Hazard Assessment

11. Does the office conduct periodic safety audits (refer to SMS 068 for guidance)? Yes No
12. Are hazard assessments performed and documented when a new process, substance, or equipment is brought into the workplace? Yes No
13. Are hazard assessments performed and documented when supervisors are advised of new or previously unrecognized hazards? Yes No

Accident/Exposure Investigation

14. Are injuries/incidents/near misses reported in a timely manner (refer to SMS 049 for guidance)? Yes No
15. Are investigations conducted to determine the cause of work-related injury or incident? Yes No

Hazard Correction

16. Are corrective actions identified and implemented upon recognition of a work-related hazard? Yes No
17. Are "lessons learned" shared with applicable office personnel? Yes No

Training and Instruction

18. Is job-specific training provided to employees prior to them undertaking the assignment? Yes No
19. Are employees re-trained upon recognition of new or previously unrecognized work-related hazards? Yes No

	<p style="text-align: center;">Health, Safety and Environment</p> <p style="text-align: center;">MODEL IIPP FOR HIGH HAZARD EMPLOYERS</p>	<p style="text-align: right;">SMS 005 NA Supplemental Information A</p> <p style="text-align: right;">Issue Date: February 2009 Revision 1: December 2009</p>
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The model Injury and Illness Prevention Program (IIPP) on the following pages has been prepared for use by employers in industries which have been determined by Cal/OSHA to be high hazard. URS offices are not required to use this model; however, it does provide the essential framework required for an IIPP.

**MODEL
INJURY AND ILLNESS
PREVENTION PROGRAM
FOR
HIGH HAZARD
EMPLOYERS**

ABOUT THIS MODEL PROGRAM

Every California employer must establish, implement and maintain a written Injury and Illness Prevention (IIP) Program and a copy must be maintained at each workplace or at a central worksite if the employer has non-fixed worksites. The requirements for establishing, implementing and maintaining an effective written injury and illness prevention program are contained in Title 8 of the California Code of Regulations, Section 3203 (T8 CCR 3203) and consist of the following eight elements:

- Responsibility
- Compliance
- Communication
- Hazard Assessment
- Accident/Exposure Investigation
- Hazard Correction
- Training and Instruction
- Recordkeeping

This model program has been prepared for use by employers in industries, which have been determined by Cal/OSHA to be high hazard. You are not required to use this program. This model program was written for a broad spectrum of employers and it may not match your establishment's exact needs. However, it does provide the essential framework required for an Injury and Illness Prevention Program.

Proper use of this model program requires the IIP Program administrator of your establishment to carefully review the requirements for each of the eight IIP Program elements found in this model program, fill in the appropriate blank spaces and check those items that are applicable to your workplace. The recordkeeping section requires that the IIP Program administrator select and implement the category appropriate for your establishment. Sample forms for hazard assessment and correction, accident/exposure investigation, and worker training and instruction are provided with this model program.

This model program must be maintained by the employer in order to be effective.

INJURY AND ILLNESS PREVENTION PROGRAM

RESPONSIBILITY

The Injury and Illness Prevention Program (IIP Program) administrator,

Program Administrator

has the authority and responsibility for implementing the provisions of this program for

Establishment Name

All managers and supervisors are responsible for implementing and maintaining the IIP Program in their work areas and for answering worker questions about the IIP Program. A copy of this IIP Program is available from each manager and supervisor.

COMPLIANCE

Management is responsible for ensuring that all safety and health policies and procedures are clearly communicated and understood by all employees. Managers and supervisors are expected to enforce the rules fairly and uniformly.

All employees are responsible for using safe work practices, for following all directives, policies and procedures, and for assisting in maintaining a safe work environment.

Our system of ensuring that all workers comply with the rules and maintain a safe work environment include:

1. Informing workers of the provisions of our IIP Program;
2. Evaluating the safety performance of all workers;
3. Recognizing employees who perform safe and healthful work practices;
4. Providing training to workers whose safety performance is deficient;
5. Disciplining workers for failure to comply with safe and healthful work practices; and
6. The following practices: _____

COMMUNICATION

We recognize that open, two-way communication between management and staff on health and safety issues is essential to an injury-free, productive workplace. The following system of communication is designed to facilitate a continuous flow of safety and health information between management and staff in a form that is readily understandable and consists of one or more of the following checked items:

- New worker orientation including a discussion of safety and health policies and procedures.
- Review of our IIP Program.
- Workplace safety and health training programs.
- Regularly scheduled safety meetings.
- Effective communication of safety and health concerns between workers and supervisors, including translation where appropriate.
- Posted or distributed safety information.
- A system for workers to anonymously inform management about workplace hazards.
- Our establishment has less than ten employees and communicates with and instructs employees orally about general safe work practices and with respect to hazards unique to each employee's job assignment.
- A labor/management safety and health committee that meets regularly, prepares written records of the safety and health committees meetings, reviews results of the periodic scheduled inspections, reviews investigations of accidents and exposures and makes suggestions to management for the prevention of future incidents, reviews investigations of alleged hazardous conditions, and submits recommendations to assist in the evaluation of employee safety suggestion.
- Other: _____

HAZARD ASSESSMENT

Periodic inspections to identify and evaluate workplace hazards shall be performed by the following competent observer(s) in the following areas of our workplace:

Competent Observer	Area

Periodic inspections are performed according to the following schedule:

1. _____;
Frequency (Daily, weekly, monthly, etc.)
2. When we initially established our IIP Program;
3. When new substances, processes, procedures or equipment which present potential new hazards are introduced into our workplace;
4. When new, previously unidentified hazards are recognized;
5. When occupational injuries and illnesses occur;
6. When we hire and/or reassign permanent or intermittent workers to processes, operations, or tasks for which a hazard evaluation has not been previously conducted; and
7. Whenever workplace conditions warrant an inspection.

Periodic inspections consist of identification and evaluation of workplace hazards utilizing applicable sections of the attached Hazard Assessment Checklist and any other effective methods to identify and evaluate workplace hazards.

ACCIDENT/EXPOSURE INVESTIGATIONS

Procedures for investigating workplace accidents and hazardous substance exposures include:

1. Visiting the accident scene as soon as possible;
2. Interviewing injured workers and witnesses;
3. Examining the workplace for factors associated with the accident/exposure;
4. Determining the cause of the accident/exposure;
5. Taking corrective action to prevent the accident/exposure from reoccurring; and
6. Recording the findings and corrective actions taken.

HAZARD CORRECTION

Unsafe or unhealthy work conditions, practices or procedures shall be corrected in a timely manner based on the severity of the hazards. Hazards shall be corrected according to the following procedures:

1. When observed or discovered;
2. When an imminent hazard exists which cannot be immediately abated without endangering employee(s) and/or property, we will remove all exposed workers from the area except those necessary to correct the existing condition. Workers necessary to correct the hazardous condition shall be provided with the necessary protection; and
3. All such actions taken and dates they are completed shall be documented on the appropriate forms.

TRAINING AND INSTRUCTION

All workers, including managers and supervisors, shall have training and instruction on general and job-specific safety and health practices. Training and instruction shall be provided as follows:

1. When the IIP Program is first established;
2. To all new workers, except for construction workers who are provided training through a Cal/OSHA approved construction industry occupational safety and health training program;
3. To all workers given new job assignments for which training has not previously provided;
4. Whenever new substances, processes, procedures or equipment are introduced to the workplace and represent a new hazard;
5. Whenever the employer is made aware of a new or previously unrecognized hazard;
6. To supervisors to familiarize them with the safety and health hazards to which workers under their immediate direction and control may be exposed; and
7. To all workers with respect to hazards specific to each employee's job assignment.

Workplace safety and health practices for all industries include, but are not limited to, the following:

1. Explanation of the employer's IIP Program, emergency action plan and fire prevention plan, and measures for reporting any unsafe conditions, work practices, injuries and when additional instruction is needed.
2. Use of appropriate clothing, including gloves, footwear, and personal protective equipment.
3. Information about chemical hazards to which employees could be exposed and other hazard communication program information.
4. Availability of toilet, hand-washing and drinking water facilities.
5. Provisions for medical services and first aid including emergency procedures.

In addition, we provide specific instructions to all workers regarding hazards unique to their job assignment, to the extent that such information was not already covered in other training.

RECORDKEEPING

We have checked one of the following categories as our recordkeeping policy.

- Category 1. Our establishment is on a designated high hazard industry list. We have taken the following steps to implement and maintain our IIP Program:**
- 1. Records of hazard assessment inspections, including the person(s) or persons conducting the inspection, the unsafe conditions and work practices that have been identified and the action taken to correct the identified unsafe conditions and work practices, are recorded on a hazard assessment and correction form; and**
 - 2. Documentation of safety and health training for each worker, including the worker's name or other identifier, training dates, type(s) of training, and training providers are recorded on a worker training and instruction form. We also include the records relating to worker training provided by a construction industry occupational safety and health program approved by Cal/OSHA.**

Inspection records and training documentation will be maintained according to the following checked schedule:

- For one year, except for training records of employees who have worked for less than one year which are provided to the worker upon termination of employment; or**
- Since we have less than ten workers, including managers and supervisors, we maintain inspection records only until the hazard is corrected and only maintain a log of instructions to workers with respect to worker job assignments when they are first hired or assigned new duties.**
-

- Category 2. We are a local governmental entity (any county, city, or district, and any public or quasi-public corporation or public agency therein) and we are not required to keep written records of the steps taken to implement and maintain our IIP Program.**

LIST OF TRAINING SUBJECTS

We train our workers about the following checked training subjects:

- The employer's Code of Safe Practices.
 - Confined spaces.
 - Safe practices for operating any agricultural equipment.
 - Good housekeeping, fire prevention, safe practices for operating any construction equipment.
 - Safe procedures for cleaning, repairing, servicing and adjusting equipment and machinery.
 - Safe access to working areas.
 - Protection from falls.
 - Electrical hazards, including working around high voltage lines.
 - Crane operations.
 - Trenching and excavation work.
 - Proper use of powered tools.
 - Guarding of belts and pulleys, gears and sprockets, and conveyor nip points.
 - Machine, machine parts, and prime movers guarding.
 - Lock-out/tag-out procedures.
 - Materials handling.
 - Chainsaw and other power tool operation.
 - Tree falling/bucking procedures and precautions, including procedures for recognizing and working with hazard trees, snags, lodged trees, and unsafe weather conditions.
 - Yarding operations, including skidding, running lines, unstable logs, rigging and communication.
 - Landing and loading areas, including release of rigging, landing layout, moving vehicles and equipment, and log truck locating, loading and wrapping.
 - Fall protection from elevated locations.
 - Use of elevated platforms, including condors and scissor lifts.
 - Safe use of explosives.
 - Driver safety.
 - Slips, falls, and back injuries.
 - Ergonomic hazards, including proper lifting techniques and working on ladders or in a stooped posture for prolonged periods at one time.
 - Personal protective equipment.
 - Respiratory Equipment.
 - Hazardous chemical exposures.
 - Hazard communication.
 - Physical hazards, such as heat/cold stress, noise, and ionizing and non-ionizing radiation.
 - Laboratory safety.
 - Bloodborne pathogens and other biological hazards.
 - Other job-specific hazards, such as _____
-
-
-

HAZARD ASSESSMENT AND CORRECTION RECORD

Date of Inspection: _____ **Person Conducting Inspection:** _____

Unsafe Condition or Work Practice: _____

Corrective Action Taken: _____

Date of Inspection: _____ **Person Conducting Inspection:** _____

Unsafe Condition or Work Practice: _____

Corrective Action Taken: _____

Date of Inspection: _____ **Person Conducting Inspection:** _____

Unsafe Condition or Work Practice: _____

Corrective Action Taken: _____

Cal/OSHA Consultation Programs

Toll-free number: 1-800-963-9424 • Internet: www.dir.ca.gov

On-site Assistance Program Area Offices



Your call will in no way trigger an inspection by Cal/OSHA enforcement.

- **Voluntary Protection Program**

San Francisco, CA 94142
(415) 703-5272

- **Research and Education Unit**

Sacramento, CA 95825
(916) 574-2528



URS SAFETY MANAGEMENT STANDARD

Aerial Lifts

1. Applicability

This standard applies to all operations of URS Corporation and its subsidiary companies.

2. Purpose and Scope

The purpose of this standard is to require the safe use and proper operation of aerial lifts, including scissors lifts, extendable boom platforms, aerial ladders, articulating boom platforms, vertical towers, or any combination thereof.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing the activities of the facility, site, or project location.

4. Requirements

- A. Aerial lifts must meet American National Standards Institute (ANSI)/Security Industry Association (SIA) A92.2 – 2001 requirements.
- B. The manufacturer's operating manual for the aerial lift must be available on the machine.
- C. Personnel must be authorized to operate aerial lifts and trained on the specific equipment being used. Training on the specific equipment must be verified by senior management, or designee, and documented in individual training or personnel records. Attachment 007-1 AMER – Aerial Lift Training Certification may be used to document operator training.

URS personnel without operator training may utilize aerial lifts when the lifts are operated by properly trained personnel. Personnel not trained but utilize aerials lifts must be trained with respect to personal protective equipment.

- D. Inspections shall be made at the beginning of each shift during which the equipment is to be used. Inspections must be documented. Attachment 007-2 AMER – Aerial Lift Inspection Sheet may be used to document the inspections. Units that have been damaged or weakened from any cause must be taken out of service until repairs are completed.
- E. The URS operator shall verify that the vehicle has a reverse signal alarm audible above the surrounding noise level or the vehicle is backed up only when an observer signals that it is safe to do so.

URS SAFETY MANAGEMENT STANDARD
Aerial Lifts

- F. The lift controls must be tested each day to determine whether they are in safe working order.
- G. Both lower and platform controls must be plainly marked as to their function.
- H. Immediately before the work trip, the route must be checked for overhead obstructions, holes, slopes, ditches, bumps, floor obstructions, debris, power lines, and other potential hazards.
- I. Personnel must wear fall protection (SMS 040 – Fall Protection) in the form of a full body harness and lanyard attached to the manufacturer’s prescribed anchorage point. Personnel must never tie-off to an adjacent pole, structure, etc. Fall protection is not required for scissors lifts utilizing standard guardrails unless specifically required by the manufacturer.
- J. Employees must wear hard hats when in or operating aerial lift equipment.
- K. When working from an aerial lift, personnel must stand firmly on the floor of the basket. Sitting or climbing on the edge of the basket and/or using planks, ladders, or other devices for work position are prohibited.
- L. Boom and basket load limits set by the manufacturer must never be exceeded.
- M. Where insulating barriers are not a part of or an attachment to the aerial lift to prevent physical contact with the lines, aerial lifts shall be operated so as to maintain the minimum distances from energized power lines and equipment as stated in the table:

Normal Voltage, kV (Phase to Phase)	Minimum Required Clearance in Feet (meters)
Operation near High-Voltage Power Lines	
Up to 50	10 (3.05)
Over 50 to 200	15 (4.60)
Over 200 to 350	20 (6.10)
Over 350 to 500	25 (7.62)
Over 500 to 750	35 (10.67)
Over 750 to 1,000	45 (13.72)

URS SAFETY MANAGEMENT STANDARD
Aerial Lifts

Operation in Transit With No Load and Boom or Mast Lowered	
Up to 0.75	4 (1.22)
Over 0.75 to 50	6 (1.83)
Over 50 to 345	10 (3.05)
Over 345 to 750	16 (4.87)
Over 750 to 1,000	20 (6.10)

NOTE: Environmental conditions such as fog, smoke, or precipitation may require increased clearances.

- N. Brakes must be set and outriggers positioned on flat, solid surfaces before elevating the basket.
- O. Before using an aerial lift on an incline, wheel chocks must be installed if it is safe to do so.
- P. Lifts must never be placed in the travel path of overhead cranes.
- Q. Because they are considered to be energized equipment, aerial lifts must be electrically ground or barricaded when they are near energized lines or equipment.
- R. Personnel must not operate lower controls unless permission has been obtained from the employee in the basket, except in case of emergency.
- S. Alteration of the insulated portion of an aerial lift that may reduce the insulating value is not permitted.
- T. Aerial lifts may not be "field modified" for uses other than those intended by the manufacturer.
- U. Scissor lifts must never be moved with the platforms up.
- V. Outriggers must be in the stored position before any aerial lift is moved.
- W. Lifts must not be operated while batteries are being charged in place.
- X. When lifts are used inside buildings, consideration must be given to carbon monoxide emissions. Lifts that are propane driven or have air-purifying scrubbers generate less carbon monoxide.

URS SAFETY MANAGEMENT STANDARD

Aerial Lifts

5. Documentation Summary

The following documentation will be maintained in the project file:

- A. Completed Attachment 007-1 AMER.
- B. Completed Attachment 007-2 AMER.

6. Resources

- A. U.S. OSHA Standard – [Aerial Lifts](#) – 29 CFR 1926.453
- B. U.S. OSHA Standard– [Vehicle Mounted Elevating and Rotating Work Platforms](#) – 29 CFR 1910.67
- C. U.S. OSHA Standard – [Mechanical Equipment](#) – 29 CFR 1926.952
- D. U.S. OSHA Standard– [Overhead Lines](#) – 29 CFR 1926.955
- E. [ANSI/SIA 92.2 - 2001](#) – American National Standard Vehicle-Mounted Elevated and Rotating Aerial Devices
- F. [SMS 040](#) – Fall Protection
- G. [Attachment 007-1 AMER](#) – Aerial Lift Training Certification
- H. [Attachment 007-2 AMER](#) – Aerial Lift Inspection Sheet



Safety Management Standards
AERIAL LIFT TRAINING CERTIFICATION

Attachment 007-1 AMER

Issue Date: June 1999
Revision 5: September 2011

Employee Name: _____

Company Name: _____

Qualified to operate the following aerial lift(s):	Make and model of equipment:	Trained by:	Date trained:	Training expiration date:
Extendable boom aerial devices				
Aerial ladders				
Articulating boom aerial devices				
Vertical towers				
Manually propelled elevating work platforms				
Boom-supported elevating work platforms				
Self-propelled elevating work platforms				
Other:				

Signature of Employee/Operator _____ Date: _____

Signature of Senior Manager, Designee, or Safety Representative _____ Date: _____



Safety Management Standards
AERIAL LIFT INSPECTION SHEET

Attachment 007-2 AMER
Issue Date: October 2007
Revision 5: September 2011

Equipment ID No. _____ Inspector's Name _____

Equipment Name _____ Employee Number _____

Instructions: The operator will inspect all applicable items indicated at the start of each shift. If an unsatisfactory condition is observed, suspend operation of the equipment and report the unsatisfactory condition to the site supervisor immediately.

Item Inspected	Check If Satisfactory	Comments
Manufacturer's Operations Manual Is Present with Equipment	<input type="checkbox"/>	
Travel Alarm	<input type="checkbox"/>	
Fall Protection Anchor Point	<input type="checkbox"/>	
Brakes	<input type="checkbox"/>	
Lights	<input type="checkbox"/>	
Horn	<input type="checkbox"/>	
Informational Plates/Markings	<input type="checkbox"/>	
Fire Extinguisher	<input type="checkbox"/>	
Battery Charge	<input type="checkbox"/>	
Battery Load Test	<input type="checkbox"/>	
Hydraulic System	<input type="checkbox"/>	
Hydraulic Fluid Level	<input type="checkbox"/>	
Hydraulic Controls	<input type="checkbox"/>	
Gauge and Instrument Operation	<input type="checkbox"/>	
Tires	<input type="checkbox"/>	
Steering	<input type="checkbox"/>	
Guardrails/Safety Chains	<input type="checkbox"/>	
Cables and Wires	<input type="checkbox"/>	
Platform	<input type="checkbox"/>	
Other (as appropriate)	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	

Operator Signature: _____

Date: _____

Time: _____

URS SAFETY MANAGEMENT STANDARD

Asbestos Operations

1. Applicability

The purpose of this standard applies to the operations of URS Corporation and its subsidiary companies for activities involving potential exposure to known or presumed asbestos-containing materials (ACM or PACM).

2. Purpose and Scope

This standard provides information relating to the performance of asbestos surveys and asbestos removal and supervisory activities to protect the safety and health of the personnel involved in these activities, and to meet specific federal, state, and local requirements for asbestos work. This procedure describes processes and requirements that will be used during the performance of the aforementioned activities, incorporating both regulatory requirements and standard industry practices.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility, site, or project location. Additional requirements regarding state licenses, permits, and required insurance are the responsibility of the project manager.

4. Requirements

A. Definitions

1. Asbestos is a mineral silicate occurring naturally as a variously colored fiber. It is non-combustible, non-conducting, and resistant to deterioration and chemical attack. Because of these properties, it has found widespread use in insulation, gaskets, coatings, plastics, brake linings, floor tile, roofing, transite board, spray-on insulation and cementitious materials. Additional information on asbestos and its potential health effects is provided in Supplemental Information A.
2. Asbestos-containing material (ACM) is defined as any material that contains greater than 1 percent asbestos (>1%) by weight. This means that any material containing 1 percent or less asbestos is considered a non-regulated ACM.
3. "Competent person" refers to a URS employee or subcontractor who has received training and is capable of identifying existing and

URS SAFETY MANAGEMENT STANDARD

Asbestos Operations

predictable asbestos hazards in the work place, and who can take prompt corrective measures to eliminate them.

4. Construction operations include demolition or salvage, removal or encapsulation, new construction or alteration, clean-up and maintenance operations, and/or transportation and disposal.
5. Presumed asbestos-containing materials (PACM) include thermal system insulation, surfacing material, resilient flooring and associated mastic, and vinyl and asphalt roofing materials found in buildings constructed prior to 1981. Cementitious siding or shingles, or transite panels, along with the above-mentioned materials, are to be designated as PACM until rebutted.

B. Asbestos Surveys

For the purpose of this procedure, an asbestos survey is defined as any time a sample of any type of building material is collected with the intent of assessing asbestos content.

1. Competent Person
 - a. Require that each project with an asbestos survey component is assigned an Asbestos Inspector Competent Person to supervise asbestos field activities. The Competent Person must meet the requirements of applicable standards and licensing requirements for this position, and is responsible for seeing that the requirements of this procedure are implemented in the field (e.g., data collection, air monitoring, and personal protective equipment [PPE] use).
2. Training
 - a. Require that all personnel conducting asbestos surveys, including those associated with Phase I Environmental Site Assessments, have completed and successfully passed a building inspector's training course and associated refreshers in accordance with U.S. Environmental Protection Agency (EPA's) Asbestos Hazard Emergency Response Act of 1986 (AHERA) Model Accreditation Program (MAP) (or country-specific equivalent) from an approved and/or accredited training provider.

URS SAFETY MANAGEMENT STANDARD

Asbestos Operations

- b. Provide training at the time of initial assignment, and at least annually, for those potentially exposed to airborne concentrations of asbestos at or above published permissible exposure limits (PELs).
3. Medical Monitoring
 - a. Require that personnel conducting asbestos surveys are placed in the URS Medical Surveillance Program. For additional information, refer to SMS 024 – Medical Screening and Surveillance.
4. Safe Work Plan
 - a. Prepare a Safe Work Plan prior to fieldwork that includes PPE, emergency procedures, and location-specific requirements.
5. Personal Protective Equipment
 - a. Require that appropriate PPE items are available and worn during asbestos surveys. For additional information, refer to SMS 029 – Personal Protective Equipment.
6. Personal Monitoring and Initial Exposure Assessments

Conduct initial exposure assessments in accordance with SMS 043 – Personal Monitoring. Record collected air-monitoring data on the Asbestos Industrial Hygiene Sample Log (Attachment 008-1 AMER). If sufficient data or experience exist to indicate that such assessments are not necessary (e.g., that no employee exposure to airborne concentrations of asbestos above 1.0 fiber/cc of air in 30 minutes, or 0.1 fibers/cc of air in 8 hours), then no initial exposure assessment is necessary. Respiratory protection must be worn until such assessments have been conducted, and it is determined that respiratory protection is not warranted. For additional information, refer to SMS 042 – Respiratory Protection.
7. Collection Procedures of Suspect ACM Bulk Samples
 - a. Collect samples after hours or when the building is not in use, if possible.
 - b. Collect samples of suspect asbestos building materials from area(s) already damaged, if possible.

URS SAFETY MANAGEMENT STANDARD

Asbestos Operations

- c. Prior to sample collection, place a drop cloth beneath the sample location.
- d. Wet selected sample locations sufficiently prior to, and if necessary, during sample extraction to minimize fiber release.
- e. Use appropriate sample collection tools to extract the sample.
- f. Wet-wipe the sample collection tools after sample extraction.
- g. Place sampled material in a pre-labeled container or package capable of being tightly sealed.
- h. Place collected sample container or package in a separate, larger package capable of being tightly sealed for a "double seal."
- i. Record sample collection data on the Bulk Sample Summary form provide in Attachment 008-2 AMER.
- j. Repair sample location as applicable to minimize and/or reduce further potential fiber release.
- k. Place all wet wipes, drop cloths, and disposable clothing and protective equipment into a labeled plastic bag. Seal and retain the bag until laboratory results are received. If all samples are negative for asbestos, dispose of the bag as normal refuse. If any of the samples are positive, the waste bag must be handled as asbestos waste and disposed of in accordance with applicable regulations.

C. Asbestos Removal Activities

- 1. For the purpose of this procedure, asbestos removal activities include, but may not be limited to, the following:
 - a. Removing and disposing of ACM encountered during renovation and construction activities.
 - b. Performing visual observations either for the intent of verifying the removal contractor is complying with the approved work plan/removal specifications, and/or verifying

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the asbestos abatement activities conducted by the removal contractor have been sufficiently performed.

- c. Documenting daily work activities.
- d. Collecting air samples that include background, work-in-progress, and final air clearance samples.

2. Classification of Asbestos Removal Projects

- a. Asbestos removal projects are divided into four classes, each with different requirements for engineering controls, work practices, and procedures:
 - i. Class I activities involving removal of thermal system insulation (TSI) or surfacing material greater than 1percent asbestos.
 - ii. Class II activities involving removal of other ACM, such as asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastics.
 - iii. Class III repair and maintenance operations where ACM is intentionally disturbed. This can include gasket removal (if gasket is crumbled, pulverized, or otherwise made friable), TSI, refractory, or cementitious material removal of less than one bag.
 - iv. Class IV maintenance and custodial activities during which employees contact but do not disturb ACM or PACM, and cleanup of dust, waste, and debris resulting from Class I, II, and III jobs. Gasket removal may occur if the gasket remains largely intact.

3. Competent Person

- a. Require that each project with an asbestos removal component is assigned a competent person to oversee or monitor asbestos activities. The competent person must meet the requirements of applicable standards for this position, and is responsible for seeing that the requirements of this procedure are implemented in the field (e.g., engineering controls, work practices, data collection, air monitoring, and PPE use).

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- b. For Class I and II asbestos work, the competent person must be on site, and must be trained in all aspects of asbestos removal and handling, including abatement, installation, removal, and handling; the contents of the asbestos standard; the identification of asbestos; removal procedures; and other practices for reducing the hazard. The training must be the certified asbestos supervisor training as specified in U.S. Environmental Protection Agency's (EPA's) Model Accreditation Plan (MAP) or country-specific regulatory requirements.
 - c. For Class I, II, and III jobs, the competent person must inspect the job site. Inspections must be made at intervals sufficient to assess whether conditions have changed, and as requested by employees.
4. Engineering and Work Practice Controls
- a. Where URS or subcontractor employees will be directly involved in the removal and disposal of ACM, appropriate engineering and work practice controls must be instituted to reduce worker exposure to asbestos to the lowest limit possible. Controls will consist of barriers and signs, use of non-aggressive and wet-removal methods, use of air filtration equipment, and worker hygiene.
 - i. Regulated Areas
 - All Class I, II, and III jobs must be conducted in regulated areas. All other operations must be conducted in regulated areas if airborne concentrations of asbestos exceed or can be expected to exceed the PEL.
 - If employees working immediately adjacent to a Class I jobs are potentially exposed to asbestos due to the inadequate containment, the employees shall either be removed from the area until the enclosure breach is repaired or an exposure assessment is performed to verify there is not a potential for exposure.
 - Regulated areas must comply with the following:

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- The regulated area must be demarcated so that the number of persons in the area is minimized, while protecting persons outside the area from exposure to airborne asbestos. Signs must be posted around the perimeter.
 - Access must be limited to authorized persons.
 - Respirators must be provided as required.
 - Protective clothing must be provided and used as required.
 - Employees may not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in the area.
- ii. Negative Pressure Containment
- Negative pressure containments, consisting of critical barriers designed to minimize, and where feasible, eliminate the release of asbestos fibers to other areas of the building, will be erected. Air within the containment will be cleaned using high-efficiency particulate air (HEPA) filtration systems. These systems deposit the cleaned air outside the containment, creating a “negative” pressure within the containment relative to the outside atmosphere.
- iii. Signs

Post and control work areas to prevent unauthorized entry. Post warning signs at all entryways into the work area. Signs must be at least 20 inches (51 centimeters) by 14 inches (36 centimeters), with the wording:

**DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
PROTECTIVE CLOTHING
IS REQUIRED IN THIS AREA**

Signs and labels shall identify the material which is present, its location, and appropriate work practices

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which, if followed, will ensure that ACM and/or PACM will not be disturbed.

Other hazard warning signs will be posted as necessary depending upon working conditions (e.g., falls, noise, etc.).

iv. Removal Methods

Once the work area has been isolated, use non-aggressive removal methods to the extent feasible to ensure material will be removed in an intact state. Use wet methods to remove materials that are not intact, unless such wet methods are not feasible or will create safety hazards. Glove bags may be used for removal of pipe runs and other insulation materials within regulation-prescribed limits. ACM removed from elevated areas such as transite boards and shingles will be lowered to the ground and be put in enclosed bags or in an enclosed container by the end of each workday. Enclosed ACM will then be transported to a client-specified hazardous waste storage area. Demolition operations may use water spray during large-scale operations according to an approved work plan.

All ACM removal will require a specific work plan detailing techniques to be used and controls required to reduce exposures to workers and the public.

All exposed surfaces within the removal area will be final-cleaned by HEPA vacuuming and wet cleaning prior to visual inspection by the competent person to ensure complete removal of visible ACM. All accessible and exposed surfaces will be visually inspected. Final clearance sampling will be performed as required.

v. Waste Disposal

Place asbestos wastes in a hazardous waste storage area designated by the client. URS will work with the client to ensure that only ACM removed from the designated work site is placed in the storage area. The Competent Person shall inspect the storage area to

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assure that waste containers are properly labeled, sealed, and stored according to applicable regulations.

Asbestos waste must be collected and labeled according to applicable regulations. Do not mix asbestos waste with other construction debris, industrial waste, or soil.

An approved contracted refuse disposal company will be responsible for transporting the waste to an EPA-approved landfill, and signing the appropriate shipping manifests. Disposal documentation and identification numbers should be in the client or site owners name for all ACM.

vi. Equipment and Tools

Decontaminate all equipment and tools used in the asbestos abatement process. Discard used filters (i.e., discarded as asbestos-contaminated).

vii. Hygiene Facilities and Practices

- Required Hygiene Facilities
 - Class I work requires a decontamination area, consisting of an equipment room to remove and bag protective clothing; a shower area where feasible; and a clean change room.
 - Class II, III, or IV work, where exposure levels exceed the PEL, or there is no negative exposure assessment (NEA), requires an equipment room (or area).
 - Class IV work done in conjunction with a higher work class and in a regulated area requires the same hygiene practice used for the regulated-area employees.
- Required Practices
 - Employees must enter and exit the regulated area through the decontamination area.

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- Employees must remove contaminated clothing and place in labeled bags for disposal/cleaning. Employees must not wear any work clothing or equipment home.
- Employees who work in negative-pressure enclosures or in areas where exposures exceed the PELs must shower at the end of the work shift. Respirators must not be removed until in the shower.

5. Training and Medical Monitoring

a. Training

Require that personnel have completed and successfully passed a "Contractor/Supervisor training" course and refreshers in accordance with EPA's AHERA MAP (or country-specific equivalent) from an approved and/or accredited training provider.

b. Medical Monitoring

Require that personnel are participating in the URS Medical Surveillance Program. For additional information, refer to SMS 024 – Medical Screening and Surveillance.

6. Safe Work Plan

Prepare a Safe Work Plan for URS staff, or review and follow the contractor's safety plan (if applicable) for URS staff.

7. Personal Protective Equipment

a. Activities Inside Negative-Pressure Containment

Wear the following PPE items when personnel enter a negative-pressure containment area, either when asbestos removal is occurring, or there is reasonable potential for exposure to airborne asbestos fibers (i.e., removing ceiling tiles prior to gross removal, inspecting areas reported as complete by the abatement contractor, etc.):

- i. Full-face air purifying (negative-pressure or PAPR) respirator with P100 (HEPA) filters (for additional

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information on the selection and use of respiratory protection, see SMS 042 – Respiratory Protection).

- ii. Hooded Tyvek® coverall suit
- iii. Hard hat
- iv. Safety boots
- v. Fall protection system as appropriate. For additional information, refer to SMS 040 – Fall Protection
- vi. Gloves.

b. Activities Outside Negative Pressure Containment

Wear the following PPE items when personnel are conducting activities outside a negative-pressure containment area.

- i. Safety glasses as appropriate
- ii. Hard hat as appropriate
- iii. Safety boots
- iv. Fall protection system as appropriate. For additional information, refer to SMS 040 – Fall Protection
- v. Gloves

c. Miscellaneous

- i. URS personnel will adhere to the PPE policy of all clients and/or locations where these activities may occur if it is more stringent than the above requirements.
- ii. URS asbestos operations personnel will contact a URS Safety Representative, if necessary, for additional information regarding the proper use and/or types of PPE that should be used.

8. Personal Monitoring and Initial Exposure Assessments

- a. Conduct initial exposure assessments in accordance with SMS 043 – Personal Monitoring. Record collected air-

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monitoring data on the Asbestos Industrial Hygiene Sample Log (Attachment 008-1 AMER). If sufficient data or experience exist to indicate that such assessments are not necessary (e.g., that no employee exposure to airborne concentrations of asbestos above 1.0 fiber/cc of air in 30 minutes or 0.1 fibers/cc of air in 8 hours), then no initial exposure assessment is necessary. This is considered to be an NEA.

- b. For Class I jobs, the NEA must be based on monitoring data collected during the job, or on data collected on a job closely resembling the job to be done. Data must have been collected within a year prior to start of the current job. If no monitoring has been done and no NEA can be made, employees have the potential to be exposed above the PEL.
- c. For Class II, III, and IV jobs, the NEA may be based on objective data collected from past studies on similar jobs; no time limit is applied.
- d. If no NEA can be made for Class I and II jobs, monitoring must be done daily until an NEA can be made.
- e. If no NEA can be made for Class III and IV jobs, monitoring must be done periodically at intervals sufficient to document exposures, and must continue until an NEA can be made (i.e., a determination by the competent person).
- f. Respiratory protection must be worn until such assessments have been conducted, and it has been determined that respiratory protection is not warranted (see SMS 042 – Respiratory Protection).

5. Documentation Summary

The following documents are required to be in the project safety file for tasks involving asbestos operations.

- A. Training certificates
- B. Medical clearance forms
- C. Appropriate and valid licenses
- D. Air monitoring results

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- E. Bulk sampling results
- F. Respirator fit test records
- G. Air permits, when required by applicable regulations
- H. Copies of waste manifest records
- I. Inventory of ACM waste generated and properly disposed of

6. Resources

- A. U.S. Occupational Safety and Health Administration (OSHA) Standard 29 Code of Federal Regulations (CFR) 1910.1001 – [Asbestos](#)
- B. U.S. OSHA Standard 29 CFR 1926.1101 – [Asbestos](#)
- C. U.S. OSHA Technical Links – [Asbestos](#)
- D. U.S. EPA Standard 40 CFR 763, Appendix C – Asbestos Hazard Emergency Response Act ([AHERA](#))
- E. U.S. EPA [AHERA Tools](#)
- F. [U.S. EPA Standard 40 CFR 61.145](#) – Demolition and Renovation of Structures
- G. [U.S. EPA Standard 40 CFR 61.146](#) – Spraying Asbestos-Containing Products
- H. [U.S. EPA Standard 40 CFR 61.150](#) – Disposal of Asbestos-Containing Waste
- I. [SMS 024](#) – Medical Screening and Surveillance
- J. [SMS 029](#) – Personal Protective Equipment
- K. [SMS 040](#) – Fall Protection
- L. [SMS 042](#) – Respiratory Protection
- M. [SMS 043](#) – Personal Monitoring
- N. [Attachment 008-1 AMER](#) – Asbestos Industrial Hygiene Sample Log
- O. [Attachment 008-2 AMER](#) – Bulk Industrial Hygiene Sample Summary

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7. Supplemental Information

- A. [Asbestos Information Sheet](#)
- B. [Sample Exposure Control Plan](#)

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Corrosive and Reactive Materials

1. Applicability

This standard applies to the operations of URS Corporation and its subsidiary companies where corrosive and/or reactive materials are used or stored.

2. Purpose and Scope

The purpose of this standard is to protect employees from the hazards of corrosive and reactive materials. This procedure considers a corrosive material as one that has a pH less than 2.0 (acid), or greater than 12.5 (base). A reactive material is a chemical that may be sensitive to shock, or may react with air or water depending upon its makeup.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility, site, or project location.

4. Requirements

- A. Appoint a responsible person who will:
 - 1. Inspect storage areas periodically.
 - 2. Monitor the quantity of corrosive and reactive materials on site, as well as that of incoming materials.
 - 3. Review work practices that involve corrosive and reactive materials.
- B. Require that all employees working with corrosive or reactive materials, or who may be exposed to such materials, are trained in accordance with SMS 002 – Hazard Communication.
- C. Control the use of corrosive and reactive materials by URS personnel.
 - 1. Order only those materials and quantities that are needed to complete a job.
 - 2. Check incoming corrosive and reactive materials for proper labeling in accordance with SMS 002 – Hazard Communication.
 - a. Label materials, if needed, as they arrive on site.
 - b. Mark reactive materials containers with the date of receipt of the chemical.

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3. Check incoming corrosive and reactive materials for material safety data sheets (MSDS). If MSDSs are not provided or are already on file, order them from the manufacturer, distributor, or vendor.
 4. Add incoming corrosive and reactive chemicals to the hazardous materials inventory, if not already present, following procedures set forth in SMS 002 – Hazard Communication.
 5. Do not store any quantity of corrosive or reactive materials in an office (with the exception of limited quantities of consumer products). These materials are to be stored off site, or at an on-site laboratory or storage area.
- D. Store corrosive and reactive materials as indicated in the MSDS:
1. In a cool, dry environment, free from extremes of temperature and humidity.
 2. In a manner that separates them from other materials (including flammables and oxidizers) and from each other.
 - a. Separate acids and bases.
 - b. Separate reactive materials from acids and bases, and protect from contact with water.
 3. On materials that are acid-resistant (Teflon-coated, plastic, etc.) for small containers.
 4. Covered, not stacked on one another, on acid-resistant material for carboys (approximately 5 gallons/22 liters).
 5. On individual racks or securely blocked on skids, with closure (plug) facing upward to prevent leakage from drums.
- E. Require that labeling and signage are in place.
1. Label containers with the appropriate warning word to indicate the hazard, such as: DANGER; WARNING; CAUTION; CORROSIVE; OXIDIZER.
- F. Use corrosive and reactive materials appropriately.
1. Prior to use and in accordance with MSDS, safe-handling procedures must be developed for each operation, and type and

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Corrosive and Reactive Materials

concentration of the chemical. In all cases, review the MSDS and product information before use.

2. Follow SMS 029 – Personal Protective Equipment when working with or around corrosive and reactive materials. Review the MSDS for the chemical used to determine the specific type of PPE needed, to include at a minimum:
 - a. Chemical-splash goggles
 - b. Chemical-resistant gloves
 - c. Chemical-resistant apron
3. Obtain medical care immediately in the event of:
 - a. Skin or eye exposure (e.g., splash) to corrosive liquids
 - b. Inhalation of vapors of corrosive liquids that cause respiratory discomfort.
4. Require an eyewash station to be located in all areas where acids or bases are used. Safety showers must be near by if significant acid or base quantities are involved.
 - a. Place emergency eyewashes and showers in accessible locations that require no more than 10 seconds to reach, and are in a travel distance no greater than 25 feet (7.5 meters) from the hazard.
 - b. Keep the areas surrounding eyewashes and safety showers free of stored materials or debris at all times.
 - c. Mark emergency eyewashes and showers with a highly visible sign.
 - d. Require the area around emergency eyewashes and showers to be well lighted and visible.
 - e. Where portable eyewash units are used, a process must be in place to change the water and clean the unit, as required by the manufacturer's instructions.
 - f. Require emergency showers and shower/eyewash combinations connected to a self-contained water supply to

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deliver a minimum 20 gallons (85 liters) per minute for 15 minutes.

- g. Require emergency showers and shower/eyewash combinations permanently connected to a potable water supply to deliver at least 30 gallons (127.5 liters) per minute continuously.
- h. Require emergency eyewashes to be capable of delivering to the eyes not less than 0.4 gallon (1.5 liters) per minute for 15 minutes.

G. Be prepared to clean up spills of corrosive and reactive materials.

- 1. Have a written spill response plan in place before materials are stored on site.
- 2. Have commercial spill kits available for cleanup of small quantities of materials. At a minimum, kits should contain appropriate protective clothing (including full-body suits, gloves, and boots) and spill control equipment (including absorbents, pillows, shovels, containers, etc.).
- 3. Where necessary, ensure that appropriate respiratory protection equipment is provided to spill responders. For additional information, see SMS 042 – Respiratory Protection.
- 4. Clean up or respond to spills promptly.
- 5. Ensure that personnel responding to a spill have been trained in the hazards associated with the spilled material, as well as use of the spill control equipment, including PPE required for the task.
- 6. Do not use combustible organic materials such as sawdust, excelsior, wood chips and shavings, paper, rags, or burlap bags to absorb or clean up spills.

H. Develop a waste management plan and procedures, including procedures for collection, storage, labeling, pick-up and transport, and final disposal.

I. Dispose of corrosive and reactive materials appropriately.

- 1. Segregate organic acids, inorganic acids, and basic wastes.

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Corrosive and Reactive Materials

2. Contract hazardous waste disposal services should be obtained, as necessary, to dispose of waste materials. All waste must be appropriately packaged for off-site transportation, if applicable.
 3. Wastes must be marked, labeled, and shipped in accordance with regulatory requirements. For additional information, see SMS 048 – Hazardous Materials/Dangerous Good Shipping.
- J. Inspect corrosive and reactive storage and use areas periodically.
1. Inspect office, laboratory, and project settings quarterly.
 2. Use the inspection sheet provided as Attachment 009-1 NA to inspect sites.

5. Documentation Summary

The following information will be maintained in the project file:

- A. Completed Corrosive and Reactive Material Inspection Sheets.
- B. Worker Right-to-Know training documentation.
- C. Written Spill Response Plan.
- D. Waste Management Plan.
- E. Documentation of training for spill response personnel.
- F. Documentation of hazard communication training for personnel exposed to corrosive and/or reactive materials.

6. Resources

- A. [ANSI Z358.1-2004](#) – American National Standard for Emergency Eyewash and Shower Equipment
- B. U.S. Occupational Safety and Health Administration (OSHA) Technical Links – [Personal Protective Equipment](#)
- C. U.S. OSHA Technical Links – [Hazard Communication](#)
- D. Australian Standards AS 3780 – 1994. [The Storage and Handling of Corrosive Substances](#)
- E. [SMS 002](#) – Hazard Communication

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- F. [SMS 029](#) – Personal Protective Equipment
- G. [SMS 042](#) – Respiratory Protection
- H. [SMS 048](#) – Hazardous Materials/Dangerous Goods Shipping
- I. [Attachment 009-1 NA](#) – Corrosive and Reactive Materials
Inspection Sheet



Health, Safety and Environment
**CORROSIVE AND REACTIVE MATERIALS
INSPECTION SHEET**

Attachment 009-1 NA

Issue Date: June 1999
Revision 3: February 2009

Location: _____

Name of Inspector: _____ **Date Inspected:** _____

Labeling

1. Original containers are labeled with: Yes No NA
- Name of chemical
 - Signal word (e.g., DANGER; WARNING; CAUTION, etc.)
 - Manufacturer

Pre-Job Activities

2. Corrosives and reactives are stored in a cool, dry environment, free from temperature extremes Yes No NA
3. Corrosives and reactives are stored in their properly labeled original containers, cushioned against shock, and stored to prevent leaks Yes No NA
4. Corrosives are not stored in the vicinity of oxidizers Yes No NA
5. Hydrofluoric acid is stored only in acid-proof polyethylene- or ceresin-lined containers Yes No NA
6. Corrosives are stored on acid-resistant material Yes No NA
7. Chromic acid, nitric acid, perchloric acid, and potassium permanganate (all oxidizers) are stored separately from other corrosives and flammables Yes No NA

Handling

8. The following minimum required PPE is used when working with corrosives: Yes No NA
- Chemical splash goggles
 - Chemical resistant gloves
 - Chemical resistant apron
9. Bottles or carboys are opened slowly to guard from splashes. Yes No NA
10. The outside of the container is washed off with water after use to clean off any droplets of material. Yes No NA
11. An eyewash is located in all areas where corrosives are used. Yes No NA
12. An eyewash is:
- Within 25 feet (7.62 meters) or 10 seconds of travel Yes No NA
 - Marked with a highly visible sign Yes No NA
 - Well lit and visible Yes No NA
 - Working and delivering a minimum of 1.5 liters of water per minute for 15 minutes Yes No NA
13. Where substantial quantities of corrosives and/or reactives are stored, access to an emergency shower is available. Yes No NA
14. Spill control materials compatible with chemicals are available for emergency use. Yes No NA

Waste Disposal

15. Organic acid, inorganic acid, and basic waste are kept segregated. Yes No NA
16. Corrosive waste is disposed in accordance with regulatory and client requirements. Yes No NA
17. A waste management plan or procedure is in place. Yes No NA
18. Arrangements for waste collection, transport, and disposal are in place. Yes No NA

Comments:

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Confined Space Entry

1. Applicability

This standard applies to URS Corporation and its subsidiary companies where confined space entry operations are performed by URS or any contractor and/or subcontractor on URS projects.

2. Purpose and Scope

The purpose of this standard is to protect personnel from the hazards associated with confined space entry.

A confined space is defined as follows:

- A. It is large enough and so configured that personnel may bodily enter and perform assigned work.
- B. It has limited or restricted means for entry or exit.
- C. It is not designed for continuous occupancy.

A non-permit space is a confined space that presents no existing or potential hazards, nor will the work performed or natural environment therein create a hazardous condition.

A permit-required space is a confined space that may present one or more potential hazards. A permit-required space may be changed to a non-permit space if all known and potential hazards are eliminated.

An alternate entry space is a confined space that was initially classified as a permit-required confined space, but has atmospheric hazards that can be completely controlled only through ventilation.

Entry into a non-permit, permit-required, or alternate entry confined space occurs whenever any body part crosses the plane of entry of the space. Note: All confined spaces will be considered to be permit-required spaces until further investigation reveals the nature and extent of the hazards.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility, site, or project location.

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Confined Space Entry

4. Requirements

- A. Determine whether a confined space is present and, if so, whether entry is required. Where a confined space has been identified but will not be entered, take positive measures to prevent entry, including setting up barriers and posting signs and warning labels.
- B. Where confined spaces are present and must be entered, determine the type of confined space present. A decision flow chart to assist in determining the type of confined space present is provided in Supplemental Information B.

Determining the type of confined space will require a thorough evaluation of the actual and potential hazards associated with the confined space. Common hazards associated with confined space entry include, but may not be limited to, atmospheric hazards, thermal hazards, chemical hazards, mechanical force, electrical hazards, and engulfment. Refer to Supplemental Information A for definitions of common confined space terminology, including hazards.

C. Permit-Required Confined Space Entry

1. Requirements of the Entry Supervisor:

- a. Conducts an assessment of confined space locations within the facility, gathering information about the spaces within the project boundaries. When the project is located within the boundaries of a client site, the Entry Supervisor will contact the facility representative to gather information about the confined space and to determine whether the facility has any entry requirements that must be followed.
- b. Performs a hazard evaluation using the Confined Space Entry Permit – Attachment 010-1 AMER. More detailed discussion of hazard assessment criteria is provided in Supplemental Information C.
- c. Assesses whether those hazards that create the permit-required confined space can be eliminated without necessitating employee entry into the space. By eliminating hazards that are immediately dangerous to life or health, administrative and rescue requirements are lessened and risk to workers is reduced.
- d. Determines rescue requirements for the space.

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Confined Space Entry

- e. Arranges for Authorized Entrants, Attendants, and rescue service personnel, where required.
 - f. Identifies all equipment necessary for the job. This may include the following:
 - i. Testing and monitoring equipment.
 - ii. Ventilating equipment.
 - iii. Communications equipment.
 - iv. Personal protective equipment.
 - v. Lighting.
 - vi. Barriers and shields to protect entrants from external hazards.
 - vii. Equipment necessary for safe ingress and egress.
 - viii. Rescue and emergency equipment.
 - ix. Any other equipment required for safe entry and exit from the confined space.
 - g. Obtains all equipment and verifies that it is functional.
 - h. Coordinates confined space entry activities with other onsite contractors who may be affected by the entry and provides them with a copy of this written program.
 - i. Cancels the entry and the permit in the event of an emergency or permit expiration.
2. Space Isolation
- a. Verify that the confined space is emptied, purged, flushed, ventilated with air, or otherwise made free of hazardous substances.
 - b. Isolate the confined space as described on the permit. Isolation procedures typically include disconnection or blocking of lines, pipes, or other material conveyances to or through the confined space that may be carrying fuels, liquids, or gases.

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Confined Space Entry

- c. Isolate and lockout/tagout all forms of potential energy inside the confined space, including the following:
 - i. Electrical.
 - ii. Mechanical.
 - iii. Thermal.
 - iv. Pneumatic.
 - v. Hydraulic.
 - d. Develop alternate procedures for protection of entrants for lines that may not be controlled (e.g., lines through storm water or sewer vaults).
 - e. Open the entry point to the confined space.
 - f. Provide barricades and post the entrance of the space with a sign stating "Danger Confined Space Do Not Enter" or equivalent wording.
3. Electrical Equipment
- a. Provide electrical equipment that meets the electrical classification of the area. Refer to SMS 012 – Electrical Safety, for additional information.
 - b. Route all portable electrical equipment through ground fault circuit interruption (GFCI) devices.
4. Atmospheric Tests
- a. Calibrate monitoring equipment before and after sampling and record information.
 - b. Make initial atmospheric tests of the space with the ventilation OFF.
 - c. Attach extension probes or lengths of silicone or similarly inert tubing material to the monitoring equipment to reach the bottom of the space. For horizontal spaces, the probe may need to be attached to a pole.

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Confined Space Entry

- d. Take atmospheric measurements in several locations (bottom, middle, top, corners), allowing extra response time from the instrumentation to register, especially if a tubing extension is used.

Consult the monitoring equipment's operating manual to determine the additional response time required.

- e. Obtain readings for oxygen first, followed by %Lower Explosive Limit, (%LEL) then for other contaminants of concern (if applicable).
- f. Record all results on the permit, and sign and initial where indicated.
- g. Determine whether acceptable entry conditions exist with respect to oxygen, %LEL, and other hazardous atmospheres.
- h. If unacceptable entry conditions are indicated, correct the limiting condition.
- i. If acceptable entry conditions exist, determine times that the monitoring will be repeated or determine whether continuous monitoring will be needed.
- j. Monitor continuously for oxygen and %LEL if hot work will be performed in the space.

5. Ventilation

- a. Open as many openings as possible in the space to aid in cross ventilation.
- b. Never ventilate confined spaces with oxygen.
- c. Ensure that air supply for the ventilation equipment originates from a clean source.
- d. Provide five (5) air changes per hour or at least 10,000 cubic feet/minute (cfm) for large spaces.
- e. If a generator is used to provide power, be sure that the exhaust does not enter the space. Carbon monoxide monitoring may be required.

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- f. Place blower ductwork such that it does not create a hazard by impairing the line of vision of attendants observing space entrants or by blowing contaminants to other workers.
 - g. Provide at least 2,000 cfm of active exhaust ventilation for each welder or torch operating under a Hot Work Permit within the space.
 - h. Use fire/explosive proof ventilating equipment that is in compliance with National Fire Protection Association (NFPA) 70, Articles 502 and 503, as applicable when exhausting flammable gases, vapors, and dusts from confined spaces.
6. Authorizing the Permit
- a. The Entry Supervisor personally inspects the work area and signs the permit after confirming that all necessary precautions have been taken and all relevant information concerning the entry parameters is documented on the permit.
 - b. Conduct a briefing informing all entrants and attendants of conditions in the space.
 - c. Require entrant(s) and attendant(s) to each print their names and sign the permit.
 - d. Affix the permit to a location near the space entrance.
7. Entry Operations
- a. Prohibit entry when oxygen-deficient or flammable atmospheres are detected in the space.
 - b. Limit entry to Authorized Entrants listed on the permit and only for the purpose stated on the permit.
 - c. Require entrants to follow all requirements listed on the permit.
 - d. Attach a body harness, if required, to a lifeline. Attach the other end of the lifeline to a fixed point or to a mechanical lifting device outside the space at all times the entrant(s) is in the space.

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- e. Require that the attendant or attendants remain at the entrance whenever an entrant is inside the confined space. The attendant may not be assigned other duties that may distract him/her from maintaining uninterrupted contact with the entrant(s). The attendant may attend to only one confined space entry at any one time. Each space must have its own attendant.
 - f. The attendant will order entrant(s) out of the space whenever
 - i. A prohibited condition on the entry permit develops.
 - ii. The surrounding work area becomes unsafe.
 - iii. Any monitoring instrumentation, rescue equipment, ventilation, etc. becomes compromised.
 - iv. Possible symptoms of exposure are noted in the entrant(s).
 - v. Entrant(s) expresses any type of concern regarding the safety of the entry.
8. Rescue
- a. Require non-entry rescue procedures to be used for every entry, where feasible. Typically, non-entry rescue will require the use of a retrieval line and full-body harness. Mechanical extraction devices, usually consisting of a tripod, winch, and lanyard affixed to the full-body harness, are required for non-entry extraction of personnel from vertical spaces more than 5 feet (1.5 meters) in depth.
 - b. Wristlets will not be used for non-entry rescue procedures unless it can be demonstrated that the use of a chest or full-body harness is not feasible or unsafe and that the use of wristlets is the most effective alternative.
 - c. Contract for qualified entry rescue services. This may be local emergency services personnel, contract rescue teams, or response teams provided by the host facility. If response teams are provided by the host facility, this must be noted in the health and safety plan and agreed to by both parties.

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- d. Entry rescue must be staged on site adjacent to the space for the duration of the entry. Ensure that rescue service personnel are provided prior access to all confined spaces to allow for development of appropriate rescue plans and to practice rescue operations, as needed.
- e. Entry rescue personnel must be staged at the entry site any time conditions within the confined space are or could become immediately dangerous to life or health (IDLH).
- f. URS will not place staff at risk by allowing confined space entry when qualified rescue teams cannot be identified.

9. When the Entry Is Complete

Cancel the permit by obtaining the signature of the entry supervisor and recording the time and date on the permit. This should be accomplished after the space is resealed, and signs and barricades are removed. If the space cannot be closed until a later time, provisions must be maintained (barricades, warning signs) to discourage persons from entering the space.

D. Non-Permit Confined Space Entry

1. Reclassification of a Permit-Required Confined Space

- a. The first step toward reclassification of a permit-required space as a non-permit space is to eliminate all its hazards without entering the space. If this is not practical and it becomes necessary for an employee to enter a permit-required space in order to eliminate its hazards, the entry must occur in accordance with the written permit-required confined space program.
- b. If the space requires cleaning, determine whether cleaning activities performed in the space would create a hazardous atmosphere. Determine whether activities outside the space would negatively affect the atmosphere inside the space. If not, the space may be reclassified as a non-permit space.
- c. Permit-required spaces with actual or potential atmospheric hazards that can be controlled but not eliminated by ventilation cannot be downgraded to non-permit spaces. The control of atmospheric hazards using forced air ventilation does not constitute elimination of those hazards

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and thus cannot be used to downgrade a permit-required space to a non-permit space.

2. Space Reevaluation

If hazards arise within a space that had been classified as a non-permit space, each employee in the space must immediately exit the space. The space must then be evaluated to determine whether it should be reclassified as a permit-required space.

3. Recordkeeping

To document that all hazards in a non-permit space are eliminated, a Non-Permit Required Confined Space Work Form (Attachment 010-2 AMER) must be completed. This form must be made available to each employee for review and signature prior to entering the space.

E. Alternate Entry Confined Space Criteria

Alternate procedures for entering permit-required spaces containing atmospheric hazards can be used if it can be demonstrated that forced air ventilation alone will control all hazards in the space.

1. Alternate Entry Criteria

- a. There may be no hazardous atmosphere within the space whenever any employee is inside the space.
- b. Continuous forced air ventilation will be used, as follows:
 - i. An employee may not enter the space until the forced air ventilation has eliminated any hazardous atmosphere.
 - ii. The forced air ventilation will be so directed as to ventilate the immediate areas where an employee is or will be present within the space and will continue until all employees have left the space.
 - iii. The air supply for the forced air ventilation will be from a clean source and may not increase the hazards in the space.
- c. The atmosphere within the space will be periodically tested as necessary to ensure that the continuous forced air

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ventilation is preventing the accumulation of a hazardous atmosphere.

- d. If a hazardous atmosphere is detected during entry:
 - i. Each employee will leave the space immediately.
 - ii. The space will be evaluated to determine how the hazardous atmosphere developed.
 - iii. Measures will be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place.

2. Recordkeeping

Monitoring and inspection data are to be documented in writing on the Alternate Entry Confined Space Work Form – Attachment 010-3 AMER. When alternate procedures are used for entering a permit-required space, verify that the space is safe for entry and that all required procedures and safety measures have been taken.

F. Audits of the Confined Space Entry Standard

Annual audits of this Safety Management Standard will be conducted in accordance with the procedures set forth in the SMS 068 – Compliance Assurance.

The Project Manager, or his/her designee, will review Entry Permits (if completed) on an annual basis (or more frequently as necessary depending on client requirements and project duration) and document this review by notation on the permits. The purpose of this review is to determine compliance with this SMS and ensure that employees performing entry operations are adequately protected from confined space hazards.

G. Training

Require Entry Supervisors, Entrants, and Attendants to be trained prior to the initial assignment, prior to a change in assigned duties, if a new hazard has been created, or if special deviations have occurred. Suggested baseline training requirements for permit-required and non-permit spaces are provided in Supplemental Information D.

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5. Documentation Summary

The following documentation will be maintained in the project file:

- A. Entry Supervisor, Authorized Entrant, and Attendant qualifications.
- B. Confined Space Entry Permits or Work Forms.
- C. Additional Work Permits, as necessary (e.g., Hot Work).
- D. Monitoring equipment calibration logs.
- E. Lockout/Tagout records (if used).
- F. Daily worker briefing records.

6. Resources

- A. U.S. Occupational Safety and Health Administration (OSHA) Standard – [Permit-Required Confined Spaces](#) – 29 Code of Federal Regulations 1910.146
- B. U.S. OSHA Technical Links – [Confined Spaces](#)
- C. American National Standards Institute/American Society of Safety Engineers – [ANSI/ASSE 117.1-2003](#) – Safety Requirements for Confined Space
- D. [SMS 012](#) – Electrical Safety
- E. [SMS 068](#) – Compliance Assurance
- F. [Attachment 010-1 AMER](#) – Confined Space Entry Permit
- G. [Attachment 010-2 AMER](#) – Non-Permit Required Confined Space Work Form
- H. [Attachment 010-3 AMER](#) – Alternate Entry Confined Space Work Form

7. Supplemental Information

- A. [Definitions](#)
- B. [Type of Confined Space Decision Flow Chart](#)
- C. [Confined Space Hazard Assessment Criteria](#)

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D. [Confined Space Training](#)

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1. Applicability

This standard applies to the operations of URS Corporation and its subsidiary companies for those projects where electricity is used, electrical systems are installed or maintained, or live electrical circuits are accessed. For work in close proximity to overhead or underground utilities, see SMS 034 – Utility Clearances and Isolation.

2. Purpose and Scope

The purpose of this standard is to describe requirements for working on electrical circuits and to reduce worker risk from electrical hazards. The primary hazards related to electricity are shock, burns, arc-blast, fire, and explosions.

Work on live electrical circuits presents hazards of injury due to electrocution and arc flash exposure. Electrocution is a function of voltage (the energy potential) and amps (the amount of energy absorbed through the circuit). The human body can absorb 3 amps with survivable damage to the tissue. At 5 amps, tissue death is nearly immediate. Electrocution may occur with voltage of less than 50 volts. Below that level, electrocution may not cause death. However, even 0.1 amp across the heart (or across the chest or arms, which correlates to current across the heart) can interfere with the heart's function. Individuals who are electrocuted across the chest may be injured in such a way as to stop the heart's function, or stop respiration. If not immediately treated; the heart of an electrocution victim can fail. Electrocution at higher voltages may cause tissue damage or burns. In either mode of electrocution, injury is nearly instantaneous, and death is a frequent outcome.

Arc-flash injury is a result of exposure to the radiation emitted from an electrical spark. An arc flash is typically a very short-duration event (on the order of microseconds), but the heat generated may be four times as hot as the surface of the sun. The radiation emitted by arc flash will cause instant tissue damage. If the eyes are unprotected, the radiation will cause instant blindness.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility, site, or project location.

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4. Requirements

- A. Any work performed on live electrical systems of 50 volts or more must be done by a qualified licensed or journeyman electrician or HVAC mechanics. Other personnel who may be exposed to electrical hazards must be trained in and be familiar with safe working practices.
- B. Arc-flash protection protocols (see Section L) must be in place any time electricians are working on or near live circuits of 50 volts or more.
- C. Personnel must follow established lockout/tagout procedures when performing work on electrical equipment or machinery unless power must be applied for the purpose of adjustment or electrical trouble-shooting. Refer to SMS 023 – Lockout and Tagout Safety.
 - 1. Consider all electrical systems as live until verified as de-energized and grounded.
 - 2. Do not work on or in close proximity to electrical circuits unless the circuit is de-energized, grounded, or guarded.
- D. General Safe Work Practices
 - 1. Use rated-load switches or circuit breakers to disconnect electric power and lighting circuits. Non-electrical workers may reset a tripped single-pole convenience outlet or lighting circuit breaker *one time*, provided it is not located in a designated emergency panel, and when, based on their knowledge, it is safe to do so. If the circuit breaker trips again, contact a supervisor to authorize and initiate the next appropriate course of action. Other types of circuit breakers may only be reset by personnel with training and knowledge of the affected systems.
 - 2. Strictly prohibit use of pocket knives and standard box cutters – use wire strippers and cable strippers to strip wire and cable, including high-voltage cable.
 - 3. Equipment must meet the requirements of the National Fire Protection Association (NFPA) and/or National Electric Code (NEC) for these locations, if electrical equipment is used near sources of flammable vapors, such as those identified in Class 1, Division 1 or Class 1, Division 2.
 - 4. Guard and secure lamps and fixtures to preclude injury. Open fluorescent fixtures must have wire guards, lenses, tube guards and

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locks, or safety sockets that require force in the horizontal axis to remove the lamp.

5. Protect lamps for general illumination from inadvertent contact or breakage either with a suitable guard or by separation of at least 7 feet from normal working surfaces.
6. Double-insulated portable electric hand tools shall be inspected prior to use for any damage or defects and tagged out of service if the protection is compromised by damage or excessive wear. Double-insulated tools must be marked (usually with standard double-insulated mark on casing).
7. Use low voltage battery powered tools when feasible and practical.
8. Unplug portable electrical hand tools when not in use.
9. Do not use electrical cords to raise or lower equipment.
10. Do not use equipment with frayed cords or three-wire cord ends that have had the grounding prong removed.
11. Use the proper power receptacle for each application. Do not manipulate the cord-end prongs to fit the wrong receptacle.
12. Avoid the use of temporary wiring. Employ appropriate ground-fault circuit interrupters with any temporary wiring, including extension cords used for portable electrical equipment and tools.
13. Do not use extension cords in place of permanent wiring (affixed to structure, run-around poles, under doors, through holes in walls or structure, etc.).
14. Always plug high-current–draw items such as coffee pots, refrigerators, microwaves, toaster ovens, and toasters directly into an approved outlet, never into extension cords or power strips.
15. Plug power strips (surge protectors) directly into an approved outlet, not into other power strips or into extension cords. Only use surge protectors listed by a nationally or internationally recognized testing laboratory. Do not plug loads into these devices that exceed the maximum recommended by the manufacturer.

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16. Inspect extension cords and cords on electrical equipment before each use. Take equipment or extension cords with damaged wiring or missing plug prongs out of service until the damage is repaired.
17. Electrical safety interlocks may be defeated only by trained and qualified personnel, and then only temporarily, when directed to do so by an approved procedure or work practice, while working on the equipment. Return the interlock to its operable condition as soon as possible.
18. De-energize circuits immediately if an electrical shock victim is still in contact with electrical energy. If not possible to de-energize the circuit, only trained and qualified employees may attempt to remove the victim. Note: Electrical shocks are medically serious regardless of the voltage. Even if the victim shows no apparent signs of injury, they must be seen by a qualified health care professional.
19. Avoid installing conductors in or removing conductors from raceways containing energized or potentially energized conductors, as a general rule, because of the possibility of conductor damage. If this type of work is unavoidable, identify and lock out/tag circuits, or the task will be considered energized work, and an Energized Work Permit (Attachment 012-1) must be secured.
20. Personnel must remain alert at all times when working near exposed electrical parts or in situations where electrical hazards may exist. Personnel must never reach blindly into areas that may contain live circuits. Personnel must not be permitted to work in areas containing electrical hazards if alertness is recognizably impaired due to illness, fatigue, or other reasons.
21. Employees must not enter an area containing exposed electrical circuits unless adequate illumination is provided. When the illumination or obstructions affect visibility and the employee might contact the exposed circuits or equipment, employee will not perform the task.
22. Do not perform tasks within the Limited Approach Boundary of energized electrical components if lack of illumination or obstructions precludes observation of the work to be performed.
23. Handle conductive materials and equipment in contact with an employee's body carefully so they do not come into contact with

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exposed conductors. Conductive material and equipment include, but are not limited to ducts, pipes, tubes, conductive hoses or ropes, metal-lined rules and scales, and steel tapes or chains.

24. Use protective shields, barriers, or insulating materials to protect workers from exposed energized parts that might be inadvertently contacted, or where dangerous electric heating or arcing is likely to occur.
25. Take precautions when work is performed in a confined or enclosed space, such as a manhole or vault, to avoid contact with the energized part. Special training in confined spaces and a confined space entry permit must be obtained before entry.
26. Housekeeping and custodial duties will not be performed adjacent to energized parts where such parts present an electrical contact hazard. Cleaning materials such as water, steam, conductive cleaning fluid, steel wool, metalized cloth, or silicon carbide will not be used in the proximity of energized parts.
27. Workers will not wear conductive apparel (e.g., watches, rings, bracelets, key chains, necklaces, metalized aprons, cloth with conductive thread, metal head gear, wire/metal-rimmed glasses, etc.).
28. Report to supervisor potential electrical hazards or unexpected occurrences during electrical renovation or construction.
29. Do not use equipment that does not meet the requirements of this standard.

E. Hazardous Locations

1. Determine whether electrical equipment and wiring will be installed in locations where any of the following may be present: flammable vapors, liquids, or gases; combustible dusts or fibers; or a concentration or quantity of flammable or combustible material. See Supplemental Information A – Hazardous Locations, for definitions of hazardous locations.
2. Use protective barriers or insulating materials if electrical systems in a confined space cannot be de-energized.
3. If an employee must handle long dimensional conductive objects (e.g., ducts and pipes) in areas with exposed energized systems,

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attempts will be made to de-energize the systems. If the systems cannot be de-energized, site procedures will be developed (e.g., use of insulation, guarding, and material handling techniques) which will minimize the hazard.

F. Circuit Interrupters and Grounding

1. Ground-Fault Circuit Interrupters (GFCI)

- a. Provide GFCI protection in wet or extremely damp areas.
- b. Employ GFCI to protect personnel when using portable electric tools and portable electric equipment, including portable lights.
- c. Locate GFCI protection between extension cords and the electrical outlets into which they are plugged.
- d. Provide GFCI for all 120-volt, single-phase, 15- and 20-ampere receptacle outlets on construction sites.
- e. Provide GFCI for all 120-volt, single-phase, 15- and 20-ampere receptacle outlets within garages, bathrooms, kitchens, and shops.
- f. Receptacles on a two-wire, single-phase portable or vehicle-mounted generator rated not more than 5 kilowatts, where the circuit conductors of the generator are insulated from the generator frame and all other grounded surfaces, need not be protected with GFCI.
- g. Test portable GFCI devices by pushing the test button on the device before each use. Permanently mounted GFCI will be tested monthly by pressing the test button.

2. Grounding

Effectively ground all wiring, electrical circuits, and equipment, except portable tools and appliances protected by an Underwriter's Laboratory (UL)-approved system of double insulation. Note that an equipment conductor grounding program that meets regulatory requirements can be used in lieu of GFCIs. Examples of equipment requiring grounding include:

- a. Portable and vehicle- or trailer-mounted generators.

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- b. Electrically powered arc welders.
 - c. Switches.
 - d. Motor-controller cases.
 - e. Fuse boxes.
 - f. Distribution cabinets.
 - g. Frames.
 - h. Non-current-carrying rails used for travel, and motors of electrically operated cranes.
 - i. Electric elevators.
 - j. Metal frames of non-electric elevators to which electric conductors are attached.
3. Assured Grounding

Whenever possible, use GFCI instead of assured grounding. Assured grounding programs must be approved by the Regional HSE Manager or HSE Director. Develop a site-specific assured grounding program. Supplemental Information C – Assured Grounding Guidelines, may be used to develop a site-specific program.

G. Circuits

1. Require that there are no missing blanks.
2. Close doors to circuit and fuse boxes when not in use.
3. Label every circuit located on a circuit breaker/fuse box, and/or motor-control center (MCC).

H. Temporary Wiring, Electrical Tools, and Extension Cords

1. Require that temporary wiring is installed and used in accordance with regulatory requirements; specifically:
 - a. Guard, bury, or isolate temporary wiring by elevation to prevent accidental contact by workers and equipment.

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- b. Require that vertical clearance above walkways is not less than 10 feet (3 meters) from circuits carrying 600 volts or less.
 - c. Support all exposed temporary wiring on insulators.
 - d. Protect temporary wiring from accidental damage.
 - e. Guard live parts of wiring.
 - f. Mark temporary power lines, switch boxes, receptacle boxes, metal cabinets, and enclosures around equipment to indicate the maximum operating voltage.
2. Require that lighting strings are installed and used in accordance with regulatory requirements; specifically:
- a. Provide adequate light throughout the building and in all work areas throughout the project, particularly passageways and stairways, and wherever necessary to avoid a hazard due to lack of light. Consideration should be given to the selection and placement of lights that will provide minimum glare, eliminate harsh shadows, and provide adequate illumination to work efficiently and safely. Ensure lighting is available at all times when employees are in the work area.
 - b. Use nonconductive lamp sockets and connections permanently molded to the conductor insulation.
 - c. Require that lighting strings have lamp guards, except where the construction of the reflector is such that the bulb is deeply recessed.
 - d. Promptly replace all broken or defective bulbs. Exposed empty light sockets are prohibited.
 - e. Protect all lights used for illumination from accidental contact or breakage.
 - f. Ground metal-case sockets.
3. Require that extension cords are installed and used in accordance with regulatory requirements, specifically:

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- a. Use only 3-wire grounded-type extension cords designated for hard service or extra hard service and listed by UL.
 - b. Check cords for damage before use and daily thereafter.
 - c. Do not exceed the rated load.
 - d. Use extension cords of adequate length. "Daisy chaining" of cords is prohibited unless specifically allowed by the cord manufacturer.
 - e. Do not use spliced cords.
 - f. Destroy and discard worn, damaged or frayed cords and cords with the ground prong removed or rendered ineffective shall be removed from service for repair and retesting.
 - g. Cord set repairs shall be performed by a qualified electrician using only UL-listed attachment plugs and receptacle ends of equal service rating. The repaired cord set shall be tested using a three prong circuit tester, a tension tester and an ohm meter prior to being returned to service.
 - h. Do not fasten extension cords with staples, hang them using non-metallic insulating hangers such as zip-ties.
 - i. Do not wrap cords or cables around any conductive materials.
 - j. Protect electrical cords and trailing cables from damage that could create a hazard to employees or other persons in the area.
4. Inspect portable electric tools brought onto the site to ensure that they are in good condition. Inspect portable cord- and plug-connected equipment for external defects and evidence of possible internal damage before use on any shift.
- I. Work On or Near Energized Hazards
 1. Two qualified personnel and an Energized Work Permit (Attachment 012-1) must be present for work on or near energized hazards, except for authorized troubleshooting with approved testing equipment or verifying de-energization during lockout/tagout.

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- a. Work is considered to be “on or near” whenever any of the following conditions occur:
 - i. Any part of the body, regardless of the level of PPE protection, enters or is inadvertently placed within the Restricted Approach Boundary, based on the maximum potential voltage involved.
 - ii. Any tool or piece of equipment (insulated or not) enters or is inadvertently placed within the Restricted Approach Boundary, based on the maximum potential voltage involved.
 - b. If URS retains a subcontractor to perform work on live electrical systems, the subcontractor will advise URS (or URS’ client) of:
 - i. Any unique hazards presented by the contract employer’s work.
 - ii. Any unanticipated hazards found during the contract employer’s work that the host employer did not mention.
 - iii. The measures the contractor took to correct any hazards reported by URS to prevent such violation from recurring in the future.
2. Obtain an Energized Work Permit (Attachment 012-1) for all work, even non-electrical work, within the restricted approach boundary.
- a. Work “on or near” live equipment as defined above is permitted only when it is impossible to shut off the equipment or circuits; or when de-energizing the equipment would introduce additional or increased hazards; or is infeasible due to equipment design or operational limitations. Examples of situations that would meet the requirements of “increased or additional hazards” include interruption of life safety equipment, deactivation of emergency alarm systems, shutdown of hazardous location ventilation equipment, or removal of illumination from a large area.
 - b. Retain a copy of the Energized Work Permit both at the work site until work is completed in the office/project file. The Energized Work Permit provides documentation of the

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justification for working the circuit or equipment energized; identifies the specific personnel who are to perform the work and the specific PPE requirements for the task; defines the scope of the task; and details additional special protective and work practices required to protect both the workers and other personnel in the area. The permit must be authorized by a member of management.

- c. ANSI-approved voltage-rated tools must be used any time the plane of the cabinet, vault, box, or opening is breached if *all* exposed live components of 50 volts or greater in a cabinet, vault, box, or other piece of electrical equipment are not completely de-energized through lockout/tagout.
- d. Full PPE must be worn, based on maximum potential voltages as defined in Section 3 below, as well as the use of ANSI-approved and voltage-rated tools, which are rated for maximum voltages, that may be encountered during metering, even though metering during authorized troubleshooting is not considered “working on or near.”

3. Approach Boundaries for Live Parts

The approach boundaries listed below will be used to define Energized Work Permit requirements, tool and equipment requirements, and PPE requirements by employees:

- a. Flash Protection Boundary: Workers within this boundary must use arc-flash protection for all parts of the body when work is being performed that could lead to an arc flash. Arc-flash protection boundaries are presented in the table below. Flash-protection boundaries at voltages above 600 volts will be calculated following NFPA 70E on a case-by-case basis using the formula found in NFPA 70E, paragraph 130.3 (A), or applying the maximum level of protection recommended in Table 130.7(C)(9)(a), based on the work being performed.
- b. Limited Approach Boundary: The limited approach boundary establishes an area around exposed energized hazards of 50 volts or greater where unqualified employees must be escorted and directly supervised by a qualified employee. Use insulated, voltage-rated, ANSI-approved tools based on the maximum voltage within this boundary. Limited

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approach boundaries are presented in the table below (refer to NFPA 70E for higher voltages).

- c. **Restricted Approach Boundary:** The restricted approach boundary establishes an area around exposed energized hazards of 50 volts or greater where unqualified employees are prohibited, and insulated tools and full PPE are required, based on the maximum voltage. A worker is considered to be working “near” energized systems when any part of the body or tool could approach an energized component closer than the distances discussed below. An Energized Work Permit is always required in these cases, except during troubleshooting with approved testing equipment. Restricted approach boundaries are presented in the table below (refer to NFPA 70E for higher voltages).

- d. **Prohibited Approach Boundary:** The prohibited approach boundary establishes an area around exposed energized hazards of 50 volts or greater where approach within the boundary is considered “working on” an energized system. A worker is considered to be “working on” energized systems when any part of the body or tool could approach an energized component closer than the distances discussed below. Unqualified workers are prohibited, and full PPE is required, based on the maximum voltage. An Energized Work Permit is always required in these cases, except during troubleshooting with approved testing equipment. Prohibited approach boundaries are presented in the table below (refer to NFPA 70E for higher voltages).

Nominal System Voltage Range, Phase to Phase¹	Flash Protection Boundary	Limited Approach Boundary	Restricted Approach Boundary	Prohibited Approach Boundary
Less than 50 volts	Not Specified	Not Specified	Not Specified	Not Specified
50 volts – 240 volts	4 ft / 1.22 m	3 ft, 6 in / 1.1 m	Avoid Contact	Avoid Contact
240 volts – 300 volts	4 ft / 1.22 m	3 ft, 6 in / 1.1 m	Avoid Contact	Avoid Contact
301 volts – 500 volts	4 ft / 1.22 m	3 ft, 6 in / 1.1 m	1 ft / 0.3 m	1 in / .03 m
501 volts – 599 volts	4 ft / 1.22 m	3 ft, 6 in / 1.1 m	1 ft / 0.3 m	1 in / .03 m

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Nominal System Voltage Range, Phase to Phase ¹	Flash Protection Boundary	Limited Approach Boundary	Restricted Approach Boundary	Prohibited Approach Boundary
600 volts	4 ft / 1.22 m	3 ft, 6 in / 1.1 m	1 ft / 0.3 m	1 in / .03 m
601 volts – 750 volts	CN	3 ft, 6 in / 1.1 m	1 ft / 0.3 m	1 in / .03 m
751 volts – 1 kV	CN	5 ft / 1.5 m	2 ft, 2 in / 0.67 m	7 in / 0.12 m
1.1 kV – 7.5 kV	CN	5 ft / 1.5 m	2 ft, 2 in / 0.67 m	7 in / 0.12 m
7.51 kV – 15 kV	CN	5 ft / 1.5 m	2 ft, 2 in / 0.67 m	7 in / 0.12 m
15.1 kV – 17 kV	CN	6 ft / 1.83 m	2 ft, 7 in / 0.82 m	10 in / 0.25 m
17.1 kV – 26.5 kV	CN	6 ft / 1.83 m	2 ft, 7 in / 0.82 m	10 in / 0.25 m
26.51 kV – 36 kV	CN	6 ft / 1.83 m	2 ft, 7 in / 0.82 m	10 in / 0.25 m
36.1 kV – 46 kV	CN	6 ft / 1.83 m	2 ft, 9 in / 0.88 m	1 ft, 5 in / 0.46 m

¹ For single-phase systems, select the range that is equal to the system's maximum phase-to-ground voltage multiplied by 1.732.

CN = Calculation Needed. See NFPA 70E, Annex D – Incident Energy and Flash Protection Boundary Calculation Methods; and choose the appropriate method out of the 5 listed. These calculations must be used only under qualified engineering supervision.

4. Establishing an Electrically Safe Work Condition

- a. Establish an electrically safe work condition before performing work (other than authorized metering as a part of troubleshooting) within the Limited Approach Boundary of exposed electrical hazards.
- b. Performing complete lockout/tagout of all electrical potentials of 50 volts or greater within the cabinet, vault, box, or work area is considered establishing an electrically safe work condition, as long as the lockout/tagout process accomplishes all of the following:
 - i. Provides a documented hazard evaluation at the site, including the identification of the person in charge of the lockout/tagout.
 - ii. Identifies every source of electrical energy of 50 volts or greater remaining inside the cabinet, vault, and

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- box, and completely eliminates them through lockout/tagout.
- iii. Tests every phase conductor or circuit part with an approved meter (phase-to-phase and phase-to-ground) to verify they are de-energized (meter will be checked before and after each test to confirm it is operating properly).
 - iv. Applies ground-connecting devices to any part or circuit where there is a possibility of induced voltages or stored electrical energy, including grounding-out of capacitors or similar devices that may hold stored energy.
- c. If both locks and tags cannot be installed, employ a second alternative method such as removal of a fuse in addition to a tag. Consider all circuits and equipment energized until an electrically safe work condition has been established and verified.
- d. Follow these work practices if an electrically safe work condition as described above has not been established:
- i. If the Restricted and/or Prohibited Approach Boundary may be breached, an Energized Work Permit will be secured, and work practices will comply with those required for “working on or near” energized hazards
 - ii. If the Limited Approach Boundary may be breached, a qualified person must be present and directly supervise the work.
 - iii. If the Arc-Flash Boundary may be breached and any work is performed that has the possibility of causing an arc flash, all personnel within the flash boundary will be protected with appropriate levels of arc-flash protection.

5. Insulated Tools and Equipment

- a. Use ANSI-approved insulated tools and/or handling equipment when working near exposed energized conductors or circuit parts. Protect the insulating materials

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on these items during storage or transportation. Use fuse-handling equipment capable of withstanding the circuit voltage when removing or installing fuses from an energized fuse terminal. Allow *only* nonconductive ropes and hand lines near exposed parts.

- b. Inspect insulated tools and equipment prior to each use. Include an examination for damage to the insulation or damage that may limit the tool from performing its intended function, or which could increase the potential for an incident. Immediately remove any defective tools and equipment from service.
- c. Use insulated tools and insulated equipment when:
 - i. Breaking the plane (or opening) of an electrical fixture (cabinet, vault, panel, etc.) where any live voltage of 50 volts or greater remains (including metering for troubleshooting). Cabinet will be considered as containing live voltage until all sources of 50 volts or greater have been completely de-energized through lockout/tagout, and confirmed to be de-energized through metering.
 - ii. Any part of the body or a tool or piece of equipment may cross the Limited Approach Boundary for the maximum voltage present.
 - iii. All tools used in either case above will be voltage-rated, ANSI-approved tools rated to the maximum voltage hazard present.
- d. Insulated tools and equipment will also comply with the following:
 - i. Grounding and testing devices will be stored in a clean, dry area and properly inspected and tested before each use.
 - ii. Use fuse or fuse-holding equipment to remove or install a fuse if the fuse terminals are energized. Fuse or fuse holder will be rated and insulated for the circuit voltage.

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- iii. Ropes or hand lines used near exposed live parts operating at 50 volts or greater will be non-conductive.
- iv. Fiberglass-reinforced plastic rod and tube tools used for live line work will meet the requirements of ASTM F 711.
- v. Portable ladders will have non-conductive side rails. Metal ladders are prohibited in areas where electrical hazards exist.

6. Personal Protective Equipment Requirements

- a. Protective equipment requirements outlined in the table below are mandatory when any part of the body or a tool or piece of equipment may be placed within the Restricted-Approach Boundary (Section 1):
 - i. All personnel must wear the required PPE as outlined in this section until all energy sources of 50 volts or greater within the Restricted Approach Boundary have been completely eliminated through lockout/tagout, and de-energization has been confirmed through metering. The ratings in this section of cal/cm² represent arc-flash protection ratings. If protective equipment is not marked with these ratings, it does not meet the requirements of NFPA 70E, and will not be used. Exceptions to these requirements are limited to those specifically addressed under each type of protective equipment.
 - ii. Maintain protective equipment in a safe, reliable condition, and visually inspect before each use. Gloves shall be leak tested before use. Store protective equipment in a manner to prevent physical damage, and damage from moisture, dust, or other deteriorating agents.
 - iii. Do not use arc-flash clothing that is contaminated with grease, oil, or flammable liquids or combustible materials or is damaged to an extent where the protective qualities are impaired. Store arc-flash clothing to avoid physical damage; damage from

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moisture, dust, or other deteriorating agents; and contamination from flammable or combustible material. Clean following the manufacturer's instructions to avoid loss of protection. If necessary, make repairs using the same flame-retardant materials used in the original garment.

- iv. When body protection is required, use all-cotton underclothing (never nylon, polyester or rayon) that contains no metal.
- v. Trim, name tags, or logos affixed to flame-retardant clothing must also be flame-retardant rated.
- vi. Hairnets and/or beard nets must be of non-melting, flame-resistant design.
- vii. Wear Class E hardhats rated for electrical protection when inside any substation or other power transmission and distribution equipment area. Inspect hardhats before use.

Voltage	Required PPE
Less than 50	<p><u>Eye/Face</u>: ANSI approved safety glasses (non-metallic) with side shields or goggles</p> <p><u>Body</u>: Long sleeve cotton shirt and cotton pants</p> <p><u>Hand</u>: Leather gloves</p> <p><u>Foot</u>: Leather, EH rated footwear</p> <p><u>Head/Ears</u>: Hard hat, hearing protection (ear canal inserts)</p>
50 to 240 volts	<p><u>Eye/Face</u>: ANSI approved safety glasses (non-metallic) with side shields or goggles and Arc-Flash Face Shield or Arc-Flash Suit Hood (4 cal/cm²)</p> <p><u>Body</u>: Flame Retardant long sleeve shirt/pants or coverall (4 cal/cm²)</p> <p><u>Hand</u>: EH gloves (Class 00 with leather protectors)</p> <p><u>Foot</u>: EH rated footwear</p> <p><u>Head/Ears</u>: Class E Hard hat, hearing protection (ear canal inserts)</p>

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Voltage	Required PPE
Above 240 to 480 volts	<p><u>Eye/Face</u>: ANSI approved safety glasses (non-metallic) with side shields or goggles and Arc-Flash Face Shield and Sock Hood (8 cal/cm²) or Arc-Flash Suit Hood (8 cal/cm²)</p> <p><u>Body</u>: Flame Retardant long sleeve shirt pants or coverall (8 cal/cm²)</p> <p><u>Hand</u>: EH gloves (Class 00 with leather protectors)</p> <p><u>Foot</u>: EH rated footwear</p> <p><u>Head/Ears</u>: Class E Hard hat, hearing protection (ear canal inserts)</p>
480 to 600 volts	<p><u>Eye/Face</u>: ANSI approved safety glasses (non-metallic) with side shields or goggles and Arc-Flash Suit Hood (8 cal/cm²)</p> <p><u>Body</u>: Flame-Retardant long sleeve shirt pants or coverall (8 cal/cm²)</p> <p><u>Hand</u>: EH gloves (Class 0 or higher with leather protectors)</p> <p><u>Foot</u>: EH rated footwear (carbon fiber recommended)</p> <p><u>Head/Ears</u>: Class E Hard hat, hearing protection (ear canal inserts)</p>
600 volts or above	<p><u>Eye/Face</u>: ANSI approved safety glasses (non-metallic) with side shields or goggles and Arc-Flash Suit Hood (25 cal/cm²)</p> <p><u>Body</u>: 2 Layer Flame-Retardant long sleeve shirt pants or coverall (25 cal/cm²)</p> <p><u>Hand</u>: EH gloves (Class 0 or higher with leather protectors)</p> <p><u>Foot</u>: EH rated footwear (carbon fiber recommended)</p> <p><u>Head/Ears</u>: Class E Hard hat, hearing protection (ear canal inserts)</p>

7. Hazard Alerting/Control Requirements

- a. Employ special precautions to warn employees of unusual electrical hazards until they are corrected or eliminated. For example, if breakers or breaker blanks are found missing inside a breaker panel, a warning sign will be placed on the panel door that limits access to qualified electricians only until the electrical hazard is returned to compliance with the electrical code.
- b. Use barricades in conjunction with safety signs where it is necessary to prevent or limit employee access to work areas containing live parts. Make barricades of non-conductive design and place so as to prevent access to the Limited Approach Boundary by non-qualified personnel (10 feet for

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exposed movable conductors, and 3½ feet for non-movable conductors up to 750 volts).

- c. Do not leave exposed energized components unattended and/or unprotected. If signs or barricades cannot assure warning and protection from electrical hazards, station an attendant to warn and protect personnel. Attendants will remain in the area as long as there is the potential for personnel to be exposed to the electrical hazards. Their primary duty is to keep unqualified personnel outside a work area where the unqualified employee might be exposed to the electrical hazard; which at an absolute minimum, is outside the Limited Approach Boundary.
- d. Employ additional alerting methods such as signs, barricades, or attendants where work is performed on equipment that is de-energized and placed in an electrically safe condition in a work area with *other* energized equipment that is similar in size, shape, and construction, to prevent employees from entering look-alike equipment.

B. Electrical Protective Equipment Requirements

- 1. Insulating blankets, matting, covers, line hose, gloves, and sleeves made of rubber must meet the following requirements:
 - a. Produce blankets, gloves, and sleeves by a seamless process.
 - b. Mark each item clearly with its Class number.
 - c. Markings must be non-conductive and not impair the insulating qualities of the equipment.
 - d. Confine markings on gloves to the cuff-portion of the glove.
- 2. Equipment must also meet the specifications contained in the governing ASTM standard outlined in the following table.

Item	Standard
Insulating matting	ASTM D 178-93 (or D 178-88)
Insulating blankets	ASTM D 1048-93 (or D 1048-88a)
Insulating covers	ASTM D 1049-93 (or D 1049-88)

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Insulating line hose	ASTM D 105-90
Insulating sleeves	ASTM D 1051-87

3. Do not use insulating equipment with any of the following defects:
 - a. Holes, tears, punctures, or cuts.
 - b. Embedded foreign objects.
 - c. Texture changes, swelling, softening, hardening, or becoming sticky or inelastic.
 - d. Any other defect that may damage insulating properties.
4. Clean insulating equipment as needed to remove foreign substances, and store in a location and manner that protects it from light, temperature extremes, excessive humidity, ozone, and other injurious substances and conditions. A thorough visual examination by the worker is always required immediately before each use.
5. Inspect and test rubber insulating equipment as outlined in the following table.

Item	Inspection	Testing by Qualified Agency	Governing Standard for Test Voltage
Rubber insulating line hose	Before each use	Upon indication that the insulating value is suspect	ASTM F 478
Rubber insulating covers	Before each use	Upon indication that the insulating value is suspect	ASTM F 478
Rubber insulating blankets	Before each use	Before first issue and every 12 months thereafter	ASTM F 479
Rubber insulating gloves	Before each use	Before first issue and every 6 months thereafter	ASTM F 496
Rubber insulating sleeves	Before each use	Before first issue and every 12 months thereafter	ASTM F 496

NOTE: In the case of blankets, gloves, and sleeves, if the equipment has been electrically tested but not issued for service, it may not be placed into service unless it has been electrically tested within the past 12 months. In all cases, a process or procedure will be deployed that assures identification and confirmation of inspection currentness for individual pieces of equipment by both the worker and an inspecting/auditing agency.

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C. Warning Sign and Marking Requirements

1. A summary of the warning signs and marking requirements for electrical systems and areas contained in industry standards is provided in the table below. Projects must comply with these requirements or provide alternate and equally effective warnings for the Company personnel.

Warning Signs and Markings	
Condition	Requirements
Entrance to rooms or other guarded locations containing exposed live parts (600 volts nominal or less).	Post conspicuous warning sign forbidding unqualified persons from entering.
Entrance to buildings, rooms, or enclosures containing exposed live parts (over 600 volts nominal).	Post warning sign reading <i>Danger-High Voltage – Keep Out</i> or similar language. Entrance must remain locked.
All electrical equipment.	Mark equipment with the manufacturer’s name, trademark, or other marking indicating the organization responsible for the product. Additional requirements for marking voltage, current, wattage, or other ratings maybe specified by the NEC.
Disconnection of power sources (including circuit breakers).	Mark each disconnection required for motors, appliances, and each service feeder or branch circuit at the point where it originates to indicate its purpose, unless located and arranged so that the purpose is evident.
Circuit breakers or fuses applied in compliance with Series Combination Ratings.	Mark equipment enclosure to indicate the equipment has been applied with Series Combination Rating. Markings must state <i>Caution–Series Rated System Amps Available: Identified Replacement Component Required.</i>
Exposed live parts of transformers.	Mark with operating voltage.
Fused cutouts not interlocked with the switch to prevent opening of the cutouts under load.	Post conspicuous sign at the cutouts reading <i>Warning – Do Not Open Under Load.</i>
More than one switch is installed with interconnected load terminals to provide for alternate connection to different supply conductors.	Post conspicuous sign reading <i>Warning – Switch May be Energized by Backfeed at each switch.</i>
Fuses potentially energized by backfeed.	Post sign on enclosure door reading <i>Warning – Fuses May Be Energized By Backfeed.</i>

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D. Power Transmission/Distribution Requirements

1. Develop additional location-specific written procedures that cover site-specific systems and define work practices that meet the spirit and intent of 29 Code of Federal Regulation (CFR) 1910.269 for locations that perform work on power transmission and distributions systems. This Safety Management Standard does not cover all of the work practices necessary to protect personnel in these highly unique and hazardous work conditions.

E. Training

1. Train affected personnel, both those qualified to perform electrical work and those not qualified who may still work on or near energized systems, in the safe work practices outlined in this section on an annual basis. Training may be at different levels for qualified and unqualified, but must be sufficient to afford the electrical safe work practices and hazard recognition knowledge required to safely perform their respective tasks. Training will also cover how a GFCI operates, hazards associated with portable electric power extension cord use, and when GFCI use is required. Affected personnel will also be instructed on how to inspect the specialized PPE required for electrical work prior to being placed in a position where this PPE is required. All personnel will receive training on electrical hazards as part of the job orientation which shall qualify as documentation for unqualified workers. Qualified workers will receive additional training specific to the job and hazards as required.
2. Document all training. Train affected personnel either as “qualified” or “unqualified,” with qualified being at a level sufficient to afford protection during actual electrical work.
3. Qualified personnel are personnel who have also been trained, at a minimum, in the following:
 - a. The skills and techniques necessary to distinguish exposed live parts from other parts of electrical equipment.
 - b. The skills and techniques necessary to determine the nominal voltage of exposed live parts.
 - c. Clearance distances for working near live circuits or equipment.

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- d. The decision-making process necessary to determine the degree and extent of the hazard, and the PPE and job planning necessary to perform the task safely.
4. Personnel who perform work on electrical circuits must also meet the following minimum requirements:
 - a. Have experience servicing the electrical components of the equipment they are assigned to service.
 - b. Have experience working on energized electric circuit parts or equipment.
 - c. Meet any governing statute or regulatory requirement, host nation, or customer requirement for special certifications or licenses.
 5. Personnel who work on power transmission/distribution systems must have additional training and experience that meets or exceeds the spirit and intent outlined in 29 CFR 1910.269. This includes the requirement to identify hazardous tasks not routinely performed, and establish procedures to ensure personnel have performed these tasks within the past 12 months, or that they are re-trained or supervised before performing them. These additional requirements are mandatory before exposure to the hazards. This additional training must be documented.
 6. Additional training (retaining) will be performed when personnel are not complying with safety-related procedures or when workplace changes necessitate the use of safety-related procedures that are different than those that the employee would normally perform.

F. Job Briefings

1. Before starting each job, the employee in charge will conduct a job briefing with other personnel involved. The briefing will cover such subjects as a pre-job hazard review associated with the job, work procedures involved, special precautions, energy source controls, and PPE requirements. Use Supplemental Information B – PPE, Tools, and Equipment, as a guide for proper PPE, as applicable. Use SMS 086 NA procedures and appropriate forms in Supplemental Information for conducting Job Safety Analysis or Job Hazard Analysis for each job.

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2. If the work or operations to be performed during the work day or shift are repetitive and similar, at least one job briefing will be conducted before the start of the first job of the day or shift. Conduct additional job briefings if significant changes might affect the safety of employees during the course of the work. A brief discussion will be satisfactory if the work involved is routine, and if the employee, by virtue of training and experience, can reasonably be expected to recognize and avoid the hazards involved in the job. A more extensive discussion must be conducted if:
 - a. The work is complicated or particularly hazardous; or
 - b. The employee cannot be expected to recognize and avoid the hazards involved in the job.
- G. Inspect the job site periodically using Attachment 012-2 NA – Electrical Hazard Checklist, to evaluate compliance with this standard.

5. Documentation Summary

The following information will be maintained in the project file:

- A. A copy of license for licensed/journeyman electrician for project (as necessary).
- B. Completed audits of electrical hazards.
- C. Documented communications between URS, contractors, licensed/journeyman electricians, or others.
- D. Records of all pertinent electrical work performed on a project, including as-built design updates.

6. Resources

- A. U.S. Occupational Safety and Health Administration (OSHA) Standard – [General Industry Electrical Safety](#) – 29 CFR 1910, Subpart S
- B. U.S. OSHA Standard – [Construction Electrical Safety](#) – 29 CFR 1926, Subpart K
- C. U.S. OSHA Standard – [Design Safety Standards for Electrical Systems](#) – 29 CFR 1910, Subpart S

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- D. American National Standards Institute/Institute of Electrical and Electronics Engineers – [National Electrical Safety Code](#) (NESC), ANSI/IEEE C2-2002
 - E. [National Fire Protection Association](#), National Electric Code, NFPA-70
 - F. [SMS 023](#) – Lockout and Tagout Safety
 - G. [SMS 034](#) – Utility Clearances and Isolation
 - H. [SMS 086](#) – Managing Health, Safety and Environment Related Risks
 - I. [Attachment 012-1 NA](#) – Energized Work Permit
 - J. [Attachment 012-2 NA](#) – Electrical Hazard Checklist
- 7. Supplemental Information**
- A. [Hazardous Locations](#)
 - B. [PPE, Tools, and Equipment Needed During Electrical Work](#)
 - C. [Assured Grounding Guidelines](#)

URS	Health, Safety, and Environment	Attachment 012-1 NA
	ENERGIZED WORK PERMIT	Issue Date: June 1999 Revision 6: September 2012

INSTRUCTIONS: An Energized Work Permit is required for any work within the Restricted Approach Boundary (1 foot for 50 to 750 volts; 2 feet, 2 inches for 751 to 15kV; see NFPA 70E for higher voltages). An energized electrical work permit is not required under the following two conditions:

- 1) Work is limited to metering as a part of troubleshooting and the maximum voltage is less than 600 volts; or
- 2) All potential sources of electrical energy of 50 volts or greater are completely eliminated within the cabinet, vault, or panel through lockout/tagout.

TO BE COMPLETED BY THE PERMIT REQUESTER			
Project/Site Name:		Work Location:	
Description of circuit/equipment:			
Description of work to be done:			
Justification of why circuit/equipment cannot be de-energized, or the work be deferred until scheduled outage:			
Requestor Name:		Requestor Title:	
Requestor Signature:		Date:	
TO BE COMPLETED BY THE ELECTRICAL QUALIFIED PERSONS DOING THE WORK			
1 – Maximum voltage of energized components:			
2 – Required PPE (check range based on maximum voltage)			
<input type="checkbox"/> 50 to 240 volts	<ul style="list-style-type: none"> • <u>Eye/Face</u>: Safety glasses with side shields or goggles and Arc-Flash Face Shield <i>or</i> Arc-Flash Suit Hood (4 cal/cm²) • <u>Body</u>: Flame-Retardant long-sleeved shirt/pants or coverall (4 cal/cm²) • <u>Hand</u>: EH gloves (Class 00 with leather protectors) • <u>Foot</u>: EH-rated footwear • <u>Head/Ears</u>: Class E hard hat, hearing protection (ear canal inserts) • <u>Tools</u>: ANSI-approved, voltage-rated 		
<input type="checkbox"/> Above 240 to 480 volts	<ul style="list-style-type: none"> • <u>Eye/Face</u>: Safety glasses with side shields or goggles and Arc-Flash Face Shield and Sock Hood (8 cal/cm²) <i>or</i> Arc-Flash Suit Hood (8 cal/cm²) • <u>Body</u>: Flame-Retardant long-sleeved shirt/pants or coverall (8 cal/cm²) • <u>Hand</u>: EH gloves (Class 00 with leather protectors) • <u>Foot</u>: EH-rated footwear • <u>Head/Ears</u>: Class E Hard hat, hearing protection (ear canal inserts) • <u>Tools</u>: ANSI-approved, voltage-rated 		
<input type="checkbox"/> 480 to 600 volts	<ul style="list-style-type: none"> • <u>Eye/Face</u>: Safety glasses with side shields or goggles and Arc-Flash Suit Hood (8 cal/cm²) • <u>Body</u>: Flame-Retardant long-sleeved shirt/pants or coverall (8 cal/cm²) • <u>Hand</u>: EH gloves (Class 0 or higher with leather protectors) • <u>Foot</u>: EH-rated footwear (carbon fiber recommended) • <u>Head/Ears</u>: Class E Hard hat, hearing protection (ear canal inserts) • <u>Tools</u>: ANSI-approved, voltage-rated 		



ENERGIZED WORK PERMIT

- 600 volts and above
 - Eye/Face: Safety glasses with side shields or goggles and Arc-Flash Suit Hood (25 cal/cm²)
 - Body: 2-Layer Flame-Retardant long-sleeved shirt/pants or coverall (25 cal/cm²)
 - Hand: EH gloves (Class 0 with leather protectors)
 - Foot: EH-rated footwear (carbon fiber recommended)
 - Head/Ears: Class E Hard hat, hearing protection (ear canal inserts)
 - Tools: ANSI-approved, voltage-rated

3 – Description of job procedure to be used in performing the work:

4 – Description of safe work practices to be employed:

5 – Method to be employed to restrict access of unqualified persons from the work area:

ELECTRICAL QUALIFIED PERSONS CERTIFICATION

I/we agree to, and certify the following:

- Work on energized circuits and components will be limited to conditions outlined on this permit.
- Required ANSI-certified tools and equipment are available and will be used.
- Required PPE is available and will be used/worn.
- A pre-task briefing has been held that included all personnel involved with this work.
- An on-site hazard assessment has been/will be conducted before work is started.
- Work described on this permit can be done safely.
- If conditions or work requirements change, or hazards not previously identified are encountered, work will stop until a new permit is issued or the new hazards have been eliminated.

Electrically Qualified Persons:

Print Name	Signature	Date
_____	_____	_____
_____	_____	_____
_____	_____	_____

APPROVAL TO PERFORM THE WORK WHILE ELECTRICALLY ENERGIZED

Project/Site Manager:	Date:
HSE Manager/Representative:	Date:
Date & Time Permit Valid:	Date & Time Permit Expires:



ELECTRICAL HAZARD CHECKLIST

Location Inspected: _____ **Job No.:** _____

Date Inspected: _____ **Name of Inspector:** _____

Check Yes, No, or NA for Not Applicable. If a comment is required, circle the number, and see Page 3.

Electrical Equipment Markings

- 1. Disconnecting switches and circuit breakers are labeled to indicate their use or equipment served. Yes No NA
- 2. The necessary voltage, wattage, or current ratings are labeled. Yes No NA
- 3. Circuit breakers clearly indicate whether they are in the "on" or "off" position. Yes No NA
- 4. Markings for arc flash hazards per NFPA 70E are on each panel or distribution box. Yes No NA

Electrical Grounding

- 5. Extension cords used have a grounding conductor (third plug). Yes No NA
- 6. Ground-fault circuit interrupters are installed as required. Yes No NA
- 7. Portable electrical tools and equipment are of the double-insulated type. Yes No NA
- 8. Ground-fault circuit interrupters open the circuit on a ground current of 5 milliamperes or greater, and are equipped with an integral push-button test circuit. Yes No NA
- 9. Ground-fault circuit interrupters are installed in accordance with the manufacturer's instructions. Yes No NA
- 10. Ground-fault circuit interrupters are tested prior to initial use, and periodically thereafter. Yes No NA
- 11. Grounding rods are at least 5/8-inch- (0.625-centimeter)-diameter steel or iron rods, 1/2-inch- (1.27-centimeter)-diameter copper-clad steel, or 3/4-inch-(1.9-centimeter)-diameter galvanized pipe. Yes No NA
- 12. Grounding rods are in 8-foot (2.5-meter) lengths and driven to full depth. Yes No NA
- 13. The paths from circuits, equipment, structures, and conduits or enclosures to ground are:
 - Permanent and continuous. Yes No NA
 - Have ample carrying capacity for the current likely to be imposed on them. Yes No NA
 - Have resistance sufficiently low to permit current flow to operate circuit breakers and similar overcurrent devices on the circuit. Yes No NA
- 14. Driven ground-rod electrodes have a resistance to ground not exceeding 25 ohms. Yes No NA
- 15. Upon installation of the driven ground-rod electrode, the resistance was tested and recorded. Yes No NA
- 16. Conductors, used for bonding and grounding circuits, are of sufficient size to carry the anticipated current. Yes No NA
- 17. Grounds are not removed until all work is complete. Yes No NA

ELECTRICAL HAZARD CHECKLIST**Electrical Guarding**

18. Switches, receptacles, etc., are provided with tight-fitting covers or plates. Yes No NA
19. All energized parts of electrical circuits and equipment are guarded against accidental contact by approved cabinets or enclosure. Yes No NA
20. All unused openings (including conduit knockouts) in electrical enclosures and fittings are enclosed with appropriate covers, plugs, or plates. Yes No NA
21. Ground-fault circuit interrupters are installed on each temporary 15- or 20-ampere, 120-volt AC circuit at locations where construction, demolition, modifications, alterations, or excavations are being performed. Yes No NA
22. Electrical switches and breakers (rated 440 volts or greater) are provided with a means for locking them out in the OFF position. Yes No NA

Electrical Systems

23. Circuit breakers accessible to personnel are protected from physical damage, and located away from ignitable material. Yes No NA
24. Weatherproof cabinets or enclosures are used when switches, circuit breakers, fuse panels, and motor controllers are in a wet or outside location. Yes No NA
25. A readily accessible, manually operated switch is provided for each incoming service or supply circuit rated less than 5 kilovolts. Yes No NA
26. Electrical raceways and enclosures are securely fastened in place. Yes No NA
27. Overcurrent protection is provided for fuses or circuit breakers for each feeder and branch circuit. Yes No NA
28. Insulating fuse tongs or extractors are used when removing fuses from circuits rated 50 to 600 volts. Yes No NA
29. Fuse cabinets have close-fitting doors that can be locked. Yes No NA

Extension Cords

30. Clamps or other securing means are provided on flexible cords or cables at plug receptacles, tools, equipment, etc., and the cord jackets are securely held in place. Yes No NA
31. Flexible cords and cables are free of splices and taps. Yes No NA
32. Only 3-wire grounded-type extension cords, designated for hard or extra-hard service, are used. Yes No NA
33. Extension cords are listed by Underwriters Laboratories, Inc. Yes No NA
34. Extension cords are checked for damage before use. Yes No NA
35. The rated load on extension cords is not exceeded. Yes No NA
36. Extension cords are not fastened with staples, hung by nails, or suspended by wire. Yes No NA

Temporary Wiring

37. Temporary wiring is guarded, buried, or isolated by elevation to prevent accidental contact by workers and equipment. Yes No NA
38. A vertical clearance above walkways for temporary wiring is not less than 10 feet (3 meters) from circuits carrying 600 volts or less. Yes No NA
39. All exposed temporary wiring is supported on insulators. Yes No NA
40. Temporary wiring is protected from accidental damage. Yes No NA



ELECTRICAL HAZARD CHECKLIST

- 41. Nonconductive lamp sockets and connections are permanently molded to the conductor insulation on lighting strings. Yes No NA
- 42. Lighting strings have lamp guards. Yes No NA
- 43. Broken or defective bulbs are replaced promptly. Yes No NA
- 44. Lights are protected from accidental contact or breakage. Yes No NA
- 45. Wiring installed in conduit is equipped with bushings at outlets and terminals. Yes No NA
- 46. Receptacles are of the grounding type, and electrically connected to the equipment-grounding conductor. Yes No NA

Worker Practices

- 47. Personnel performing electrical repairs are properly trained and qualified. Yes No NA
- 48. Workers de-energize, ground, or guard electrical circuits before working in close proximity to them. Yes No NA
- 49. Workers consider all electrical systems as live until verified de-energized and grounded. Yes No NA
- 50. Proper lockout/tag-out procedures are used for de-energizing electric circuits. Yes No NA
- 51. Arc flash protection protocols are in place for work on circuits of 50 volts or higher. Yes No NA

Equipment

- 52. Only fiberglass or wood ladders are used when working near electrical hazards. Yes No NA
- 53. Insulation mats are placed on floors and on frames of equipment when working on energized equipment. Yes No NA
- 54. Only voltage-rated tools are used on or near live circuits. Voltage rating is appropriate for the work being performed. Yes No NA

Personal Protective Equipment

- 55. Rubber matting, blankets, insulated sleeves, and rubber gloves are inspected before use. Yes No NA
- 56. Workers use safety glasses and face shields during work activities where there is a reasonable probability of eye injury (and on systems with 50 or more volts). Yes No NA
- 57. Workers wear arc flash protective clothing, hoods, face shields, and gloves when working on live circuits greater than 50 volts (per NFPA 70E). Yes No NA

COMMENTS:

	<p style="text-align: center;">Health, Safety and Environment</p> <p style="text-align: center;">HAZARDOUS LOCATIONS</p>	<p style="text-align: right;">SMS 012 NA Supplemental Information A</p> <p style="text-align: right;">Issue Date: February 2009 Revision 2: January 2011</p>
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“Class I Locations”

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

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

- B. Class I, Division 2 location is a location:
 - 1. In which volatile flammable liquids or flammable gases are handled, processed, or used, but in which the hazardous liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in case of abnormal operation of equipment; or
 - 2. In which ignitable concentrations of gases or vapors are normally prevented by positive mechanical ventilation, and which might become hazardous through failure or abnormal operations of the ventilating equipment; or
 - 3. That is adjacent to a Class I, Division 1 location, and to which ignitable concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

“Class II Locations”

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

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

	<p style="text-align: center;">Health, Safety and Environment</p> <p style="text-align: center;">HAZARDOUS LOCATIONS</p>	<p style="text-align: right;">SMS 012 NA Supplemental Information A</p> <p style="text-align: right;">Issue Date: February 2009 Revision 2: January 2011</p>
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1. In which combustible dust is or may be in suspension in the air under normal operating conditions, in quantities sufficient to produce explosive or ignitable mixtures; or
 2. Where mechanical failure or abnormal operation of machinery or equipment might cause such explosive or ignitable mixtures to be produced, and might also provide a source of ignition through simultaneous failure of electric equipment, operation of protection devices, or from other causes, or
 3. In which combustible dusts of an electrically conductive nature may be present.
- B. Class II, Division 2 location is a location in which:
1. Combustible dust will not normally be in suspension in the air in quantities sufficient to produce explosive or ignitable mixtures, and dust accumulations are normally insufficient to interfere with the normal operation of electrical equipment or other apparatus; or
 2. Dust may be in suspension in the air as a result of infrequent malfunction of handling or processing equipment, and dust accumulations resulting therefrom may be ignitable by abnormal operation or failure of electrical equipment or other apparatus.

“Class III Locations”

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

- A. Class III, Division 1 location is a location in which easily ignitable fibers or materials producing combustible flyings are handled, manufactured, or used.
- B. Class III, Division 2 location is a location in which easily ignitable fibers are stored or handled, except in process of manufacture.



If there is a danger of:	Then use the following:
<ul style="list-style-type: none">• Head injury from electric shock, or• Burns due to contact with exposed energized parts	<ul style="list-style-type: none">• Nonconductive head protection – Type II, E nonconductive hard hat
Injury to the eyes or face from: <ul style="list-style-type: none">• Electric arcs or flashes; or• Flying objectives resulting from electrical explosion	<ul style="list-style-type: none">• Protective equipment for the eyes and face – face shield and safety glasses
<ul style="list-style-type: none">• Shock to hands while handling energized wires	<ul style="list-style-type: none">• Lineman’s rubber insulated gloves rated for the voltage exposed to. Leather overgloves may be needed if exposure to abrasive surfaces is possible.
<ul style="list-style-type: none">• Shock while working in areas where high voltage electrical systems are present, or• Shock when performing electrical repairs	<ul style="list-style-type: none">• Non-conductive protective foot wear
Exposure to electric arcing or flashing from: <ul style="list-style-type: none">• Circuits of more than 50 volts;• Opening or closing 2400 volt oil cutout switching devices;• Removing or installing links in high voltage able tap boxes; or• Removing or installing fuses in high voltage circuits.	<ul style="list-style-type: none">• Protective arc flash clothing (levels 0-40 to address energy potential as specified in NFPA 70E).
IF	THEN
<ul style="list-style-type: none">• Energized parts are exposed.	<ul style="list-style-type: none">• Use nonconductive ropes and handlines near the exposed energized part.
<ul style="list-style-type: none">• Working near exposed energized conductors or circuit parts.	<ul style="list-style-type: none">• Use insulated tools or handling equipment if the tools or handling equipment might make contact with such conducts or parts.
<ul style="list-style-type: none">• The insulating capability of insulated tools or handling equipment is subject to damage.	<ul style="list-style-type: none">• Protect the insulating material.
<ul style="list-style-type: none">• Removing or installing fuses when the fuse terminals are energized.	<ul style="list-style-type: none">• Use fuse-handling equipment insulated for the circuit voltage.
<ul style="list-style-type: none">• Working near exposed energized parts that might be accidentally contacted or where dangerous electric heating or arcing might occur.	<ul style="list-style-type: none">• Use protective shields, protective barriers, or insulating materials to protect from shock, burns, or other electrically related injuries.
<ul style="list-style-type: none">• Normally enclosed live parts are exposed for maintenance or repair.	<ul style="list-style-type: none">• Guard the parts to protect unqualified persons from contact with the live parts.

	<p style="text-align: center;">Health, Safety and Environment</p> <p style="text-align: center;">ASSURED GROUNDING GUIDELINES</p>	<p style="text-align: right;">SMS 012 NA Supplemental Information C Issue Date: January 2011</p>
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OSHA (29 CFR 1926.404) requires that employers use either ground-fault circuit interrupters (GFCIs) or an Assured Equipment Grounding Conductor Program to protect employees on construction sites. This Plan consists of the two elements described below.

1. Ground-Fault Circuit Interrupters

All 120-volt, single-phase 15- and 20-ampere receptacle outlets on construction sites that are not part of the permanent wiring of the building or structure, and that are in use by employees will have approved GFCIs for personnel protection. *Temporary electrical service GFCIs will be tested weekly by depressing the "Test" button and ensuring receptacle functionality.*

Receptacles on a two-wire, single-phase portable or vehicle-mounted generator rated not more than 5 kilovolts, where the circuit conductors of the generator are insulated from the generator frame and all other grounded surfaces, need not be protected with GFCIs.

2. Assured Equipment Grounding Conductor Program

URS has established and implemented this Assured Equipment Grounding Conductor Program on construction sites covering all cord sets, receptacles that are not a part of the building or structure, and equipment connected by cord and plug that are available for use, or used by employees and volunteer construction workers.

Each cord set, attachment cap, plug, and receptacle of cord sets, and any equipment connected by cord and plug, except cord sets and receptacles that are fixed and not exposed to damage, ***must be visually inspected before each day's use*** for external defects, such as deformed or missing pins or insulation damage, and for indications of possible internal damage. Equipment found damaged or defective will not be used until repaired.

URS will designate one or more competent person at each construction site to implement this program. *"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.*

Tests

The following two tests will be performed on all cord sets, receptacles that are not a part of the permanent wiring of the building or structure, and cord- and plug-connected equipment required to be grounded.

Continuity Test

The continuity test ensures that the equipment-grounding conductor is electrically continuous. Perform this test on all cord sets, receptacles that are not part of a building or structure's permanent wiring, and cord- and plug-connected equipment required to be grounded. Use a simple continuity tester, such as a lamp and battery, bell and battery, an ohmmeter, or a receptacle tester.

Terminal Connection Test

The terminal connection test ensures that the equipment-grounding conductor is connected to its proper terminal. Perform this test with the same equipment used in the first test.

Each receptacle and attachment cap or plug will be tested for correct attachment of the equipment-grounding conductor. The equipment-grounding conductor will be connected to its proper terminal.

All required tests will be performed:

1. Before first use and visually inspected daily thereafter.
2. Before equipment is returned to service following any repairs.
3. Before equipment is used after any incident that can be reasonably suspected to have caused damage; such as when a cord set is run over, "pinched" in a doorway, or "crushed" in a window.
4. Perform monthly continuity tests.

The employer will neither make available nor permit any employees to use equipment that has not met the four requirements listed above.

Records will be kept of the tests performed, as required. These test records will identify each receptacle, cord set, and cord- and plug-connected equipment piece that passed the test, and will indicate the last date it was tested or the interval for which it was tested. This record will be kept by means of logs, color coding, or other effective means, and will be maintained until replaced by a more current record. The record will be made available on the job site for inspection by OSHA and any affected employee.

Part of the URS recordkeeping task, and the method preferable to OSHA, color coding is used for marking cord sets and cord- and plug-connected equipment. The table below lists a color code that is widely used. Colored plastic or vinyl electrical tape is placed on one or both ends of cords and cord- and plug-connected equipment to denote the month that the tests were performed.

Assured Equipment Grounding Conductor Program Color Code		
Month #	Month Tested	Color of tape(s) to apply to cord
1	January	White
2	February	White + Yellow
3	March	White + Blue
4	April	Green
5	May	Green + Yellow
6	June	Green + Blue

Assured Equipment Grounding Conductor Program Color Code			
Month #	Month Tested	Color of tape(s) to apply to cord	
7	July	Red	
8	August	Red +	Yellow
9	September	Red +	Blue
10	October	Orange	
11	November	Orange +	Yellow
12	December	Orange +	Blue

To remember the color of tape to place on the newly tested cord, keep in mind the color for the start of each calendar quarter by season:

White → January → Winter

Green → April → Spring

Red → July → Summer, or the 4th of July

Orange → October → Fall, or pumpkin

Then add:

Yellow for the second month in each quarter

Blue for the third month of each quarter

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Excavation

1. Applicability

This standard applies to operations where URS Corporation and subsidiary companies perform trenching and excavation activities, and/or where URS employees are exposed to hazards associated with trenching and excavation activities.

2. Purpose and Scope

The purpose of this standard is to protect personnel from the hazards associated with excavation and trenching activities.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility, site, or project location.

4. Requirements

A. Competent Person

Where potential employee exposure to hazards associated with the excavation (e.g., entrapment, falls greater than 4 feet (1.2 meters), cave-ins, etc.) can reasonably be anticipated, an excavation-competent person must be on site. The excavation-competent person:

1. Has documentation of training as an excavation-competent person.
2. Must be physically located at the excavation site while work is in progress.
3. Is responsible for conducting daily inspections of excavations, adjacent areas, and protective systems prior to each shift.
4. Is responsible for inspection after every rainstorm or other potentially hazard-producing event.
5. Must have knowledge of soils and soil classification.
6. Understands design and use of protective systems.
7. Understands the requirements of the applicable regulations.
8. Has authority to stop work and take corrective actions when conditions change.

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9. Has the ability to recognize and test hazardous atmospheres.
10. If URS hires a subcontractor to perform excavation or trenching activities, the subcontractor will be required to assign an excavation-competent person to the project. Documentation of this person's qualifications will be maintained in the project safety file.

B. Preliminary Planning

1. Underground and aboveground utilities, adjacent structures or retaining walls, spoil layout, truck routes, and emergency procedures must be identified before work begins. Structures that may be impacted shall be properly supported before work begins.
2. When the excavation or trench approaches the estimated location of underground utilities, the exact location will be determined by methods identified in SMS 034 – Utility Clearance and Isolation.

C. Access/Egress

1. Entry into an excavation or trench should not be made unless absolutely necessary.
2. If personnel enter an excavation or trench that is 4 feet (1.2 meters) deep or more, ladders, steps, ramps, or other safe means of access and egress must be provided, and located 25 feet (7.6 meters) or less of lateral travel for all personnel. If a ladder is used, the ladder must extend 3 feet (0.9 meter) above the surface of the ground.
3. In excavations and trenches that employees may be required to enter, excavated materials and equipment must be effectively stored and retained at least 2 feet (0.6 meter) or more from the edge of a properly sloped/shored excavation. As an alternative to this clearance requirement, barriers or other effective retaining devices may be used in lieu thereof in order to prevent excavated or other materials from falling into the excavation.
4. Surface crossing of trenches by personnel or vehicles should not be made unless absolutely necessary. When necessary, the following conditions must be met:
 - a. Vehicle crossings must be designed by and installed under the supervision of a registered professional engineer.

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- b. Walkways or bridges must have a minimum clear width of 20 inches (50.8 centimeters [cm]), be equipped with standard guardrails, and extend a minimum of 24 inches (61 cm) past the surface edge of the trench.
5. When performing excavation oversight or observation on an excavation/trench greater than 4 feet (1.2 meters) in depth, fall protection may be required. Refer to SMS 040 – Fall Protection for more information.

D. Soil Classification

When sloping, benching, or installed protective systems are used, soil classification of each rock and soil deposit must be classified by a competent person. Soil and rock will be classified as one of the following: stable rock, Type A soil, Type B soil, or Type C soil. The classification will be based on the results of at least one visual analysis and one manual analysis, such as soil plasticity dry strength, thumb penetration, pocket penetrometer, or hand-operated shear vane. In the event that soil classification requires additional technical expertise, the competent person will consult with a registered professional engineer. (See Supplemental Information A – Soil Classification.)

E. Protective Systems

1. Employees in excavations deeper than 4 feet (1.2 meters) must be protected by means of properly designed protective systems.
2. Protective systems for excavations or trenches deeper than 20 feet (6.1 meters) must be designed and stamped by a registered professional engineer.
3. Protective systems must have the capacity to resist all loads that are intended or could reasonably be expected to be applied or transmitted to the system.
 - a. Sloping and Benching
 - When personnel are required to work in trenches or excavated areas, all slopes must be excavated to at least the angle of repose, or otherwise safely supported to prevent cave-ins.
 - The determination of the angle of repose and design of the supporting system must be based on careful

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evaluation of pertinent factors such as: depth of cut; possible variation in water content of the material while the excavation is open; anticipated changes in materials from exposure to air, sun, water, or freezing; loading imposed by structures, equipment, overlying material, or stored material; and vibration from equipment, blasting, traffic, or other sources. (See Supplemental Information B – Angles of Repose – Simple Slopes.)

- The slopes and configurations of sloping and benching systems for excavations 4 feet (1.2 meters) to 20 feet (6.1 meters) deep will be selected and constructed by the employer or his designee, and must be in accordance with the following requirements.
- Soil must be analyzed by a competent person to determine the soil or rock type. The maximum allowable slope for each soil or rock type is identified in the table below.

Soil or Rock Type	Maximum Allowable Slope (Horizontal: Vertical)
Stable Rock	Vertical 90°
Type A	¾:1 or 53°
Type B	1:1 or 45°
Type C	1½: 1 or 34°

- Soil classification is not required if 1½:1 (Horizontal:Vertical) or 34° slope is used. If this slope is greater than 1½:1 (Horizontal:Vertical) or 34°, a soil classification must be made. The excavation must comply with one of the following three options.
 - Option I – Maximum allowable slope, and allowable configurations for sloping and benching systems will be determined in accordance with the conditions and requirements in Supplemental Information A – Soil Classification; and Appendix B – Sloping and Benching.
 - Option II – Designs of sloping or benching systems will be selected by using tabulated data based on soil conditions. These tables must be calculated and prepared by a registered professional engineer. The

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plan must be stamped by a registered professional engineer, and this information must be documented and filed on site.

- Option III – A registered professional engineer must design the sloping and benching system and stamp the plan. This information must be documented and filed on site.

Excavations with sloping and benching in excess of 20 feet deep must be designed and stamped by a registered professional engineer.

b. Timber and Aluminum Hydraulic Shoring for Trenches

Designs of support systems, shield system, and other protective systems will be selected and constructed by the employer or their designee, and must be in accordance with one of four options.

- Option I – Designs using Appendices A, C, and D (see 29 Code of Federal Regulations [CFR] 1926 Subpart P). Shoring in trenching will be determined using conditions and requirements of Supplemental Information A – Soil Classification; Appendix C – Timber Shoring; and Appendix D – Aluminum Hydraulic Shoring.
- Option II – Designs of support systems, shield systems, or other protective systems that are drawn from manufacturer's tabulated data will be in accordance with all specifications, recommendations, and limitations issued or made by the manufacturer (i.e., trench jacks, hydraulic). This information must be filed on site.
- Option III – Designs using other tabulated data. Designs of support systems, shield systems, or other protective systems will be selected from and be in accordance with tabulated data. This information must be filed on site.
- Option IV – Design by registered professional engineer. Support systems, shield systems, and other protective systems not using Option I, II, or III must be approved and stamped by a registered professional engineer.

c. Alternatives to Timber Shoring

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- Portable trench boxes or sliding trench shields may be used for the protection of personnel in lieu of a shoring system or sloping. Where such trench boxes or shields are used, they must be designed, constructed, and maintained in a manner that will provide protection equal to or greater than the sheeting or shoring required for the trench.
 - Trench boxes require placement using portable lifting equipment such as backhoes or other tractor-like devices. The job hazard analysis will consider the hazards of lifting and placement of the trench boxes, including the proper use of chains, stability of the mobile equipment, swing radius protection for load, and load rating for the lifting device.
 - Trench shields and boxes must either be pre-manufactured with listed load ratings, or designed, stamped, and constructed under the direction of a registered professional engineer.
- d. Protective systems designed to protect employees in excavations deeper than 20 feet (6.1 meters) must be designed and stamped by a registered professional engineer.
- e. Excavations must be clearly identified and barricaded to keep unauthorized individuals out.
- f. Walkways, runways, and sidewalks must be kept clear of excavated material or other obstructions, and no sidewalks should be undermined unless shored to protect employees and others.
- g. If it is necessary to place heavy objects or operate heavy equipment on a level above and near any excavation, the side of the excavation must be sheet piled, shored, and braced as necessary to resist the extra pressure due to such superimposed loads.

F. Hazardous Atmospheres and Confined Spaces

1. In excavations or trenches of any depth where an oxygen deficient (<19.5 percent) or flammable (>10 percent Lower Explosive Limit

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[LEL]) or other potentially toxic environment could be expected to exist, the atmosphere of the excavation must be monitored before workers enter the excavation. Air monitoring must be conducted before personnel enter an excavation or trench, and then periodically to ensure that the atmosphere remains safe. Monitoring will be conducted at a minimum of three vertical depths of the excavation to detect potentially stratified gas layers (e.g., propane has a density 1.55 times that of normal air and will accumulate in the lower depths of an open trench).

2. The frequency of air monitoring will be increased if equipment used in or near the excavation or trench may alter the atmosphere where personnel are working. All air monitoring must be documented and maintained in the project safety files.
3. Attended emergency rescue equipment, such as a breathing apparatus, a safety harness and line, basket stretcher, etc., must be readily available where adverse atmospheric conditions may exist or develop in an excavation or trench.
4. Excavations or trenches may qualify as confined spaces. When this occurs, compliance with SMS 010 – Confined Space Entry, is required.

G. Water Accumulation

1. Employees will not work in excavations where water is accumulating unless adequate precautions have been taken to protect employees. Personnel must exit excavations and trenches during rainstorms.
2. De-watering equipment must be installed and monitored by a competent person while personnel are in an excavation.
3. Diversion ditches, dikes, or other suitable means will be used to prevent water from entering an excavation and to provide adequate drainage of the area adjacent to the excavation.
4. Excavations and trenches must be inspected by a competent person after each rain event and before personnel are permitted to re-enter the excavation or trench.

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H. Excavation and Trenching Permit

1. An Excavation/Trenching Permit (Attachment 013-1 AMER) must be completed prior to all excavation or trenching activities.
2. The Excavation and Trenching Permit must be completed and signed by all applicable parties as indicated on the permit. The Project Manager shall determine which signatures are required.
3. Excavation and Trenching Permits may be valid for up to 1 week.

I. Daily Inspections

1. Daily inspections must be made (Attachment 013-2 AMER) of excavations and trenches. Where potential employee exposure to hazards associated with the excavation (e.g., entrapment, falls greater than 4 feet (1.2 meters), cave-ins, etc.) can reasonably be anticipated, these inspections must be made by a competent person.
2. Inspections must be conducted daily before the start of work, after every rainstorm, after other events that would increase hazards such as snowstorm, thaw, earthquake, or dramatic change in weather, and when fissures, tension crack, sloughing, undercutting, water seepage, bulging at the bottom or other similar conditions occur.
3. If evidence of possible cave-ins or slides is apparent, all work in the excavation or trench must cease until the necessary precautions have been taken to safeguard the personnel.

J. Excavating at Potential MEC/UXO Sites

1. If the project site is suspected of munitions and explosives of concern (MEC) or unexploded ordinance (UXO) contamination, the UXO team will conduct a reconnaissance and MEC/UXO avoidance to provide clear access routes to each site before excavation crews enter the area.
2. MEC/UXO sites with planned excavation activities will not be conducted until a complete plan for the site is prepared and/or approved by the URS UXO Safety Officer. MEC/UXO avoidance must be conducted during excavation operations on known or suspect MEC/UXO sites (SMS 039).

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K. Training/Briefings

1. Conduct and document daily safety briefings for all employees associated with excavation activities. Discuss excavation hazards, protective measures, and work practices that will be applicable to the day's activities.

5. Documentation Summary

The following information will be maintained in the project file:

- A. Competent person qualifications.
- B. Excavation and Trenching Permit(s).
- C. Daily inspections by an excavation-competent person.
- D. Air monitoring records.

6. Resources

- A. U.S. Occupational Safety and Health Administration (OSHA) Standard [Excavations](#) 29 CFR 1926, Subpart P
 1. Appendix B, [Sloping and Benching](#)
 2. Appendix C, [Timber Shoring](#)
 3. Appendix D, [Aluminum Hydraulic Shoring](#)
 4. Appendix E, [Alternatives to Timber Shoring](#)
- B. U.S. OSHA Technical Links – [Trenching and Excavation](#)
- C. [SMS 010](#) – Confined Space Entry
- D. [SMS 034](#) – Utility Clearance and Isolation
- E. [SMS 039](#) – Munitions Response / Munitions and Explosives of Concern
- F. [SMS 040](#) – Fall Protection
- G. [Attachment 013-1 AMER](#) – Excavation/Trenching Permit
- H. [Attachment 013-2 AMER](#) – Daily Excavation/Trench Inspection Form

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7. Supplemental Information

- A. [Soil Classification](#)
- B. [Angle of Repose – Simple Slopes](#)



EXCAVATION / TRENCHING PERMIT

Authorization No.: _____ Date and Time Permit Valid: _____
Competent Person: _____ Date and Time Permit Expires: _____
Project Name: _____ Excavation/Trench Location: _____

Description or Job Special Procedures:

ESTIMATED DIMENSIONS: DEPTH = _____ TOP = W _____ L _____ BOTTOM = W _____ L _____
SOIL ANALYSIS METHOD(S) USED: [] Visual [] Manual [] Tabulated Data
SOIL TYPE: [] Stable Rock [] Type A [] Type B [] Type C [] Avg. Compression Strength _____ tsf [] Compressed Strength Data _____
SOIL CHARACTERISTICS: [] Cemented [] Cohesive [] Layered [] Fissured [] Granular [] Plastic [] Dry [] Moist [] Saturated [] Submerged
MANUAL TEST USED: [] Plasticity [] Dry Strength [] Ribbon [] Thumb Penetration [] Pocket Penetrometer [] Dry Testing [] Other
PROTECTIVE SYSTEMS: Protective systems for excavations/trenches deeper than 20 feet (6.1 meters) must be designed and approved by a registered professional engineer.
UTILITIES: [] One Call Service Notified [] Utilities Marked by Public Utilities [] Property Owner Contacted [] Utility Drawings Reviewed [] Private Utility Locator Utilized
SLOPING/BENCHING: [] Vertical (90°) [] 3/4 :1 (53°) [] 1:1 (45°) [] 1 1/2:1 (34°) [] 2:1 (26°) [] Other
SHORING: [] Timber [] Aluminum Hydraulic [] Trench Shield/Trench Box
LIST OF KNOWN OBSTRUCTIONS: [] Electrical [] Telephone [] Water [] Sewer [] Steam [] Natural Gas [] Drain [] Process [] Alarm [] Pilings [] Concrete Encasement [] Footings [] Other
OTHER: [] Means of Egress Required [] Confined Space Permit Required [] Mechanical Ventilation Required
SPECIAL INSTRUCTIONS and WORK INSTRUCTIONS

	<p align="center">Safety Management Standard</p> <p align="center">EXCAVATION / TRENCHING PERMIT</p>	<p align="right">Attachment 013-1 AMER</p> <p align="right">Issue Date: July 2000 Revision 8: September 2013</p>
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All unsafe conditions must be corrected prior to excavation entry. If any hazardous conditions are observed, the excavation must be evacuated immediately, and no one is allowed to re-enter until corrective action has been taken.

Signature and Dates
(Project Manager shall determine which signatures are required)

	Print Name	Signature	Date
Excavation Competent Person (Required)	_____	_____	_____
Site Supervisor	_____	_____	_____
Safety Representative	_____	_____	_____
Registered Professional Engineer (if applicable)	_____	_____	_____
Other	_____	_____	_____

Competent Person: _____	Date/Time: _____
Project Name: _____	Weather Conditions: _____
Excavation Location: _____	Rainfall Amounts 24 Hours Previous: _____

Access/Egress

- Is access and egress located within 25 feet (7.6 meters) of entrants? Yes No Not Applicable
- If ladders are used, do they extend 3 feet (0.9 meter) beyond the top of the excavation? Yes No Not Applicable

Soil Characteristics

- Is any water seepage noted in trench walls or bottom? Yes No Not Applicable
- Are pumps in place, or available if needed? Yes No Not Applicable
- Is there evidence of significant fracture planes in soil or rock? Yes No Not Applicable
- Are there any zones of unusually weak soils or materials not anticipated? Yes No Not Applicable
- Have tension cracks been observed along the top on any slopes? Yes No Not Applicable
- Are there any noted dramatic dips or bedrock? Yes No Not Applicable
- Is there any evidence of caving or sloughing of soil since the last inspection? Yes No Not Applicable

Protective Systems

- Are slopes cut at design angle of repose? Yes No Not Applicable
- Is the shoring system installed in accordance with the design? Yes No Not Applicable
- Is the shoring being used secure? Yes No Not Applicable
- Does the design include an adequate safety factor for equipment being used? Yes No Not Applicable
- Is traffic being adequately kept away from the excavation/trenching operation? Yes No Not Applicable
- Are hydraulic shores pumped to design pressure? Yes No Not Applicable
- Is vibration from equipment or traffic too close to the trenching operation? Yes No Not Applicable
- Are trench box(s) certified? Yes No Not Applicable

Hazardous Atmosphere & Confined Spaces

- Is the hazardous atmosphere testing being conducted on a regular basis? Yes No Not Applicable
- Have rescue procedures been established, and is equipment immediately available? Yes No Not Applicable



Safety Management Standard
DAILY EXCAVATION / TRENCH
INSPECTION FORM

Attachment 013-2 AMER

Issue Date: July 2000
Revision 8: September 2013

Miscellaneous

- Are utility markings in place? Yes No Not Applicable
- Are trees, boulders, or other hazards located in the area? Yes No Not Applicable
- Are barricades or covers in place and in good condition? Yes No Not Applicable
- Is excavated material and equipment at least 2 feet (0.6 meter) from the edge of the excavation? Yes No Not Applicable
- Are GFCIs used on all temporary electrical cords? Yes No Not Applicable
- Is the excavation within the original scope of the excavation permit? Yes No Not Applicable
- Is a valid excavation permit executed for the excavation/trenching activity? Yes No Not Applicable
- Are daily safety briefings being conducted for employees associated with excavation activities? Yes No Not Applicable

Notes/Comments:

R E S P O N S I B I L I T Y	"I hereby attest that the following conditions existed and that the following items were checked or reviewed during this inspection."	
	All unsafe conditions must be corrected prior to excavation entry. If any hazardous conditions are observed, the excavation must be immediately evacuated, and no one is allowed to re-enter until corrective action has been taken.	
	Daily Excavation/Trenching Inspection Completed By:	
	COMPETENT PERSON	Date/Time

	<p style="text-align: center;">Safety Management Standard</p> <p style="text-align: center;">SOIL CLASSIFICATION</p>	<p style="text-align: right;">SMS 013 AMER Supplemental Information A</p> <p style="text-align: right;">Issue Date: February 2009 Revision 1: December 2009</p>
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"Type A" soils

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:

1. The soil is fissured;
2. The soil is subject to vibration from heavy traffic, pile driving, or similar effects;
3. The soil has been previously disturbed;
4. 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 (4H:1V) or greater; or
5. The material is subject to other factors that would require it to be classified as a less stable material.

"Type B" soils

1. Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa); or
2. Granular cohesionless soils including angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam.
3. Previously disturbed soils except those which would otherwise be classed as Type C soil.
 - a. Soil that Dry rock that is not stable; or
 - b. 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 (4H:1V), but only if the material would otherwise be classified as Type B.

"Type C" soils

1. Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less;
2. Granular soils including gravel, sand, and loamy sand;
3. Submerged soil or soil from which water is freely seeping;
4. Submerged rock that is not stable, or
5. Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper.

SOIL CLASSIFICATION

Soil Texture	Visual detection of particle size and general appearance of the soil	Squeezed in hand and pressure released		Soil ribboned between thumb and finger when moist.
		When Air Dry	When Moist	
Sand	Soil has a granular appearance in which the individual grain sizes can be detected. It is free flowing when in a dry condition.	Will not form a cast and will fall apart when pressure is released.	Forms a cast, which will crumble when lightly touched.	Cannot be ribboned.
Sandy Loam	Essentially a granular soil with sufficient silt and clay to make it somewhat coherent. Sand characteristics predominate.	Forms a cast, which readily falls apart when lightly touched.	Forms a cast, which will bear careful handling without breaking.	Cannot be ribboned.
Loam	A uniform mixture of sand, silt and clay. Grading of sand fraction quite uniform from coarse to fine. It is mellow, has somewhat gritty feel, and yet is smooth and slightly plastic.	Forms a cast, which will bear careful handling without breaking.	Forms a cast, which can be handled freely without breaking.	Cannot be ribboned.
Silt Loam	Contains a moderate amount of the finer grades of sand and only a small amount of clay over half of the particles are silt. When dry it may appear quite cloddy which readily can be broken and pulverized to a powder.	Forms a cast, which can be freely handled. Pulverized it has a soft flour-like feel.	Forms a cast, which can be freely handled. When wet, soil runs together and puddles.	It will not ribbon but it has a broken appearance, feels smooth and may be slightly plastic.
Silt	Contains over 80% of silt particles with very little fine sand and clay. When dry, it may be cloddy, readily pulverizes to powder with a soft flour-like feel.	Forms a cast, which can be handled without breaking.	Forms a cast, which can be freely handled. When wet, it readily puddles.	It has a tendency to ribbon with a broken appearance, feels smooth.
Clay Loam	Fine textured soil breaks into hard lumps when dry. Contains more clay than silt loam. Resembles clay in a dry condition; identification is made on physical behavior of moist soil.	Forms a cast which can be handled freely without breaking.	Forms a cast, which can be handled freely without breaking. It can be worked into a dense mass.	Forms a thin ribbon, which readily breaks, barely sustaining its own weight.
Clay	Fine textured soil breaks into very hard lumps when dry. Difficult to pulverize into a soft flour-like powder when dry. Identification based on cohesive properties of the moist soil.	Forms a cast which can be freely handled without breaking.	Forms a cast, which can be handled freely without breaking.	Forms long, thin flexible ribbons. Can be worked into a dense, compact mass. Considerable plasticity.
Organic Soils	Identification based on the high organic content. Muck consists of thoroughly decomposed organic material with considerable amount of mineral soil finely divided with some fibrous remains. When considerable fibrous material is present, it may be classified as peat. The plant remains or sometimes the woody structure can easily be recognized. Soil color ranges from brown to black. They occur in lowlands. In swamps or swales. They have high shrinkage upon drying. Table 1. –Field Method for identification of soil texture			

ANGLE OF REPOSE**FOR SLOPING OF SIDES OF EXCAVATIONS LESS THAN 20 FEET DEEP**

Note: Clays, Silts, Loams
or Non-Homogenous
Soils Require Shoring
or Bracing

The Presence of
Ground Water Requires
Special Treatment

Examples*

Type A Soils:

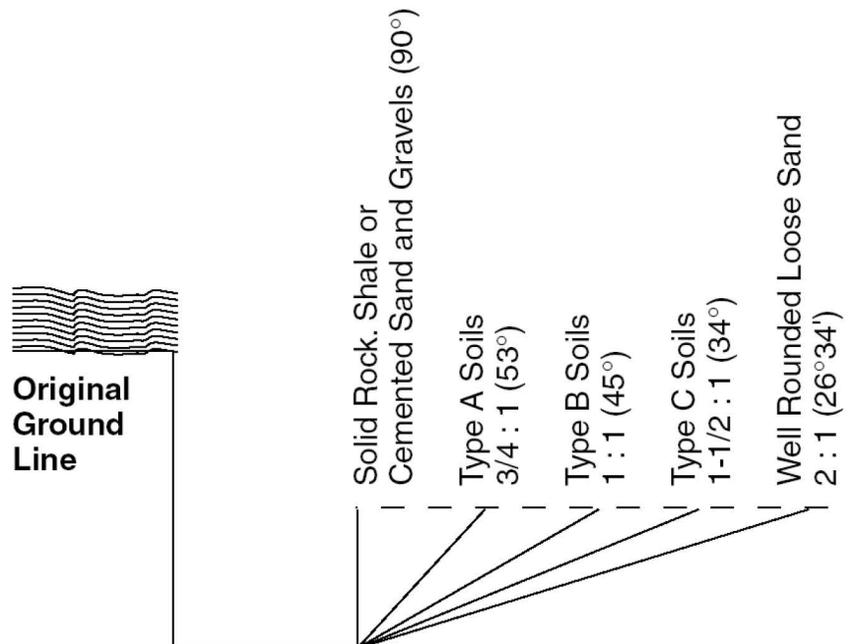
Clay, silt clay, sandy clay
clay loam, caliches,
and hardpan

Type B Soils:

Angular gravel, silt,
silt loam, sandy loam,
unstable dry rock

Type C Soils:

Gravel, sand and loamy
sand, submerged
soil and rock, and
layered soils

**REFERENCE:**

OSHA Safety and Health Standards 1926
Appendix A and B to Subpart P

URS SAFETY MANAGEMENT STANDARD

Fire Protection and Prevention

1. Applicability

This standard applies to URS Corporation and its subsidiary companies.

2. Purpose and Scope

The purpose of this standard is to reduce/eliminate potential fire hazards in the workplace and to provide for a rapid, effective response should a fire occur.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility, site, or project location. At project sites controlled by contractors or building owners, some of these responsibilities may be covered by building/facility owners or owner agents.

4. Requirements

A. Fire Protection

1. A fire protection program will be developed and followed throughout all phases of work.
 - a. Access to available firefighting equipment will be maintained at all times.
 - b. Firefighting equipment will be inspected monthly and maintained in operating condition. Defective equipment will be immediately replaced.
 - c. Fire extinguishers that out of service or discharged will be immediately tagged, removed from service, and replaced.
 - d. Firefighting equipment will be conspicuously located and not obstructed from view in the workplace.
 - e. Where and when required or necessary, the project manager will provide a trained and equipped firefighting organization (fire brigade) to assure adequate protection.
2. A temporary or permanent water supply (sufficient volume, duration, and pressure) required to properly operate the firefighting equipment will be made available as soon as combustible materials accumulate.

URS SAFETY MANAGEMENT STANDARD
Fire Protection and Prevention

- a. Where underground water mains are to be provided, they will be installed, completed, and made available for use as soon as practicable.
- b. Fire Hose and Connections
 - i. One hundred feet, or less, of 1.5-inch (3.75-cm) hose, with a nozzle capable of discharging water at 25 gallons (95 liters) or more per minute, may be substituted for a fire extinguisher rated not more than 2A 20BC in the designated area, provided the hose line can reach all points in the area.
 - ii. If fire hose connections are not compatible with local firefighting equipment, the project manager will provide adapters or equivalent to permit connections.
 - iii. During demolition involving combustible materials, charged hose lines supplied by hydrants, water trucks with pumps, or equivalent will be made available.
- c. Fixed Firefighting Equipment
 - i. Sprinkler Protection
 - Where URS is involved in the construction of a facility in which automatic sprinkler protection is required, the installation of the sprinklers will closely follow the construction, and sprinklers will be placed into service as soon as practicable.
 - Where URS is involved in the demolition or alteration of a facility, existing automatic sprinkler installations should be retained in service as long as reasonable. Only authorized persons will permit the operation of sprinkler control valves. Modification of sprinkler systems to permit alterations or additional demolition should be expedited so that the automatic protection may be returned to service as quickly as possible. Sprinkler control valves will be checked daily, at the close of work/business, to ascertain that the protection is in service.

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Fire Protection and Prevention

ii. Standpipes

In all structures requiring standpipes or where standpipes exist in structures being altered, they will be maintained to always be ready for fire protection use. Conspicuously marked standpipes will be provided with connections on the outside of the structure (at the street level). Each floor will be equipped with at least one standard hose outlet.

iii. Fire Alarm Devices

- An alarm system (e.g., telephone system, siren) will be established to alert both the employees on the site and the local fire department of an emergency.
- The alarm code and reporting instructions will be conspicuously posted at phones and at all employee entrances.

iv. Fire Cutoffs

- In new construction, firewalls and exit stairways required for the completed buildings will be given construction priority. Fire doors, with automatic closing devices, will be hung on openings as soon as practicable.
- Fire cutoffs will be retained in buildings undergoing alterations or demolition until operations necessitate their removal.

d. Jobsite Requirements

- i. Material storage areas will be equipped with fire extinguishers adequate for their size, construction, and the material stored therein.
- ii. Welding, cutting, grinding, and burning will not be done within 25 feet (7.6 meters) of any material fuel storage area. Fire extinguishers will be provided at the site of welding operations.

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Fire Protection and Prevention

- iii. Flammable materials will be stored as far as possible from the working area, at least 25 feet (7.6 meters). Safety cans will be used when handling and transporting fuel, gas, and other flammables.
- iv. Extinguishers are to be adequately maintained.
- v. The telephone number of the nearest organized firefighting group is to be displayed at jobsite telephones.

3. Fire Extinguishing Equipment

a. Extinguisher Requirements

Use only UL-listed extinguishers. Mark extinguishers and extinguisher locations, indicating the suitability of each extinguisher for a particular classification of fire.

b. Building and Occupancy Hazard Protection

Requirements for fire extinguisher protection are divided into two categories: building protection and occupancy hazard protection. Provide for extinguishing equipment to protect both the building structure (if it is combustible) and the occupancy hazards inside it.

- i. For building protection, provide fire extinguishers rated for Class A fires or greater, as required by applicable building codes.
- ii. For protection against occupancy hazards, provide fire extinguishers rated for Class A, B, C, or other fire potential as appropriate. Requirements may vary from section to section within a single building. Determine the occupancy hazards, as well as the proper ratings of necessary fire extinguishers, of each room or section. Classify rooms or sections as light hazard, ordinary hazard, or extra hazard. See Supplemental Information B for additional details and assistance in determining extinguisher requirements.

c. Extinguisher Placement

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Fire Protection and Prevention

- i. Place extinguishers in conspicuous locations, along normal paths of travel, and near exits. If the extinguishers are not readily visible, use wall markings, signs, or lights to identify their locations.
- ii. Ensure that extinguishers are readily accessible. Keep the space in front of and below extinguishers clear at all times. The floor area beneath extinguishers may be marked as a reminder to keep the area clear.
- iii. Hang extinguishers on hangers, brackets, or other equipment furnished by the manufacturer, or place them on shelves. If an extinguisher weighs less than 40 pounds (18.1 kg), the top of the extinguisher will not be more than 5 feet (1.5 meters) above the floor. If an extinguisher weighs equal to or more than 40 pounds (18.1 kg), it will not be more than 3.5 feet (1.1 meters) above the floor. The clearance between the bottom of the extinguisher and the floor will never be less than 4 inches (10.2 cm).
- iv. Provide the appropriate number and types of fire extinguishers for operations being performed. Refer to Supplemental Information A for guidance.

d. Inspection

Properly trained personnel will inspect extinguishers at least monthly. The monthly inspection will include the following items at a minimum:

- i. Location.
- ii. Rating.
- iii. Access.
- iv. Visibility.
- v. Operating instructions.
- vi. Seals.
- vii. Tamper indicators.

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viii. Fullness.

ix. Physical condition.

Attach inspection tags to each extinguisher indicating the dates of purchase, inspection, testing, and recharging, and the initials of the inspector. In addition to the tag, a colored tape may be used to indicate that an extinguisher has been inspected.

Fire extinguishers must be inspected annually by a qualified fire services contactor.

e. Testing and Maintenance

- i. Establish periodic testing programs to ensure that extinguishers are in proper operating condition. Only properly trained personnel (preferably fire extinguisher vendors) should maintain extinguishers.
- ii. At the conclusion of testing or maintenance work, attach a tag to the extinguisher showing the date and the signature of the person who performed the service.

f. Testing Intervals

- i. Each year, recharge soda acid and foam extinguishers, and weigh others according to the manufacturer's instructions. Inspect the body, hose, and nozzle of the extinguisher, and examine the dry powder. Note: Testing is not necessary for stored pressure units unless a loss of pressure or other conditions indicates a need; however, units mounted in vehicles or otherwise subject to mechanical packing should have their powder examined.
- ii. Every five years, test the pressure parts of all extinguishers except Halon 1301 extinguishers; dry chemical extinguishers with braised-brass, mild steel, or aluminum shells; and dry-powder extinguishers for metal fires.

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- iii. Every six years, empty dry-chemical, stored-pressure extinguishers and examine working parts for operability.
- iv. Every 12 years, test the pressure parts of Halon 1301 extinguishers; dry-chemical extinguishers with braised-brass, mild steel, and aluminum shells; and dry-powder extinguishers for metal fires.

g. Employee Training

- i. Where fire extinguishers are provided for employee use, training will be provided on general principles of portable fire extinguishers, including stages of fires and classes of fire extinguisher. The emphasis should be on hazards of fighting a fire during the initial phases of a fire.
- ii. Personnel designated to use firefighting as part of a site Emergency Action Plan must have training in the use of appropriate equipment. Training must be conducted prior to initial assignment and annually thereafter or whenever there is a change in the Emergency Action Plan or new equipment is introduced.

B. Fire Prevention

1. General

- a. Develop an Emergency Preparedness Plan as outlined in SMS 003 – Emergency Preparedness Plan.
- b. Conduct evacuation drills at least annually.
- c. Maintain good housekeeping to reduce fire hazards and to provide safe routes of egress should a fire occur.
- d. Conduct periodic workplace inspections to identify fire hazards such as unnecessary accumulation of combustibles (including paper and boxes), unnecessary storage of flammables, and sources of ignition.

2. Ignition Hazards

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Fire Protection and Prevention

- a. Electrical wiring and equipment for light, heat, or power purposes will be properly installed.
 - b. Equipment powered by internal combustion will be located with the exhausts positioned away from combustible materials. When the exhausts are piped outside the building under construction, a clearance of at least 6 inches (15 cm) will be maintained between piping and combustible material.
 - c. Smoking is prohibited at or in the vicinity of operations that constitute a fire hazard. Such areas will be conspicuously posted as follows: "NO SMOKING OR OPEN FLAME."
 - d. Portable, battery-powered lighting equipment, used in connection with the storage, handling, or use of flammable gases or liquids, will be approved for the hazardous locations. For more information, see SMS 015 – Flammable and Combustible Liquids and Gases.
 - e. The nozzles of air, inert gas, and steam lines or holes used in the cleaning or ventilation of tanks and vessels containing hazardous concentrations of flammable gases or vapors will be bonded to the tank or vessel shell. Bonding devices will not be attached or detached while hazardous concentrations of flammable gases or vapors exist.
3. Temporary Buildings
- a. Temporary buildings will not be erected where the location adversely affects any means of employee exit.
 - b. Temporary buildings, located within another building or structure, will be of noncombustible construction or combustible construction having a fire resistance rating of not less than 1 hour.
 - c. Temporary buildings, located other than inside another building and not used for handling and storage of flammable or combustible liquids, flammable gases, explosives, or blasting agents, or similar hazardous occupancies, will be located at a distance of not less than 10 feet (3 meters) from another building or structure. Groups of temporary buildings, not exceeding 2,000 square feet (186 square meters) in total, will be considered a single temporary building.

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Fire Protection and Prevention

4. Open Yard Storage

- a. Combustible materials will be stored with regard to the stability of piles and in no case higher than 10 feet (3 meters).
- b. Driveways between and around combustible storage piles will be at least 15 feet (4.6 meters) wide and maintained free of accumulations of rubbish, equipment, or other articles or materials. Driveways will be spaced to produce a maximum grid system unit of 50 feet (15.2 meters) by 150 feet (45.7 meters).
- c. The entire storage site will be kept free from accumulations of unnecessary combustible materials. Weeds and grass will be maintained, and procedures will be established for periodic cleanup of the entire area.
- d. The method of piling combustible materials will be solid and in orderly regular piles. No combustible material will be stored outdoors within 10 feet (3 meters) of a building or structure.
- e. Portable fire extinguishing equipment, suitable for the fire hazard involved, will be provided at convenient, conspicuously accessible locations in the yard area. Portable fire extinguishers, rated not less than 2A:20BC, will be placed to assure that the maximum travel distance to the nearest unit will not exceed 100 feet (30.5 meters).

5. Indoor Storage

- a. Storage will not obstruct, or adversely affect, means of exit.
- b. Materials will be stored, handled, and piled with regard to their fire characteristics.
- c. Noncompatible materials, which may create a fire hazard, will be segregated by a barrier having a fire resistance of at least 1 hour.
- d. Materials will be piled to minimize the spread of fire internally and to permit convenient access for firefighting. Stable piling will be maintained at all times. Aisle space will be

URS SAFETY MANAGEMENT STANDARD
Fire Protection and Prevention

maintained to safely accommodate the widest vehicle used within the building for firefighting purposes.

- e. A clearance of at least 36 inches (90 cm) will be maintained between the top level of the stored material and the sprinkler deflectors.
- f. Clearance will be maintained around lights and heating units to prevent ignition of combustible materials.
- g. A clearance of 24 inches (60 cm) will be maintained around the fire door's path of travel, unless a barricade is provided, in which case no clearance is needed. Material will not be stored within 36 inches (90 cm) of a fire door.

C. Temporary Heating Devices

1. Ventilation

- a. Fresh air will be supplied in sufficient quantities to maintain the health and safety of employees. Where natural means of fresh air supply are inadequate, mechanical ventilation will be provided.
- b. Heaters used in confined spaces necessitate that special care be taken to provide sufficient ventilation to ensure proper combustion, maintain the health and safety of workmen, and limit temperature increase in the area.

2. Clearance and Mounting

- a. Temporary heating devices will be installed to provide clearance to combustible materials not less than the amount shown in the following table:

Minimum Clearance in inches (cm)			
Heating Appliance	Sides	Rear	Chimney Connector
Room heater, circulating type	12 (30)	12 (30)	18 (45)
Room heater, radiant type	36 (90)	36 (90)	18 (45)

- b. Temporary heating devices that are listed for installation with lesser clearance than specified in the previous table must be

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installed in accordance with the manufacturer's specifications.

- c. Heaters not suitable for use on wood floors will not be set directly upon them or other combustible materials. When such heaters are used, they will rest on suitable heat-insulating material or concrete at least 1 inch (2.5 cm) thick or equivalent. The insulating material will extend beyond the heater 2 feet (60 cm) or more in all directions.
- d. Heaters used near combustible tarpaulins, canvas, or similar coverings will be located at least 10 feet (3 meters) from the coverings. The coverings will be securely fastened to prevent ignition or upsetting of the heater due to wind action on the covering or other material.

3. Stability

When in use, heaters will be set horizontally level, unless otherwise permitted by the manufacturer's instructions.

4. Solid Fuel Heaters

Solid fuel heaters are prohibited in buildings and on scaffolds.

5. Oil Fired Heaters

- a. Flammable liquid-fired heaters will be equipped with a primary safety control to stop the flow of fuel in the event of flame failure. Barometric or gravity oil feed will not be considered a primary safety control.
- b. Heaters designed for barometric or gravity oil feed will be used only with integral tanks.
- c. Heaters specifically designed and approved for use with separate supply tanks may be directly connected for gravity feed, or an automatic pump, from a supply tank.

5. Documentation Summary

The following documentation will be maintained in the project file:

- A. Emergency Action Plans.

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Fire Protection and Prevention

- B. Fire extinguisher inspection logs.
- C. Employee training documentation.
- D. Site audits.
- E. Evacuation drills.

6. Resources

- A. U.S. Occupational Safety and Health Administration (OSHA) Standard – [Means of Egress](#) – 29 Code of Federal Regulations (CFR) 1910, Subpart E
- B. U.S. OSHA Standard – [Exit Routes, Emergency Action Plans, and Fire Prevention Plans](#) – 29 CFR 1910.38
- C. U.S. OSHA Standard – [Fire Protection](#) – 29 CFR 1910, Subpart L
- D. U.S. OSHA Software – [Fire Safety Advisor](#)
- E. U.S. OSHA Construction Standard – [Fire Protection and Prevention](#) – 29 CFR 1926.150, Subpart F
- F. National Fire Protection Association – Standard for Portable Fire Extinguishers – [NFPA 10](#)
- G. International Code Council – [International Fire Code](#)
- H. [SMS 003](#) – Emergency Preparedness Plan
- I. [SMS 015](#) – Flammable and Combustible Liquids and Gases

7. Supplemental Information

- A. [Fire Classifications](#)
- B. [General Fire Extinguisher Requirements](#)

	<p style="text-align: center;">Health, Safety and Environment</p> <p style="text-align: center;">FIRE CLASSIFICATIONS</p>	<p style="text-align: right;">SMS 014 NA Supplemental Information A Issue Date: February 2009</p>
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A. Fire Classifications

Fires are classified as Class A, B, C, D, or Special, depending upon the types of materials involved. These classifications are defined as follows:

1. Class A – Fires in ordinary combustible materials such as wood, cloth, paper, trash, rubber, and plastic.
2. Class B – Fires in flammable liquid, oil, grease, tar, oil-base paint, lacquer, and flammable gas.
3. Class C – Fires involving energized electrical equipment or systems, resulting in the extinguishing media conducting electricity. When electrical equipment or systems are de-energized, extinguishers for Class A or B fires can be used safely.
4. Class D - Fires involving combustible metals such as magnesium, titanium, zirconium, lithium, potassium, and sodium. Specialized techniques, extinguishing agents, and extinguishing equipment have been developed to control and extinguish fires of this type. Generally, do not use normal extinguishing agents on metal fires. In such fires, there is the danger of increasing the intensity of the fire because of a chemical reaction between some extinguishing agents and the burning metal.
5. Special - Fires that involve certain combustible metals or reactive chemicals require, in some cases, special extinguishing agents or techniques.

B. Extinguisher Classifications and Ratings

All types of extinguishers are not equally effective against all classifications of fires. Therefore, extinguishers are rated according to the classification and size of the fires against which they are effective. Extinguisher ratings are found on the extinguisher label. A rating consists of a letter indicating the classification of fire on which the extinguisher is effective and a rating number indicating the relative extinguishing effectiveness. The significance of the rating number varies with the classification of fire for which the extinguisher is rated. The following rating criteria are used:

1. For extinguishers rated for Class A fires, the rating number indicates relative effectiveness, the higher the number, the more effective the extinguisher. The minimum recommended rating for extinguishers rated for Class A fires is 2A.

	<p style="text-align: center;">Health, Safety and Environment</p> <p style="text-align: center;">FIRE CLASSIFICATIONS</p>	<p style="text-align: right;">SMS 014 NA Supplemental Information A Issue Date: February 2009</p>
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2. For extinguishers rated for Class B fires, the rating number represents the average size (in square feet) of the fire the extinguisher could put out.
3. No number is used for extinguishers rated for Class C fires, because Class C fires are essentially either Class A or B fires involving energized electrical wiring and equipment.

C. Hazard Classifications

The materials in a building or area present hazards of varying potential. These hazards are classified. As follows:

1. Light or Low Hazard – A room or area where, considering the amount of combustible material or flammable liquids present, fires of small size should be anticipated (e.g., change trailers, toilet trailers, and general storage).
2. Ordinary or Moderate Hazard – A location where, considering the amount of combustibles or flammable liquids present, fires of moderate size should be anticipated (e.g., temporary construction offices and most shops).
3. Extra or High Hazard – A location where, considering the amount of combustibles or flammable liquids present, fires of severe magnitude should be anticipated (e.g., carpenter shops and storage areas for flammable liquids and lumber).

1. Fire Extinguishers – General

The following are **minimum** requirements for fire extinguisher placement in office buildings, construction facilities, support buildings, and/or buildings under construction. In some cases, client requirements may be more stringent, in which case the client’s requirements supersede the guidelines below.

Extinguisher Requirements for Class A Hazards

Rating Shown on Extinguisher	Maximum Travel Distance to Extinguishers in Feet (m)	Maximum Area to be Protected per Extinguisher		
		Light Hazard sq. ft. (m ²)	Ordinary Hazard sq. ft. (m ²)	Extra Hazard sq. ft. (m ²)
1-A	-	-	-	-
2-A	75 (23)	6,000 (557)	3,000 (279)	-
3-A	75 (22.9)	9,000 (836)	4,500 (418)	3,000 (279)
4-A	75 (22.9)	11,250 (1,045)	6,000 (557)	4,000 (372)
6-A	75 (22.9)	11,250 (1,045)	9,000 (836)	6,000 (557)
10-A	75 (22.9)	11,250 (1,045)	11,250 (1,045)	10,000 (929)
20-A	75 (22.9)	11,250 (1,045)	11,250 (1,045)	11,250 (1,045)
40-A	75 (22.9)	11,250 (1,045)	11,250 (1,045)	11,250 (1,045)

Extinguisher Requirements for Class B Hazards

Type of Hazard	Minimum Extinguisher Rating	Maximum Travel Distance to Extinguishers in Feet (m)
Light	5-B	30 (9.1)
	10-B	50 (15.2)
Ordinary	10-B	30 (9.1)
	20-B	50 (15.2)
Extra	40-B	30 (9.1)
	80-B	50 (15.2)

Extinguisher Requirements for Class C Hazards

Class C extinguishers are required wherever energized electrical equipment is located. Since a Class C fire itself is either Class A or Class B (involving ordinary combustible material, flammable liquids, or flammable gases), the extinguishers are sized and located as for a Class A or B hazard.

Types of Extinguishers Approved for Types of Hazards

Class A Hazards	Class B Hazards	Class C Hazards
Cartridge-operated water or antifreeze	Carbon dioxide*	Carbon dioxide
Stored pressure water or antifreeze	Dry chemical	Dry chemical
Wetting Agent Foam	Multipurpose dry chemical (ABC)	Multipurpose dry chemical (ABC)
Loaded stream	Halon 1301	Halon 1301
Multipurpose dry chemical (ABC)	Halon 1211	Halon 1211
Pump tank water or antifreeze (Halon 1211)		

*Certain sizes are not classified or acceptable to meet requirements.

2. Hot Work

A minimum of one fire extinguisher, rated at least 20BC, must be provided for each hot work location. The extinguisher should be conspicuously positioned no more than 10 feet (3.04 meters) from the hot work. Refer to SMS 020- Hot Work”.

3. Motorized Construction Equipment

At least one portable fire extinguisher, rated at least 20BC, must be provided on each piece of motorized construction equipment.

4. Temporary Construction/Work Trailer

A minimum of one fire extinguisher, rated at a minimum of 2A, must be provided for each temporary construction/work trailer.

URS SAFETY MANAGEMENT STANDARD

Flammable and Combustible Liquids and Gases

1. Applicability

This standard applies to all operations of URS Corporation and its subsidiary companies.

2. Purpose and Scope

The purpose of this standard is to provide information regarding the proper storage, handling, and work practices associated with flammable and combustible liquids and gases.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility, site, or project location.

4. Requirements

A. Appoint a Responsible Person who will:

1. Determine if flammable or combustible liquids and gases are stored on-site. Flammable liquids have a flash point of less than 100 degrees Fahrenheit (°F) (37.8 degrees Celsius [°C]). Combustible liquids have a flash point greater than or equal to 100°F (37.8°C). These liquids are further divided into three classes (I, II, III) and subclasses (A, B, C) as summarized in Attachment 015-1 NA.
2. Inspect storage areas monthly.
3. Monitor the quantity of flammable and combustible liquids and gases on the site.
4. Review work practices involving flammable and combustible liquids and gases.
5. Material safety data sheets (MSDS) for all hazardous substances, including flammable and combustible liquids, must be provided by vendors or subcontractors, and maintained on site. For more information, see SMS 002 – Hazard Communication.
6. Furnish portable fire extinguishers in such quantities, sizes, and types as needed for the special hazards of operation and storage. For more information, see SMS 014 – Fire Prevention and Protection.

URS SAFETY MANAGEMENT STANDARD
Flammable and Combustible Liquids and Gases

- B. Control flammable and combustible liquids and gases entering the site by ordering only those materials and quantities that are needed to complete a job.
- C. Cylinders – General Use & Transport
1. Open and close cylinder valves using the appropriate tools provided by the cylinder supplier.
 2. Remove regulators and replace caps before transporting cylinders.
 3. Do not roll or drop cylinders. Transport cylinders in a vertical and secured positing using a cylinder basket, cylinder cart or other secure equipment.
 4. Do not use cylinders if the cap can not be removed by hand. Do not use tools (e.g., hammer) to loosen caps. Tag the cylinder “Do Not Use” and return the cylinder to a designated storage area to be returned to the cylinder supplier.
 5. Welding gas and oxygen cylinders must be stored at a minimum of 20 feet (6.1 meters) apart or separated by a 5 foot (1.5 meters) high firewall that is rated for a minimum of ½ hour.
- D. General Storage
1. Use only approved containers, tanks, and pumping equipment for storage and handling of flammable and combustible liquids. Use approved (UL or FM) metal safety cans (with spring-closing lid and spout cover, and optional flash-arresting screen) for the handling and use of flammable liquids in 1- to 5-gallon (4- to 19-liter) quantities. For additional information, see Attachment 015-1 NA – Flammable and Combustible Liquid Classifications.
 2. Segregate gas cylinders based on hazards. Store oxygen separately from acetylene or other flammables. Store cylinders in secure and upright position, with caps secure and cylinders marked as to the contents and hazards.
 3. Place all rags, waste, etc., soiled by combustible or flammable materials in tightly closed metal containers for daily disposal.
 4. Take precautions, including proper ventilation, to prevent the ignition of flammable vapors. Sources of ignition include, but are not limited to: open flames; lightning; smoking; cutting and welding;

URS SAFETY MANAGEMENT STANDARD
Flammable and Combustible Liquids and Gases

hot surfaces; frictional heat; static, electrical, and mechanical sparks; spontaneous ignition; chemical reactions; and radiant heat.

5. Require approved personal protective equipment for all persons handling flammable or combustible liquids, as outlined by the appropriate MSDS.
6. Train employees exposed to flammable or combustible liquids in the hazards of these materials; in their safe handling, use and disposal; in their protection from ignition sources; in the type, use, and placement of containers and cabinets; in the location of fire extinguishers; in the protection against toxic vapors; and in the procedures to follow in case of spill or fire.

E. Indoor Storage

1. Keep indoor storage of flammable liquids to a minimum. Do not store more than 25 gallons (95 liters) of flammable or combustible liquids outside of an approved storage cabinet.
2. Do not store flammable or combustible liquids in areas used for exits, stairways, or normally used for the safe passage of people.
3. Do not store more than 120 gallons (454 liters) of flammable and combustible liquids in a single flammable storage cabinet; of these liquids, not more than 60 gallons (227 liters) can be Class I and II flammable liquids. Do not store oxidizers and other reactive chemicals in flammable cabinets.
4. Up to three cabinets may be grouped together. Groups of cabinets must be separated by at least 100 feet (30.5 meters).
5. Conspicuously label all cabinets "Flammable—Keep Fire Away."
6. Indoor flammable liquid storage rooms must conform to NFPA codes, including requirements regarding fire ratings, spill containment, maximum capacity, electrical classifications, and ventilation requirements.
7. Storage of liquefied petroleum gas (LPG) within buildings is prohibited, and outdoor storage of LPG must meet applicable building and fire codes.

F. Outside Storage

URS SAFETY MANAGEMENT STANDARD
Flammable and Combustible Liquids and Gases

1. Maintain a minimum of 20 feet (6.1 meters) between flammable and combustible storage areas and any building.
2. Storage of containers (not more than 60 gallons [227 liters] each) cannot exceed 1,100 gallons (4,164 liters) in any one pile or area.
3. Grade the storage area in a manner to divert possible spills away from buildings, and curb or dike so as to contain entire volume of liquids and prevent spills from impacting soil or groundwater.
4. Keep the entire storage site free from accumulation of unnecessary combustible materials. Closely cut weeds and grass, and establish a regularly scheduled cleanup procedure for the whole area.
5. Maintain adequate access-ways to open-yard storage to allow access by fire-fighting equipment. Equipment that is blocking access must be manned at all times so that it may be readily moved if necessary.

G. Labeling and Signage

1. Post a "NO SMOKING OR OPEN FLAME" sign in all areas where flammable and combustible materials are stored, handled, and processed.
2. Require all containers and cylinders to be labeled with the contents and adequate hazard warnings per SMS 002 – Hazard Communication.
3. Properly label cylinders that will no longer be used or are empty and place in a designated area to be returned to the cylinder supplier.

H. Use of Materials on Site

1. Use flammable and combustible liquids and gases in a manner that is consistent with the label and MSDS for the product.
2. Use only those amounts of materials needed for the job. Transfer of these materials to ready-to-use containers is encouraged.
3. Use personal protective equipment stated on the product label and MSDS. For additional information, consult SMS 029 – Personal Protective Equipment.
4. For dispensing and/or fueling operations, ensure:

URS SAFETY MANAGEMENT STANDARD
Flammable and Combustible Liquids and Gases

- a. Signs are posted with instructions on the dispensing or fueling process.
 - b. Operators have been trained in the dispensing or fueling process.
 - c. Equipment being refueled has the engine shut off prior to fueling.
 - d. Smoking is prohibited in vehicle and equipment refueling areas.
 - e. Adequate protection is provided to safeguard dispensing pumps from physical damage from vehicles.
 - f. Dispensing nozzles have auto shut-off or self closing valves and provisions for containing or controlling over-spillage.
 - g. Heating equipment installed in lubrication or service areas, where flammable liquids are dispensed, is of an approved type, and where feasible, is installed at least 8 feet (2.4 meters) above the floor.
 - h. Tank cars and trucks being loaded or unloaded and flammable storage tanks and systems are properly bonded and grounded.
 - i. Transfer of flammable liquids from one container to another is done only when containers are electrically interconnected (bonded).
 - j. Proper PPE is required during the dispensing or fueling process. For additional information, see SMS 029 – Personal Protective Equipment; and Attachment 015-2 NA – Flammable, Combustible, Oxidizer, and Compressed Gas Inspection Checklist.
- I. Spill Control
- 1. Have a written spill response plan in place before materials are stored or used on site. Any project with an aggregate aboveground storage of more than 1,320 gallons or underground quantity of 42,000 gallons of diesel fuel, petroleum-based oils, gasoline, and oil lubricants must have a current Spill Prevention Control and Countermeasures (SPCC) plan.

URS SAFETY MANAGEMENT STANDARD
Flammable and Combustible Liquids and Gases

2. Clean up or respond to spills promptly according to applicable local, state, and federal regulations. This may require notification of authorities if a Reportable Quantity (RQ) is exceeded.
3. Move leaking cylinder to a ventilated area away from ignition sources. Do not attempt to repair a leaking cylinder. Contact the cylinder supplier to determine proper response methods.

J. Disposal

1. Keep solvent waste and flammable liquids in fire-resistant, covered containers until they are removed from the worksite.
2. Do not place flammable or combustible waste in municipal garbage.
3. Do not pour flammable or combustible liquids down drains or onto the ground.
4. Dispose of flammable or combustible hazardous materials with a licensed and approved hazardous material disposal company.

K. Inspection

1. Inspect flammable and combustible storage and use areas and gas storage areas on a monthly basis.
2. Use the inspection sheet provided as Attachment 015-2 NA to inspect the storage areas.
3. Inspect cylinder regulators, gauges, valves, hoses and connections before use. Any damaged equipment shall be tagged out-of-service.
4. Regulators shall be specific to the gas being used and no adapters may be used to connect regulators to cylinders.

L. Training

Require that hazard communication training includes specific hazard information for the flammables and combustibles used.

J. Compliance

Review and comply with country and client/customer-specific requirements.

URS SAFETY MANAGEMENT STANDARD

Flammable and Combustible Liquids and Gases

5. Documentation Summary

The following information will be maintained in the project file:

- A. Location of the MSDS inventory
- B. Completed Flammable and Combustibles Inspection Checklist (Attachment 015-2 NA)

6. Resources

- A. [National Fire Protection Association](#) – Liquefied Petroleum Gas Code – Standard 58, Flammable and Combustible Liquids Code – Standard 30, Isolated Construction Projects – Standard 395
- B. Regulations of the U.S. Coast Guard – [Carriage of Flammable and Combustible Cargo](#)
- C. U.S. Occupational Safety and Health Administration (OSHA) Standard – Flammable and Combustible Liquids – [29 CFR 1910.106](#),
- D. U.S. Occupational Safety and Health Administration (OSHA) Standard – Spray Finishing using Flammable and Combustible Materials – [29 CFR 1910.107](#),
- E. U.S. Occupational Safety and Health Administration (OSHA) Standard – Flammable and Combustible Liquids (Construction Standard) – [29 CFR 1926.152](#)
- F. [Uniform Fire Code](#) – Flammable and Combustible Liquids – Article 79
- G. [SMS 002](#) – Hazard Communication
- H. [SMS 014](#) – Fire Prevention and Protection
- I. [SMS 029](#) – Personal Protective Equipment
- J. [Attachment 015-1 NA](#) – Flammable and Combustible Liquid Classifications
- K. [Attachment 015-2 NA](#) – Flammable, Combustible, Oxidizer, and Compressed Gas Inspection Sheet



Health, Safety and Environment
FLAMMABLE AND COMBUSTIBLE
LIQUID CLASSIFICATIONS

Attachment 015-1 NA

Issue Date: June 1999
Revision 5: September 2011

Flammable Liquid	Flash Point	Boiling Point
Class 1A	< 73° F (22.8°C)	< 100° F (37.8°C)
Class 1B	< 73° F (22.8°C)	> 100° F (37.8°C)
Class 1C	> 73° F (22.8°C) < 100° F (37.8°C)	
Combustible Liquid		
Class 2	> 100° F (37.8°C) < 140° F (60°C)	
Class 3	≥ 140° F (60°C)	

Maximum Allowable Size of Containers and Portable Tanks

Container Type	Flammable Liquids			Combustible Liquids	
	Class 1A	Class 1B	Class 1C	Class II	Class III
Glass or approved plastic	1 pint (0.5 liter)	1 quart (1 liter)	1.3 gallons (5 liters)	1.3 gallons (5 liters)	1.3 gallons (5 liters)
Metal (other than drums) or approved plastic	1.3 gallons (5 liters)	5.3 gallons (20 liters)	5.3 gallons (20 liters)	5.3 gallons (20 liters)	5.3 gallons (20 liters)
Safety cans	2.6 gallons (10 liters)	5.3 gallons (20 liters)	5.3 gallons (20 liters)	5.3 gallons (20 liters)	5.3 gallons (20 liters)
Metal drums (DOT specifications)	119 gallons (450 liters)				
Approved metal portable tanks	793 gallons (3,000 liters)				



Health, Safety and Environment
**FLAMMABLE, COMBUSTIBLE, OXIDIZER, AND
COMPRESSED GAS INSPECTION CHECKLIST**

Attachment 015-2 NA
Issue Date: June 1999
Revision 5: September 2011

Location Inspected: _____ Job No.: _____

Date Inspected: _____ Name of Inspector: _____

Storage Cabinets		
1.	Flammable cabinets do not obstruct room exits.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
2.	No more than 60 gallons (227 liters) of flammable or 120 gallons (454 liters) of combustible liquid are stored in a cabinet.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
3.	No more than three cabinets are located in a storage area.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
4.	Metal storage cabinets have self-closing doors.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
5.	Cabinets are labeled "FLAMMABLE – KEEP FIRE AWAY"	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
Safety Cans		
6.	Safety cans are constructed of stainless steel, Monel, or tin.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
7.	Safety cans have a flame arrestor and spring-loaded cap on both the filling and pouring spouts.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
Drum & Drum Storage Areas		
8.	Drums are stored in a vertical position.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
9.	Bungs are closed when liquid is not being transferred.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
10.	Drums are shielded from the sun.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
11.	Funnels with installed flash arrestor are used when transferring flammable liquids into drums.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
12.	A minimum distance of 25 feet (7.6 meters) between a drum storage area and buildings is present.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
13.	A "NO SMOKING" sign is posted in the area.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
14.	An emergency spill kit is located near the drum storage area.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
15.	A 20-pound dry-chemical fire extinguisher is located no less than 10 feet (3 meters) or more than 50 feet (15 meters) from the storage area.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
Waste Cans		
16.	Combustible scrap, debris, and waste materials (oily rags, etc.) are stored in covered metal cans.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
17.	Waste cans are removed from the work area daily.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
18.	Waste cans have spring-loaded self-closing lids.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
Storage Rooms Designed Specifically For Flammable Materials		
19.	Room construction meets NFPA fire-resistance requirements.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
20.	Rooms with automatic extinguishing systems have the following:	
	<ul style="list-style-type: none">Noncombustible liquid-tight raised sills or ramps at least 4 inches (0.36 meters) in height.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
	<ul style="list-style-type: none">Flooring at least 4 inches (0.36 meters) below the surrounding floor, or an open-grated trench that drains to a safe location.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
	<ul style="list-style-type: none">Openings with approved self-closing fire doors.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
	<ul style="list-style-type: none">Liquid-tight construction where the walls join the floors.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA

**FLAMMABLE, COMBUSTIBLE, OXIDIZER, AND
COMPRESSED GAS INSPECTION CHECKLIST**

	<ul style="list-style-type: none">Shelving, racks, dunnage floor overlay, and other interiors with 1-inch wood.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
21.	Rooms are ventilated by a gravity or mechanical exhaust system that:			
	<ul style="list-style-type: none">Commences not more than 1 foot (0.3 meter) above the floor.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
	<ul style="list-style-type: none">Is designed to provide for a complete change of air within the room at least six times per hour.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
	<ul style="list-style-type: none">Is controlled by a switch located outside the door, with ventilating equipment and any light fixtures operated from the same switch.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
Flammable & Combustible Storage Areas Within Buildings				
22.	At least one portable fire extinguisher rated not less than 20-B is located outside of but not more than 10 feet (3 meters) from the door opening into any room used for the storage of more than 60 gallons (227 liters) of flammable or combustible liquids.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
23.	Buildings or rooms are locked when not occupied.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
24.	Exits, stairways, or passageways are not used for storing flammables and combustibles.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
25.	No more than 25 gallons (95 liters) of Class IA or 60 gallons (227 liters) of Class IB, II, or III liquids are located in a room outside of a flammable storage locker or flammable storeroom.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
26.	An aisle at least 3 feet (0.91meters) wide is maintained in storage areas.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
27.	No more than those amounts needed for one day's use are stored in buildings under construction.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
Outside Storage of Flammable and Combustible Liquids				
28.	At least one portable fire extinguisher having a rating of not less than 20-B is located not less than 25 feet (7.6 meters) or more than 75 feet (22.8 meters) from any outside flammable liquid storage area.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
29.	For containers not more than 60 gallons each (227 liters), no more than 1,100 gallons (4,164 liters) in any one group are stored.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
30.	Groups of containers are separated by 5-foot (1.52 meters) clearances.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
31.	Groups of containers are more than 50 feet (15 meters) from buildings.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
32.	Portable tanks (not exceeding 660 gallons [2,498 liters] in capacity) are provided with emergency venting devices as specified by NFPA 30.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
33.	Storage areas are free of accumulation of weeds, debris, and other combustible materials not necessary to the storage.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
Storage Tanks				
34.	Tanks have relief vents.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
35.	Tank vents are not close to open flames, stacks, heating apparatus, or any other source of ignition.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
36.	A dike or curb or other suitable means to prevent the spread of leakage from tanks.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
37.	Diked areas have a capacity equal in volume to at least that of the largest tank plus 10 percent of all other tanks in the enclosure.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
38.	Provisions to drain off accumulations of ground- or rainwater or spills in diked areas.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
Dispensing of Flammable and Combustible Liquids				
39.	Dispensing outlets for above-ground tanks with nationally listed automatic-closing valve, without a latch-open device.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
40.	Dispensing systems are electrically bonded and grounded.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA

**FLAMMABLE, COMBUSTIBLE, OXIDIZER, AND
COMPRESSED GAS INSPECTION CHECKLIST**

41.	Tanks, hoses, and containers of 5 gallons (19 liters) or less in metallic contact while transferring flammable liquids.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
42.	Electrically bonded systems are used for transferring flammable liquids in containers in excess of 5 gallons (19 liters).	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
43.	Closed piping systems are used for drawing flammable liquids during transfer.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
44.	Flammables and combustibles are drawn from a container or portable tank by use of gravity or through a pump using an approved self-closing valve.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
Liquefied Petroleum Gas – Refueling				
45.	Equipment is shut down during refueling operations.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
46.	Leather gloves and safety glasses are worn during refueling operations.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
47.	Smoking and hot work is prohibited during refueling.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
48.	Refueling occurs at least 25 feet (7.6 meters) from buildings.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
Compressed Gases – Storage				
49.	Cylinders must be capped when regulators are removed.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
50.	Oxygen and fuel cylinders are stowed in designated well-ventilated areas.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
51.	Storage areas have temperatures less than 130° F (54.4° C).	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
52.	Cylinders are stored upright and secured from falling over.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
53.	Cylinders are in segregated groups by gas type and not intermingled with other cylinders.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
54.	Oxygen cylinders are stored at least 20 feet (6.1 meters) away from flammables. (A fire-resistive partition of at least 1-hour fire-resistance rating of at least 5-foot (1.52 meters) height may also be used.)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
55.	Flammable or combustible materials are kept at least 20 feet (6.1 meters) away from stored cylinders.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
56.	Gas cylinder valves are protected from snow and ice during winter months.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
57.	Oxygen cylinders are kept free from oil and grease.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
58.	Welding cylinders are securely fastened to ready-use racks.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
59.	Smoking or open flames are not permitted in areas where cylinders are stored.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
60.	Cylinder storage areas are posted with the following sign: “DANGER – NO SMOKING OR OPEN FLAME”	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
61.	Cylinders are labeled with gas contents and warning statement.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
62.	Empty cylinders are segregated from full cylinders.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
Oxidizers				
63.	Oxidizers are stored separately from flammables.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
64.	When oxidizers are shifted to a second container, the container is labeled with the appropriate warning labels.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
65.	Secondary containers are compatible with oxidizers.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
66.	Oxidizers are stored away from heat sources where the maximum temperature exceeds 100° F (37.8° C).	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
67.	Chromic acid, nitric acid, perchloric acid, and potassium permanganate (all oxidizers) are stored separately from other corrosives and flammables.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA

URS SAFETY MANAGEMENT STANDARD

Hand Tools and Portable Equipment

1. Applicability

This standard applies to URS Corporation and its subsidiary companies in which hand tools and/or portable powered equipment, including chain saws; brush cutters, powder-actuated tools, and similar high-hazard implements are used.

2. Purpose and Scope

The purpose of this standard is to provide procedures for the safe use and handling of hand tools and portable powered equipment. SMS 064 – Hand Safety provides additional information on the safe use of hand tools.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility, site or project location.

4. Requirements

A. General

1. Keep hand and power tools in good repair and use them only for the task for which they were designed. Use tools only in accordance with the manufacturer's recommendations.
2. Remove damaged or defective tools from service. Affix a "Do Not Use" tag (or similar) to the tool until repairs are made or the tool is destroyed.
3. Provide employees using hand tools or portable powered equipment with personal protective equipment (PPE) and train employees in the use of PPE required for the operation being undertaken.
4. Keep surfaces and handles clean and free of excess oil and grease to prevent slipping.
5. Do not carry sharp tools in pockets; this practice may cause puncture wounds.
6. Clean tools and return to a suitable toolbox, room, rack, or other storage area upon completion of a job.
7. Before applying pressure, ensure that wrenches have a good bite.

URS SAFETY MANAGEMENT STANDARD

Hand Tools and Portable Equipment

- a. Brace yourself by placing your body in the proper position so that that you will not fall in case the tool slips.
 - b. Make sure hands and fingers have sufficient clearance in the event the tool slips.
 - c. Always pull on a wrench, never push.
8. When working with tools overhead, place tools in a holding receptacle or secure when not in use to prevent them from falling.
 9. Do not leave tools in or on passageways, access ways, walkways, ramps, platforms, stairways, or scaffolds where they can create a tripping hazard.
 10. Do not throw tools from place to place or from person to person, or drop tools from heights.
 11. Use nonsparking tools in atmospheres with fire or explosive characteristics.
 12. Inspect all tools prior to start-up or use to identify any defects.
 13. Powered hand tools should not be capable of being locked in the ON position, except as noted elsewhere in this standard.
 14. Require that all power-fastening devices be equipped with a safety interlock capable of activation only when in contact with the work surface.
 15. Ensure that all portable powered tools designed to accommodate guards are equipped with such when in use.
 16. Do not allow loose clothing, long hair, loose jewelry, rings, and chains to be worn while working with power tools.
 17. Do not use cheater pipes.
 18. Make provisions to prevent machines from automatically restarting upon restoration of power (see SMS 023 – Lockout and Tagout Safety).
 19. Where URS issues tools to its employees, the supervisor is responsible for the safe condition of tools and equipment.

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20. Where workers furnish their own tools, their tools must conform to the requirements demanded for safety and efficiency. The supervisor has the responsibility to regularly inspect these tools for defects.

B. Electrical Power Tools

1. Electric-power-operated tools will be either of the approved double-insulated type or grounded in accordance with the National Electric Code.
2. The use of the electric cord for hoisting or lowering electric tools is an unsafe practice and will not be permitted.
3. All handheld powered drills, tappers, fastener drivers, horizontal, vertical, and angle grinders with wheels greater than 2 inches (5.1 centimeters) in diameter, disc sanders, belt sanders, reciprocating saws, saber saws, and other similar operating powered tools will be equipped with a momentary contact ON/OFF control and may have a lock-on control provided that turnoff can be accomplished by a single motion of the same finger or fingers that turn it on.
4. All other handheld powered tools such as circular saws, chain saws, and percussion tools without positive accessory holding means will be equipped with a constant pressure switch that will shut off the power when the pressure is released (i.e., "dead man" switch).

C. Grinding Tools

1. Inspect work rests and tongue guards for grinders.
 - a. Work rest gaps should not exceed $\frac{1}{8}$ inch (3 mm).
 - b. Tongue guard gaps should not exceed $\frac{1}{4}$ inch (6 mm).
2. Do not adjust work, guards, or tool rests while the grinding wheel is moving.
3. Inspect the grinding wheel for cracks, chips, defects, or excessive wear. Remove from service if any defects are found.
4. Wear goggles when grinding. A clear full face shield may be worn with the goggles.

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5. Do not use the side of a grinding wheel unless the wheel is designed for side grinding.
6. Always stand to the side of the blade, never directly behind it.
7. Use grinding wheels only at their rated speed.
8. Grinding aluminum is prohibited.
9. For operations in the United Kingdom:
 - a. No grinding wheels exceeding 55 mm are to be used.
 - b. All wheels are to be marked with their safe maximum speed.
 - c. Abrasive wheels will be operated only by personnel who have been specifically trained and specified competent by URS.
 - d. Abrasive wheels will be operated only by persons specified as competent, under the abrasive wheel regulations.
 - e. Abrasive wheels must be operated only if the manufacturer's guard is fitted and they are in good working order.

D. Power Saws

1. Require that circular saws are fitted with blade guards.
2. Inspect each day prior to use. Remove damaged, bent, or cracked saw blades from service immediately.
3. Require that table saws are fitted with blade guards and a splitter to prevent the work from squeezing the blade and kicking back on the operator.
4. Require guards that cover the blade to the depth of the teeth on hand-held circular saws. The guard should freely return to the fully closed position when withdrawn from the work surface.

E. Woodworking Machinery

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1. Do not leave woodworking tools running when unattended.
2. Keep the operating table and surrounding area clear of debris.
3. Do not use compressed air to remove dust and chips from woodworking machinery.
4. Locate the ON/OFF switch to prevent accidental start-up. The operator must be able to shut off the machine without leaving the workstation. Safety goggles and kickback aprons should be provided for and worn by operators. Respirators or local exhaust ventilation may also be necessary based on the type of material being cut or sanded.
5. Guard planers and joiners to prevent contact with the blades throughout the full length of the cutting area.
6. Ensure that band saw blades are fully enclosed except at the point of operation.
7. Require that swing cut-off saws have a guard completely covering the upper half of the saw.
8. Require that circular cross-cut and rip saws are provided with a hood guard, splitter, and anti-kickback device. The hood should adjust itself automatically to the thickness of and remain in contact with the material being cut. All circular saws will be provided with a hood guard.
9. Ensure that exposed parts of the saw blade under the table are properly guarded.
10. Equip all swing cutoff and radial saws that are drawn across a table with limit stops to prevent the saw from traveling beyond the edge of the table.
11. Hold the material being cut firmly against a back guide or fence and cut with a single, steady pass.
12. Cut green or wet material slowly and with caution. Check all material being cut for nails, hard knots, etc.
13. Use a push stick when:

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- a. The cutting operation requires the hands of the operator to come close to the blade.
 - b. Small pieces are being machined.
14. When cutting long stock, provide extension tables and a helper to assist the operator.
15. Adjust saw blades so they clear only the top of the cut.
16. Automatic feed devices should be used whenever feasible.
17. When drills are used:
- a. Take care to prevent clothing from being wound around the drill. Wear sleeves buttoned at the wrist or short-sleeved shirts.
 - b. Clamp or hold down material being drilled to prevent spinning with the drill.
 - c. If the bit is long enough to pass through the material, provide against damage and injury.
 - d. Secure magnetic drills with a chain or rope to prevent falling. Label cord connections to prevent unplugging.
18. When sanders are used:
- a. Move sanders away from the body.
 - b. Because dust may create an explosion hazard, guard against open flames and sparks.

F. Pneumatic Tools and Equipment

1. Require that pneumatic tools have:
- a. Tool retainers to prevent the tool from being ejected from the barrel during use.
 - b. Safety clips, chains, tie wires, or other retaining devices to secure connections between tool/hose/compressor to prevent whipping in case of disconnection or failure.

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2. Do not lay hose in walkways, on ladders, or in any manner that presents a tripping hazard.
3. Never use compressed air to blow dirt from hands, face, or clothing.
4. Do not use compressed air for cleaning purposes unless the pressure is reduced to 30 pounds per square inch (psi) or less. This rule does not apply for concrete form, mill scale, green cutting, and similar cleaning operations. Proper respiratory, hand, eye, and ear protection must be worn.
5. Never raise or lower a tool by the air hose.
6. Shut off the pressure and exhaust from the line before disconnecting the line from any tool or connection.

G. Powder-Actuated Fastener Tools

1. Use powder-actuated tools that comply with the requirements of the American National Standards Institute (ANSI)/American Society of Safety Engineers (ASSE) Standard A10.3 – 2006 – Powder-Actuated Fastening Systems.
2. Assess local and state regulations governing the use of these tools to ensure compliance.
3. Use only individuals who have been trained by a manufacturer's representative and possess the proper license to operate, repair, service, and handle powder-actuated tools.
4. With each tool, the manufacturer or supplier should furnish a detailed instruction manual covering the application, operation, and maintenance of the tool. The manufacturer's recommendation for size of charge, stud unit, or pin, and for specific application must be followed explicitly by the operator.
5. Keep cartridges or shells in the original containers, in separate metal containers, or in the carrying case provided with the tool, and then stored in locked containers. Keep cartridges of varied charges or forces segregated from each other.

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6. Take precaution, as defined by the manufacturer, in the event of a misfire.
7. Provide information from the manufacturer on the safe use, testing, and maintenance of each type of tool in each tool kit.
8. Never use a powder-actuated tool in a flammable or explosive atmosphere.
9. Require the use of goggles or a full face shield as well as safety glasses during operation of powder-actuated tools.
10. Use only tools that are provided with a shield or muzzle guard. This shield or guard should be of a size, design, and material that will effectively confine flying particles and prevent escape of ricocheting studs and pins.
11. Ensure that powder-actuated tools are not able to be fired unless the tool is pressed against the work surface.
12. Always handle powder-actuated tools like firearms, with hands clear of the muzzle and barrel pointed away from all persons, especially when the tool is being closed or assembled after loading.
13. Ensure that the tool is not able to fire if the tool is dropped when loaded.
14. Ensure that firing the tool requires two separate operations, with the firing movement being separate from the motion of bringing the tool to the firing position.
15. Provide signs and barricades when shooting into walls or floors with personnel working on the other side.
16. Never fire into easily pierced or soft substrates or into materials of unknown resistance to piercing. In these situations, there is potential for the fastener to penetrate and pass through, creating a flying projectile hazard. If penetration of these materials is required, the material should be backed with a box of wood or sand at least four inches (10 cm) thick and of adequate area.
17. Do not use powder-actuated tools in reinforced concrete if there is the possibility of striking the rebar.

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18. Do not use powder-actuated tools on cast iron, high carbon, heat treated steel, or armor plate, thin slate, marble, glass, live rock, glazed brick or tile, terra cotta, or other brittle substances, or where the composition is unknown.
19. Do not fire studs closer than three inches (7.5 cm) from the edge or corner when being used on brick or concrete. Do not fire studs closer than ½ inches (1.25 cm) from the edge when being used on steel.
20. Never load and leave a powder-actuated tool unattended. It should be loaded only prior to its intended firing. Use only studs or pins specifically designed for the tool.
21. Test tools each day prior to loading by testing safety devices according to the manufacturer's recommended procedure.
22. Inspect, clean, and store powder-actuated tools in a safe place at the end of each day. No tool will be stored loaded. Store tools with the barrels removed or breech open.
23. At the manufacturer's recommended intervals, the tool will be completely dismantled and carefully inspected for wear on the safety devices by a qualified person familiar with the tool. Worn parts will be replaced before the tool is used again. It is recommended that factory-authorized service representatives be utilized for inspection, repair, and parts replacement, where possible.

H. Chain Saws

1. Approval by the HSE manager is required for all use of chain saws.
2. Inspect the saw prior to each use and periodically during daily use.
3. Never cut above chest height.
4. Require that the idle is correctly adjusted on the chain saw. The chain should not move when the saw is in the idle mode.
5. Start cutting only after a clear escape path has been made.

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6. Shut the saw off when carrying through brush or on slippery surfaces. The saw may be carried no more than 50 feet (15 meters) while idling.
 7. Require applicable protective gear. This will include, but is not limited to:
 - a. Logger's safety hat.
 - b. Safety glasses and face shield.
 - c. Steel-toed boots.
 - d. Protective leggings.
 - e. Hearing protection.
 - f. Work gloves.
 8. Inspect saws to ensure that they are fitted with an inertia break and hand guard.
 9. *Never* operate a chain saw when fatigued.
 10. Do not allow others in the area when chain saws are operated.
 11. Make sure there are no nails, wire, or other imbedded material that can cause flying particles.
 12. Do not operate a chain saw that is damaged or improperly adjusted, or is not completely and securely assembled. Always keep the teeth sharp and the chain tight. Worn chains should be replaced immediately.
 13. Keep all parts of your body away from the saw chain when the engine is running.
 14. For all operations, only personnel specifically trained and certified as competent by URS may operate chain saws.
- I. Hand-Operated Pressure Equipment
1. Direct pressure equipment such as grease guns, and paint and garden sprayers away from the body and other personnel in the area. The person operating any equipment

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such as this, which has a potential for eye injury, must wear protective goggles.

2. The noise produced when using certain types of pressure equipment may require the use of hearing protection.
3. Never allow the nozzle of a pressurized tool to come in contact with any body parts while operating. There is potential for injection of a chemical directly into the user's body, resulting in severe injury or death.

J. Gasoline-Powered Tools

1. Never pour gasoline on hot surfaces.
2. Never fuel around an open flame or while smoking.
3. Shut down the engine before fueling.
4. Provide adequate ventilation when using in enclosed spaces.
5. Use only Underwriters Laboratories (UL) - or FM-approved safety cans to transport flammable liquids. The use of unapproved containers for gasoline is strictly prohibited.
6. Label gasoline containers in compliance with Hazard Communication requirements, indicating the chemical and physical hazards of the product.

K. Inspection

Inspect all hand tools on a regular basis. Immediately remove defective tools from service, and tag or destroy them to prevent further use.

5. Documentation Summary

The following documentation will be maintained in the project file:

- A. Site briefings regarding tool use.
- B. Records of tools removed from service.
- C. Copies of powder-actuated tool licenses (as applicable).

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D. Tool inspection documentation.

6. Resources

- A. U.S. Occupational Safety and Health Administration (OSHA) Standard – [Hand and Portable Power Tools](#) – 29 Code of Federal Regulations (CFR) 1910, Subpart P
- B. U.S. OSHA Standard – [Construction Tools – Hand and Power](#) – 29 CFR 1926, Subpart I
- C. American National Standards Institute ([ANSI](#))/[American Society of Safety Engineers \(ASSE\) Standard A10.3 – 2006](#) – Powder-Actuated Fastening Systems
- D. [National Association of Demolition Contractors](#)
- E. United Kingdom – ['Provision and Use of Work Equipment' Regulations 1998](#)
- F. Australia/New Zealand Standards – Powder-Actuated Handheld Fastening Tools - AS/NZS 1873.1:2003 Australian/New Zealand Standards – [Hand-held Motor-operated Electric Tools – AS/NZS 60745.1:2003](#)
- G. [SMS 023](#) – Lockout and Tagout Safety
- H. [SMS 064](#) – Hand Safety

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Hazardous Waste Operations

1. Applicability

This standard applies to all operations of URS Corporation and its subsidiary companies involving the investigation or remediation of sites impacted with hazardous wastes or hazardous materials, including those associated with underground storage tanks.

Normally, investigation projects for real estate transactions conducted to confirm that a site is "clean" are not covered under this standard. If the Project Manager reasonably expects that there is the potential for a "clean" site to actually have some level of contamination, it should initially be treated as contaminated, and be subject to this standard.

2. Purpose and Scope

The purpose of this standard is to minimize the risks to URS personnel and subcontractors while conducting hazardous waste field operations.

Investigation techniques discussed in this standard include, but are not limited to, hand augering, soil gas evaluation, groundwater monitoring, test pits, and all types of power drilling, including direct-push. Remediation techniques discussed under this standard include, but are not limited to, excavation, groundwater treatment, soil gas treatment, containment, and landfarming.

The applicability of the Hazardous Waste Operations and Emergency Response (HAZWOPER) standard to URS activities is primarily in the areas of site investigation and remediation. URS relies on outside vendors or clients to provide emergency response teams (HazMat Teams) at our project sites and locations. On a project-specific basis, if the need arises for URS to provide an emergency response team, then the HAZWOPER requirements specific to that activity will be developed and incorporated into the project health and safety plan (HASP). This includes specific chemical protective clothing, equipment, and post-emergency response operations.

3. Implementation

Implementation of this standard is the responsibility of the URS Manager directing activities of the facility, site, or project location.

4. Requirements

The URS Management System Elements and Safety Management Standards were designed to help employees to identify, evaluate, and control safety and health hazards and to provide for emergency response. Site/project hazards and

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Hazardous Waste Operations

scope of work dictate the specifics, which are covered in Facility Emergency Action Plans and Project HASPs.

A. Project Evaluation

Assess the technical and field aspects of every hazardous waste site project to evaluate:

1. Risk of exposure to hazardous chemicals, with particular attention to suspected or known human carcinogens.
2. Personal protective equipment requirements.
3. Air monitoring requirements.
4. Emergency services requirements.
5. Hazards addressed by other URS Safety Management Standards (e.g., SMS 010 – Confined Space Entry).
6. Hazardous materials shipping and disposal responsibilities.
7. Other safety and health hazards associated with site operations.

B. Client/Contract Evaluation

1. Review contract documents to determine whether the client has any special internal or regulatory requirements for hazardous waste site operations.
2. Implement client requirements in addition to those of this standard. Those requirements that are the most protective (e.g., most stringent) will be used.

C. Site-Specific Health and Safety Plan

1. Prepare a site-specific HASP for every project under this standard.
2. HASPs must be written or approved by the appropriate Safety Manager, or a safety professional specifically approved by the Safety Manager, and by the project manager. Modifications and addendums to the HASP require approval by the Safety Manager and project manager.

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3. Evaluate client and agency requirements prior to preparing the HASP, particularly if the client or an agency will approve the HASP prior to implementation.
4. On a site-/project-specific basis, conduct a hazard assessment and identify appropriate engineering controls, work practices, and personal protective equipment (PPE) requirements. This assessment and the mitigations and controls must be documented in site-/project-specific HASP(s) and Job Safety Analysis (or equivalent).
5. On a site-/project-specific basis, conduct a hazard assessment for potential physical and chemical exposures and identify monitoring equipment, frequency, action levels, and actions. These must be incorporated into project-/site-specific HASP(s). Guidance on monitoring is provided in SMS 043 – Personal Monitoring/Industrial Hygiene.
6. On a site-/project-specific basis and based on the potential chemical exposures and work activities, develop specific decontamination procedures that include instructions on materials, decontamination steps, and location of decontamination. The purpose of these procedures will be to ensure personnel leaving contaminated areas are appropriately decontaminated, and all equipment is disposed or decontaminated.
7. PPE selection, use, and maintenance are presented in SMS 029 – Personal Protective Equipment. This information is documented on a site/project specific basis in the site/project HASP. The HASP may include PPE requirements that vary by task and project conditions. The Site Safety Officer (SSO) will implement these PPE changes included in the HASP, but may not modify the HASP PPE requirements. Work may not proceed unless the PPE required by the HASP is available and properly used.

The HASP shall include the following minimum PPE: hard hat, safety glasses, high visibility vest, and safety-toe shoes/boots.

8. Remove any non-impermeable PPE clothing that becomes contaminated with hazardous substances in accordance with the decontamination procedures noted above.

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9. Provide regular showers, change rooms, and sanitation facilities for employees, as necessary. Unauthorized personnel shall not remove protective clothing or equipment from change rooms.

D. Training – Remediation and Investigation Activities

Verify that each assigned URS employee has completed the following required training.

1. 40-hour initial training from an approved training provider, (24 hours of initial training for operations outside of North America).
2. 3 days of on-the-job training (1 day is required for operations outside of North America).
3. 8-hour refresher training completed within 12 months of the initial or subsequent refresher training. If the time lapse since the 40 hour training or 8 hour refresher (whichever is later) is greater than two years, contact a Division, Regional, or Business Unit Safety Manager or Director. The Safety Manager/Director may require additional training (e.g., on-line modules) including the 40 hour class to be re-taken.
4. 8-hour Site Safety Officer (Supervisor) training for directing the activities of any other URS employee or subcontractor.
5. Additional training for the Site Safety Officer as described below.

E. Training – Emergency Response

The HAZWOPER standard is primarily applicable to URS operations involving remediation and investigations at hazardous waste sites or sampling at Treatment, Storage, and/or Disposal Facilities (TSDFs). URS typically contracts emergency response or relies on client or local emergency response teams. On an as-needed basis, if a project requires URS to provide a HAZMAT emergency response team, the following training requirements must be met.

1. Operations Level – a minimum of 8 hours of initial and refresher training for those responsible for acting defensively in the case of a release, attempting to contain the release from a safe distance.
2. HAZMAT Technician – at least 24 hours of initial training and 8 hours of refresher training. They will participate in operations-level

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training and know how to implement the emergency response plan for the facility/site/project location.

3. HAZMAT Specialist – at least 24 hours of initial training and 8 hours of refresher training. They will be trained in the same content as the HAZMAT Technician, as well as in how to develop a site safety and control plan.
4. Incident Commander – will have at least 40 hours of training covering the Operations Level training and techniques for implementing the emergency response plan and directing the incident. They will be knowledgeable in relevant regulations. The Incident Commander will become the individual in charge of a site-specific incident command system and will coordinate and control communications with external agencies.

F. Site Safety Officer

1. Appoint a Site Safety Officer (SSO) with appropriate qualifications for the specific hazardous waste project.
2. Assure that the SSO for complex projects, such as those with complicated remediation activities, has no duties other than site safety and health.
3. Verify that the SSO has completed basic supervisor training, and has additional required training and experience as applicable:
 - a. Additional respiratory protection training is required for projects where supplied air respirators may be used.
 - b. Heavy equipment/construction safety.
 - c. Personal air monitoring.
4. The SSO will monitor decontamination and other site activities for effectiveness.

G. Exposure Monitoring

Require that exposure monitoring is conducted in accordance with the HASP on all hazardous waste projects.

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H. Project Equipment

1. Provide all health and safety equipment as described by the project HASP.
2. Provide all personal protective equipment as described by the project HASP.

I. Medical Surveillance

Verify that each URS employee assigned to the project meets the minimum requirements of the URS Medical Surveillance Program (refer to SMS 024 – Medical Screening and Surveillance). This typically includes:

1. Baseline examination
2. Annual examination
3. Appropriate clearance for respirator use.

J. Compliance Assurance

SMS 068 – Compliance Assurance is a tool for use in determining the effectiveness and compliance of a hazardous waste site operation.

5. Documentation Summary

The following information will be maintained in the project file:

- A. Completed Health and Safety Plan
- B. Completed and signed HASP approval form
- C. Signed HASP acceptance form (or equivalent)
- D. Completed health and safety field forms that are included in each HASP
- E. Training and Medical Surveillance Clearance documentation for project personnel

6. Resources

- A. U.S. Occupational Safety and Health Administration (OSHA) – [Hazardous Waste Operations](#)

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- B. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities – [National Institute for Occupational Safety and Health \(NIOSH\) 85-115](#)
- C. [SMS 010](#) – Confined Space Entry
- D. [SMS 024](#) – Medical Screening & Surveillance
- E. [SMS 029](#) – Personal Protective Equipment
- F. [SMS 043](#) – Personal Monitoring
- G. [SMS 068](#) – Compliance Assurance

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Heat Stress

1. Applicability

This standard applies to URS Corporation and its subsidiary companies on projects where ambient (not adjusted) temperatures exceed 70 degrees Fahrenheit (°F) (21 degrees Celsius [°C]) for personnel wearing chemical-protective clothing, including impermeable protective clothing such as Tyvek or Saranex coveralls, and 90°F (32°C) for personnel wearing standard permeable work clothes. Permeable clothing refers to clothes of standard cotton or synthetic materials. Note that certain governmental entities require heat stress prevention techniques be implemented at lower temperatures or whenever outdoor work is conducted. Always consult local regulations to determine if more stringent standards apply.

2. Purpose and Scope

The purpose of this standard is to protect project personnel from the effects of heat-related illnesses.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility, site, or project location.

4. Requirements

- A. The project Health and Safety Plan will address heat stress control when temperatures identified in Section 1 of this standard are anticipated.

This standard introduces three different means of monitoring for heat stress conditions: Wet Bulb Globe Temperature (WBGT), Humidex Based Heat Response and Physiological Monitoring. These methods can be used separately or in conjunction. For employees wearing chemical-protective clothing, physiological monitoring (Section D) is the most effective approach, because evaporative cooling capability is limited.

- B. Heat stress is influenced by air temperature, radiant heat, and humidity. The WBGT is a useful index of the environmental contribution to heat stress. Because WBGT is only an index of the environment, the contributions of work demands, clothing, and state of acclimatization must also be accounted for, as described in the following steps.

1. Monitor ambient temperatures and conduct heat stress monitoring in accordance with the project Health and Safety Plan. Revise the heat

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Heat Stress

stress monitoring and controls if there are any reports of discomfort due to heat stress.

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

Table 1
Examples of Activities within Workload Categories

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

5. Determine the approximate proportion of work within an hour during a typical shift. Typically, the initial work schedule will be 60 minutes of work

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per hour (100 percent work) with a small break in the morning and afternoon, as appropriate, and a 30-minute lunch break mid-day.

6. Compare the WBGT values measured in 4.B.1 to the screening criteria and action limit values in the following table, using the determinations made in 4.B.3 through 4.B.5.

Table 2
SCREENING CRITERIA AND ACTION LIMIT
FOR HEAT STRESS EXPOSURE
(WBGT Values in °F /°C)

Work Cycle (60 min/ hour)	TLV				Action Limit			
	Light Work	Mod. Work	Heavy Work	Very Heavy Work	Light Work	Mod. Work	Heavy Work	Very Heavy Work
75 to 100%	87.8/ 31.0	82.4/ 28.0	N/A	N/A	82.4/ 28.0	77.0/ 25.0	N/A	N/A
50 to 75%	87.8/ 31.0	84.2/ 29.0	81.5/ 27.5	N/A	83.3/ 28.5	78.8/ 26.0	75.2/ 24.0	N/A
25 to 50%	89.6/ 32.0	86.0/ 30.0	84.2/ 29.0	82.4/ 28.0	85.1/ 29.5	80.6/ 27.0	77.9/ 25.5	76.1/ 24.5
0 to 25%	90.5/ 32.5	88.7/ 31.5	86.9/ 30.5	86.0/ 30.0	86.0/ 30.0	84.2/ 29.0	82.4/ 28.0	80.6/ 27.0

- a. If the measured WBGT is *less than* the action limit value, there is little risk of excessive exposure to heat stress, and work can continue. Continue to monitor ambient conditions with the WBGT. However, if there are reports of the symptoms of heat-related disorders, then the analysis of little risk should be reconsidered.
- b. If the measured WBGT is *greater than* the action limit value, institute heat stress controls, including a work-rest cycle, and perform physiological monitoring as described in section D of this standard.
- c. Because of the physiological strain associated with heavy work among less fit workers regardless of WBGT, values are not provided in Table 1 for continuous work. For the same reason, values are not provided in Table 1 for up to 50% of very heavy work. Physiological monitoring should always be implemented under these conditions.
- d. If the measured WBGT is greater than the TLV value, work should stop and physiological monitoring should be followed.
- e. For workers wearing cloth coveralls (e.g., Nomex fire resistant clothing), add 3 to the measured WBGT. For impermeable clothing,

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such as Tyvek or Saranex, the WBGT procedures cannot be used. For these situations, workers should begin physiological monitoring as soon as the temperature in the work area exceeds 70°F (21°C).

C. Humidex Based Heat Response

1. The Humidex method is a simplified way of protecting workers from heat stress which is based on the WBGT to estimate heat strain. It is an equivalent scale intended to express the combined effects of warm temperatures and humidity. Humidex is used as a measure of perceived heat that results from the combined effect of excessive humidity and high temperature.
2. This method requires only a local air temperature and relative humidity value. Monitoring must continue throughout the day for changing conditions. Identify a representative location where measurements can be taken. Measurements should be recorded at least hourly when ambient temperatures and 90°F (32°C) for personnel wearing normal permeable work clothes.
3. Specific procedures to complete the Humidex Based Heat Response Plan are included in Attachment 018-1 AMER – Humidex Worksheet.

D. Physiological Monitoring

Physiological monitoring provides a means to assess the effectiveness of the heat stress controls (training, hydration, work-rest cycles, etc.) that are in place. Based on the results of physiological monitoring and self-assessment, work-rest cycles can be adjusted to more effectively control heat stress by shortening the work period, or to allow for longer work periods if workers are recovering adequately during rest breaks.

1. Perform physiological monitoring as soon as the employee stops working and begins their break (rest). Perform *physiological monitoring at least every hour*. *Base rest breaks* on the results of the monitoring, workers' self-assessment, and professional judgment.
 - a. Example 1: If the WBGT is 85°F (29.4°C) or less for acclimatized, light-duty workers, they can work 60 minutes per hour (100 percent work), and they need only take their regularly scheduled breaks.
 - b. Example 2: If the WBGT is greater than 85°F (29.4°C) for acclimatized, light-duty workers, physiological monitoring must be

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performed, and workers' work-rest cycles must be adjusted as described below.

2. Have workers assess themselves and their body's reaction to the heat and work conditions (self-assessment), and report any signs or symptoms of heat illness. These can include nausea or dizziness, heat cramps, extreme thirst, or very dark urine.
3. Based on the results of the physiological monitoring and on the workers' self-assessments, the work period may be adjusted as follows:
 - a. The work period may be *increased* (generally, by 5- to 10-minutes intervals, up to a maximum of 4 hours) if the results of the first 2 hours of the physiological monitoring and the workers' self-assessments indicate that workers *are* recovering adequately (see below), and on the judgment of the Health and Safety Technician.
 - b. The work period *must be decreased* if the results of the physiological monitoring and the workers' self-assessment indicate that workers are NOT recovering adequately (see below).
4. Perform physiological monitoring
 - a. The worker or the Health and Safety Technician must measure and record body temperature and pulse rate as described below. Use SMS 018-2 AMER – Heat Stress Monitoring Record as a tool.
5. Body Temperature Monitoring
 - a. Monitor body temperature to determine if employees are adequately dissipating heat buildup. Ear probe thermometers which are adjusted to oral temperature (aural temperature) are convenient and the preferred method of measurement. Determine work/rest regimen as follows:
 - i. Measure oral body temperature at the end of the work period. Oral body temperatures are to be obtained prior to the employee drinking water or other fluids.
 - ii. If temperature exceeds 99.6°F (37.5°C), shorten the following work period by 1/3 without changing the rest period.
 - iii. If, at the next rest period, temperature still exceeds 99.6°F (37.5°C), the worker should not be allowed to continue work until repeated temperature measurements are in the acceptable range (i.e., less

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than 99.6°F). Do not leave the worker alone during the recovery time. Watch for signs of heat illness and be prepared to implement emergency response as necessary.

iv. Do not allow a worker to wear impermeable PPE when his/her oral temperature exceeds 100.6°F (38.1°C).

b. Have employees assess themselves and their body's reaction to the heat and work conditions, and report any signs or symptoms of heat stress, including, but not limited to, feeling nauseous or dizzy, skin rash or skin irritation, muscle cramps, weakness or fatigue, extreme thirst, dizziness, blurred vision, headache, or very dark urine.

6. Pulse Rate Monitoring

a. Take the radial (wrist) pulse as early as possible in the rest period and determine the worker's heart rate in beats per minute. The heart rate is determined by counting the pulse for ten seconds and multiplying the number by 6 to get the beats per minute. Record this as P1.

b. Wait 2 minutes and repeat the pulse measurement. Record this as P2.

c. If P1 is greater than or equal to 110 beats per minute (bpm) and if (P1 – P2) is less than or equal to 10 bpm (indicating that workers are not recovering adequately), shorten the next work cycle by 1/3 without changing the rest period.

d. At the next rest period, if P1 is still equal to or greater than 110 bpm, and if (P1 – P2) is still less than or equal to 10 bpm, shorten the following work cycle by 1/3 without changing the rest period.

e. At the third rest period, if P1 is still equal to or greater than 110 bpm and (P1 – P2) is still less than or equal to 10 bpm, the worker should not be allowed to continue work until repeated pulse measurements are in the acceptable range (i.e., P1 is less than 110 bpm and (P1 – P2) is greater than 10 bpm). Do not leave the worker alone during the recovery time. Watch for signs of heat illness and be prepared to implement emergency response as necessary.

E. Record monitoring results and worker's self-assessments on Attachment 018-2 AMER – Heat Stress Monitoring Record.

F. Investigate the use of auxiliary cooling devices in extreme heat conditions.

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- G. Conduct briefings for employees regarding health hazards and control measures associated with heat stress whenever conditions require the implementation of heat stress monitoring. Supervisors should receive training in heat related illness prevention prior to supervising employees in areas where heat stress could occur. The training should include emergency response information provided in Supplemental Information A.
- H. Provide cool water and electrolyte replacement drinks as described in Supplemental Information A.
- I. Allow employees who are not accustomed to working in hot environments appropriate time for acclimatization, as described in Supplemental Information A.
- J. Provide break areas as described in Supplemental Information A.

5. Documentation Summary

The following information will be maintained in the project file:

- A. Heat Stress Monitoring Records
- B. Employee Safety Briefing Verification Forms

6. Resources

- A. NIOSH – [Working in Hot Environments \(Publication No. 86-112\)](#), 1986
- B. NIOSH – Criteria for a Recommended Standard for Occupational Exposures to Hot Environments ([Publication No. 86-113](#)), 1986
- C. ACGIH – Documentation of the Threshold Limit Values and Biological Indices, 2007
- D. AFL-CIO Building Trades Division – [Heat Stress in Construction](#)
- E. Occupational Health Clinics for Ontario Worker, Inc. – [Humidex Based Heat Response Plan](#)
- F. [Attachment 018-1 AMER](#) – Humidex Worksheet
- G. [Attachment 018-2 AMER](#) – Heat Stress Monitoring Record

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7. Supplemental Information

- A. [Heat Stress Informational Supplement](#)

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

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

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

Heat Index Adjustment Table

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

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

Heat Index Response Plan*

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

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

HEAT RASH

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

First Aid for Heat Rash - To prevent heat rash, shower after work, dry off thoroughly, and put on clean, dry underwear and clothes. Try to stay in a cool place after work. If, in spite of this, you develop heat rash, see your physician.

HEAT CRAMPS

Heavy sweating with inadequate electrolyte replacement causes heat cramps. Signs and symptoms include:

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

First Aid for Heat Cramps - Leave the work area, and rest in a cool, shaded place.

Mild heat cramps can be treated by drinking beverages that contain salt or eating salty food. Severe heat cramps are treated with fluids and salts given intravenously.

Once the spasms disappear, you may return to work. Taking adequate breaks and drinking electrolyte replacement drink should prevent the cramps from returning.

HEAT EXHAUSTION

Heat exhaustion occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include:

- Pale, cool, moist skin.
- Heavy sweating.
- Dizziness.
- Nausea.
- Fainting.
- Headache.
- Blurred vision.
- Vomiting.

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

	<p style="text-align: center;">Safety Management Standard</p> <p style="text-align: center;">HEAT STRESS</p> <p style="text-align: center;">INFORMATIONAL SUPPLEMENT</p>	<p style="text-align: right;">SMS 018 AMER Supplemental Information A</p> <p style="text-align: right;">Issue Date: February 2009 Revision 2: August 2010</p>
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First Aid for Heat Exhaustion – Treatment involves replacing fluids (rehydration) and salts and removing the person from the hot environment. If symptoms are mild, sipping cool, slightly salty beverages every few minutes may be all that is needed. Removing or loosening clothing and applying wet cloths or ice packs to the skin also aid cooling.

HEAT STROKE

Heat stroke is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels, typically at or above 104°F (40°C). Immediate action must be taken to cool the body before serious injury and death occurs. Competent medical help must be obtained. Signs and symptoms are:

- Red, hot, usually dry skin.
- Lack of or reduced perspiration (lack of perspiration may be masked for those wearing chemical protective clothing since perspiration from earlier in the day will be present).
- Nausea.
- Vomiting.
- Dizziness and confusion.
- Strong, rapid pulse.
- Coma.

First Aid for Heat Stroke - THIS IS A MEDICAL EMERGENCY! SUMMON MEDICAL ASSISTANCE IMMEDIATELY!

While awaiting transportation to the hospital, a person should be wrapped in cold, wet bedding or clothing; immersed in a lake, stream, or cool bathtub; or cooled with ice. At the hospital, body cooling is usually accomplished by removing the clothes and covering the exposed skin with water or ice. To speed evaporation and body cooling, a fan may be used to blow air on the body. Body temperature is measured frequently, often constantly. To avoid overcooling, cooling is stopped when the body temperature is reduced to about 102°F (38°C).

HEAT STRESS PREVENTION

The best approach to avoiding heat-related illness is through preventative heat stress management.

Rest areas - A relatively cool, shaded area must be provided for breaks when ambient temperatures exceed 70°F (21°C) and workers are wearing chemical protective clothing (including uncoated Tyvek), or if temperatures exceed 80°F (26°C) and workers are wearing "Level D" coveralls or work clothes. For hazardous waste sites, the rest area should be located in the support zone adjacent to the contamination reduction zone, situated so that part of it is in the decon area so workers can take breaks without going through full decon. If shade is not available, shaded areas shall be constructed. This same type of canopy can be set up to shade personnel performing various types of work in hot weather. Cooling measures other than shade (e.g., misting, air conditioned break areas, air conditioned

	<p style="text-align: center;">Safety Management Standard</p> <p style="text-align: center;">HEAT STRESS</p> <p style="text-align: center;">INFORMATIONAL SUPPLEMENT</p>	<p style="text-align: right;">SMS 018 AMER Supplemental Information A</p> <p style="text-align: right;">Issue Date: February 2009 Revision 2: August 2010</p>
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vehicles, etc.) can be used in lieu of shade provided it can be demonstrated that they are at least as effective in cooling employees. Employees should have access to these rest areas at break times and at any other time when suffering from heat illness or believing a preventive recovery period is needed.

Liquids - Encourage employees to drink plenty of cool plain water and electrolyte replacement drinks. Supplementing water with cool electrolyte replacement drinks, such as Gatorade, Squench or Quik-kick (drink), is helpful to employees who tend to sweat a lot. Do not use "community cups"; use paper cups. Employees should have access to potable drinking water equivalent to one quart of water per employee per hour during the shift. Less water can be available at the start of the shift provided it is effectively replaced when required.

Have workers drink 16 ounces (0.5 liters) of drink before beginning work, such as in the morning and after lunch. At each break, workers should drink 8 to 16 ounces (0.25 to 0.5 liters). Employees should not wait until they are thirsty to drink.

Discourage the use of alcohol during non-working hours, and discourage the intake of coffee during work hours, as these make heat stress control more difficult.

Acclimatization - This is the process by which your body "gets used to" hot work environments. This is achieved by slowly increasing workloads. Start at 50 percent capacity on day one, and increase by 10 percent per day; on day six, you'll be at 100 percent. You don't lose acclimatization over a weekend, but it'll start to decrease after three to four days. If you don't do hot work for a week, the acclimatization is gone. You don't have to do full shift hot work to achieve or retain acclimatization; a minimum of 100 minutes of continuous hot work exposure per day is adequate.

Auxiliary Cooling - Auxiliary cooling is usually obtained by providing workers with a specially-designed vest, which is worn under the protective clothing, but over any underclothing. These vests typically provide cooling via one of two methods: the use of ice or other frozen media, or the use of a vortex cooler. Each method has its advantages and disadvantages.

The frozen media vest requires a means for freezing the media, and the media (usually water or "blue ice") will melt, requiring replacement.

The vortex cooler tends to cool more uniformly. Instead of frozen media, this vest uses the expansion of compressed air to cool the wearer. The drawback is the compressed air requirement, but this is negated when the wearer is already using an airline respirator supplied by a compressor. A vortex cooler should not be supplied from air cylinders, as this will draw down the cylinders rapidly.

Auxiliary cooling should be considered when the following conditions exist:

- Ambient temperature over 80°F (26°C).
- Workers are wearing impermeable garments (i.e., Tyvek, Saranex, Chemrel, etc.).
- It is desirable to have long work shifts with minimum interruption.

URS SAFETY MANAGEMENT STANDARD

Heavy Equipment Operations

1. Applicability

This standard applies to the operations of URS Corporation and its subsidiary companies where heavy equipment is in operation by URS employees or subcontractors.

2. Purpose and Scope

The purpose of this standard is to require that heavy equipment is operated in a safe manner; that the equipment is properly maintained; and that ground personnel are protected. Heavy equipment includes construction and mining equipment such as backhoes, excavators, skid steers, graders, loaders, dozers, tractors, cranes, drills, and draglines.

In addition to this standard, refer to SMS 023 – Lockout and Tagout Safety, SMS 038 – Cranes and Derricks; and SMS 056 – Drilling Safety.

Military related vehicles and equipment (e.g., tanks) are not covered under this standard.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility, site, or project location.

4. Requirements

A. Authorized Operators

1. Evaluate operators through documented experience (resume), and as appropriate, a practical evaluation of skills. Supplemental Information A through G, or a similar method, may be used for evaluating operators.
2. Allow only qualified operators to operate equipment. Trainees may operate equipment under the direct supervision of a trainer.
3. Prohibit equipment from being operated by any personnel who have not been specifically authorized to operate it.
4. Maintain a list of operators for the project, and the specific equipment that they are authorized to operate.

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5. Operators must wear seatbelts at all times in all equipment and trucks.
6. Except where allowed by the manufacturer, prohibit personnel other than the operator from riding in or on the equipment unless additional seating (with seatbelts) is provided by the manufacturer. In some cases, a trainer may ride in a cab not equipped with additional seating when training activities are being conducted.
7. Operators and service personnel must maintain three points of contact whenever mounting and dismounting a piece of equipment.
8. Brief operators on the following rules of operation:
 - a. Operators are in control of their work area.
 - b. Equipment must be operated in a safe manner and within the constraints of the manufacturer's Operation Manual.
 - c. Operators must stop work whenever unauthorized ground personnel or equipment enter their work area, and only resume work when the area has been cleared.
 - d. Operators must not use mobile phones while operating heavy equipment.

B. Ground Personnel

1. Require that URS ground personnel or ground personnel interacting with URS heavy equipment operations have received training, and comply with the following rules of engagement:
 - a. Wear high-visibility protective vests when in work areas with any operating equipment.
 - b. Stay outside of the swing zone or work area of any operating equipment.
 - c. No standing or working in the equipment operator's blind spots.
 - d. Ground personnel may only enter the swing or work area of any operating equipment when:

URS SAFETY MANAGEMENT STANDARD

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1. They have attracted the operator's attention and made eye contact.
 2. The operator has idled the equipment down, placed it in neutral, grounded engaging tools, and set brakes.
 3. The operator gives the ground personnel permission to approach.
- e. Ground personnel must never walk, or position themselves between, any fixed object (e.g., working face, highwall) and operating equipment, or between two operating pieces of equipment.

C. Equipment

1. Maintain operation manuals at the site for each piece of equipment that is present on the site and in use.
2. Require that operators have read or been trained on the manual for the equipment, and operate the equipment within the parameters of the manual and this standard.
3. Require that all equipment is provided with roll-over protection systems (ROPS). Tracked excavators, road trucks, and drills are exempt from ROPS requirements, but must have a cab that provides protection from overhead hazards.
4. Verify that seatbelts are present and functional in all equipment and that they have not reached the expiration date (if date tag is missing, the seatbelt must be replaced). Note: Seatbelts shall be replaced in accordance with the manufacturer's recommendation. If there is no manufacturer's recommendation, then seatbelts shall be replaced 3 years from date of installation or 5 years from the date of manufacture.
5. Prohibit the use of equipment that has or had cab glass (per the manufacturer's specifications) that is cracked/broken (obstructing the operator's view) or missing.
6. Require that backup alarms are properly functioning on all trucks and equipment. Tracked excavators must have bi-directional alarms, or the operator must be provided with a spotter whenever tracking in either direction.

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7. Require all attachments such as buckets, blades, forks, etc., to be grounded when not in use.
8. Require brakes to be set and wheels chocked or equivalent (when applicable) when not in use.
9. Require fire extinguishers to be placed on all vehicles or equipment as required, and inspected by the operator prior to each shift. Service records will be documented and maintained in the project office. Monthly inspections must be documented on the extinguishing equipment.
10. Require that all haulage vehicles, whose payload is loaded by means of cranes, power shovels, loaders, or similar equipment, has a cable shield and/or canopy adequate to protect the operator from shifting or falling material. If protection is not available for the operator, the operator must leave the vehicle and wait in a designated safe location until it is loaded.
11. Require that a locking device be provided that will prevent the accidental separation of towed and towing vehicles on every fifth-wheel mechanism and two-bar arrangement.
12. Require that trip handles for tailgates of dump trucks and heavy equipment be arranged so that when dumping, the operator will be in the clear.
13. Require that motors and engines are shut off during fueling or maintenance operations. Ensure proper grounding/bonding between equipment and fuel vehicle prior to fueling operations. During fueling operations, ensure the fuel nozzle remains in contact with the tank and no smoking or open flame is present in the immediate area.
14. Require that each project location maintain construction equipment records onsite (including rental units) with inspections, maintenance, service and repair history. Records shall be made available for review upon request. Note: Documents may be electronically stored in the project files.

D. Subcontractor Equipment

1. Require that no unsafe vehicles or equipment be allowed in construction areas. Where compliance is refused, the project manager or his or her designate should be notified immediately.

URS SAFETY MANAGEMENT STANDARD

Heavy Equipment Operations

2. Require that subcontractor employees follow established safety procedures in operation, inspection, and maintenance of vehicles and equipment.
3. Require that URS supervisors visually observe the subcontractors' vehicles and equipment, and report any unsafe conditions or practices to the project manager. Equipment not in compliance with applicable safety standards is prohibited.

E. Safe Operation

1. All vehicles transporting material or equipment on public roads must comply with local laws pertaining to weight, height, length, and width. Obtain any permits required for these loads. [Energy & Construction may also refer to Project Execution Procedure 214 – Compliance with Department of Transportation Requirements for Equipment, Vehicles & Drivers.]
2. Prohibit operating Company-owned, leased, or rented vehicles or equipment while under the influence of alcohol or illegal drugs.
3. Seatbelts must be worn by all operators, drivers, and passengers within company-owned or leased vehicles and equipment.
4. Do not drive equipment into an unsafe area. This includes areas of construction where unnecessary tire, steering, or body damage could result, or where soil conditions are not adequate to support the equipment.
5. Do not smoke on, in, or within 50 feet (15 meters) of vehicles hauling fuel oils, gasoline, or explosives.
6. Do not ride with arms or legs outside of the truck body, in a standing position on the body, on running boards, or seated on side fenders, cabs, cab shields, rear of truck bed, or on the load.
7. Do not drive any vehicle at a speed greater than is reasonable and safe for weather conditions, traffic, intersections, width, and character of the roadway, type of motor vehicles, and any other existing condition.
8. Oilers, apprentices, and other operators will not be allowed to operate equipment unless authorized by the project manager or general superintendent.

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Heavy Equipment Operations

9. Do not operate any equipment beyond its safe load or operational limits.
10. Keep all employees clear of loads about to be lifted, or suspended loads.
11. Outfit equipment operated in hazardous atmosphere environments with the proper safety equipment (e.g., spark arrestors).
12. Utilize equipment with enclosed cabs where feasible or accessible. Where use of equipment with enclosed cabs is not feasible or said equipment is not accessible, require that operators use eye protection in accordance with potential airborne hazards present.

F. Inspection and Maintenance

1. Require operators to inspect equipment daily (or before each shift), using Attachment 019-1 AMER or equivalent (Energy & Construction's EQ 505 form).
2. Prohibit use of equipment deemed to be unsafe, as determined by daily inspection, until required repairs or maintenance has been completed.
3. Conduct maintenance as prescribed by the manufacturer in the Operation Manuals for each piece of equipment or division/site-specific preventative maintenance procedures.
4. During maintenance and repair, require that:
 - a. SMS 023 – Lockout and Tagout Safety procedures are followed.
 - b. Motors are turned off, unless required for performing maintenance or repair.
 - c. All ground-engaging tools are grounded or securely blocked.
 - d. Controls are set in a neutral position.
 - e. Brakes are set.
 - f. Electrically driven equipment is installed with provision for tagging and locking out the controls while under repair.

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- g. Manufacturer's requirements for maintenance and repair are followed.
- 5. Provide and use a safety tire rack, cage, or equivalent protection when inflating, mounting, or dismounting tires installed on split rims, or rims equipped with locking rings or similar devices.
- 6. Maintenance records for any service, repair or modification which affects the safe performance of the equipment must be maintained onsite and available to operator, and maintenance personnel, and regulatory agencies upon request.

5. Documentation Summary

The following information will be maintained in the project file:

- A. Operator qualifications.
- B. Daily Equipment Inspections.
- C. Site briefing documentation for operator rules and ground personnel "rules of engagement".

6. Resources

- A. U.S. Occupational Safety and Health Administration (OSHA) Standard – [Motorized Vehicles and Mechanized Equipment](#) – 29 Code of Federal Regulations (CFR) 1926, Subpart O
- B. U.S. Mine Safety and Health Administration – [30 CFR 48](#) – Training and Retraining Miners
- C. U.S. Mine Safety and Health Administration – [30 CFR 56](#) Subpart H – Loading, Hauling, and Dumping
- D. U.S. Mine Safety and Health Administration – [30 CFR 56](#) Subpart M – Machinery and Equipment
- E. U.S. Mine Safety and Health Administration – [30 CFR 77](#) Subpart E – Safeguards for Mechanical Equipment
- F. U.S. Mine Safety and Health Administration – [30 CFR 77](#) Subpart K – Ground Control

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- G. U.S. Mine Safety and Health Administration – [30 CFR 77](#) Subpart Q – Loading and Haulage
- H. [National Association of Demolition Contractors](#) – Safety Manual
- I. [SMS 023](#) – Lockout and Tagout Safety
- J. [SMS 038](#) – Cranes and Derricks
- K. [SMS 056](#) – Drilling Safety
- L. [Attachment 019-1 AMER](#) – Equipment Inspection Form

Note: The above regulatory resources are for U.S. operations only.

7. Supplemental Information

- A. [Rubber Tire Backhoe Operator Skill Evaluation](#)
- B. [Scraper Operator Skill Evaluation](#)
- C. [Bulldozer Operator Skill Evaluation](#)
- D. [Dump Truck Operator Skill Evaluation](#)
- E. [Roller/Compactor Skill Evaluation](#)
- F. [Front-End Loader Operator Skill Evaluation](#)
- G. [Grader Operator Skill Evaluation](#)
- H. [Excavator Operator Skill Evaluation](#)
- I. [Water Truck Operator Skill Evaluation](#)



Safety Management Standard
DAILY HEAVY EQUIPMENT
SAFETY INSPECTION CHECKLIST

Attachment 019-1 AMER

Issue Date: June 1999
Revision 8: September 2013

Equipment ID No: _____ Inspector's Name: _____

Equipment Name: _____ Employee No.: _____

Beg. Hours: _____ End Hours: _____ Date: _____

INSTRUCTIONS: Each shift must inspect all applicable items indicated. If an unsatisfactory condition is observed, suspend operation of the equipment and report the unsatisfactory condition to the site supervisor immediately.

ITEM INSPECTED	CHECK IF SATISFACTORY	COMMENTS	CORRECTED BY	DATE
Equipment Operating Manuals Available	<input type="checkbox"/>			
Falling Object Protective Structure (FOP)	<input type="checkbox"/>			
Roll-Over Protection Structure (ROP)	<input type="checkbox"/>			
Seat Belts	<input type="checkbox"/>			
Operator Seat Bar(s)	<input type="checkbox"/>			
Side Shields, Screens, or Cab	<input type="checkbox"/>			
Lift-Arm Device	<input type="checkbox"/>			
Grab Handles	<input type="checkbox"/>			
Back-up Alarm – Working	<input type="checkbox"/>			
Lights	<input type="checkbox"/>			
Guards	<input type="checkbox"/>			
Horn	<input type="checkbox"/>			
Windshield Wipers	<input type="checkbox"/>			
Glass, Mirrors	<input type="checkbox"/>			
Anti-Skid Tread Clear of Mud	<input type="checkbox"/>			
Safety Signs (i.e., counterbalance swing area)	<input type="checkbox"/>			
Fire Extinguisher	<input type="checkbox"/>			
General Condition	<input type="checkbox"/>			
Fuel Connection	<input type="checkbox"/>			
Oil (fuel and no leaks)	<input type="checkbox"/>			
Clear of Extra Materials	<input type="checkbox"/>			
Controls Function Properly	<input type="checkbox"/>			
Hydraulic System (full and no leaks)	<input type="checkbox"/>			
Parking Brake	<input type="checkbox"/>			
Lift Arm and Bucket	<input type="checkbox"/>			
Tires/Tracks	<input type="checkbox"/>			
Steering	<input type="checkbox"/>			
Breathing Air System	<input type="checkbox"/>			
Blast Shields	<input type="checkbox"/>			
Flammable Atmosphere Protective Equipment	<input type="checkbox"/>			
Quantity of Fuel Added	<input type="checkbox"/>			
Quantity of Oil Added	<input type="checkbox"/>			

Operator Signature _____



Safety Management Standard

RUBBER TIRE BACKHOE OPERATOR
SKILL EVALUATION

SMS 019 AMER
Supplemental Information A

Issue Date: February 2009
Revision 3: September 2013

Date _____ Employee Name _____ Evaluator _____

Description:

This equipment is used for primarily for excavation, although it may occasionally be used for other miscellaneous tasks for which crane or stick type equipment is required.

STEPS	KEYPOINTS	SATISFACTORY
1)	Demonstrated abilities a) Pre-shift inspection check list (SMS Attachment 019-1, EQ 505 or equivalent) i) Check equipment for loose bolts, leaks; oil, hydraulic and water ii) Make sure area around the equipment is clear of people and other equipment iii) Check for fire extinguisher iv) Make sure that the following equipment is operational a) Brakes b) Lights c) Back-up alarms d) Hand rails & ladders e) Seat belts f) Tires if applicable g) Glass, wipers h) Gauges, including temperature, oil, and fuel i) Wheel chocks v) Notify supervision of any equipment that is not operational vi) The operator can park a piece of equipment that is unsafe to operate if it poses a danger or hazard to employees or property b) Maintain three points of contact while entering and exiting the equipment	<input type="checkbox"/> Yes <input type="checkbox"/> No
2)	Identification of equipment controls	<input type="checkbox"/> Yes <input type="checkbox"/> No
3)	Excavating techniques a) Benching, sloping b) Spoil removal from side wall c) Back filling operations d) Aware of surroundings and personnel near the swing radius of boom	<input type="checkbox"/> Yes <input type="checkbox"/> No
4)	Can arrange controls and boom for travel	<input type="checkbox"/> Yes <input type="checkbox"/> No
5)	Speed in relation to terrain (controlled speed)	<input type="checkbox"/> Yes <input type="checkbox"/> No
6)	Stock piling with front end bucket	<input type="checkbox"/> Yes <input type="checkbox"/> No
7)	Loading truck bed with bucket	<input type="checkbox"/> Yes <input type="checkbox"/> No
8)	Parking and shut down procedures a) Equipment line-up i) Straight line ii) Allow easy access for maintenance and servicing b) Turn off all accessories c) Set all park brakes d) Lower bucket to ground e) Place and position wheel chocks f) Perform a general walk around looking for items for maintenance	<input type="checkbox"/> Yes <input type="checkbox"/> No



Safety Management Standard
SCRAPER OPERATOR SKILL EVALUATION

SMS 019 AMER
Supplemental Information B
Issue Date: February 2009
Revision 3: September 2013

Date _____ Employee Name _____ Evaluator _____

Description:

Drives a tractor to pull a steel bowl-like or box-like scoop (scraper), mounted on wheels, which scrapes up earth and transports it to a designated place; manipulates a series of levers to lower cutting edge of the scraper into the ground, to raise cutting edge when scraper is full, and to empty scraper.

STEPS	KEYPOINTS	SATISFACTORY
1.	Demonstrated abilities a) Pre-shift inspection check list (SMS Attachment 019-1, EQ 505 or equivalent) i) Check equipment for loose bolts and leaks; check oil, air, hydraulic fluids and water ii) Make sure area around the equipment is clear of people and other equipment iii) Check for fire extinguisher iv) Make sure that the following equipment is operational a) Brakes b) Lights c) Back-up alarms d) Hand rails & ladders e) Seat belts f) Tires g) Glass, wipers h) Gauges, including temperature, oil, air and fuel i) Wheel chocks v) Notify supervision of any equipment that is not operational vi) The operator can park a piece of equipment that is unsafe to operate if it poses a danger or hazard to employees or property b) Maintain three points of contact while entering and exiting the equipment	<input type="checkbox"/> Yes <input type="checkbox"/> No
2.	Identification of equipment controls	<input type="checkbox"/> Yes <input type="checkbox"/> No
3.	Loading techniques a) Use of apron b) Use of cutting edge c) Push loading d) Push/pull loading e) Use of ejector	<input type="checkbox"/> Yes <input type="checkbox"/> No
4.	Shifting and hauling	<input type="checkbox"/> Yes <input type="checkbox"/> No
5.	Rough cut and fill	<input type="checkbox"/> Yes <input type="checkbox"/> No
6.	Spreading material	<input type="checkbox"/> Yes <input type="checkbox"/> No
7.	Fine grading	<input type="checkbox"/> Yes <input type="checkbox"/> No
8.	Obtaining compaction	<input type="checkbox"/> Yes <input type="checkbox"/> No
9.	Parking and shut down procedures a) Equipment line-up i) Straight line ii) Allow easy access for maintenance and servicing b) Turn off all accessories c) Lower apron d) Lower bowl to the ground e) Place and position wheel chocks f) Perform a general walk around looking for maintenance items	<input type="checkbox"/> Yes <input type="checkbox"/> No



Safety Management Standard
BULL DOZER OPERATOR
SKILL EVALUATION

SMS 019 AMER
Supplemental Information C

Issue Date: February 2009
Revision 3: September 2013

Date _____ Employee Name _____ Evaluator _____

Description:

Operates a large tractor with a concave steel blade or push block mounted in front of the chassis to level, distribute and push earth. This equipment may be used to push earth carrying equipment. At times a ripper attachment is used for ripping the earth prior to loading the scraper. Operator regulates height of blade or push block from ground and may help in necessary adjustments to equipment as needed.

STEPS	KEYPOINTS	SATISFACTORY
1)	Demonstrated abilities a) Pre-shift inspection check list (SMS Attachment 019-1, EQ 505 or equivalent) i) Check equipment for loose bolts and leaks; check oil, air, hydraulic fluid and water ii) Make sure area around the equipment is clear of people and other equipment iii) Check for fire extinguisher iv) Make sure that the following equipment is operational a) Brakes b) Lights c) Back-up alarms d) Hand rails & ladders e) Seat belts f) Tracks g) Glass, wipers h) Gauges, including temperature, oil, air and fuel i) Audible horn v) Notify supervision of any equipment that is not operational vi) The operator can park a piece of equipment that is unsafe to operate if it poses a danger or hazard to employees or property b) Maintain three points of contact while entering and exiting the equipment	<input type="checkbox"/> Yes <input type="checkbox"/> No
2)	Identification of equipment controls	<input type="checkbox"/> Yes <input type="checkbox"/> No
3)	Pushing techniques a) Use of push blade b) Loading of push load equipment	<input type="checkbox"/> Yes <input type="checkbox"/> No
4)	Use of ripper shanks	<input type="checkbox"/> Yes <input type="checkbox"/> No
5)	Rough cut and fill	<input type="checkbox"/> Yes <input type="checkbox"/> No
6)	Spreading material	<input type="checkbox"/> Yes <input type="checkbox"/> No
7)	Fine grading	<input type="checkbox"/> Yes <input type="checkbox"/> No
8)	Obtaining compaction by tracking in material	<input type="checkbox"/> Yes <input type="checkbox"/> No
9)	Parking and shut down procedures a) Equipment line-up i) Straight line ii) Allow easy access for maintenance and servicing b) Turn off all accessories c) Lower rippers d) Lower blade to the ground e) Perform a general walk around looking for maintenance items	<input type="checkbox"/> Yes <input type="checkbox"/> No



Safety Management Standard
DUMP TRUCK OPERATOR
SKILL EVALUATION

SMS 019 AMER
Supplemental Information D

Issue Date: February 2009
Revision 3: September 2013

Date _____ Employee Name _____ Evaluator _____

Description:

Drives a heavy-duty gasoline or diesel-powered truck used in hauling material to fill areas or dump sites. The truck is either a tandem rear axle type, or is a tractor truck, single or tandem axle, pulling a trailer, articulated or fixed axle haul truck. May service and make necessary adjustments for proper operation of equipment.

STEPS	KEYPOINTS	SATISFACTORY
1)	Demonstrated abilities a) Pre-shift inspection check list (SMS Attachment 019-1, EQ 505 or equivalent) i) Check equipment for loose bolts and leaks; check oil, air, hydraulic fluid and water ii) Make sure area around the equipment is clear of people and other equipment iii) Check for fire extinguisher iv) Make sure that the following equipment is operational (1) Brakes (2) Lights (3) Back-up alarms (4) Hand rails & ladders (5) Seat belts (6) Tires (7) Glass, wipers (8) Gauges, including temperature, oil, air and fuel (9) Wheel chocks v) Notify supervision of any equipment that is not operational vi) The operator can park or side line a piece of equipment that is unsafe to operate if it poses a danger or hazard to employees or property b) Maintain three points of contact while entering and exiting the equipment	<input type="checkbox"/> Yes <input type="checkbox"/> No
2)	Identification of equipment controls	<input type="checkbox"/> Yes <input type="checkbox"/> No
3)	Truck Weighing a) Tare weights b) Gross Weights	<input type="checkbox"/> Yes <input type="checkbox"/> No
4)	Loading Techniques a) Parking into load patterns b) Bed preparation for material c) Remains in cab in loading area and while being loaded	<input type="checkbox"/> Yes <input type="checkbox"/> No
5)	Shifting and Hauling	<input type="checkbox"/> Yes <input type="checkbox"/> No
6)	Stockpiling	<input type="checkbox"/> Yes <input type="checkbox"/> No
7)	Backing with the use of mirrors	<input type="checkbox"/> Yes <input type="checkbox"/> No
8)	Dumping/Spreading Material a) Fill material b) Base course material c) Surface materials d) Asphalt e) Lowers truck bed (dump trucks) or dump chutes (belly dumps) f) Follows spotters directions (when applicable)	<input type="checkbox"/> Yes <input type="checkbox"/> No
9)	Parking and shut down procedures a) Equipment line-up i) Straight line ii) Allow easy access for maintenance and servicing b) Turn off all accessories c) Use park brake d) Place and position wheel chocks e) Perform a general walk around looking for maintenance items	<input type="checkbox"/> Yes <input type="checkbox"/> No



Safety Management Standard
ROLLER / COMPACTOR OPERATOR
SKILL EVALUATION

SMS 019 AMER
Supplemental Information E
Issue Date: February 2009
Revision 3: September 2013

Date _____ Employee Name _____ Evaluator _____

Description:

Operates a self-propelled gasoline or diesel machine, which has pneumatic tires, steel wheels/drums used to compact earth fills, flexible bases and all types of materials. Rollers are also used for compaction to achieve a desired or specified density. Rides on the machine platform and moves lever and pedals or throttles to control and guide machine.

STEPS	KEYPOINTS	SATISFACTORY
1)	Demonstrated abilities a) Pre-shift inspection check list (SMS Attachment 019-1, EQ 505 or equivalent) i) Check equipment for loose bolts and leaks; check oil, air, hydraulic fluid and water ii) Make sure area around the equipment is clear of people and other equipment iii) Check for fire extinguisher iv) Make sure that the following equipment is operational a) Brakes b) Lights c) Back-up alarms d) Hand rails & ladders e) Seat belts f) Tires, if applicable g) Glass, wipers h) Gauges, including temperature, oil, air and fuel i) Wheel chocks v) Notify supervision of any equipment that is not operational vi) The operator can park a piece of equipment that is unsafe to operate if it poses a danger or hazard to employees or property b) Maintain three points of contact while entering and exiting the equipment	<input type="checkbox"/> Yes <input type="checkbox"/> No
2)	Identification of equipment controls	<input type="checkbox"/> Yes <input type="checkbox"/> No
3)	Rolling techniques to obtain compaction a) Use of controls b) Vibratory controls c) Turns and maneuvers d) Aware of surroundings	<input type="checkbox"/> Yes <input type="checkbox"/> No
4)	Rolling patterns a) Staggered patterns with other rollers	<input type="checkbox"/> Yes <input type="checkbox"/> No
5)	Parking and shut down procedures a) Equipment line-up i) Straight line ii) Allow easy access for maintenance and servicing b) Turn off all accessories c) Place and position wheel chocks d) Perform a general walk around looking for maintenance items	<input type="checkbox"/> Yes <input type="checkbox"/> No



Safety Management Standard
FRONT END LOADER
OPERATOR SKILL EVALUATION

SMS 019 AMER
Supplemental Information F

Issue Date: February 2009
Revision 3: September 2013

Date _____ Employee Name _____ Evaluator _____

Description:

Operates a rubber tire or crawler type tractor with an attached bucket on front end. Moves a lever to raise and lower and dump contents of bucket. Machine is used to load materials from stockpiles, excavation, loading trucks.

STEPS	KEYPOINTS	SATISFACTORY
1)	Demonstrated abilities a) Pre-shift inspection check list (SMS Attachment 019-1, EQ 505 or equivalent) i) Check equipment for loose bolts and leaks; check oil, air, hydraulic fluid and water ii) Make sure area around the equipment is clear of people and other equipment iii) Check for fire extinguisher iv) Make sure that the following equipment is operational a) Brakes b) Lights c) Back-up alarms d) Hand rails & ladders e) Seat belts f) Tires g) Glass, wipers h) Gauges, including temperature, oil, air and fuel i) Wheel chocks v) Notify supervision of any equipment that is not operational vi) The operator can park a piece of equipment that is unsafe to operate if it poses a danger or hazard to employees or property b) Maintain three points of contact while entering and exiting the equipment	<input type="checkbox"/> Yes <input type="checkbox"/> No
2)	Identification of equipment controls	<input type="checkbox"/> Yes <input type="checkbox"/> No
3)	Loading techniques a) Use of bucket and controls b) Crowding the pile c) Pump loading, etc. d) Loading patterns e) Loading trucks f) Loading scrapers	<input type="checkbox"/> Yes <input type="checkbox"/> No
4)	Control handling of soils	<input type="checkbox"/> Yes <input type="checkbox"/> No
5)	Shifting and hauling	<input type="checkbox"/> Yes <input type="checkbox"/> No
6)	Stockpiling	<input type="checkbox"/> Yes <input type="checkbox"/> No
7)	Mixing and moisture conditioning	<input type="checkbox"/> Yes <input type="checkbox"/> No
8)	Feeding crusher	<input type="checkbox"/> Yes <input type="checkbox"/> No
9)	Rough cut and fill	<input type="checkbox"/> Yes <input type="checkbox"/> No
10)	Spreading material	<input type="checkbox"/> Yes <input type="checkbox"/> No
11)	Parking and shut down procedures a) Equipment line-up i) Straight line ii) Allow easy access for maintenance and servicing b) Turn off all accessories c) Lower bucket to the ground d) Place and position wheel chocks e) Perform a general walk around looking for maintenance items	<input type="checkbox"/> Yes <input type="checkbox"/> No

**Safety Management Standard****GRADER OPERATOR
SKILL EVALUATION**SMS 019 AMER
Supplemental Information GIssue Date: February 2009
Revision 3: September 2013

Date _____ Employee Name _____ Evaluator _____

Description:

Rides in cab of grader and moves levers and steering wheel to guide machine and regulate the scraper blade or ripper. Blade is mounted on a carrying and turning circle at the front of the machine. Equipment is used to level or mix soils and aggregates to grade and to lay asphalt and flexible base materials and clean haul roads.

STEPS	KEYPOINTS	SATISFACTORY
1)	Demonstrated abilities a) Pre-shift inspection check list (SMS Attachment 019-1, EQ 505 or equivalent) i) Check equipment for loose bolts and leaks; check oil, air, hydraulic fluid and water ii) Make sure area around the equipment is clear of people and other equipment iii) Check for fire extinguisher iv) Make sure that the following equipment is operational a) Brakes b) Lights c) Back-up alarms d) Hand rails & ladders e) Seat belts f) Tires g) Glass, wipers h) Gauges, including temperature, oil, air and fuel v) Notify supervision of any equipment that is not operational vi) Wheel chocks vii) The operator can park a piece of equipment that is unsafe to operate if it poses a danger or hazard to employees or property b) Maintain three points of contact while entering and exiting the equipment	<input type="checkbox"/> Yes <input type="checkbox"/> No
2)	Identification of equipment controls	<input type="checkbox"/> Yes <input type="checkbox"/> No
3)	Leveling and scraping techniques a) Use of levers b) Use of cutting edge c) Controlling front wheel tilt d) Controlling crab motion e) Use of ripper	<input type="checkbox"/> Yes <input type="checkbox"/> No
4)	Shifting and traveling with loaded moe board	<input type="checkbox"/> Yes <input type="checkbox"/> No
5)	Rough cut and fill	<input type="checkbox"/> Yes <input type="checkbox"/> No
6)	Spreading material	<input type="checkbox"/> Yes <input type="checkbox"/> No
7)	Fine grading	<input type="checkbox"/> Yes <input type="checkbox"/> No
8)	Parking and shut down procedures a) Equipment line-up i) Straight line ii) Allow easy access for maintenance and servicing b) Turn off all accessories c) Lower moe board to the ground d) Place and position wheel chocks e) Perform a general walk around looking for maintenance items	<input type="checkbox"/> Yes <input type="checkbox"/> No



Safety Management Standard
EXCAVATOR OPERATOR
SKILL EVALUATION

SMS 019 AMER
Supplemental Information H
Issue Date: September 2011
Revision 1: September 2013

Date _____ Employee Name _____ Evaluator _____

Description:

Operates a rubber tire or crawler type tractor with an attached bucket on front end. Moves a lever to raise and lower and dump contents of bucket. Machine is used to load materials from stockpiles, excavation, loading trucks.

STEPS	KEYPOINTS	SATISFACTORY
1)	Demonstrated abilities a) Pre-shift inspection check list (SMS Attachment 019-1, EQ 505 or equivalent) i) Check equipment for loose bolts and leaks; check oil, air, hydraulic fluid and water ii) Make sure area around the equipment is clear of people and other equipment iii) Check for fire extinguisher iv) Make sure that the following equipment is operational a) Brakes b) Lights c) Back-up alarms d) Hand rails & ladders e) Seat belts f) Tires g) Glass, wipers h) Gauges, including temperature, oil, air and fuel i) Wheel chocks (for rubber tire type excavators) v) Notify supervision of any equipment that is not operational vi) The operator can park a piece of equipment that is unsafe to operate if it poses a danger or hazard to employees or property b) Maintain three points of contact while entering and exiting the equipment	<input type="checkbox"/> Yes <input type="checkbox"/> No
2)	Identification of equipment controls	<input type="checkbox"/> Yes <input type="checkbox"/> No
3)	Loading techniques a) Use of bucket and controls b) Crowding the pile c) Pump loading, etc. d) Loading patterns e) Loading trucks f) Loading scrapers	<input type="checkbox"/> Yes <input type="checkbox"/> No
4)	Control handling of soils	<input type="checkbox"/> Yes <input type="checkbox"/> No
5)	Shifting and hauling	<input type="checkbox"/> Yes <input type="checkbox"/> No
6)	Stockpiling	<input type="checkbox"/> Yes <input type="checkbox"/> No
7)	Mixing and moisture conditioning	<input type="checkbox"/> Yes <input type="checkbox"/> No
8)	Feeding crusher	<input type="checkbox"/> Yes <input type="checkbox"/> No
9)	Rough cut and fill	<input type="checkbox"/> Yes <input type="checkbox"/> No
10)	Spreading material	<input type="checkbox"/> Yes <input type="checkbox"/> No
11)	Parking and shut down procedures a) Equipment line-up i) Straight line ii) Allow easy access for maintenance and servicing b) Turn off all accessories c) Lower bucket to the ground d) Place and position wheel chocks (rubber tire type excavator) e) Perform a general walk around looking for maintenance items	<input type="checkbox"/> Yes <input type="checkbox"/> No



Safety Management Standard
WATER TRUCK OPERATOR
SKILL EVALUATION

SMS 019 AMER
Supplemental Information I
Issue Date: September 2011
Revision 1: September 2013

Date _____ Employee Name _____ Evaluator _____

Description:

Drives articulated, pull type, single and two axle type water trucks. Waters roads, fills, and cut areas to suppress dust.

STEPS	KEYPOINTS	SATISFACTORY
1)	Demonstrated abilities a) Pre-shift inspection check list (SMS Attachment 019-1, EQ 505 or equivalent or DOT daily inspection if applicable) i) Check equipment for loose bolts and leaks; check oil, air, hydraulic fluid and water ii) Make sure area around the equipment is clear of people and other equipment iii) Check for fire extinguisher iv) Make sure that the following equipment is operational a) Brakes b) Lights c) Back-up alarms d) Hand rails & ladders e) Seat belts f) Tires g) Glass, wipers h) Gauges, including temperature, oil, air and fuel i) Wheel chocks v) Notify supervision of any equipment that is not operational vi) The operator can park a piece of equipment that is unsafe to operate if it poses a danger or hazard to employees or property b) Maintain three points of contact while entering and exiting the equipment	<input type="checkbox"/> Yes <input type="checkbox"/> No
2)	Identification of equipment controls	<input type="checkbox"/> Yes <input type="checkbox"/> No
3)	Loading Techniques a) Minimizes spillage b) Uses chocks or turns into berm	<input type="checkbox"/> Yes <input type="checkbox"/> No
4)	Shifting and Hauling	<input type="checkbox"/> Yes <input type="checkbox"/> No
5)	Properly applies water to ramps/corners	<input type="checkbox"/> Yes <input type="checkbox"/> No
6)	Backing with the use of mirrors	<input type="checkbox"/> Yes <input type="checkbox"/> No
11)	Parking and shut down procedures a) Equipment line-up i) Straight line ii) Allow easy access for maintenance and servicing b) Turn off all accessories c) Use park break d) Place and position wheel chocks e) Perform a general walk around looking for maintenance items	<input type="checkbox"/> Yes <input type="checkbox"/> No

URS SAFETY MANAGEMENT STANDARD

Hot Work

1. Applicability

This standard applies to the operations of URS Corporation and its subsidiary companies involving welding, torch cutting, grinding, and other spark- or heat-producing operations.

2. Purpose and Scope

The purpose of this standard is to establish safe hot work practices to reduce or eliminate personal injury and potential fire and explosion hazards.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility, site, or project location.

4. Requirements

A. General

1. Inspect the immediate work area, areas adjacent to the immediate work, areas beneath the work area, and the area immediately above the work area for flammable solvents, vapors, and gases. Do not perform the task if hot work cannot be performed safely.
2. Verify that planned hot work operations conform to client hot work procedures and permit requirements.
3. Issue Hot Work Permits (Attachment 020-1 NA) for any work that will generate sufficient heat or sparks and has the potential to ignite combustible and/or flammable materials. Complete the Hot Work Permit just prior to hot work activities commencing. Permits are not required for well-defined areas (e.g., maintenance shops, equipment lay-down areas).
4. Perform housekeeping in hot work areas to remove all flammable or combustible materials. Move all flammable and combustible materials at least 35 feet (10.7 meters) from the work area.
5. Cover all wood planking, scaffolds, wooden forms, and other combustible material that cannot be removed, with fire blankets or other suitable material. Additionally, employ spark guards and methods of confining welding slag to protect the flammable or combustible materials.

URS SAFETY MANAGEMENT STANDARD
Hot Work

6. Provide a fire watch when performing hot work in areas where fires might develop, including:
 - a. Where combustible materials are closer than 35 feet (10.7 meters) from the location of hot work;
 - b. Where easily ignited combustibles are located more than 35 feet (10.7 meters) from the hot work;
 - c. Where wall or floor openings are within 35 feet (10.7 meters) of the hot work, and may expose combustible materials; or
 - d. Where combustible materials are adjacent to the opposite side of a metal wall, floor, or ceiling, and are likely to be exposed to radiant heat from the hot work.
7. Continue the fire watch for 30 minutes after completion of hot work.
8. Require that at least one 20-pound ABC fire extinguisher is available at each hot work location. Personnel assigned to use the fire extinguishers must be trained in the proper use and potential hazards of firefighting response actions.
9. Position welding screens or shields to protect workers and passers-by from welding arc rays.
10. Provide metal buckets or containers for disposal of electrode stubs.
11. Refer to SMS 010 – Confined Space Entry for ventilation and other requirements for hot work in confined spaces.
12. Identify the type of metal to be worked on and protective coatings that have been applied to the metal. Where coatings are flammable or toxic the coating will be stripped a minimum of four inches (10 centimeters) from the areas of heat application.
13. Ascertain the past content of drums, tanks, barrels, piping, or other containers. Thoroughly clean and/or purge containers so that no flammable vapors are present during hot work activities.
14. Provide adequate ventilation (natural or mechanical) for all welding, cutting, brazing, and related operations.
15. Ensure first aid equipment is available at all times during these operations.

URS SAFETY MANAGEMENT STANDARD
Hot Work

B. Air Monitoring (Gas Testing)

1. If a potentially hazardous atmosphere exists, atmospheric conditions must be tested before hot work begins, and monitored periodically throughout the shift.
2. The atmosphere inside a container/vessel will be monitored for flammable vapor prior to performing any welding, cutting, or grinding on the container surface.
3. Ensure air monitoring equipment is properly calibrated in accordance with the manufacture's recommendations before use.
4. Acceptable atmospheric conditions are: Oxygen content between 19.5 and 23.5%; combustible gasses less than 10% of the lower explosive limit (LEL). If unsafe conditions are detected, stop work immediately.

C. Training

1. Personnel performing the duties of fire watch must be trained in the use of fire extinguishing equipment, and must be familiar with the methods of sounding a fire alarm.
2. Personnel working as cutters, welders, and supervisors must have adequate training and experience to perform their duties properly, with due regard to safety.
3. Personnel operating arc welding equipment and gas-shielded welding equipment must be judged competent with the maintenance and operational hazards of the equipment. If gas-shielded arc welding is done, they must be familiar with the American Welding Society Standard A6-1-1966.

D. Personal Protective Equipment

The following personal protective equipment is required for hot work activities:

1. Proper eye protection, such as welding hood with proper shade lens; cutting or burning goggles for torch cutting; and full face-shields for grinding. See SMS 029 – Personal Protective Equipment for proper lens shades.
2. Safety glasses must be worn under hoods and face-shields.

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Hot Work

3. Appropriate gloves for task being performed.
4. Fire-resistant welding jackets or leathers.
5. High-top boots.
6. Clothing free of oil and grease, and preferably woven of non-synthetic fiber.
7. Hard hat.
8. Appropriate respiratory protection as required.

E. Torch-Cutting Operations

Personal conducting hot work activities must:

1. Inspect torches and hoses at the beginning of each shift for leaking shutoff valves, damaged hose and couplings, and tip connections.
2. Tag defective torches and remove from service until properly repaired by qualified personnel.
3. Require that oxygen and fuel gas regulators and valves are in proper working order.
4. Light torches with strikers or other approved means, never with matches or lighters.
5. Keep oxygen cylinders and fittings free of oil and grease.
6. Require that oxygen and fuel gas hoses are easily distinguishable from each other and are not interchangeable. Do not use a single hose having more than one gas passage.
7. Provide flashback arrestors/check valves on all oxygen and fuel gas regulator gauges and torch handles.
8. Remove hoses that show evidence of flashback or damage from service, and repair or discard.
9. Do not cover more than 4 inches out of 12 inches (10 centimeters out of 30 centimeters) of hose with tape when taping parallel lengths of hose to prevent tangling.

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Hot Work

10. Use only hose couplings that cannot be unlocked or disconnected by means of a straight pull.
11. Use only ventilated boxes to store hose are ventilated.
12. String hoses overhead using non-metallic hangers, or otherwise position them to keep clear of walkways, ladders, and stairways.
13. Provide proper ventilation and respiratory equipment when cutting zinc-coated, cadmium-coated, chromium-bearing, mercury-bearing, or other toxic-material-containing metals. See SMS 042 – Respiratory Protection.
14. Shut off cylinder valves and bleed regulators and hoses when leaving cutting rigs unattended, and at the end of each shift.

F. Cylinder Handling

Personal conducting hot work activities must:

1. Secure cylinders in an upright position at all times, except for short periods of time while cylinders are actually being hoisted or carried, if necessary.
2. Replace and secure valve safety caps when cylinders are not in use.
3. Close valves, remove regulators, and replace valve safety caps before moving cylinders, unless cylinders are firmly secured on a special carrier intended for this purpose.
4. Close cylinder valves when work is finished, when cylinders are empty, or when cylinders are moved at any time.
5. Move cylinders by tilting and rolling them on their bottom edges; by use of a bottle cart; or with motorized equipment. Never lay cylinders on their sides and roll them.
6. Never drop cylinders or permit them to strike one another violently, even when empty.
7. Do not use magnets, chokers, or slings to hoist cylinders. Use a cradle or bottle rack designed and constructed for hoisting purposes.
8. Use only warm, not boiling, water to thaw cylinders and valves.

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9. Provide bottle carts, chains, or other steadying devices to keep cylinders from being knocked over while in use.
10. Cylinders must be labeled with either the chemical or trade name of the contents.

G. Cylinder Usage and Storage

Personnel conducting hot work must:

1. Never use cylinders as rollers or supports, whether empty or full.
2. Never use damaged or defective cylinders.
3. Ensure no person other than the gas supplier attempts to mix gases in a cylinder. No one except the owner or person authorized by the owner of the cylinder may refill a cylinder. Cylinder contents must not be used for purposes other than those intended by the supplier.
4. Require all cylinders to be equipped with a handle or wrench so that they can be turned off immediately if necessary.
5. Stand to the side of the outlet and open valve slightly and close immediately prior to connecting a regulator to a cylinder. Never crack a valve near ignition sources.
6. Always open the cylinder valve slowly to prevent damage to the regulator. Do not open valves on fuel gas cylinders more than 1½ turns to ensure quicker closure.
7. Do not use fuel gas from cylinders through torches or other devices that are equipped with shutoff valves without reducing the pressure through a suitable regulator attached to the cylinder valve or manifold.
8. When the valve on a fuel gas cylinder is opened, if there is found to be a leak around the valve stem, close the valve and tighten the gland nut. If this action does not stop the leak, discontinue use of the cylinder, and properly tag and remove it from the work area. In the event that fuel gas leaks from the cylinder valve, rather than the valve stem, and the gas cannot be shut off, properly tag the cylinder and remove it from the work area. If a regulator attached to a cylinder valve will effectively stop a leak through the valve seat, the cylinder need not be removed from the work area.

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9. Remove the cylinder from the work area if a leak develops at a fuse plug or other safety device.
10. Position cylinders where they will not be struck by sparks, slag, or flame.
11. Never take gas cylinders into confined spaces.
12. Place cylinders where they cannot become part of an electrical circuit.
13. Do not strike an electrode against a cylinder to strike an arc.
14. Do not use hammers or wrenches to open cylinders having fixed hand wheels.
15. Do not use acetylene at a pressure in excess of 15 pounds per square inch (psi) gauge pressure, or 30 psi absolute.
16. Store cylinders in a location where they will not be subjected to sources of artificial heat.
17. Separate oxygen cylinders in storage from fuel gas cylinders and combustible materials by at least 20 feet (6 meters) or by a noncombustible barrier at least 5 feet (1.5 meters) high, having a fire resistance rating of at least one-half hour.
18. Provide proper signs at storage areas of flammable or oxidizing gasses, such as "DANGER – FLAMMABLE; No Smoking or Open Flames."
19. Keep storage areas free of vegetation, trash, and other combustible materials.
20. Oxygen reacts violently in the presence of oil or grease. Keep oxygen fittings, cylinders, caps, couplings, regulators, hoses, and other apparatus away from and free of oil and grease. Do not handle oxygen cylinders while wearing oily gloves.
21. Do not use oxygen as a substitute for compressed air.
22. Remove regulators and replace valve safety caps when storing cylinders, or when cylinders will be left unattended. Always close the cylinder valve and release the gas from the regulator prior to regulator removal.

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H. Pressure Reducing Regulators

1. Pressure regulators, including the gauges, must be in proper working order while in use; if not, remove from service.
2. Regulators must be an approved type for the type of gas to be utilized.
3. When a pressure-reducing regulator is attached to a compressed gas cylinder, the cylinder valve must be opened just slightly at first so that the regulator can take on pressure slowly, after which the valve may be turned open to its normal position. If the regulator takes on pressure too suddenly, it can damage the regulator and pressure gauges. The operator must stand to the side of the glass-covered gauges and not in front of them.

I. Arc Welding and Cutting Operations

1. Shield all arc welding and cutting operations by noncombustible or flameproof screens that protect other personnel from the direct rays of the arc.
2. Use only electrode holders that are specifically designed for arc cutting and welding, and are of a sufficient capacity to safely handle the maximum rated current required by the electrodes.
3. Require that electrode holders are properly insulated.
4. Remove electrodes from the holders and placeholders so they cannot make contact with people or conducting objects when leaving holders unattended.
5. Do not dip hot electrode holders in water.
6. Require that the welding machine frame is properly grounded.
7. Shut off the welding machine when the welder leaves his work for any appreciable length of time, at the end of each shift, or when the machine is to be moved.
8. Operators shall inspect equipment daily prior to use. Defective or damaged equipment shall not be used and shall be tagged and removed from service. Equipment shall be repaired by qualified personnel before being returned to service.

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9. Require that the welding/cutting/ground cables meet the following requirements:
 - a. Cables must be completely insulated, flexible, and capable of handling the maximum current requirements of the work in progress.
 - b. Cables must be free from repair or splices for a minimum distance of 10 feet (3 meters) from the electrode holder, except when standard insulated connectors or splices with insulating value equal to the cable are used.
 - c. Use insulated connectors of a capacity at least equal to that of the cable for splices. If connecting lugs are used, they must be completely and substantially insulated.
 - d. Ensure that ground cables have a safe current-carrying capacity at least equal to the maximum output capacity of the unit or units that they services.
 - e. Never attach a ground cable to a pipeline containing gases or flammable liquids.
 - f. String all cables overhead with non-metallic hangers or otherwise position to keep clear of walkways, ladders, and stairways.
 - g. Immediately remove all damaged and worn cable from service until properly repaired by qualified personnel.

5. Documentation Summary

The following information will be maintained in the project file:

- A. Hot Work Permits

6. Resources

- A. U.S. Occupational Safety and Health Administration (OSHA) Construction Standard – [Welding and Cutting](#) – 29 Code of Federal Regulations (CFR) 1926, Subpart J
- B. U.S. OSHA Standard – [Welding, Cutting, and Brazing](#) – 29 CFR 1910, Subpart Q
- C. [ANSI](#) Z49.1-2005, "Safety in Welding, Cutting, and Allied Processes"

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- D. [American Welding Society](#) Standard A6-1-1966
- E. [SMS 010](#) – Confined Space Entry
- F. [SMS 029](#) – Personal Protective Equipment
- G. [SMS 042](#) – Respiratory Protection
- F. [Attachment 020-1 NA](#) – Hot Work Permit



Health, Safety and Environment

Attachment 020-1 NA

HOT WORK PERMIT

Issue Date: April 1999
Revision 7: March 2013

Issued to:	Responsible Person:	Date:
Building:	Area Equipment:	Control No.
Special Work To Be Done:		Time From: To:
Please check appropriate response:		
1. Has affected personnel been briefed on job safety and requirements?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
2. Has equipment been properly prepared for this work?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
3. Does other work or processes affect this work?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
4. Has fire detection and/or gas systems been isolated?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
5. Is the work area clean and ready for work to begin?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
6. Has isolation lockout been completed? If so, record lock and tag numbers below.		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
7. Has fire watch been assigned with appropriate equipment?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
Name(s)		
8. Is GAS TEST required? <input type="checkbox"/> Yes <input type="checkbox"/> No Test results: Percent LEL _____ O ₂ _____ H ₂ S _____ CO _____ Other toxic Continuous? <input type="checkbox"/> Yes <input type="checkbox"/> No Total Hydrocarbons _____ Others As Required _____		Time Tester (Initials): _____ <input type="checkbox"/> AM <input type="checkbox"/> PM
Remarks:		
Special Instructions: <input type="checkbox"/> Yes <input type="checkbox"/> No	Lock Numbers	Tag Numbers
Job Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No	Time/Initials:	Permit Cancelled: (Time)

Endorsements as Required

	Name:	Signature:	Time:
Area Operations Technician:			
Person Doing The Work:			
Job Supervisor/Foreman:			
Project Supervisor:			
Safety Manager:			

URS SAFETY MANAGEMENT STANDARD

Housekeeping

1. Applicability

This standard applies to the operations of URS Corporation and its subsidiary companies.

2. Purpose and Scope

The purpose of this standard is to ensure proper housekeeping in office locations, on construction sites, and fixed work facilities to prevent cross contamination of hazardous materials, fires, and injuries resulting from slips, trips and falls.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility or site.

4. Requirements

A. General

1. Require tools, materials, extension cords, hoses, and other equipment to be stowed at the end of the day. These materials must not be strewn about the site in a manner that may cause tripping or other hazards while in use.
2. Clear general waste, scraps, debris, and rubbish from work areas, passageways, and stairs in and around the facility on a daily basis. Do not throw or drop materials from upper levels to lower levels or to the ground unless disposal areas are provided and the area below is barricaded or secured.
3. Provide metal or other approved containers in adequate numbers to handle waste and rubbish disposal.
4. Garbage (including solid or liquid wastes), refuse, and hazardous waste such as caustics, acids, and toxic materials must be stored in approved and covered containers. Containers must be appropriately labeled as to contents. SMS 009 – Corrosive and Reactive Materials and SMS 017 – Hazardous Waste Operations, provide additional information on hazardous materials.
5. Store supplies and generated wastes or scrap in locations away from walkways and in a manner that will not trip workers. Maintain

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Housekeeping

stored materials in safe, neat stockpiles for ease of access and to prevent collapse or falling.

6. Keep weeds and vegetation away from stockpiled materials and walkways.
7. Maintain flooring, stairways, gangways, access ways, and walkways in a clean, dry, and smooth condition.
8. Ensure that oil, grease, water, ice, or other hazardous materials that may cause slipping or fire hazards are removed promptly.
9. Ensure employees are trained in appropriate waste disposal procedures.
10. Identify a member of line management (typically a site supervisor or foreman) with the responsibility of ensuring proper waste disposal and storage requirements are followed.

B. Regularly inspect the work area for slip and trip hazards.

1. Office and trailer locations – Inspect work areas at least quarterly. Use the inspection sheet provided as Attachment 021-1 AMER.
2. Field sites – Inspect sites at least biweekly. Use the inspection sheet provided as Attachment 021-1 AMER.
3. Field sites performing aircraft and vehicle maintenance – Inspect the sites weekly if sanding, drilling, grinding, and/or painting operations are conducted. Use the inspection sheet provided as Attachment 021-2 AMER.

C. Thoroughly investigate all injuries resulting from slips, trips, and falls on site. Correct those housekeeping conditions contributing to injuries.

D. Project management personnel shall address the following issues in project pre-planning:

1. Estimate the types and quantities of waste or scrap generated during site-specific project activities.
2. Identify any needs for specialized containers or waste disposal services.
3. Coordinate waste disposal options with the client.

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4. Identify any hazards associated with handling or storage of waste or scrap and determine if control measures, including engineering, administrative controls, or personal protective equipment, are required.
 5. Identify waste or scrap handling and storage procedures that will minimize impacts to site personnel, client operations, and the environment.
 6. Identify waste segregation criteria, as well as opportunities for recycling.
- E. For operations involving work with hazardous materials (including metals associated with aviation maintenance activities), the manager directing activities of the facility or site will assure that:
1. Eating, drinking, and smoking areas are removed from the work areas. Hand washing stations shall be available nearby for employees entering the eating and smoking areas.
 2. Resting, eating and smoking areas will be kept clean.
 3. Work areas will be cleaned to remove accumulated contaminants. Working surfaces, including workbenches, desks, and other lateral working surfaces, will be wiped down daily with an appropriate cleaner (soap, solvent, or oxidizing agent). Walking surfaces will be cleaned to remove accumulated contaminants weekly or more often.
 4. Chemicals shall be properly stored to minimize the potential for spills. Chemicals shall be stored in proper containers, organized, labeled and in secondary containment, when required.
 5. Spill cleanup materials must be accessible and appropriate for the materials that may be spilled.
 6. Proper communication measures shall be in place and initiated upon a spill event. Procedures should be based on type and quantity of materials spilled. Spills will be reported to regulatory agencies when required by regulations.
 7. Employees shall be trained on the proper response procedures for spilled materials. Training shall address proper communication procedures in the event of a spill.

URS SAFETY MANAGEMENT STANDARD Housekeeping

5. Documentation Summary

The following information will be maintained in the project file:

- A. Completed Inspection Sheets
- B. Spill Response Training

6. Resources

- A. U.S. Occupational Safety and Health Administration (OSHA) Standard – [Sanitation – 29 Code of Federal Regulations \(CFR\) 1910.141](#)
- B. U.S. OSHA Standard – [Walking and Working Surfaces – 29 CFR 1910.22.](#)
- E. [SMS 009](#) – Corrosive and Reactive Materials
- F. [SMS 017](#) – Hazardous Waste Operations
- G. [Attachment 021-1 AMER](#) – Housekeeping Inspection Sheet
- H. [Attachment 021-2 AMER](#) – Special Housekeeping Inspection Sheet
- Sanding, Drilling, Grinding, and Painting



HOUSEKEEPING INSPECTION SHEET

Building or Location: _____

Inspection Conducted by: _____ Date: _____

Check Yes, No, or NA for Not Applicable.

General Site Housekeeping

1. Do not block exits or emergency equipment. Yes No NA
2. Do not leave equipment or materials lying on the ground. Yes No NA
3. Keep storage areas free from the accumulation of materials that constitute trip hazards. Yes No NA
4. Remove scrap materials and other debris from work area. Yes No NA
5. Remove combustible scrap and debris by safe means at regular intervals. Yes No NA
6. Store oily rags in metal cans with tight fitting lids. Remove oily rags at the end of the day. Yes No NA

Visibility

7. Ensure that halls, stairways and walkways are well lit. Yes No NA
8. Ensure that well designed light switches are present in areas where walkways are not always lighted. Yes No NA
9. Ensure that dust, smoke or steam does not create poor visibility. Yes No NA
10. Ensure that glare from floodlights or windows do not create poor visibility in work areas. Yes No NA

Stairs

11. Ensure that handrails are tight and at the proper level. Yes No NA
12. Ensure that handrails extend past the top and bottom step. Yes No NA
13. Ensure that white or yellow strips are painted on the first and last step for better visibility. (Not an OSHA requirement – recommendation only). Yes No NA
14. Ensure that steps are not rough or defective. Yes No NA
15. Ensure that stair treads are wide enough and risers consistently spaced. Yes No NA
16. Ensure that stairs are free of obstructions. Yes No NA

Floor Conditions

17. Ensure that floors of every workroom are clean, and so far as possible, in a dry condition. Yes No NA
18. Ensure that floors are not oily, overly waxed, or polished. Yes No NA
19. Where wet floors or processes are present, provide proper drainage and false floors, mats, or other dry standing places. Yes No NA
20. Finish floor surfaces with non-slip coatings where spills are likely. Yes No NA
21. Ensure that floors and passageways are free from protruding nails, splinters, holes, or loose boards. Yes No NA
22. Ensure that floors are free of holes and depressions. Yes No NA
23. Ensure that aisles or pathways are wide enough for easy passage and for carrying objects (48 inches is recommended). Yes No NA
24. Ensure that ramps are covered with non-slip surfaces or matting. Yes No NA

- 25. Keep carpets or rugs free from loose or frayed edges that may catch boots or shoes. Yes No NA
- 26. Keep walkways free from extension cords, air hoses and cables. Yes No NA
- 27. Keep pathways free from boxes, containers, machine parts, or other tripping hazards. Yes No NA

Ground Conditions

- 28. Ensure that trip hazards are not present. Yes No NA
- 29. Ensure that fall hazards are not present. Yes No NA
- 30. Ensure that holes or changes in ground elevation are either filled or guarded. Yes No NA
- 31. Ensure that muddy walkways are filled with gravel to reduce slipping. Yes No NA
- 32. Ensure that all employees who work in wet or greasy conditions wear slip resistant footwear. Yes No NA

Equipment

- 33. Ensure that vehicle steps are of adequate size, surface placement for safe dismounting. Yes No NA
- 34. Ensure that hand grips or ladders are adequate for getting into and out of equipment. Yes No NA
- 35. Ensure that ladders have been checked for damage and removed from service if found unsafe. Yes No NA

Chemicals

- 36. Ensure that chemicals are properly stored to minimize a potential spill. Yes No NA
- 37. Ensure that spill cleanup materials are available and appropriate for the type of potential spill. Yes No NA

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

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

Signature

Date



Safety Management Standards
SPECIAL HOUSEKEEPING INSPECTION SHEET
Sanding / Drilling / Grinding / Painting

Attachment 021-2 AMER

Issue Date: June 1999
Revision 8: March 2014

Week Ending: _____

Checklist Completed by: _____

The following checklist will be used as a guide and is considered the minimum housekeeping requirement for work areas where sanding, drilling, and grinding operations on aircraft and vehicles are performed. Dust from sanding/drilling/grinding on aircraft and vehicles contain metals, chemical coatings, and paint-based contaminants that can accumulate on work areas and flat surfaces. Good housekeeping practices throughout the work area are the key to mitigating this hazard.

	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
1. Remove all metal grindings and dust from sanding or grinding areas using a vacuum equipped with a HEPA filter.	<input type="checkbox"/>						
2. Remove contaminants on top of flat surfaces with HEPA-filter-equipped vacuum. <i>Do not use fox-tails or low pressure air to blow dust off work benches, work areas or clothes.</i>	<input type="checkbox"/>						
3. Wipe down surfaces of workbenches with damp rags using water and a surface-active cleanser. (A weekly requirement, more often if needed)	<input type="checkbox"/>						
4. Sweep floors daily, without creating dust clouds. Wet mop work area floors. (A weekly requirement using water and a surface-active cleanser).	<input type="checkbox"/>						
5. Wipe down all other surfaces (besides the workbench) where dust collects using damp rags. (A bi-weekly requirement).	<input type="checkbox"/>						
6. Monitor personnel to ensure no drinking or eating occurs in the industrial work areas.	<input type="checkbox"/>						
7. Monitor personnel recognizing the hazards of cross contamination. Ensure all personnel are washing their hands before eating, drinking, or smoking on breaks.	<input type="checkbox"/>						

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

URS SAFETY MANAGEMENT STANDARD

Lockout and Tagout Safety

1. Applicability

This standard applies to operations of URS Corporation and its subsidiary companies in field and office locations that are engaged in the lockout and tagout of energized sources.

2. Purpose and Scope

This standard outlines the minimum requirements for the lockout/tagout of energy isolating devices. It will be used to ensure that a machine or piece of equipment is isolated from all potentially hazardous energy before employees perform servicing or maintenance activities where the unexpected energization, start-up, or release of stored energy could cause injury.

Types of energy sources that will be protected against include, but are not limited to, the following:

- A. Electrical circuits.
- B. Fluid systems (water and liquid product).
- C. Pneumatic systems.
- D. Flammable systems (including liquid and gaseous fuels).
- E. Thermal systems (steam).
- F. Gravity systems.
- G. Hazardous material systems.

3. Implementation

Implementation of this procedure is the responsibility of the URS manager directing activities of the facility or site.

4. Requirements

A. General

1. "Authorized employee" is a person who locks/tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment and who has received the training described in Section C.

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Lockout and Tagout Safety

2. "Affected employee" is an employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout and tagout (LOTO), or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.
3. "Qualified person" is person who is familiar with the construction and operation of the equipment and the hazards involved, and who
 - a. Requests de-energizing of an energy source.
 - b. Inspects de-energizing with the authorized employee.
 - c. Assures that an authorized employee has locked and tagged the source.
 - d. Requires that all applicable authorized employees affix lock/tags at the same locations(s).
 - e. Operates the equipment controls or otherwise verifies that the equipment cannot be restarted after being locked out.
 - f. Coordinates the continuation of LOTO protection through shift or personnel changes.
 - g. Controls accountability of locks and tags.
 - h. Makes appropriate entries on the Lock and Tag Log – Attachment 023-1 AMER. Where the number of energy control activities is extensive or the scope of energy controls is complex, the qualified person may choose to use the Lockout/Tagout Permit – Attachment 023-2 AMER as an aid.
 - i. Conducts tests and visual inspections prior to reenergizing to check that circuits and equipment can be safely energized.
4. Employees will not work on or in equipment, vessels, etc. that are *not* in a "zero energy state."
5. Coordinate all energy control activities with client, owner, contractor, and subcontractor practices and programs.
6. Require that all locks used in a LOTO program are marked in such a way so as to distinguish the locks from locks used for any other purpose.

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Lockout and Tagout Safety

7. Require that all locks are keyed differently and that only one key exists for each lock and remains in the possession of the authorized employee to whom it has been assigned.
8. Require that each lock be traceable to an individual person using a tag, picture, number or other unique identifier.
9. Require that any employee who fails to follow these procedures, or who tampers with or removes a LOTO device without authorization, will be subject to disciplinary action.
10. Require that periodic inspections/reviews of the LOTO procedure is conducted and documented at least annually to ensure procedures are accurate and being followed. Attachment 023-3 may be used to document the review.
11. Require that equipment-specific procedures be documented for the control of potentially hazardous energy when equipment has multiple energy sources. The procedure shall include specific steps for shutting down, isolating, blocking and securing machines or equipment to control hazardous energy. The procedure shall include specific steps for placement, removal and transfer of lockout devices or tagout devices and the responsibility for them. In addition, the procedure shall contain specific requirements for testing a machine or equipment to determine and verify the effectiveness of lockout devices, tagout devices, and other energy control measures.

B. Procedure

Follow this LOTO procedure whenever the unexpected operation of equipment, switch, valve, or other energy sources could injure someone. Only authorized employees may perform jobs requiring LOTO procedures. Common jobs for which LOTO is used include repairing electrical circuits, cleaning or oiling machinery with moving parts, clearing jammed mechanisms, replacing control units or valves, and performing preventative maintenance.

1. **Step 1 – Achieving Zero Energy**
 - a. Before turning off a machine or equipment, you must know the type and magnitude of the energy, the hazards of the energy to be controlled, and the way the energy will be controlled. Identify and locate all sources of energy that

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Lockout and Tagout Safety

could affect individuals involved. Note that more than one source of energy may be involved at each machine or piece of equipment.

- b. Determine whether more than one employee or crew will be working on the machine or equipment. Also, evaluate the potential for personnel on multiple shifts to be working on the equipment. If multiple shifts will be working on the same equipment, procedures shall be developed to ensure energy control is maintained. When lockout or tagout devices remain on energy-isolation devices from a previous shift, the incoming shift members must verify for themselves that the machinery is effectively isolated and deenergized.
- c. Notify all affected personnel that equipment is going to be de-energized and accessed. This can be done verbally or visually, or by hanging a warning tag on the control panel.
- d. Disconnect the main sources of power by breaking the primary power circuit, valve, pipe, etc. Locking out a low voltage control circuit is not considered breaking a main power source.
- e. Disconnect each separate power source of multiple power systems (e.g., air over hydraulic, electric over hydraulic).
- f. Release all residual energy remaining behind the power source (e.g., hydraulic or air pressure). If there is a possibility of re-accumulation of stored energy level, verify isolation until the task is complete or the possibility no longer exists. Use the following methods to guard against energy left in equipment after it has been isolated:
 - i. Inspect the system to ensure that all parts have stopped moving.
 - ii. Install grounding wires.
 - iii. Relieve trapped pressure.
 - iv. Release the tension of springs or block the movement of spring-driven parts.
 - v. Block or brace parts that could fall because of gravity.

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Lockout and Tagout Safety

- vi. Bleed pneumatic and hydraulic systems and leave vent valves open. Block parts in hydraulic and pneumatic systems that could move from loss of pressure.
 - vii. Drain process piping systems and close valves to prevent the flow of hazardous materials.
 - viii. Use blank flanges on lines without valves that must be blocked.
 - ix. Purge reactor tanks and process lines.
 - x. Dissipate extreme heat or cold, or wear protective clothing.
 - xi. Remove fuses from electrical circuits.
 - xii. Monitor situations where there is a potential for stored energy to re-accumulate.
- g. Lockout devices and tags must be applied as follows:
- i. In a manner that will hold the energy-isolating device in a safe or off position.
 - ii. Tags (when used) will clearly show the operation or movement from the safe or off position. Examples of sample tags are provided in Supplemental Information A.
 - iii. When both tags and locks are used, the tag should be placed at the same point as the lock.
 - iv. When locks cannot be used and tags cannot be placed directly on the energy-isolating device, the locks/tags need to be highly visible and placed as close as possible.
 - v. Note that locks and tags by themselves do not de-energize equipment. Attach them only after the machinery has been isolated from its energy sources.
- h. Secure all power sources in the de-energized position with a lockout device. Note that in many situations the equipment

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Lockout and Tagout Safety

requiring lockout may belong to the facility owner/manager (our clients). These facilities typically require their procedures to be followed and their equipment to be used. Use multiple lock devices when more than one lock is required. The authorized person will identify and notify all persons protected by the lockout. Each person who is protected by the lockout:

- i. Places a signed lock and tag on source location(s).
 - ii. Keeps the key to his/her own lock.
 - iii. Removes his/her own lock (only exception: person not on site and person is contacted).
 - iv. Works *only* on protected source(s).
 - v. Removes lock and tag at completion of work shift or transfer.
 - vi. If more than one employee is required to lockout and tag a piece of equipment, a LOTO device capable of accepting multiple locks will be used. Under no circumstances is an employee allowed to work on a lock and tag belonging to another employee.
- i. If the energy source can be locked, this is the preferred method of tagging. (Lockout devices require a key or combination to hold it in a safe position). If tagout must be used, the tag must be weather and chemical resistant, be standard in size and color, and have a text warning such as DO NOT START, DO NOT OPEN, etc.
 - j. Block or blank any machinery, device, or piping system that can move on its own or deliver energy with or without the power source.
 - k. Test equipment prior to working on it to ensure that all sources of energy have been isolated. This may include verifying that the main disconnect switch or circuit breaker can't be moved to the "on" position, depressing all start buttons and activating controls, or using a voltmeter to check for potential energization sources.

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Lockout and Tagout Safety

2. **Step 2 - Preparing to Re-energize**
 - a. Once the task has been completed, ensure that tools are picked up and safety chains, guards, guard rails, warning signs, etc. are replaced. Notify affected personnel that the lockout device is going to be removed.
 - b. Position controls correctly for start-up; ensure that the machine is ready for operation.
 - c. Remove locks and tags. This can be done only by the person applying the lock and/or tag, except as noted elsewhere in this standard.
 - d. Once all lockout devices have been removed, the equipment or process may be restarted.
3. Temporary operation of locked-out source
 - a. Make sure everyone is clear of the system.
 - b. Make sure tools are clear.
 - c. Remove lock(s).
 - d. Energize the system and conduct check.
 - e. Immediately de-energize the system and replace locks.
4. Unauthorized removal of locks and tags is prohibited. Use the following procedure for the supervisor or qualified person to remove the lock/tag when the employee is not available:
 - a. Verify that the authorized employee is not on site and available to remove his or her own tag.
 - b. Check that employees are not exposed to hazards.
 - c. Verify that the equipment is safe to operate, tools have been removed, and guards have been replaced.
 - d. Remain with affected equipment so that no one returns while equipment or process is being restarted.
 - e. Remove lock/tag and energize equipment.

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Lockout and Tagout Safety

- f. Require that the affected employee knows the lockout device has been removed before he/she resumes work.

C. Training

1. Authorized employees must receive training prior to conducting LOTO activities.
2. Training must include the following:
 - a. Purpose of lockout/tagout procedure.
 - b. Hazards associated with different energy sources.
 - c. Recognition of when to use LOTO procedures.
 - d. Electrical lockout procedures.
 - e. Valve lockout procedures.
 - f. Compliance with lockout procedures.
 - g. Discussion of specific procedures.
3. Awareness training of affected employees will be conducted to ensure that they understand the purpose of the LOTO procedures, the hazards associated with different energy sources, and their responsibilities under the LOTO program.
4. Retraining of authorized employees will be conducted and documented:
 - a. When there is a change in
 - i. Assignments.
 - ii. Machines.
 - iii. Equipment.
 - iv. Processes.
 - b. When there are new hazards or changes in the energy control procedure.

URS SAFETY MANAGEMENT STANDARD

Lockout and Tagout Safety

- c. When evaluation of lockout/tagout procedures reveals a need for additional training.
5. The manager or safety supervisor should maintain a list of the names of all employees who are authorized to perform LOTO operations on specified machines or equipment.

5. Documentation Summary

The following documentation will be maintained in the project file:

- A. Training records for authorized employees.
- B. Lock and Tag Log (Attachment 023-1 AMER).
- C. Lockout/Tagout Permit (Attachment 023-2 AMER).

6. Resources

- A. American National Standards Institute ([ANSI](#)) Z244.1- 2003 – Control of Hazardous Energy – Lockout/Tagout and Alternative Methods
- B. U.S. Occupational Safety and Health Administration (OSHA) Standard–[Accident Prevention Signs and Tags](#) – 29 Code of Federal Regulations (CFR) 1926.200
- C. U.S. OSHA Standard – [The Control of Hazardous Energy](#) – 29 CFR 1910.147
- D. U.S. OSHA Standard – [Lockout and Tagging of Circuits](#) – 29 CFR 1926.417
- E. U.S. OSHA Technical Links – [Lockout/Tagout](#)
- F. [Attachment 023-1 AMER](#) – Lock and Tag Log
- G. [Attachment 023-2 AMER](#) – Lockout/Tagout Permit
- H. [Attachment 023-3 AMER](#) – Annual Program and Training Assessment Checklist

7. Supplemental Information

- A. [Sample Tags](#)

URS	Safety Management Standard	Attachment 023-2 AMER
	LOCKOUT / TAGOUT PERMIT	Issue Date: June 1999 Revision 6: September 2013

Equipment/System to be Isolated: _____

Building: _____ Floor: _____ Column: _____

Other Location: _____

Purpose of Isolation: _____

Type of Isolation: _____

Authorized Employee: _____ Date: _____

Special Instructions: _____

Lockout/Tagout Performed: _____

Tag No.	Device ID	Bldg/Floor/Col.	Installed By	Removed By

Verification System Is Safe for Specified Work to Start

Authorized Employee: _____ Date: _____ Time: _____

Accountability

Accepts Protection

Requesting Authority: _____ Date: _____ Time: _____

Accountability

Release Protection

Requesting Authority: _____ Date: _____ Time: _____

Lockout/Tagout Removal Authorization

Authorized Employee: _____ Date: _____ Time: _____



Safety Management Standard
**ANNUAL PROGRAM AND TRAINING
ASSESSMENT CHECKLIST**

Attachment 023-3 AMER
Issue Date: June 1999
Revision 6: September 2013

Date of Inspection:	
Site/Program:	
Location/Department:	
Lockout Tagout Program Owner (Assessor):	
Lockout Tagout Authorized Employees Interviewed:	

NAME	ID	NAME	ID
1.		6.	
2.		7.	
3.		8.	
4.		9.	
5.		10.	

TRAINING	Yes	No
1. Have Authorized employees Qualified Persons had lockout tagout training?	<input type="checkbox"/>	<input type="checkbox"/>
2. Are affected employees trained on LOTO and are they being notified before starting LOTO activities?	<input type="checkbox"/>	<input type="checkbox"/>
3. Have employees been re-trained when job assignments, machines, equipment or processes have changed?	<input type="checkbox"/>	<input type="checkbox"/>

Comments:

EQUIPMENT	Yes	No
4. Do you have available Lockout Locks, Tags, and the appropriate lockout devices to physically isolate hazardous energy?	<input type="checkbox"/>	<input type="checkbox"/>
5. Do you have lockout locks and tags that are uniquely keyed and identified when in use?	<input type="checkbox"/>	<input type="checkbox"/>
6. Are all locks used in the LOTO program are marked in such a way so as to distinguish the locks from locks used for any other purpose, and are these locks only used for lockout tagout?	<input type="checkbox"/>	<input type="checkbox"/>
7. Does the tag used with the lock identify the worker servicing the machine or equipment?	<input type="checkbox"/>	<input type="checkbox"/>

Comments:

PROCEDURES	Yes	No
8. Have equipment & machine-specific LOTO procedures been written for each machine or type of equipment?	<input type="checkbox"/>	<input type="checkbox"/>
9. Have the LOTO procedures been updated for machines, equipment, or processes that have changed?	<input type="checkbox"/>	<input type="checkbox"/>



**Safety Management Standard
ANNUAL PROGRAM AND TRAINING
ASSESSMENT CHECKLIST**

Attachment 023-3 AMER
Issue Date: June 1999
Revision 6: September 2013

10. Do employees know the LOTO procedures and where they are located?	<input type="checkbox"/>	<input type="checkbox"/>
Comments:		
PERFORMANCE	Yes	No
11. Can authorized employees identify all hazardous energy sources and associated hazards for each of the equipment or machines to be locked out?	<input type="checkbox"/>	<input type="checkbox"/>
12. Do employees follow the proper LOTO procedures for de-energizing the equipment or machine to a zero-energy state?	<input type="checkbox"/>	<input type="checkbox"/>
13. Does the employee demonstrate the proper steps for the placement, removal and transfer of LOTO devices?	<input type="checkbox"/>	<input type="checkbox"/>
14. Do authorized employees use the proper methods for the "try attempt" to verify the equipment was de-energized?	<input type="checkbox"/>	<input type="checkbox"/>
15. Before releasing the machine or equipment from LOTO, does the employee; inspect the machine to ensure it is intact, ensure that all employees are safely positioned, notify affected employees and all other employees in the area,	<input type="checkbox"/>	<input type="checkbox"/>
16. Are affected employees and all other employees in the area notified that the LOTO devices have been removed?	<input type="checkbox"/>	<input type="checkbox"/>
17. If you answered "No" to any of the questions 11-16, has the employee been re-trained?	<input type="checkbox"/>	<input type="checkbox"/>
Comments:		
DEFICIENCIES AND OBSERVATIONS:		
1.		
2.		
3.		
4.		

Approved: _____
Assessor & Lockout Tagout Owner Date _____

Approved: _____
Site/Location Safety Representative/Manager Date _____

Approved: _____
Site/Location Manager Date _____

	<p style="text-align: center;">Safety Management Standard</p> <p style="text-align: center;">SAMPLE TAGS</p>	<p style="text-align: right;">SMS 023 AMER Supplemental Information A Issue Date: February 2009</p>
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This energy source has been LOCKED OUT

Only the individual who signed the reverse side may remove this lock/tag
Remarks: _____



**LOCKED
OUT**

DO NOT OPERATE

This lock/tag may only be removed by:

Name _____

Dept _____

Expected Completion _____

URS SAFETY MANAGEMENT STANDARD

Medical Screening and Surveillance

1. Applicability

This standard applies to the operations of URS Corporation and its subsidiary companies for employees assigned to work environments where there is a potential for exposure to chemical, biological, and/or physical hazards.

Individuals will be selected for medical screening based on regulatory standards, project health and safety plan (HASP), assessments, the expected use of personal protective equipment (PPE), and client contract requirements.

2. Purpose and Scope

The purpose of this standard is to prevent occupational illness and injury by early identification of exposure-related health effects before they result in disease. Medical examinations will be performed to determine whether employees are capable of safely performing assigned tasks, to verify that protective equipment and controls are effectively providing protection, and to comply with government regulations. Included are provisions for emergency medical consultation and treatment.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility, site, or project location.

The Occupational Health Manager (OHM) is responsible for development and administration of this program in coordination with the URS Medical Service Provider (MSP). The OHM will maintain current injury and illness data, and participate with corporate, division, regional, country, or strategic business unit Health, Safety, and Environment (HSE) Managers in evaluation of this program. The MSP will provide occupational medicine oversight for the program and will approve medical surveillance protocols.

Locations in the United States and Canada will follow all requirements of this program.

International locations will follow sections B.1, 2, 3, 5, 6, 7, and 8; G.3; and H.1 of this program.

URS SAFETY MANAGEMENT STANDARD

Medical Screening and Surveillance

4. Requirements

A. Selection of program participants

1. The Medical Surveillance Evaluation (MSE) form – Attachment 024-2 NA provides the primary guidance for determining whether medical screening is required for an employee and the frequency of periodic exams. The MSE is to be completed by the employee and his or her supervisor at the time of hire for any employee who may work outside an office environment. At each annual performance review, the MSE is to be reviewed for accuracy. Other reviews are required whenever there is a change in job tasks.
2. Additional site- or project-specific biological monitoring or toxicological screening may be required in addition to this program's scheduled core exams. These medical tests will be specified by the project-specific HASP and will be authorized by the MSP on the exam appointment protocol. Note: See Section D.2 if the employee will have an initial assignment at a HAZWOPER site.

B. Types of medical screening and surveillance exams

1. A baseline or preassignment baseline exam will be conducted prior to the start of work assignments requiring medical surveillance.
2. Periodic exam schedules are established by the MSP using the following criteria:
 - a. Employees performing the following types of work will receive annual exams: construction activities in the exclusion zone of HAZWOPER sites; field work activities in the exclusion zone of HAZWOPER sites for 30 or more days per year; or projects involving exposure to materials regulated by the Occupational Safety and Health Administration (OSHA) or Mine Safety and Health Administration (MSHA) at or above established action levels.
 - b. Employees performing the following types of work will receive biennial exams: field work activities at HAZWOPER sites less than 30 days per year; waste disposal activities; non-HAZWOPER environmental sampling; or chemistry laboratory, pilot plant projects, or bench-scale operations for 30 or more days per year.

URS SAFETY MANAGEMENT STANDARD

Medical Screening and Surveillance

3. Employees currently participating in an examination program will receive exit exams when they leave their work assignment as identified in the Exit Exam Determination – Attachment 024-6 NA. In the event an employee declines the exit exam, the employee will be requested to sign a Waiver of Exit Medical Surveillance Exam – Attachment 024-7 NA.
4. Department of Transportation (DOT) exams will be conducted biennially when an employee is assigned to drive a vehicle with a gross weight rating of more than 10,000 pounds or a placarded vehicle of any size used to transport hazardous chemicals. DOT exam certification can be added to a routine baseline or periodic exam protocol when scheduling with the MSP.
5. When noise levels in the employee's work environment equal or exceed an 8-hour time-weighted average of 85 decibels as measured on the A-scale (dBA), annual audiograms will be performed. For employees involved in construction activities or construction management, enrollment in this program will be required if more than 50% of their time is spent in an active construction area and working in an area with posted noise hazards.
6. Individual radiation dose monitoring will be conducted as required by the site-specific HASP with approval by a Radiation Safety Officer. Personal dosimetry (film badges) is typically required; however, depending on the specific radiation hazard, additional monitoring or scans may be required.
7. To determine an employee's ability to wear a respirator, a medical evaluation will be performed before an employee is fit tested or assigned to wear a respirator.
8. Employees assigned to work in environments with airborne concentrations of asbestos fibers at or above the established action level (OSHA, MSHA, state, or other applicable regulations) will receive asbestos-specific baseline and annual exams. Exit exams will be performed if an exam has not been performed within the previous 6 months or if an employee has medical complaints related to potential asbestos exposure.
9. Blood sampling and monitoring for lead and other heavy metals will be conducted every 6 months until two consecutive blood

URS SAFETY MANAGEMENT STANDARD
Medical Screening and Surveillance

samples/analyses are acceptable. An employee with elevated heavy metal blood levels should be temporarily assigned to a task with minimal exposure, pending medical clearance. Sampling and monitoring will be performed every 2 weeks during the reassignment period. Employees will be notified of results within 5 days when levels are not acceptable. Medical Removal Protection benefits may apply in this situation.

10. Urine samples may be collected for some heavy metal exposures such as cadmium and mercury. Samples must be collected within 30 days of assignment to any task with potential for exposure to cadmium or other heavy metals. Medical monitoring results will be used to assess worker exposure and exposure control methods.
11. Medical monitoring will also be required to assess potential worker health risk to other chemical hazards, including polyaromatic hydrocarbons (PAHs), pesticides, benzene, chlorinated solvents, crystalline silica, and other chemical hazards as identified in prejob hazard analysis. The MSP will be consulted to determine necessary testing protocols and acceptance levels. The physician's opinion letter will be used to determine the worker's ability to perform the specified task and to wear PPE necessary to accomplish the task in a safe manner.
12. Skin exposures to hazardous chemicals with "Skin" notation will be evaluated case by case in consultation with the MSP. Allergic and hyper-sensitivity symptoms will be evaluated by the MSP as required.

C. Exam protocols

1. The Medical Screening and Surveillance Exam Protocol – Attachment 024-3 NA identifies the medical exam components of this program.
2. Evaluation will be confidential and provided during normal hours. Employees will be offered the opportunity to discuss the results of the evaluation with the MSP. All exam results are considered personal and confidential information, and will not be stored in any unsecured records not transmitted without the employee's permission.

URS SAFETY MANAGEMENT STANDARD
Medical Screening and Surveillance

D. Scheduling of exams

1. The Office or Project Manager, usually with assistance from the local HSE Representative, is responsible for contacting the MSP when baseline, exit, and project-specific exams are required. The MSP maintains an employee scheduling database for tracking periodic exams and will contact the employee for scheduling during the month the exam is due. These steps are detailed in the Medical Surveillance Exam Process – Attachment 024-4 NA.
2. Employees hired with an initial assignment to work at a HAZWOPER site whose work duties require passing a physical exam or who have an essential job function of wearing a respirator will receive a job offer contingent upon passing a preassignment baseline exam. See HAZWOPER and Respirator Preassignment Baseline Exam Protocol – Attachment 024-5 NA.
3. In the event of an urgent business need, a temporary clearance to begin work the day of the exam may be requested at the time a baseline exam is scheduled through the MSP. The temporary clearance will be issued by the local physician and will be good for up to 14 days or until the MSP physician's final clearance is received, whichever comes first.
4. If an exam becomes due during an employee's pregnancy, it is advised to defer the exam until after delivery and the employee returns to work from family/medical leave status.

E. Exam Follow-Up

1. Following each exam, the MSP will issue a physician's written opinion (Health Status Medical Report), which will include any medical restrictions and address the employee's ability to use personal protective equipment, to the HSE Representative. See Exam Follow-Up Procedures – Attachment 024-8 NA.
2. The MSP will mail the exam invoice to the Local Office HSE Representative, who will either approve the charge and forward the invoice to the accounts payable department for payment or forward the charge to the manager responsible for the employee for charge assignment and payment. (Medical exams that are part of this program are provided to URS employees at no cost to the employee.)

URS SAFETY MANAGEMENT STANDARD

Medical Screening and Surveillance

3. The MSP will mail a confidential letter detailing the results of the exam to the employee at his or her home address within 30 days of the exam date.

F. Medical Records

1. Medical records include records concerning an employee's health status that is made or maintained by a physician, nurse or other health care professional. Medical records are maintained and preserved in confidential, locked files in the custody of the MSP for at least the duration of employment plus 30 years. Only information regarding the employee's ability to perform the job assignment will be provided to company representatives.
2. Employees in medical monitoring programs are notified initially, and annually thereafter, of the existence, location and ability to access medical records maintained by the MSP. Upon request, each employee (or designated representative) will have access to the employee's medical record. Prior to the release of health information to the employee (or designated representative), a specific written consent must be signed by the employee. Records will be provided in a reasonable time and manner at no cost to the employee.
3. International records (excluding the United States and Canada) will be maintained in-country at the local clinic.
4. Projects that use local clinics or employer/client clinics may store records at that site, but at the termination of the project, all employee medical records must be transferred to long-term records retention or forwarded to WorkCare™.
5. Subcontractors and vendors are expected to maintain their own employee records and reports, but the employee physician's opinion letters will be available for inspection and verification of compliance.
6. If in the event, URS ceases operations, medical records will be transferred to the successor employer. If no successor employer is available, records will be transferred to the National Institute for Occupational Safety and Health.

URS SAFETY MANAGEMENT STANDARD

Medical Screening and Surveillance

G. Program Evaluation

1. The OHM and corporate, regional, country, or SBU HSE Managers will evaluate this program annually and as needed. Issues to review include program efficacy and efficiency, employee satisfaction, and cost-effectiveness.
2. The MSP will prepare an Annual Medical Trending Report specifying the number and types of exams performed and anonymous statistical exam results in group data format.
3. Each employee is mailed a Post-Exam Evaluation by the MSP. Employee feedback regarding the clinic, medical staff, and exam procedures are reviewed, and corrective actions are identified and taken as needed.

5. Documentation Summary

The following documentation will be maintained in the office / project file:

- A. Medical Surveillance Evaluation.
- B. Health Status Medical Report.

6. Resources

- A. U.S. Occupational Safety and Health Administration (OSHA) Technical Links – [Medical Screening/Surveillance](#)
- B. [U.S. OSHA Publication 3162](#) – Screening and Surveillance: A Guide to OSHA Standards, 1999
- C. [SMS 065](#) – Injury Management
- D. [Attachment 024-1 NA](#) – WorkCare™ Medical History Questionnaire
- E. [Attachment 024-2 NA](#) – Medical Surveillance Evaluation
- F. [Attachment 024-3 NA](#) – Medical Screening and Surveillance Exam Protocol
- G. [Attachment 024-4 NA](#) – Medical Surveillance Exam Process

URS SAFETY MANAGEMENT STANDARD
Medical Screening and Surveillance

- H. [Attachment 024-5 NA](#) – HAZWOPER and Respirator Preassignment Baseline Exam Protocol
- I. [Attachment 024-6 NA](#) – Exit Exam Determination
- J. [Attachment 024-7 NA](#) – Waiver of Exit Medical Surveillance Exam
- K. [Attachment 024-8 NA](#) – Exam Follow-Up Procedures

Medical History Questionnaire

- Baseline Annual/Biennial
 Exit Other

Employee Name: _____
Company Name: _____
Office: _____
Date: _____



Medical History Questionnaire

Your Instructions

- Location of your exam will be listed on your Appointment Protocol.
- Please have your Supervisor or Health & Safety Professional complete the Job Profile on the inside flap of this page if you do not know the responses.
- See your Supervisor or Health & Safety Professional for directions to the clinic. Please bring the completed exam packet and your Appointment Protocol.
- If lab work is ordered, do not eat for 8 hours prior to exam. (Water and unsweetened juice or black decaffeinated coffee is allowed. Dry toast if you have an afternoon appointment.)
- Avoid all alcohol consumption for 24 hours prior to the exam.
- Avoid loud noise exposure for 14 to 16 hours before the exam.
- If you wear contact lenses, please do not insert them on the day of the exam. Bring a pair of glasses.
- If you use hearing aids, please bring them to the clinic.
- Your employer is responsible for the cost of this exam. It is important to be on time for your appointment.
- If you cannot attend your appointment, please call (800) 455-6155 to cancel, or your employer may be charged.

**Please answer all the questions in this booklet.
If you have any questions, please call 1-800-455-6155.**

Making Health Count

I. Instructions

Your supervisor must allow you to answer this questionnaire during normal working hours, or at a time and place that is convenient to you. To maintain your confidentiality, your employer or supervisor must not look at or review your answers, and your employer must tell you how to deliver or send this questionnaire to the healthcare professional who will review it.

Has your employer told you how to contact the healthcare professional who will review this questionnaire? Yes No

This questionnaire is used to gather information about your health and physical condition, both now and in the past. This information will be used to determine if you can safely perform the duties of your job. This exam is not intended to substitute for care provided by your personal physician. Results of the exam will be sent to your home address. The results of the examination are kept confidential.

Print the following information:

Last Name: _____ First Name: _____

Home Mailing Address: _____

City: _____ State: _____ Zip: _____

Email Address: _____ Social Security #: _____

Sex: Male Female Date of Birth: _____ Age: _____

Race: Hispanic or Latino White Asian Black or African American

American Indian or Alaska Native Native Hawaiian or Other Pacific Islander

Two or More Races (Not Hispanic or Latino)

Position: _____ Site Location: _____ Date Employed: _____

What is the phone number (including area code) at which you can be reached by the healthcare professional who reviews this questionnaire? _____

What is the best time to reach you? From: _____ AM PM To: _____ AM PM

Read and sign this Consent for Release of Medical Records:

I hereby authorize **WorkCare** to release in confidence to _____ (company) and/or its subsidiaries medical information, including but not limited to the results of medical evaluations, physical examinations or medical testing, as it specifically pertains to my medical qualification to perform the stated Job Duty consistent with the applicable requirements of OSHA, MSHA. I further authorize the examining physician and/or clinic to release to WorkCare any medical information related to my medical or physical condition. You have a right to receive a copy of this authorization.

Signature: _____ Date: _____

II. Complete This Entire Section

Job Profile

If you have questions regarding this Job Profile, please discuss with your supervisor in order to complete this section.

Job Duty/Title:

Indicate your job title: _____

(Example: Driller, Engineer, Environmental Scientist, etc.)

Indicate your job duty: _____

Indicate the time you spend in each area:

Field _____ % Office _____ % Travel _____ %

Physical Requirements:

Are there any specific physical demands of the job that are important? (Examples: Lifting, carrying)

If yes, please describe: _____

Yes No

Protective Equipment:

Is clearance for the use of respiratory equipment needed?

Escape only (no rescue) Emergency rescue only

Is there specific safety equipment (beyond hard hat, gloves, boots, and appropriate clothing) that is used in the safe performance of this job?

If yes, please describe: _____

Yes No
 Yes No

1. **Please Check the Following Types of Respiratory Protective Equipment Used**

✓		Duration	Frequency	Temperature Extremes	Humidity
<input type="checkbox"/>	Half Face Piece Air Purifying Respirator				
<input type="checkbox"/>	Full Face Piece Air Purifying Respirator				
<input type="checkbox"/>	Powered Air Purifying Respirator				
<input type="checkbox"/>	Self-Contained Breathing Apparatus				
<input type="checkbox"/>	Air Line Respirator				

2. Is it possible that you will be required to wear Level A protection at any time? (SCBA, fully encapsulated suit, chemical resistant gloves & boots.)

Yes No

3. Is it possible that you will be required to wear Level B protection at any time? (SCBA, chemical resistant clothing, chemical resistant gloves & boots.)

Yes No

4. Describe significant potential chemical exposures: _____

5. Will you be working under hot conditions (temperatures exceeding 77°F)?

Will you be working under humid conditions?

Will you be working at high altitudes?

Describe the work you'll be doing while you're using your respirator(s):

Yes No
 Yes No
 Yes No

6. Describe any special or hazardous conditions you might encounter when you're using your respirator(s). (For example, confined spaces, life-threatening gases):

7. During the period in which you use the respirator(s), is your work effort:

a. Light (less than 200 kcal per hour) *Example: Sitting while mailing or filing; performing light assembly work, etc.*

Hours per shift: _____

Yes No

b. Moderate (200 to 350 kcal per hour) *Example: Transferring a moderate load (about 35 lbs.) at trunk level; pushing a wheel barrel with a heavy load, etc.*

Hours per shift: _____

Yes No

c. Heavy (above 350 kcal per hour) *Example: Lifting a heavy load (about 50 lbs.) from the floor to your waist; shoveling, etc.*

Hours per shift: _____

Yes No

8. Describe any special responsibilities you'll have while using your respirator(s) that may affect the safety and well-being of others (e.g. rescue, security):

9. Are there any substances that you cannot work with?

Describe: _____

Yes No

III.

Review of Systems

Answer "Yes" if you currently have any of these symptoms/conditions and/or have had them significantly in the past. List date when first occurred.

		Yes	No	Date
1.	A. Fever	<input type="checkbox"/>	<input type="checkbox"/>	
	B. Chills	<input type="checkbox"/>	<input type="checkbox"/>	
	C. Weight loss	<input type="checkbox"/>	<input type="checkbox"/>	
	D. Loss of energy/fatigue	<input type="checkbox"/>	<input type="checkbox"/>	
2.	A. Poor vision	<input type="checkbox"/>	<input type="checkbox"/>	
	B. Color blindness	<input type="checkbox"/>	<input type="checkbox"/>	
	C. Double vision	<input type="checkbox"/>	<input type="checkbox"/>	
	D. Eye injury	<input type="checkbox"/>	<input type="checkbox"/>	
	E. Cataract	<input type="checkbox"/>	<input type="checkbox"/>	
	F. Glaucoma	<input type="checkbox"/>	<input type="checkbox"/>	
	G. Do you wear glasses or contacts?	<input type="checkbox"/>	<input type="checkbox"/>	
3.	A. Ear infection	<input type="checkbox"/>	<input type="checkbox"/>	
	B. Mastoid surgery	<input type="checkbox"/>	<input type="checkbox"/>	
	C. Hearing loss	<input type="checkbox"/>	<input type="checkbox"/>	
	D. Sore throat	<input type="checkbox"/>	<input type="checkbox"/>	
	E. Frequent hoarseness	<input type="checkbox"/>	<input type="checkbox"/>	
	F. Dental problems	<input type="checkbox"/>	<input type="checkbox"/>	
4.	A. Allergies	<input type="checkbox"/>	<input type="checkbox"/>	
	B. Sinus trouble	<input type="checkbox"/>	<input type="checkbox"/>	
	C. Hay fever	<input type="checkbox"/>	<input type="checkbox"/>	
5.	A. Tuberculosis	<input type="checkbox"/>	<input type="checkbox"/>	
	B. Asthma & breathing difficulties	<input type="checkbox"/>	<input type="checkbox"/>	
	C. Lung collapse	<input type="checkbox"/>	<input type="checkbox"/>	
	D. Pneumonia	<input type="checkbox"/>	<input type="checkbox"/>	
	E. Shortness of breath	<input type="checkbox"/>	<input type="checkbox"/>	
	F. Persistent or severe colds	<input type="checkbox"/>	<input type="checkbox"/>	
	G. Persistent or severe coughs	<input type="checkbox"/>	<input type="checkbox"/>	
	H. Chest surgery	<input type="checkbox"/>	<input type="checkbox"/>	
	I. Wheezing	<input type="checkbox"/>	<input type="checkbox"/>	
	J. Emphysema	<input type="checkbox"/>	<input type="checkbox"/>	
	K. Bronchitis	<input type="checkbox"/>	<input type="checkbox"/>	
6.	A. High blood pressure	<input type="checkbox"/>	<input type="checkbox"/>	
	B. Heart murmur	<input type="checkbox"/>	<input type="checkbox"/>	
	C. Enlarged heart	<input type="checkbox"/>	<input type="checkbox"/>	
	D. Heart disease/failure	<input type="checkbox"/>	<input type="checkbox"/>	
	E. Rheumatic fever	<input type="checkbox"/>	<input type="checkbox"/>	
	F. Heart palpitations	<input type="checkbox"/>	<input type="checkbox"/>	
	G. Irregular heart beat	<input type="checkbox"/>	<input type="checkbox"/>	
	H. Heart attack	<input type="checkbox"/>	<input type="checkbox"/>	
	I. Chest pain	<input type="checkbox"/>	<input type="checkbox"/>	
7.	A. Varicose veins	<input type="checkbox"/>	<input type="checkbox"/>	
	B. Stroke	<input type="checkbox"/>	<input type="checkbox"/>	
	C. Leg ulcers	<input type="checkbox"/>	<input type="checkbox"/>	
	D. Swelling of ankles	<input type="checkbox"/>	<input type="checkbox"/>	
	E. Leg pain when walking	<input type="checkbox"/>	<input type="checkbox"/>	
8.	A. Anemia	<input type="checkbox"/>	<input type="checkbox"/>	
	B. Leukemia	<input type="checkbox"/>	<input type="checkbox"/>	
	C. Sickle cell disease	<input type="checkbox"/>	<input type="checkbox"/>	
	D. Other blood disease	<input type="checkbox"/>	<input type="checkbox"/>	
9.	A. Diabetes	<input type="checkbox"/>	<input type="checkbox"/>	
	B. Thyroid problems	<input type="checkbox"/>	<input type="checkbox"/>	
	C. Cancer or tumors	<input type="checkbox"/>	<input type="checkbox"/>	
	D. Heat related illness	<input type="checkbox"/>	<input type="checkbox"/>	
10.	A. Rash/dermatitis	<input type="checkbox"/>	<input type="checkbox"/>	
	B. Bruise easily	<input type="checkbox"/>	<input type="checkbox"/>	
	C. Psoriasis	<input type="checkbox"/>	<input type="checkbox"/>	
	D. Wart/mole change	<input type="checkbox"/>	<input type="checkbox"/>	
	E. Eczema/Acne	<input type="checkbox"/>	<input type="checkbox"/>	

		Yes	No	Date
11.	A. Headaches	<input type="checkbox"/>	<input type="checkbox"/>	
	B. Head injury	<input type="checkbox"/>	<input type="checkbox"/>	
	C. Neck Injury	<input type="checkbox"/>	<input type="checkbox"/>	
12.	A. Birth defect	<input type="checkbox"/>	<input type="checkbox"/>	
	B. Frequent backaches	<input type="checkbox"/>	<input type="checkbox"/>	
	C. Back surgery	<input type="checkbox"/>	<input type="checkbox"/>	
	D. Disc disease	<input type="checkbox"/>	<input type="checkbox"/>	
	E. Back injury or strain	<input type="checkbox"/>	<input type="checkbox"/>	
	F. Back x-rays	<input type="checkbox"/>	<input type="checkbox"/>	
	G. Chiropractic treatments	<input type="checkbox"/>	<input type="checkbox"/>	
	H. Arthritis/Rheumatism	<input type="checkbox"/>	<input type="checkbox"/>	
	I. Knee problems	<input type="checkbox"/>	<input type="checkbox"/>	
	J. Swollen joints	<input type="checkbox"/>	<input type="checkbox"/>	
	K. Amputation	<input type="checkbox"/>	<input type="checkbox"/>	
13.	L. Broken Bones Type:	<input type="checkbox"/>	<input type="checkbox"/>	
	M. Dislocations	<input type="checkbox"/>	<input type="checkbox"/>	
	N. Carpal tunnel syndrome	<input type="checkbox"/>	<input type="checkbox"/>	
	O. Repetitive strain extremities	<input type="checkbox"/>	<input type="checkbox"/>	
	A. Ulcers	<input type="checkbox"/>	<input type="checkbox"/>	
	B. Colitis	<input type="checkbox"/>	<input type="checkbox"/>	
	C. Diarrhea (frequent)	<input type="checkbox"/>	<input type="checkbox"/>	
	D. Stomach problems	<input type="checkbox"/>	<input type="checkbox"/>	
	E. Vomiting	<input type="checkbox"/>	<input type="checkbox"/>	
	F. Bloody bowel movements	<input type="checkbox"/>	<input type="checkbox"/>	
	G. Hepatitis/Abdominal liver enzymes	<input type="checkbox"/>	<input type="checkbox"/>	
H. Cirrhosis	<input type="checkbox"/>	<input type="checkbox"/>		
I. Yellow jaundice	<input type="checkbox"/>	<input type="checkbox"/>		
J. Gallbladder trouble	<input type="checkbox"/>	<input type="checkbox"/>		
14.	A. Epilepsy/seizures	<input type="checkbox"/>	<input type="checkbox"/>	
	B. Fainting spells	<input type="checkbox"/>	<input type="checkbox"/>	
	C. Loss of consciousness	<input type="checkbox"/>	<input type="checkbox"/>	
	D. Dizziness or vertigo	<input type="checkbox"/>	<input type="checkbox"/>	
	E. Frequent exhaustion	<input type="checkbox"/>	<input type="checkbox"/>	
	F. Trouble with nerves	<input type="checkbox"/>	<input type="checkbox"/>	
	G. Frequent worry/depression	<input type="checkbox"/>	<input type="checkbox"/>	
15.	A. Kidney trouble/stones	<input type="checkbox"/>	<input type="checkbox"/>	
	B. Bladder trouble	<input type="checkbox"/>	<input type="checkbox"/>	
	C. Kidney/bladder surgery	<input type="checkbox"/>	<input type="checkbox"/>	
	D. Blood in urine	<input type="checkbox"/>	<input type="checkbox"/>	
	E. Difficulty urinating	<input type="checkbox"/>	<input type="checkbox"/>	
16.	A. Venereal disease	<input type="checkbox"/>	<input type="checkbox"/>	
	B. Infertility/difficulty conceiving	<input type="checkbox"/>	<input type="checkbox"/>	
	C. Children with birth defects	<input type="checkbox"/>	<input type="checkbox"/>	
17. Female	A. Irregular period/painful menstruation	<input type="checkbox"/>	<input type="checkbox"/>	
	B. Hysterectomy	<input type="checkbox"/>	<input type="checkbox"/>	
	C. Are you pregnant?	<input type="checkbox"/>	<input type="checkbox"/>	
	D. Difficulty becoming pregnant	<input type="checkbox"/>	<input type="checkbox"/>	
	E. Date of last menstrual period	Date:		
	F. Date of last pelvic/pap smear	Date:		
	G. Date of last mammogram	Date:		
	H. Breast lumps	<input type="checkbox"/>	<input type="checkbox"/>	
	I. Breast discharge	<input type="checkbox"/>	<input type="checkbox"/>	
	J. Repeated miscarriages	<input type="checkbox"/>	<input type="checkbox"/>	
18. Male	A. Inability to have an erection	<input type="checkbox"/>	<input type="checkbox"/>	
	B. Discharge or bleeding from the penis	<input type="checkbox"/>	<input type="checkbox"/>	
	C. Abnormal testicular self examination	<input type="checkbox"/>	<input type="checkbox"/>	
	D. Prostate problems	<input type="checkbox"/>	<input type="checkbox"/>	

Describe any "Yes" responses by number: _____

Are you currently unable to perform any type of activity? Yes No Describe: _____

III.**Social History****Yes No**

1. Do you now or in the past month ever smoked cigarettes? Yes No
2. Have you ever smoked cigarettes in the past? Yes No
3. If you now smoke or have smoked in the past, how many years total have you smoked? _____
4. If you now smoke or have smoked in the past, how many packs/day do/did you smoke on average?

<input type="checkbox"/> Less than one-half	<input type="checkbox"/> Two	<input type="checkbox"/> Three
<input type="checkbox"/> One	<input type="checkbox"/> Two and one-half	<input type="checkbox"/> More than three
<input type="checkbox"/> One and one-half		
5. Do you use any one of the following tobacco products?

<input type="checkbox"/> Pipe tobacco	<input type="checkbox"/> Snuff	<input type="checkbox"/> None
<input type="checkbox"/> Smokeless tobacco	<input type="checkbox"/> Cigars	
6. Do you regularly drink alcoholic beverages? Yes No
7. If yes, how many drinks, beers or glasses of wines do you drink daily?

<input type="checkbox"/> Less than 1	<input type="checkbox"/> 3-4	<input type="checkbox"/> 7-8
<input type="checkbox"/> 1-2	<input type="checkbox"/> 5-6	<input type="checkbox"/> More than 8
8. Do you exercise strenuously for at least 45 min.?

<input type="checkbox"/> Daily	<input type="checkbox"/> 1 time a week	<input type="checkbox"/> Never
<input type="checkbox"/> 3 times a week	<input type="checkbox"/> Rarely	
9. Do you feel frustrated, stressed or uptight?

<input type="checkbox"/> Daily	<input type="checkbox"/> 1 time a week	<input type="checkbox"/> Never
<input type="checkbox"/> 3 times a week	<input type="checkbox"/> Rarely	
10. Do you eat greasy or fatty foods?

<input type="checkbox"/> Daily	<input type="checkbox"/> 1 time a week	<input type="checkbox"/> Never
<input type="checkbox"/> 3 times a week	<input type="checkbox"/> Rarely	

V.**Past Medical History****For Annual or Exit Exam – Indicate if There Has Been a Change Since Last Exam**

1. Are you currently being treated for illness or injury? Yes No
2. Have you been treated for persistent illness or injury? Yes No
3. Describe any "yes" responses: _____
4. Please list hospital admissions: If none, check here

Year	Reason for Hospitalization
_____	_____
_____	_____
_____	_____
5. Please list allergies to any medication, food, clothing, bee stings or other substances: _____
6. How many days of work did you miss in the last 12 months due to your health? _____
7. Have you ever pursued a compensation claim or received disability payment for an occupational injury or disease? Yes No
8. Have you ever been turned down for life insurance? Yes No
9. Have you ever had injuries from an auto accident? Yes No

VI. Current Medications

Fill out the following questions for any exam type.

When was your last tetanus immunization booster? Month: _____ Year: _____

Do you currently have prescriptions for drugs or medications? Yes No

Have you ever been addicted to drugs? Yes No

Describe: _____

Have you ever abused prescription medication? Yes No

Describe: _____

Do you take any of the following medications regularly?

Heart medicine	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Aspirin	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Thyroid medicine	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Blood pressure medicine	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Oral medicine for diabetes	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Diuretic (Water pill)	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Insulin for diabetes	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Medicine for seizures	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Nerve or sleeping pill	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Allergy/Asthma medications	<input type="checkbox"/> Yes	<input type="checkbox"/> No

VII. Family History

Fill out the following questions for any exam type. Indicate change since last exam.

Father: Living List Diseases: _____ If deceased, cause of death: _____

Mother: Living List Diseases: _____ If deceased, cause of death: _____

Brother: Living List Diseases: _____ If deceased, cause of death: _____

Sister: Living List Diseases: _____ If deceased, cause of death: _____

Has any member of your immediate family had any of the following?

Cancer	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Diabetes	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Nervousness	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Mental Illness	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Tuberculosis	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Rheumatism	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Kidney Disease	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Heart Disease	<input type="checkbox"/> Yes	<input type="checkbox"/> No			

Continue to Next Section on
Following Page ►

This Page is to Be Completed Only As Initial or Post Offer Exams

VIII. Past Job History

List All Jobs Ever Held Starting With Your First – Include Part Time And Volunteer Work

Name Of Employer	From Mo/Yr	To Mo/Yr	# Hrs Worked Per Week/Shift	Description of Work	Potential Hazards (Dust, Fumes, Chemicals, Heat, Noise, Physical Agents, Metals, Radiation)

IX. Toxic Exposure History

At work or at home, have you ever been significantly exposed to hazardous solvents, hazardous airborne chemicals (e.g. gases, fumes, dust) or have you had significant skin contact with hazardous chemicals?

Yes No

Describe: _____

Have you worked with any of the materials, or under any of the conditions, listed below:

	Yes	No
Asbestos	<input type="checkbox"/>	<input type="checkbox"/>
Silica (e.g. sandblasting)	<input type="checkbox"/>	<input type="checkbox"/>
Coal (e.g. mining)	<input type="checkbox"/>	<input type="checkbox"/>
Grinding	<input type="checkbox"/>	<input type="checkbox"/>
Welding	<input type="checkbox"/>	<input type="checkbox"/>
Asphalt, pitch or tar	<input type="checkbox"/>	<input type="checkbox"/>
Beryllium	<input type="checkbox"/>	<input type="checkbox"/>
Cadmium	<input type="checkbox"/>	<input type="checkbox"/>
Cotton Dust	<input type="checkbox"/>	<input type="checkbox"/>
Pesticides	<input type="checkbox"/>	<input type="checkbox"/>
Fuel	<input type="checkbox"/>	<input type="checkbox"/>
Oils	<input type="checkbox"/>	<input type="checkbox"/>
Lead	<input type="checkbox"/>	<input type="checkbox"/>
Nickel/Chrome	<input type="checkbox"/>	<input type="checkbox"/>
Paint	<input type="checkbox"/>	<input type="checkbox"/>
Microwave/Radio Frequency	<input type="checkbox"/>	<input type="checkbox"/>
Nuclear Radiation/X-Ray	<input type="checkbox"/>	<input type="checkbox"/>
Fiberglass	<input type="checkbox"/>	<input type="checkbox"/>
Plastics	<input type="checkbox"/>	<input type="checkbox"/>
Solvents	<input type="checkbox"/>	<input type="checkbox"/>
Compressed Gases	<input type="checkbox"/>	<input type="checkbox"/>
Aluminum	<input type="checkbox"/>	<input type="checkbox"/>
Iron	<input type="checkbox"/>	<input type="checkbox"/>
Tin	<input type="checkbox"/>	<input type="checkbox"/>
Dusty Environments	<input type="checkbox"/>	<input type="checkbox"/>

Have you ever worked around excessive noise?

Yes No

Where: _____

Have you ever worked in an excessive hot or cold environment? Yes No

Where: _____

Have you ever worked around vibration or with vibrating tools? Yes No

Have you ever worked in a doctor's office, clinic or hospital where you might have had exposure to biohazardous materials? Yes No

Have you ever performed a site assessment on any of the potential hazards listed above in Past Job History? Yes No

Describe: _____

Any other hazardous exposures? Yes No

If yes, describe these exposures: _____

Have you ever lived near a large industrial plant or in areas of excessive air pollution? Yes No

Have you ever been in the military service? Yes No

If yes, were you exposed to biological or chemical agents (either in training or in combat)? Yes No

Have you ever worked on a HAZMAT team? Yes No

List any second jobs or side businesses you have:

List your current and previous hobbies:

Respirator Users Only

**The following two pages only need to be completed by those assigned to use respirators.
If uncertain about respirator use, please complete.**

Respirator Use

	Yes	No
1. Have you ever worn a respirator in the past?	<input type="checkbox"/>	<input type="checkbox"/>
2. If no, go to Question #4. If yes, what type of respirator did you wear:		
<input type="checkbox"/> Disposable particulate filter mask (non-cartridge dust mask)		
<input type="checkbox"/> Half face air purifying respirator		
<input type="checkbox"/> Full face air purifying respirator		
<input type="checkbox"/> Powered air purifying respirator		
<input type="checkbox"/> Supplied air (airline) respirator		
<input type="checkbox"/> Self contained breathing apparatus (SCBA)		
<input type="checkbox"/> Escape only respirator		
3. If you've ever used a respirator, have you ever had any of the following problems:		
Eye irritation	<input type="checkbox"/>	<input type="checkbox"/>
Skin allergies or rashes	<input type="checkbox"/>	<input type="checkbox"/>
Anxiety	<input type="checkbox"/>	<input type="checkbox"/>
General weakness or fatigue	<input type="checkbox"/>	<input type="checkbox"/>
Any other problem or difficulty that interfered with your use of a respirator	<input type="checkbox"/>	<input type="checkbox"/>
Describe: _____		

Heart, Lungs and Other Body Systems

	Yes	No
4. Have you ever had an abnormal EKG (Electrocardiogram) Describe: _____	<input type="checkbox"/>	<input type="checkbox"/>
5. Have you ever had or currently have any of the following cardiovascular or heart problems:		
Heart attack	<input type="checkbox"/>	<input type="checkbox"/>
Stroke	<input type="checkbox"/>	<input type="checkbox"/>
Angina (chest pain)	<input type="checkbox"/>	<input type="checkbox"/>
Heart failure	<input type="checkbox"/>	<input type="checkbox"/>
High blood pressure	<input type="checkbox"/>	<input type="checkbox"/>
Heart arrhythmia	<input type="checkbox"/>	<input type="checkbox"/>
Swelling in your legs or feet (not caused by standing or walking)	<input type="checkbox"/>	<input type="checkbox"/>
Any other heart problem that you have been told about	<input type="checkbox"/>	<input type="checkbox"/>

Heart, Lungs and Other Body Systems (cont.)

	Yes	No
6. Have you ever had surgery of the arteries, coronary bypass or angioplasty? If yes: <input type="checkbox"/> Within the past year <input type="checkbox"/> More than one year ago	<input type="checkbox"/>	<input type="checkbox"/>
7. Have you ever had or currently have any of the following pulmonary or lung problems:		
Asbestosis	<input type="checkbox"/>	<input type="checkbox"/>
Asthma	<input type="checkbox"/>	<input type="checkbox"/>
Chronic bronchitis	<input type="checkbox"/>	<input type="checkbox"/>
Emphysema	<input type="checkbox"/>	<input type="checkbox"/>
Pneumonia	<input type="checkbox"/>	<input type="checkbox"/>
Tuberculosis	<input type="checkbox"/>	<input type="checkbox"/>
Silicosis	<input type="checkbox"/>	<input type="checkbox"/>
Lung cancer	<input type="checkbox"/>	<input type="checkbox"/>
Broken ribs	<input type="checkbox"/>	<input type="checkbox"/>
Pneumothorax (collapsed lung)	<input type="checkbox"/>	<input type="checkbox"/>
Any chest injuries or surgeries	<input type="checkbox"/>	<input type="checkbox"/>
8. Have you <u>ever</u> had seizures (fits)?	<input type="checkbox"/>	<input type="checkbox"/>
9. Have you <u>ever</u> been told you had diabetes (sugar disease)?	<input type="checkbox"/>	<input type="checkbox"/>
10. Have you <u>ever</u> had allergic reactions that interfere with your breathing?	<input type="checkbox"/>	<input type="checkbox"/>
11. Have you <u>ever</u> experienced claustrophobia (fear of closed-in spaces)?	<input type="checkbox"/>	<input type="checkbox"/>
12. Have you <u>ever</u> had trouble smelling odors?	<input type="checkbox"/>	<input type="checkbox"/>
13. Have you <u>ever</u> had or currently have any of the following pulmonary, cardiovascular, lung or heart symptoms?		
Shortness of breath	<input type="checkbox"/>	<input type="checkbox"/>
Shortness of breath when walking on level ground or walking up a slight hill or incline	<input type="checkbox"/>	<input type="checkbox"/>
Shortness of breath when walking with other people at an ordinary pace on level ground	<input type="checkbox"/>	<input type="checkbox"/>
Have to stop for breath when walking at your own pace on level ground	<input type="checkbox"/>	<input type="checkbox"/>
Shortness of breath when washing or dressing yourself	<input type="checkbox"/>	<input type="checkbox"/>
Shortness of breath that interferes with your job	<input type="checkbox"/>	<input type="checkbox"/>

Heart, Lungs and Other Body Systems (cont.)

- | | Yes | No |
|---|--------------------------|--------------------------|
| 14. Do you <u>currently</u> take medication for any of the following problems: | | |
| Breathing | <input type="checkbox"/> | <input type="checkbox"/> |
| Heart trouble | <input type="checkbox"/> | <input type="checkbox"/> |
| Blood pressure | <input type="checkbox"/> | <input type="checkbox"/> |
| Seizures (fits) | <input type="checkbox"/> | <input type="checkbox"/> |
| 15. Have you had or currently have any of the following symptoms of lung illness: | | |
| Coughing that produces phlegm (thick sputum) | <input type="checkbox"/> | <input type="checkbox"/> |
| Coughing that occurs when you are lying down | <input type="checkbox"/> | <input type="checkbox"/> |
| Coughing up blood in the last month | <input type="checkbox"/> | <input type="checkbox"/> |
| Wheezing | <input type="checkbox"/> | <input type="checkbox"/> |
| Wheezing that interferes with your job | <input type="checkbox"/> | <input type="checkbox"/> |
| Chest pain when you breath deeply | <input type="checkbox"/> | <input type="checkbox"/> |
| Coughing that wakes you early in the morning | <input type="checkbox"/> | <input type="checkbox"/> |
| Any other symptoms that you think may be related to lung problems | <input type="checkbox"/> | <input type="checkbox"/> |
| 16. Have you ever had any of the following cardiovascular or heart symptoms: | | |
| Frequent pain or tightness in your chest | <input type="checkbox"/> | <input type="checkbox"/> |
| Pain or tightness in your chest during physical activity | <input type="checkbox"/> | <input type="checkbox"/> |
| Pain or tightness in your chest that interferes with your job | <input type="checkbox"/> | <input type="checkbox"/> |
| In the past two years, have you noticed your heart skipping or missing a beat? | <input type="checkbox"/> | <input type="checkbox"/> |
| Heartburn or indigestion that is not related to eating | <input type="checkbox"/> | <input type="checkbox"/> |
| Any other symptoms that you think might be related to heart or circulation problems | <input type="checkbox"/> | <input type="checkbox"/> |

Full Face or SCBA Respirator User Only

Answer the following questions if you have been selected to use either a full-face piece respirator or Self-Contained Breathing Apparatus [SCBA].

- | | Yes | No |
|---|--------------------------|--------------------------|
| 17. Have you ever lost vision in either eye (temporarily or permanently)? | <input type="checkbox"/> | <input type="checkbox"/> |
| 18. Do you currently have any of the following vision problems? | | |
| Wear contact lenses | <input type="checkbox"/> | <input type="checkbox"/> |
| Wear glasses | <input type="checkbox"/> | <input type="checkbox"/> |
| Color blind | <input type="checkbox"/> | <input type="checkbox"/> |
| Any other eye or vision problem | <input type="checkbox"/> | <input type="checkbox"/> |

Full Face or SCBA Respirator User Only (cont.)

- | | Yes | No |
|---|--------------------------|--------------------------|
| 19. Have you ever had an injury to your ears, including a broken eardrum? | <input type="checkbox"/> | <input type="checkbox"/> |
| 20. Do you currently have any of the following hearing problems: | | |
| Difficulty hearing | <input type="checkbox"/> | <input type="checkbox"/> |
| Wearing a hearing aid | <input type="checkbox"/> | <input type="checkbox"/> |
| Any other hearing or ear problem | <input type="checkbox"/> | <input type="checkbox"/> |
| Describe fully: _____ | | |
| _____ | | |
| _____ | | |
| 21. Have you ever had a back injury? | <input type="checkbox"/> | <input type="checkbox"/> |
| 22. Do you currently have any of the following muscle or skeletal problems: | | |
| Weakness in any of your arms, hands, legs or feet | <input type="checkbox"/> | <input type="checkbox"/> |
| Back pain | <input type="checkbox"/> | <input type="checkbox"/> |
| Difficulty moving your arms and legs | <input type="checkbox"/> | <input type="checkbox"/> |
| Pain or stiffness when you lean forward or backward at the waist | <input type="checkbox"/> | <input type="checkbox"/> |
| Difficulty moving your head up and down | <input type="checkbox"/> | <input type="checkbox"/> |
| Difficulty moving your head side to side | <input type="checkbox"/> | <input type="checkbox"/> |
| Difficulty bending at your knees | <input type="checkbox"/> | <input type="checkbox"/> |
| Difficulty squatting to the ground | <input type="checkbox"/> | <input type="checkbox"/> |
| Difficulty climbing a flight of stairs or a ladder while carrying more than 25 lbs. | <input type="checkbox"/> | <input type="checkbox"/> |
| Any other muscle or skeletal problems that might interfere with using a respirator? | <input type="checkbox"/> | <input type="checkbox"/> |
| Describe fully: _____ | | |
| _____ | | |
| _____ | | |

Continue to Next Section on Following Page ►

X. For Yearly/Exit Examinations Only

- 1a. Approximately how many days of hazardous fieldwork have you performed since your last exam? _____
- 1b. Approximately how many days in Level C (using an air-purifying respirator)? _____
- 1c. Approximately how many days in Level B (self-contained breathing apparatus or air line)? _____
2. Approximately how many different hazardous material sites have you worked on since your last examination? _____
3. What were the chemical or other hazards of concern to which you had or currently have significant potential exposure since your last examination? List chemicals of concern in table below.

Chemicals of Concern	Approximate # of Days	Exposure Frequency			Exposure Duration		
		Daily	Weekly	Monthly	<1 Hr.	1-8 Hr.	> 8 Hrs.

4. Since your last exam, have you had difficulty doing your job, because of:
 - a. Sensitivity to chemicals, dust, sunlight, etc.? Yes No Don't Know
 - b. Inability to perform certain motions? Yes No Don't Know
 - c. Inability to assume certain positions? Yes No Don't Know
 - d. Heat stress? Yes No Don't Know
 - e. Other medical reasons? Yes No Don't Know
5. Have you experienced any health symptoms that may be related to exposures to hazardous materials since your last examination? If so, please describe: _____

6. Since your last examination, have you had any type of illness that resulted in more than 3 consecutive days lost time from work? Yes No
Describe: _____

7. Do you feel that you have and/or had exposure to ticks? Yes No When: _____
How would you quantify the exposure: Very significant Significant Insignificant None Unknown

8. Have you ever had any symptoms or signs (e.g. rash) which you attribute to tick bites? Yes No
If yes, please describe: _____

- 9a. How would you rate the effectiveness of the health and safety procedures used for work? (Check only one.)
 Poor Fair Good Excellent

9b. Comments: _____

10. Have you ever had an illness, condition or symptom which:
 - Occurred only during work? Yes No
 - Occurred only after work, in evening? Yes No
 - Occurred when you begin work after a weekend or holiday? Yes No
 - Disappeared during vacations or weekends? Yes No

11. Have you ever developed an illness or symptoms that you think were related to work? Yes No
12. Have you ever worked with a substance that made your nose, chest or sinuses congested? Yes No
13. Have you ever worked with substances that irritated your skin or caused a rash? Yes No

STOP! Physicians Complete the Remaining Sections.

Physical Examination and Supporting Studies

(Please initial on Authorization Form when completed.)

Height

_____ Inches

Weight

_____ lbs.

Temperature

_____ °

Blood Pressure

_____ / _____

Pulse (Resting)

_____ / min.

For DOT only: Pulse immediately after 2 min. exercise: _____

Vision

Visual acuity: If applicant wears glasses, test and record both with and without glasses.

Near

	Left	Right	Both
Corrected	20/____	20/____	20/____
Uncorrected	20/____	20/____	20/____

Color Vision

Normal
Abnormal
Can recognize red & green

Far

	Left	Right	Both
Corrected	20/____	20/____	20/____
Uncorrected	20/____	20/____	20/____

Peripheral Vision

Normal
Abnormal

Urinalysis

Specified Gravity: _____ Albumin: _____ Female LMP: _____
Sugar: _____ Blood: _____

Audiogram (If marked yes on Exam Checklist.)

	500	1000	2000	3000	4000	6000	8000
Right:	_____	_____	_____	_____	_____	_____	_____
Left:	_____	_____	_____	_____	_____	_____	_____

(Note: Testing documentation must be forwarded to WorkCare.)

Spirometry (If marked yes on Exam Checklist.)

FVC _____ Observed Vol. FEV₁ _____ Observed Vol. $\frac{FEV_1}{FVC}$ _____ %

FVC _____ Predicted % _____ FEV₁ _____ Predicted % _____

(Note: Testing documentation must be forwarded to WorkCare.)

EKG (If marked yes on Exam Checklist.)

Normal Abnormal

(Note: All EKG strips must be forwarded to WorkCare.)

Chest X-Ray (If marked yes on Exam Checklist.)

Normal Abnormal

Comments: _____

Specimen Collection Per Exam Checklist

All laboratory specimens must be shipped by the day of the exam! If this is a Friday exam, mark air bill for Saturday delivery. Exam data should be included for shipment in the box with the laboratory specimens.

Medical Examination

Checklist	Normal	Abnormal	Detailed Description of Abnormal Findings
Hands / Skin Hair Skin Color / Texture Nails	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Head / Eyes / Nose / Throat / Mouth Configuration Lids / Conj / Sclera Pupils / Fundi / EOM Nasal Septum / Mucosa Teeth / Gums / Tongue / Palate	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Nervous System Central Motor Sensory Cerebellar Reflexes	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Neck / Nodes Bruit ROM Muscle Strength Thyroid Cervical Nodes Inguinal / Axillary Nodes	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Chest / Lungs Shapes / Symmetry Diaphragmatic Excursion Percussion Auscultation	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Cardiovascular Carotids Neck Veins / Pulses Heart Sounds (Murmurs) Heart Size	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Gastro / Intestinal Liver Spleen Masses Tenderness Scars Hernia	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Musculoskeletal / Extremities Spinal Alignment Extremities (Edema, Varicosities) Joints ROM	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Comments:			
Examining Physician (Print):	Physician Signature:	Date:	

Summary of Findings and Comments Relevant to Abnormal Conditions

Signature of Licensed Examining Physician: _____

Printed Name: _____ Phone: (____) _____

Summary of Findings and Comments Relevant to Abnormal Conditions

1. The results of the required testing should be recorded on page 11.
2. Please be sure to note EKG and chest x-ray readings on **Normal** or **Abnormal** on page 11, if required for this exam.
3. Please review any **Yes** answers **ONLY** for questions on pages 4, 5, 7, 8 and 9 of this booklet. You are not required to review the other history questions.
4. Your physical examination findings should be recorded on page 12 and 13.
5. The booklet and any specimens must be shipped to our laboratory **THE DAY OF THE EXAM.**

**Please answer all the questions in this booklet.
If you have any questions, please call 1-800-455-6155.**





Health, Safety and Environment
MEDICAL SURVEILLANCE
EVALUATION

Attachment 024-2 NA

Issue Date: February 2001
Revision 9: March 2012

This information will be used to determine routine medical screening exams for employees who work outside of an office setting. In addition, site-specific health and safety plans may specify project-related medical surveillance for regulated substances.

Please answer each entry:

Date: _____

Name: _____

Phone #: _____

Employee #: _____

Job Title: _____

Location: _____

Business: _____

Region/Business Unit: _____

Supervisor: _____

HSE Representative: _____

Choose One:

- New employee Current employee with job change
- Transfer from _____ OFFICE

The following questions assess federally mandated medical screenings and surveillance requirements:

Respirator	<input type="checkbox"/> Yes <input type="checkbox"/> No	Does your job require you to wear a respirator or to be certified for respirator use? If yes, how many days per year? <input type="checkbox"/> 1-29 <input type="checkbox"/> 30+
Hearing	<input type="checkbox"/> Yes <input type="checkbox"/> No	Does your job require you to wear hearing protection because you: a) Work in an environment where noise levels equal or exceed an 8-hour time-weighted average of 85 decibels? b) Perform construction activities or construction management around heavy equipment on a construction project more than 50 percent of the time?
Asbestos	<input type="checkbox"/> Yes <input type="checkbox"/> No	Do you perform intrusive work with asbestos (i.e., sampling, demolition, etc.)?



Health, Safety and Environment
**MEDICAL SURVEILLANCE
EVALUATION**

Attachment 024-2 NA

Issue Date: February 2001
Revision 9: March 2012

Lead	<input type="checkbox"/> Yes <input type="checkbox"/> No	Are you currently performing construction work where you may be exposed to airborne lead concentration at or above the OSHA action level or are you currently in a job that requires you to be in a medical surveillance program for lead (i.e., removal of lead-based paint or other demolition activities)?
Radiation	<input type="checkbox"/> Yes <input type="checkbox"/> No	Are you classified as a radiation worker?
DOT Driver	<input type="checkbox"/> Yes <input type="checkbox"/> No	Do you drive a truck with a gross vehicle weight rating of 10,000 pounds or more during company trips?
Diving	<input type="checkbox"/> Yes <input type="checkbox"/> No	Do you perform diving activities?
Biohazard	<input type="checkbox"/> Yes <input type="checkbox"/> No	Does your job require work with bloodborne pathogens?
Remediation	<input type="checkbox"/> Yes <input type="checkbox"/> No	Do you perform remediation construction activities, field construction sampling, or supervision activities at hazardous waste remediation sites or hazardous waste treatment, storage, or disposal (TSD) facilities that could expose you to hazardous substances above permissible exposure levels (i.e., work in exclusion zones)? If yes, how many days per year? <input type="checkbox"/> 1-29 <input type="checkbox"/> 30+
Field and Lab	<input type="checkbox"/> Yes <input type="checkbox"/> No	Answer Yes if you do ANY of the following: a) Work at HAZWOPER sites 1 to 29 days per year b) Perform waste disposal activities c) Perform non-HAZWOPER environmental sampling d) Work in a chemistry laboratory 30 or more days per year e) Work on a pilot plant project 30 or more days per year f) Conduct bench-scale operations 30 or more days per year
Other	<input type="checkbox"/> Yes <input type="checkbox"/> No	Site- or project-specific biological monitoring or toxicological screening as specified by the project-specific health and safety plan.

Distribution:

- Supervisor
 HSE Representative

Employee Signature

Date

Supervisor Signature

Date



Health, Safety and Environment

Attachment 024-3 NA

**MEDICAL SCREENING and SURVEILLANCE
EXAM PROTOCOL**

Issue Date: February 2001
Revision 9: March 2012

PROTOCOL	HAZWOPER (Baseline or Preassignment Baseline)	HAZWOPER (Annual or Biennial)	HAZWOPER (Exit)	DIVING (Baseline and Biennial)	DOT Driver Certification (Baseline and Biennial)	ASBESTOS (Baseline, Annual, and Exit)	SILICA (Baseline and Biennial)	RESPIRATOR (Baseline and Biennial)
Medical History & Respiratory Questionnaire	X	X	X	X	X	X	X	X
Medical Exam	X	X	X	X	X	X	X	If indicated by questionnaire
Physical Exam (height, weight, pulse, oral temperature, blood pressure)	X	X	X	X	X	X	X	
Vision	X	X	X	X	X	X	X	
Urinalysis	X	X	X	X	X		X	
Audiogram (hearing test)	X	X	X	X	X	If indicated by project noise levels	X	
Spirometry (pulmonary function test)	X	X	X	X		X	X	Every 2 years
Electrocardiogram (EKG)								
< Age 40				Every 2 years				
Age < or = 50	X	Every 4 years		X			Every 4 years	
Age 50+	X	Every 2 years		X			Every 2 years	
Chest x-ray (one view)								
Age < or = 50	X	Every 4 years	If symptomatic or due on periodic	X		Baseline and every 5 years per 1910.1001	Baseline and Annual if 20+ years of silica exposure or Biennial if <20 years silica exposure	
Age 50+	X	Every 2 years	If symptomatic or due on periodic	X		Baseline and every 2-5 years per 1910.1001		
B-reader						X	X	
Complete Blood Count with White Cell Differential	X	X	X	X			X	
Blood Chemistry Panel	X	X	X	X			X	
Other				Sickle Cell (Baseline) Treadmill Stress Test (Baseline & Biennial after age 40)		OSHA Asbestos Questionnaire (Initial/Periodic)	OSHA Silica Questionnaire (Initial/Periodic) TB Skin Test (MSHA regulated sites)	

Note: Additional entry, periodic, and exit biological monitoring or toxicological screening may be indicated in the project-specific health and safety plan. Examples include blood lead/ZPP, serum/RBC cholinesterase, urine heavy metals (arsenic, cadmium, mercury, chromium, or beryllium), urine radiation (thorium, uranium), biological vaccinations (hepatitis A/B, tetanus), blood benzene, blood beryllium LPT, etc. Substance abuse testing is not included in the medical screening and surveillance program. Please consult the business-specific substance abuse testing program for more information.



Health, Safety and Environment

Attachment 024-3 NA

**MEDICAL SCREENING and SURVEILLANCE
EXAM PROTOCOL**

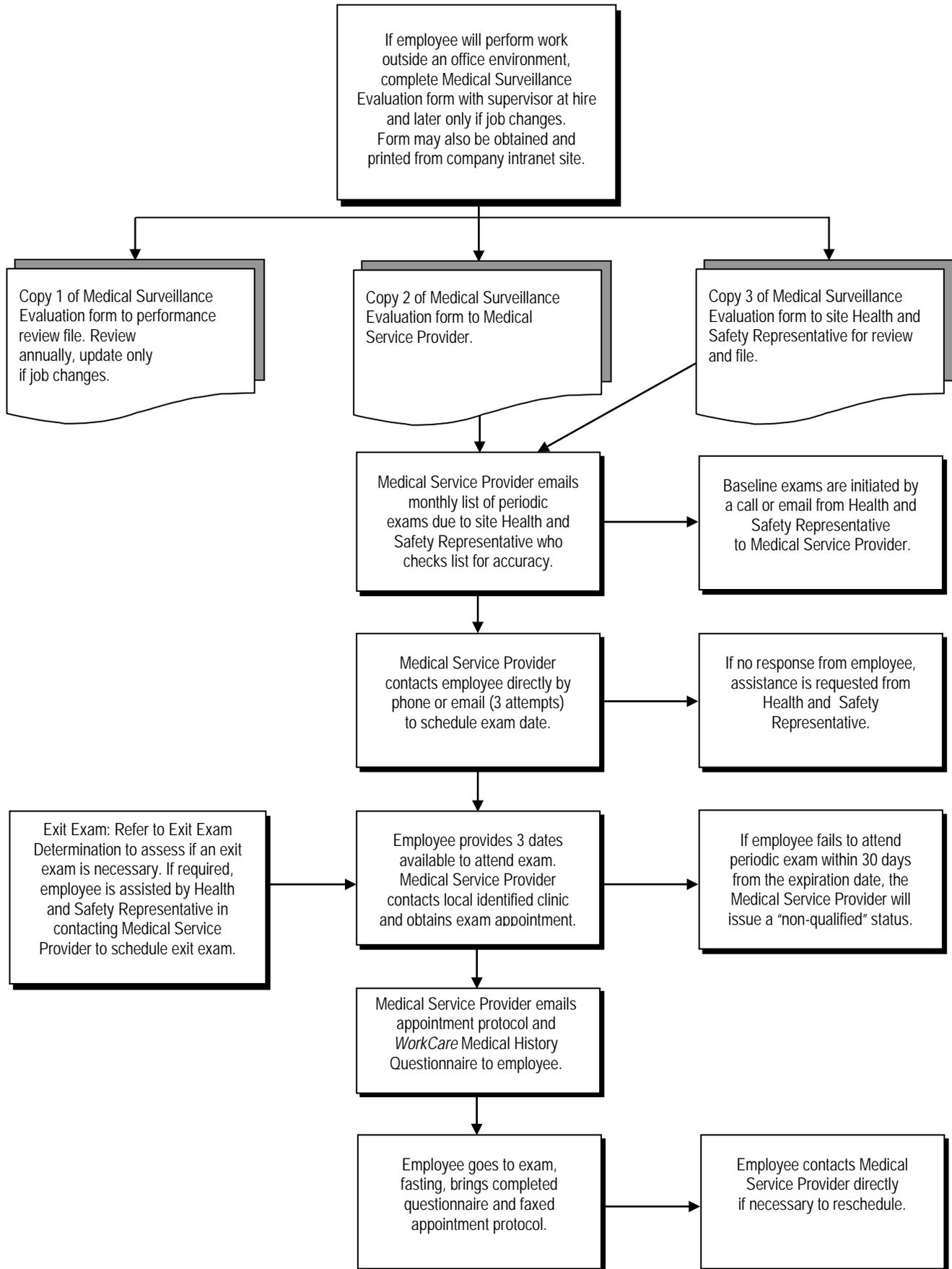
Issue Date: February 2001
Revision 9: March 2012

PROTOCOL	Hearing Conservation (Annual)	Cadmium (Annual/Exit)	Hexavalent Chromium (Annual/Exit)	Engine Run (Biennial)	Fuel Cell (Annual)	Ground Physical (Every 5 years)	Flight Deck Critical/Non-Critical (Annual)	Flight Deck Critical (Annual)
Medical History & Respiratory Questionnaire		X	X	X	X	X	X	X
Medical Exam		X	X	X	X	X	X	X
Physical Exam (height, weight, pulse, oral temperature, blood pressure)		X	X	X	X	X	X	X
Vision				X	X		X (near/far/depth)	X (Near/far/color/depth)
Urinalysis		X		x	X			
Audiogram (hearing test)	X			X	X		X	
Spirometry (pulmonary function test)		X	X		X			
Electrocardiogram (EKG)								
< Age 40								
Age < or = 50				X				Age >40
Age 50+				X				
Chest x-ray (one view)								
Age < or = 50				X				
Age 50+				X				
B-reader								
Complete Blood Count with White Cell Differential					X			
Blood Chemistry Panel		X			X			Lipid panel if age >40
Other	Hearing Conservation Questionnaire	Cadmium Panel	Urine Chromium					Ordinance Questionnaire, Drug Screen, Tonometry after 40 years of age and if indicated by exam, MD to sign Ordinance card



**MEDICAL SCREENING and SURVEILLANCE
EXAM PROTOCOL**

PROTOCOL	CRANE OPERATOR (Annual)	AIR TRAFFIC CONTROLLER (Annual)	CDF ORDINANCE Physicals (Annual)	NAVAL ORDINANCE Physicals (biennial)	LASER EYE EXAM	FORKLIFT Physicals (every 3 years)
Medical History & Respiratory Questionnaire	X	X	X	X		X
Medical Exam	X	X	X	X		X
Physical Exam (height, weight, pulse, oral temperature, blood pressure)	X	X	X	X		X
Vision	X (near/far/color/ depth)	X	x	X		X (visual acuity, color, depth, perception and peripheral fields)
Urinalysis	X					X
Audiogram (hearing test)	X	X	X			X
Spirometry (pulmonary function test)			X			X
Electrocardiogram (EKG)						
< Age 40		Baseline only	X			X
Age < or = 50			X	>40		X
Age 50+			X			X
Chest x-ray (one view)						
Age < or = 50		Baseline only	Baseline/exit			
Age 50+			X			
B-reader						
Complete Blood Count with White Cell Differential			X			
Blood Chemistry Panel			X	Lipid panel if age >40		X
Other	Hearing Conservation Questionnaire	Waist circumference Fasting blood sugar, drug screen	Ordinance PPE eval (work in heat), pupil size and reactivity	Ordinance Questionnaire, Drug Screen Tonometry after 40 years of age and if indicated by exam, MD to sign Ordinance card	Retinal Mapping	

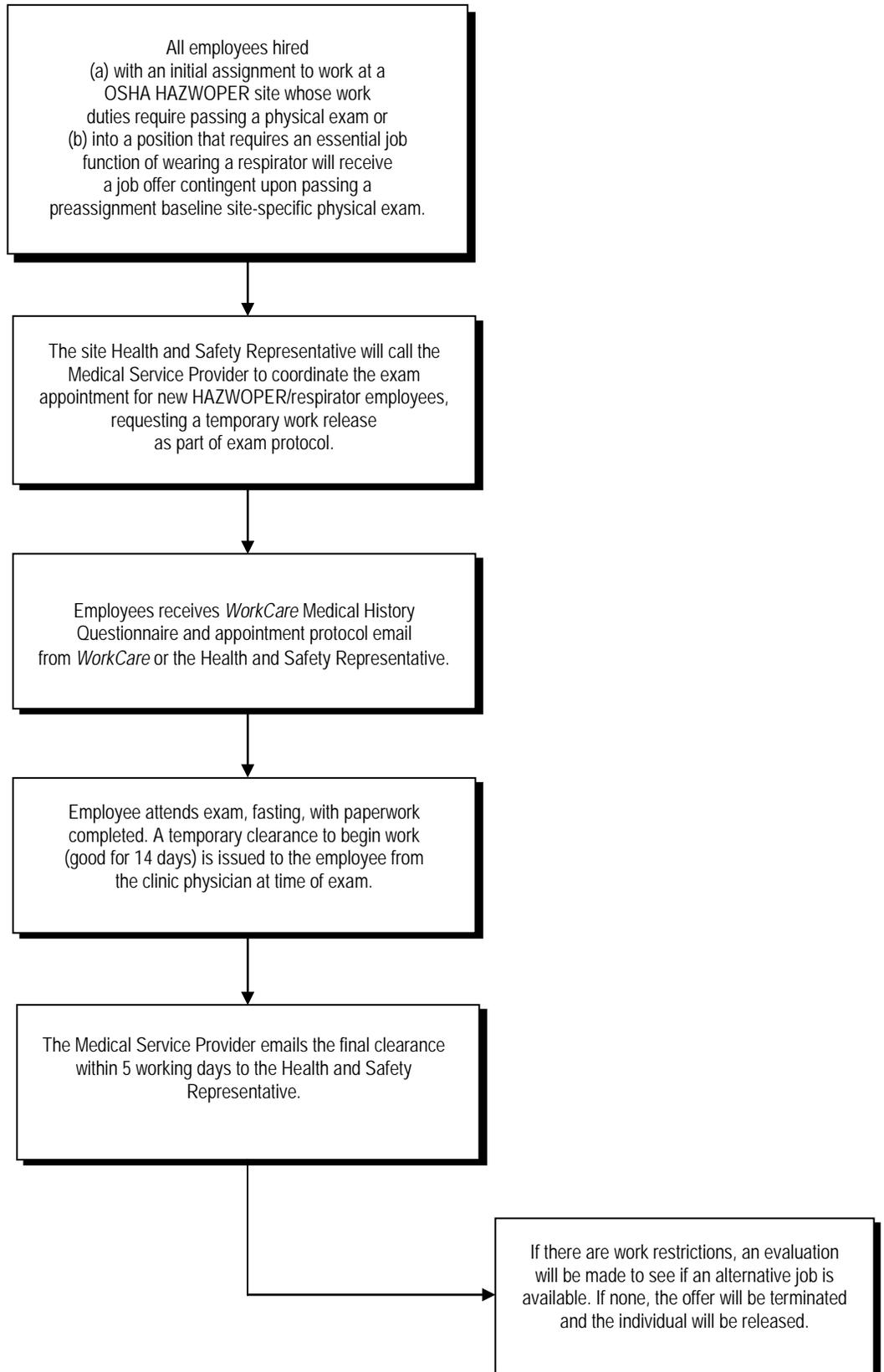


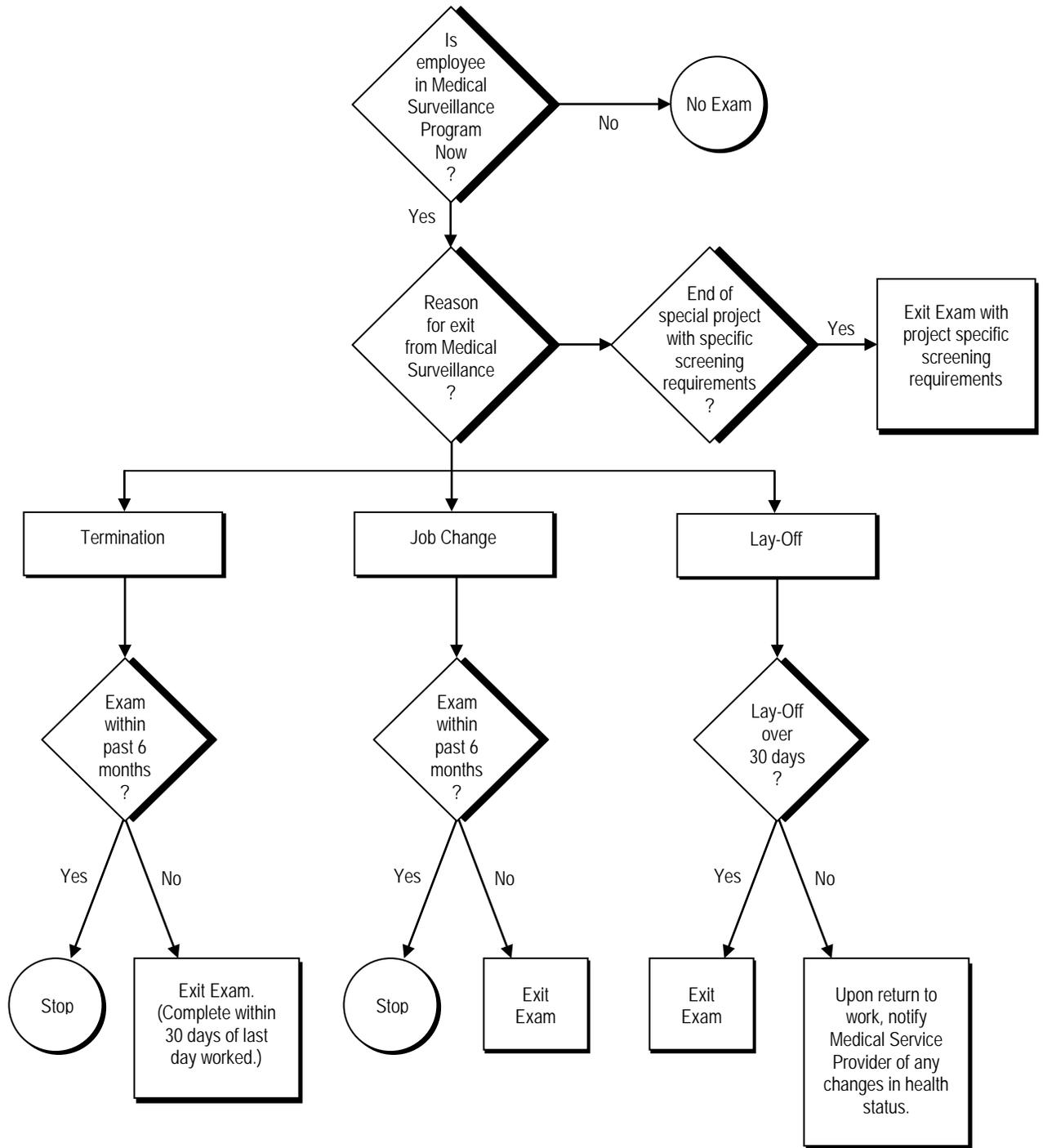


Health, Safety and Environment
**HAZWOPER AND RESPIRATOR
PRE-ASSIGNMENT BASELINE
EXAM PROTOCOL**

Attachment 024-5 NA

Issue Date: February 2001
Revision 9: March 2012





Note: Exit exams from Medical Service Provider or previous employer may be used for review as a URS Corporation baseline exam if completed within the past 3 months. A *WorkCare* Medical History Questionnaire is completed by the employee and submitted with a copy of the previous exam for physician review and approval.



Health, Safety and Environment
**WAIVER OF EXIT MEDICAL
SURVEILLANCE EXAM**

Attachment 024-7 NA

Issue Date: February 2001
Revision 9: March 2012

I have been a participant in URS' Medical Screening and Surveillance Program, which entitles me to an exit medical surveillance exam upon reassignment to a position that does not require medical clearance or termination of my employment. I understand that URS encourages employees to schedule and complete an exit medical exam; however, I voluntarily relinquish the opportunity to have an exit medical exam.

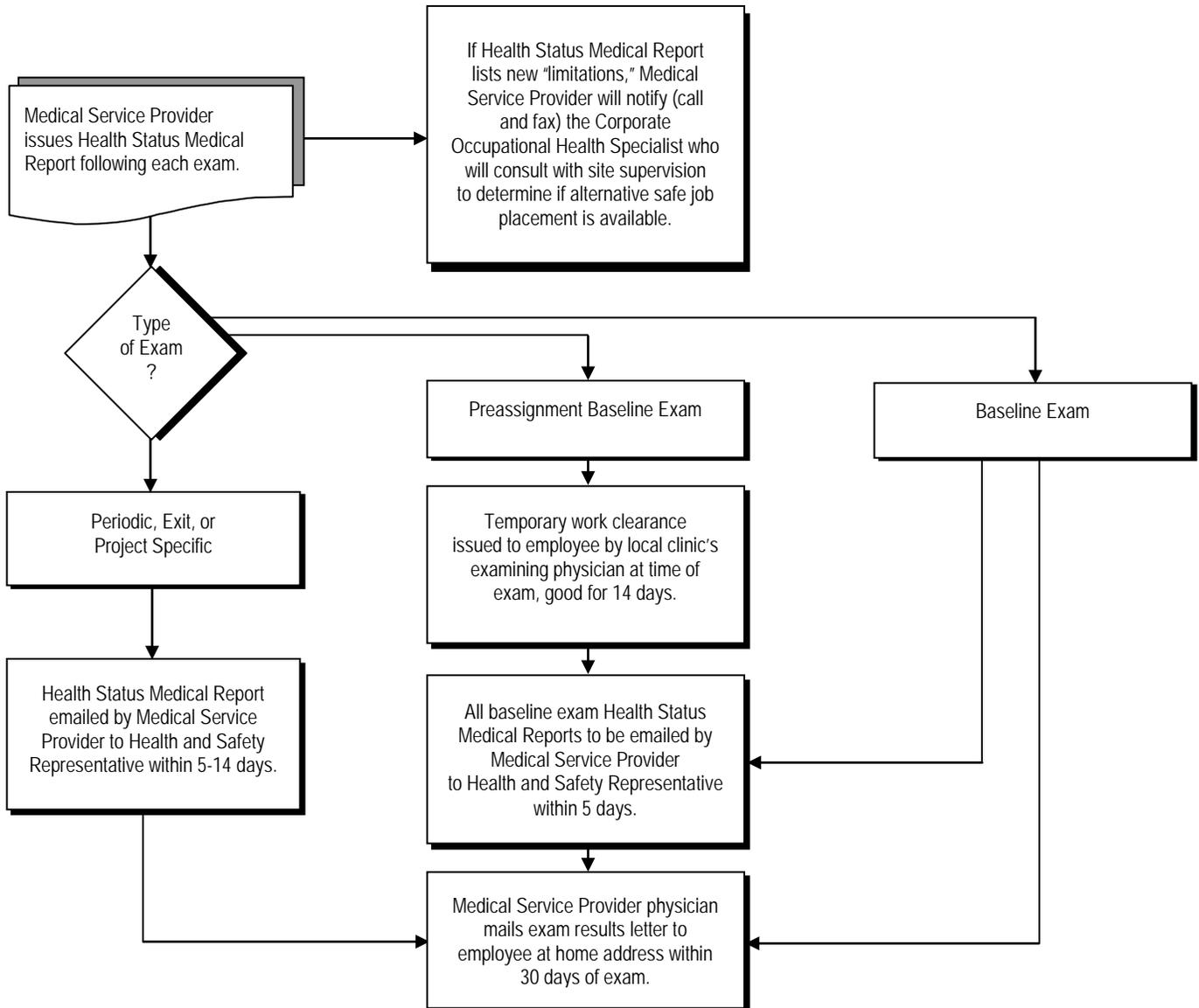
Name

Employee Number

Date

Employee Signature

Medical Surveillance Exam Clearances



URS Safety Management Standard

New Employee Health, Safety, and Environment Orientation

1. Applicability

This standard is applicable to newly hired personnel for the operations of URS Corporation and its subsidiary companies.

2. Purpose and Scope

The New Employee Health and Safety Orientation is designed to introduce new employees to the URS Corporation Health, Safety, and Environment (HSE) Management System. The orientation is intended to be a brief overview and does not take the place of task-, program-, or project-specific health and safety training. In the course of the orientation, the employee's direct supervisor will determine which additional training courses the new employee must complete prior to being assigned to specific job tasks.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility, site, or project location.

4. Requirements

- A. All employees should receive an orientation the following topics as soon as feasible after hire, regardless of their proposed working environment:
 - 1. The URS Corporation Health, Safety, and Environment (HSE) Management System.
 - a. HSE Policy.
 - b. HSE philosophy and employee responsibilities.
 - c. Health and safety organization and responsibilities.
 - d. HSE website.
 - 2. Incident reporting requirements, including a review of Safety Management Standard (SMS) 049 – Injury/Illness/Incident Reporting and Notifications.
 - a. Report all work-related injuries, illnesses, property damage events, environmental releases, business interruptions, and near misses to your supervisor and/or HSE representative immediately.

URS Safety Management Standard
New Employee Health, Safety, and Environment Orientation

- b. The need for accurate completion of incident report forms.
 - c. The need for cooperation with investigative procedures.
 - d. Appropriate methods of incident report distribution, per Business requirements.
3. Medical screening and surveillance requirements, including a review of SMS 024 – Medical Screening and Surveillance.
- a. Describe program requirements.
 - b. Determine applicability to new employee.
 - c. Explain worker’s compensation claim process.
4. Behavior-Based Safety (BBS) principles, including a review of SMS 072 – Behavior Based Safety (where utilized).
- a. The value of BBS.
 - b. The behavior observation process.
5. The Short Service Employee (SSE) program, including a review of SMS 078 – Short Service Employee (where utilized).
- a. Limitations of SSEs.
 - b. Assignment of a mentor.
 - c. SSE status schedule.
 - d. Variance requirements.
6. Vehicle safety requirements, including a review of SMS 057 – Vehicle Safety Program.
- a. Requirements for vehicle safety training.
 - b. Guidelines for safe operation of company vehicles.
 - c. Policies on distracted driving.

URS Safety Management Standard
New Employee Health, Safety, and Environment Orientation

7. Health and safety training programs.
 - a. Review training background.
 - b. Obtain copies of training certificates.
 - c. Assign training courses as required by work location and assignment.
- B. For employees who will work primarily from a URS office, address the following general safety issues as soon as feasible after the hire date:
 1. Office Emergency Action Plan.
 - a. Evacuation routes and assembly areas.
 - b. Location of fire extinguishers/alarms.
 - c. Office layout.
 2. Reporting unsafe or unhealthful working conditions.
 3. Reporting injuries and emergencies.
 - a. What to do in an emergency.
 - b. Whom to call or contact in an emergency.
 4. General office safety.
 - a. Housekeeping.
 - b. Storage issues.
 - c. Slips, trips, and falls.
 - d. Workplace security.
 5. Health and safety committees (where applicable).
 - a. Describe committee organization.
 - b. Meet committee chair.
 6. Office ergonomics, including a review of SMS 054 – Office Ergonomics.

URS Safety Management Standard
New Employee Health, Safety, and Environment Orientation

- a. How to set up an ergonomically correct workstation.
 - b. When to report ergonomics concerns/injuries.
- 7. Substance abuse prevention.
 - a. Random testing.
 - b. For-cause and accident testing.
 - c. Government-mandated testing.
- C. For employees who will work primarily from a project site, address the following general safety issues:
 - 1. Obtaining and reviewing Health and Safety Plans, and Safe Work Plans.
 - a. Describe the applicable Hazard Analysis Process.
 - b. Develop Job Safety Analyses (JSA).
 - c. Discuss individual responsibility for safe work.
 - 2. Obtaining personal protective clothing and equipment.
 - a. Review SMS 029 – Personal Protective Equipment (PPE).
 - b. Describe the process for obtaining PPE.
 - 3. Emergency action plans.
 - a. Evacuation alarms.
 - b. Emergency procedures.
 - c. Emergency phone numbers/contacts.
 - d. Location of first aid/emergency medical services.
 - e. Muster/assembly points.
 - 4. Site orientation.
 - a. Site layout/parking areas/access roads.

URS Safety Management Standard
New Employee Health, Safety, and Environment Orientation

- b. Site offices.
 - c. Break areas/smoking permitted areas.
 - d. PPE/tool/equipment storage locations.
 - e. Methods/locations for identifying hazardous and restricted areas.
5. Hazards unique to the project site.
- a. Physical hazards.
 - b. Chemical hazards.
 - c. Biological hazards.
 - d. Radiological hazards.
 - e. Client operations.
 - f. Traffic hazards and restrictions.
6. Task-specific hazards (e.g., falls, confined spaces, excavations, hot work, electrical, working near water).
7. Project-specific requirements.
- a. Site training requirements.
 - b. Drug testing requirements.
- D. Online training is available to assist in performing new employee orientations. Training modules for new employees are available through the URS Learning Management System (LMS) for Infrastructure & Environment employees and through Knowledgewire for Energy & Construction employees.

URS Safety Management Standard
New Employee Health, Safety, and Environment Orientation

5. Documentation Summary

The following documentation will be maintained:

- A. Completed New Employee Safety Orientation Checklist (Attachment 025-1 NA).
- B. Copies of applicable training certificates.

6. Resources

- A. URS Corporation [Health, Safety, and Environment Management System](#)
- B. Office-specific Emergency Action Plan (EAP)
- C. Project-specific Health and Safety Plan (HASP) or Safe Work Plan (SWP)
- D. [SMS 024](#) – Medical Screening and Surveillance
- E. [SMS 029](#) – Personal Protective Equipment
- F. [SMS 049](#) – Injury/Illness/Incident Reporting and Notifications
- G. [SMS 054](#) – Office Ergonomics
- H. [SMS 057](#) – Vehicle Safety Program
- I. [SMS 072](#) – Behavior Based Safety
- J. [SMS 078](#) – Short Service Employee
- K. [Attachment 025-1 NA](#) - New Employee Health, Safety and Environment Orientation Checklist



Health, Safety and Environment
**NEW EMPLOYEE
HSE ORIENTATION CHECKLIST**

Attachment 025-1 NA
Issue Date: July 2000
Revision 3: December 2009

Employee: _____ Employee #: _____

Business Unit: _____ Date: _____

GENERAL SAFETY	Completed (☑)
URS Health, Safety, and Environment Management System	
• Health, Safety, and Environment (HSE) Policy	<input type="checkbox"/>
• HSE philosophy and employee responsibilities	<input type="checkbox"/>
• Health and safety organization and responsibilities	<input type="checkbox"/>
• HSE website	<input type="checkbox"/>
Incident/Near Miss Reporting Requirements	
• Immediately report incidents and near misses to supervisor	<input type="checkbox"/>
• Correct completion of incident report forms	<input type="checkbox"/>
• Appropriate methods of report distribution	<input type="checkbox"/>
Medical Screening and Surveillance	
• Program requirements	<input type="checkbox"/>
• Applicability to new employee	<input type="checkbox"/>
• Drug testing requirements	<input type="checkbox"/>
• Worker's compensation claim process	<input type="checkbox"/>
Behavior Based Safety (BBS) (where utilized)	
• Value of BBS	<input type="checkbox"/>
• Behavior observation processes	<input type="checkbox"/>
Short Service Employee (SSE) Program	
• Limitations on SSEs	<input type="checkbox"/>
• Assignment of mentors	<input type="checkbox"/>
• SSE status schedule	<input type="checkbox"/>
• Variance requirements	<input type="checkbox"/>
Vehicle Safety Requirements	
• Training requirements	<input type="checkbox"/>
• Guidelines for the safe operation of company vehicles	<input type="checkbox"/>
• Policies on distracted driving (e.g. no use of cell phone while driving)	<input type="checkbox"/>
Health and Safety Training Program	
• Review training background	<input type="checkbox"/>
• Obtain copies of training certificates	<input type="checkbox"/>
• Assign training courses appropriate for work location and assignment	<input type="checkbox"/>
OFFICE SAFETY	
Emergency Action Plans	
• Evacuation routes and assembly areas	<input type="checkbox"/>
• Fire extinguishers/alarms	<input type="checkbox"/>
• Office layout	<input type="checkbox"/>



Health, Safety and Environment
**NEW EMPLOYEE
HSE ORIENTATION CHECKLIST**

Attachment 025-1 NA
Issue Date: July 2000
Revision 3: December 2009

General office safety	
• Report unsafe working conditions	<input type="checkbox"/>
Health and Safety Committees (where applicable)	
• Describe committee organization	<input type="checkbox"/>
• Meet committee chair	<input type="checkbox"/>
Office Ergonomics	
• Online module completed (if primarily an office employee)	<input type="checkbox"/>
• Setting up an ergonomically correct workstation	<input type="checkbox"/>
• When to report ergonomics concerns/injuries	<input type="checkbox"/>
FIELD SAFETY	
Obtaining and reviewing Health and Safety Plans/Safe Work Plans	
• Describe the Hazard Analysis Process	<input type="checkbox"/>
• Discuss the development of Job Safety Analyses	<input type="checkbox"/>
Obtaining personal protective clothing and equipment	
• Review SMS 029 for personal protective equipment (PPE)	<input type="checkbox"/>
• Describe the process for obtaining necessary PPE	<input type="checkbox"/>
Emergency Action Plans	
• Evacuation alarms	<input type="checkbox"/>
• Emergency procedures, phone numbers, and contacts	<input type="checkbox"/>
• Location of first aid/emergency medical services	<input type="checkbox"/>
• Location of assembly points	<input type="checkbox"/>
Site Orientation	
• Site layout	<input type="checkbox"/>
• Location of site offices and break areas	<input type="checkbox"/>
• Location of PPE/tool/equipment storage locations	<input type="checkbox"/>
Project-specific Hazards	
• Physical hazards	<input type="checkbox"/>
• Chemical hazards	<input type="checkbox"/>
• Biological hazards	<input type="checkbox"/>
• Radiological hazards	<input type="checkbox"/>
• Client operations	<input type="checkbox"/>
Task-specific hazards	
• Falls, confined spaces, excavations, etc.	<input type="checkbox"/>
Project-specific requirements	
• Training	<input type="checkbox"/>
• Drug testing	<input type="checkbox"/>

Conducted By: _____ Employee Signature: _____

URS SAFETY MANAGEMENT STANDARD

Noise and Hearing Conservation

1. Applicability

This standard applies to the operations of URS Corporation and its subsidiary companies where personnel may encounter noise exposures that may exceed 85 decibels, measured using an A-weighted scale (dBA), as an 8-hour time-weighted average (TWA).

2. Purpose and Scope

The purpose of this procedure is to protect employees from hazardous noise exposures and to prevent hearing loss.

3. Implementation

Implementation of this procedure is the responsibility of the URS manager directing activities of the facility, site, or project location.

4. Requirements

A. General

1. The use of hearing protectors is required in any location where powered or motorized equipment or any other noise source could reasonably be expected to exceed 85 dBA. Whenever information indicates that any employee's exposure may equal or exceed an 8-hour TWA of 85 dBA, the project manager or location manager will be responsible for enforcing the proper use of hearing protectors.
2. Implement a hearing conservation program in accordance with 29 Code of Federal Regulations (CFR) 1910.95(c) when applicable. Work not applicable to 29 CFR 1910.95(c) will assess hazards of noise exposure on a task basis, and implement engineering or administrative controls to reduce employee noise exposure.
3. Hearing protectors will be used in the event that administrative or engineering controls are either not effective or not feasible, and the following criteria will be applicable to selection of hearing protection devices.
 - a. Require that at least two types of hearing protectors are available to employees free of charge, and that the type of hearing protector is suitable to the task.

URS SAFETY MANAGEMENT STANDARD

Noise and Hearing Conservation

- b. Require that hearing protectors are used in accordance with manufacturer's specifications to effectively protect hearing.
- c. Evaluate the effectiveness of the hearing protectors chosen. The manufacturer's assigned noise reduction rating (NRR) for hearing protection devices can seldom be achieved in workplace conditions; therefore this rating must be attenuated for real world conditions and use. To do so, subtract 7 from the NRR of the protector provided by the manufacturer. Divide this result by 2, and then subtract the remained from the observed "A" scale sound level measurement collected in the employee's work area (see Section 4.B). If this number is below 85, the hearing protectors are adequate for use in the work area.

B. Noise Surveys

1. Noise surveys must be conducted in a manner that reasonably reflects the exposure of the affected employees. Surveys must be conducted under the supervision of a URS Safety Representative.
2. Sound-level meters and audio dosimeters used to determine employee exposure to noise sources must be Type II (accurate to within +/- 2 dBA), operated in "slow" response, on the "A" scale, and be calibrated to factory guidelines (including periodic factory recalibration).
3. Attachment 026-1AMER (Sound Level Survey) and Attachment 026-2AMER (Noise Dosimetry Field Sheet) may be used to record noise surveys.

C. Noise Controls

Eliminate noise sources to the extent possible. Examples of controls that must be considered include:

1. Adding or replacing mufflers on motorized equipment.
2. Adding mufflers to air exhausts on pneumatic equipment.
3. Following equipment maintenance procedures to lubricate dry bearings and replace worn or broken components.
4. Isolating loud equipment with barriers.
5. Replacing loud equipment with newer and quieter models.

URS SAFETY MANAGEMENT STANDARD

Noise and Hearing Conservation

6. Using caution signs and Hearing Protection Required signs to designate noisy work areas.
7. Installing HPD-dispensing devices at the entrance to noisy work areas.

D. Audiometric Exams

1. Tests

- a. Details on the medical surveillance program (including audiometric testing) are included in SMS 024 – Medical Screening and Surveillance.
- b. Audiometric tests will be performed by a person meeting the requirements described in 29 CFR 1910.95(g)(3). Within 6 months of an employee's first exposure at or above the action level, a valid baseline audiogram will be established, against which subsequent audiograms can be compared. Testing to establish a baseline audiogram will be preceded by 14 hours without exposure to noise. Hearing protectors may be used as a substitute for the requirement that a baseline audiogram will be preceded by 14 hours without exposure to workplace noise. The medical surveillance provider will notify employees of the need to avoid high levels of non-occupational noise exposure during the 14-hour period immediately preceding the audiometric examination. For multi-year projects, an annual audiogram will be obtained for each employee exposed at or above an 8-hour time-weighted average of 85 decibels.
- c. Each employee's annual audiogram will be compared to that employee's baseline audiogram to determine if the audiogram is valid, and if there is a standard threshold shift (STS). A standard threshold shift is a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000, and 4000 hertz (Hz) in either ear. If the annual audiogram shows that an employee has suffered an STS, the employer will obtain a retest within 30 days, and consider the results in assessing an STS as the annual audiogram. The audiologist, otolaryngologist, or physician will review problem audiograms, and will determine whether there is a need for further evaluation. If an STS has occurred, the medical surveillance provider will notify the employee in writing within 21 days of the determination.

URS SAFETY MANAGEMENT STANDARD

Noise and Hearing Conservation

E. Standard Threshold Shifts

If an employee's test results show a confirmed STS, their hearing protection will be evaluated and refitted, and a medical evaluation may be required.

F. Training

Verify that each employee who must work in a noisy environment is current on required Hearing Conservation Training. At a minimum, training shall be conducted before initial assignment and annually. Training must include the following topics:

1. The effects of noise on hearing.
2. The purpose of hearing protectors.
3. The advantages and disadvantages of various types of hearing protectors.
4. The attenuation of various types of hearing protection.
5. The selection, fitting, care, and use of hearing protectors.
6. The purpose of audiometric testing.
7. An explanation of the audiometric testing procedure.

5. Documentation Summary

The following documentation will be maintained:

- A. Noise surveys, when applicable.
- B. Training records.
- C. Audiometric test results.

6. Resources

- A. U.S. Occupational Safety and Health Administration (OSHA) Standard – [Occupational Noise Exposure – 29 CFR 1910.95](#)

URS SAFETY MANAGEMENT STANDARD
Noise and Hearing Conservation

- B. U.S. OSHA Construction Standard – [Occupational Noise Exposure – 29 CFR 1926.52 and 1926.101](#)
- C. U.S. MSHA – Occupational Noise Exposure [30 CFR 62](#)
- D. U.S. FRA – Occupational Noise Exposure [49 CFR 227](#)
- E. [U.S. OSHA Technical Links – Noise and Hearing Conservation](#)
- F. American Industrial Hygiene Association: [Protect Yourself from Noise-Induced Hearing Loss](#)
- G. [National Hearing Conservation Association web site](#)
- H. [SMS 024](#) – Medical Screening and Surveillance
- I. [Attachment 026-1AMER](#) – Sound Level Survey
- J. [Attachment 026-2AMER](#) – Noise Dosimetry Field Sheet

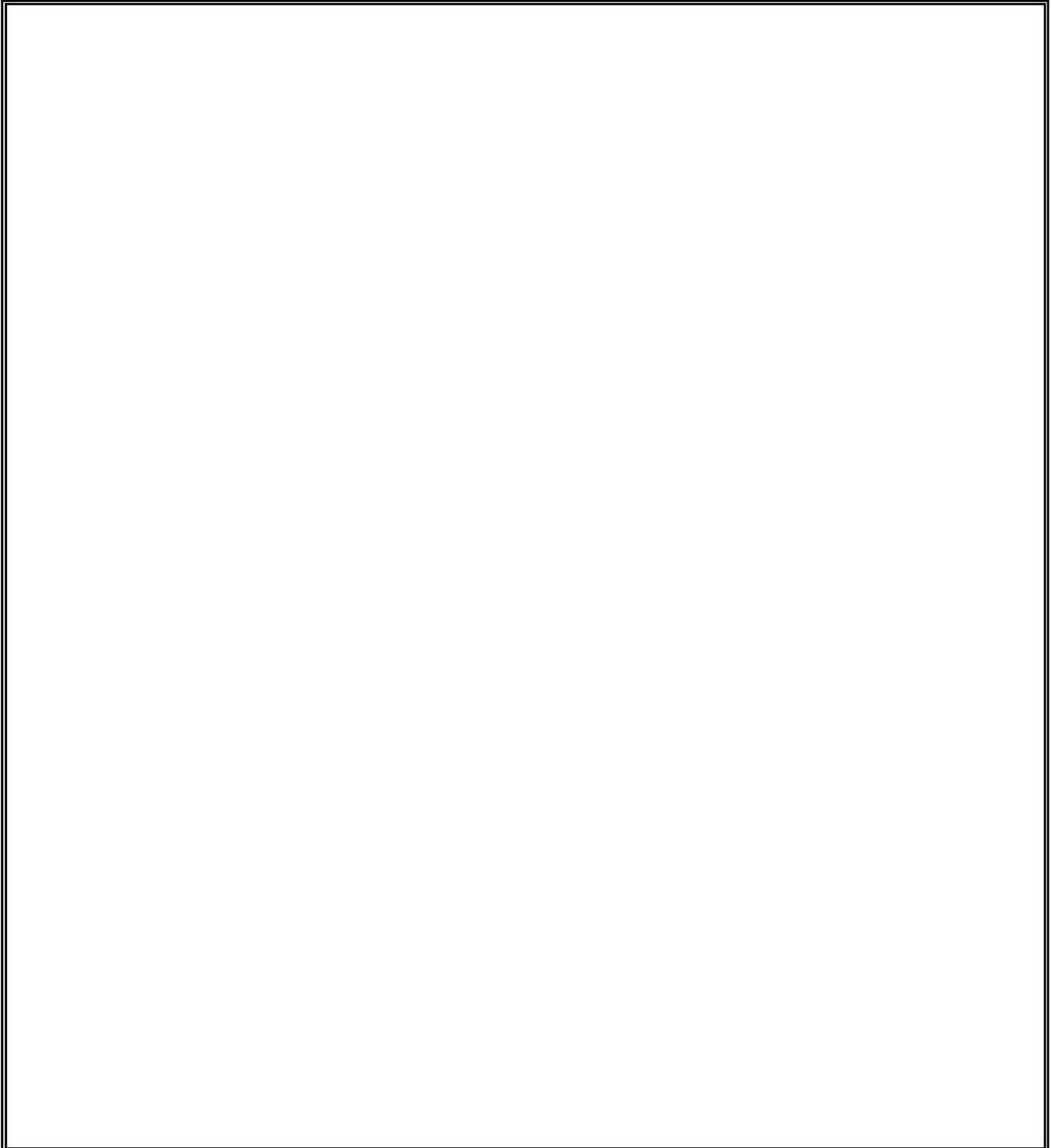


Safety Management Standard
SOUND LEVEL SURVEY

Attachment 026-1 AMER
Issue Date: July 2000
Revision 8: September 2013

Drawing of Equipment or Work Layout

Reference Numbers refer to the Test Numbers on Page 1





**NOISE DOSIMETRY
FIELD SHEET**

Sample Identification

Sample #: _____ Date: _____
Employee Monitored: _____ Employee #: _____
Job: _____ Location: _____

Dosimeter Information

Model: _____ Serial # _____
Criterion Level (in dBA): _____ Threshold (in dBA): _____ Exchange Rate (in dBA): _____
Calibration (in dBA): Initial _____ Final _____
Weighting: Fast Slow

Calibrator Information

Model: _____ Serial #: _____ Class 1 2
Battery Check Completed: Date of Factory Calibration: _____

Sample Information

Time On: _____ Time Off: _____ Total Run Time (in min): _____
Time Weighted Average (in dBA): _____ %Dose: _____ Est. %Dose: _____
Average Sound Level (L_{avg}): _____ Peak Sound Level (L_{pk}): _____
Maximum Sound Level (L_{max}): _____ Minimum Sound Level (L_{min}): _____

Workplace Conditions

Scheduled Hours per Shift: _____ Operations: Normal? Abnormal?

Explain: _____

Hearing Protection: Type _____ % of Time Worn _____

Work Description/Comments

Sampled By: _____

URS SAFETY MANAGEMENT STANDARD

Ladders

1. Applicability

This standard applies to URS Corporation and its subsidiary companies where ladders are used.

2. Purpose and Scope

The purpose of this standard is to ensure the safe use and proper construction, inspection, and maintenance of ladders at office and project locations.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility, site, or project location.

4. Requirements

A. General

1. Use ladders to access various elevations. They will be used only for the purpose for which they are designed, and will not normally be used as a working platform.
2. Provide ladders for safe access to all elevations where permanent or temporary stairways or suitable ramps or runways are not provided.
3. Never use ladders with broken or missing rungs or steps, broken or split side rails, or other faulty or defective construction. When ladders with such defects are discovered, immediately tag and withdraw from service.
4. Place ladder feet on a stable and level footing and keep the area around the top and bottom of the ladder clear.
5. Do not place ladders in passageways, doorways, driveways, or any location where they may be displaced by other work activities, unless protected by barricades or guards.
6. Ensure ladders have uniform step spacing; step spacing should not exceed 12 inches (30 centimeters).
7. Ensure the side rails, cleats, and/or rungs of ladders are kept clear and free of lines, hoses, cables, wires, oil, mud, ice, grease, and debris.

URS SAFETY MANAGEMENT STANDARD

Ladders

8. Employees must face ladders at all times while ascending, descending, or while working from the ladder.
 - a. Three points of contact (i.e., two hands + one foot or two feet + one hand) must be maintained at all times when either ascending or descending a ladder.
 - b. Grasp the ladder rungs with hands while climbing and not the side rails.
9. Tie, block, or otherwise secure straight ladders while in use to prevent their being displaced or moved.
10. Never use metal ladders for electrical work or where they or the user may contact electrical conductors.
11. Ladders must be equipped with non-skid safety feet.
12. Ladders must not be loaded beyond the maximum intended load for which they were built, or beyond the manufacturer's rated capacity.
13. When not in use, ladders will be stored under suitable cover and secured against movement. When stored horizontally, both ends and the middle will be supported to prevent sagging and warping of rails.
14. Use only ladders approved by the applicable government or standards organization.
15. Aluminum ladders may not be used in the vicinity of electrical energy sources.

B. Straight and Extension Manufactured Ladders

1. Position straight and extension ladders at such a pitch that the horizontal distance from the top support to the foot of the ladder is about one-quarter of the working length of the ladder (1 foot (30 centimeters) out for every 4 feet (1.2 meters) up).
2. Do not use ladders in a horizontal position as platforms, runways, or scaffolds.
3. Extend the side rails at least 3 feet (0.9 meter) above the landing, except in those instances where such an extension would in itself

URS SAFETY MANAGEMENT STANDARD

Ladders

produce a hazard. When this is not practical, install grab rails at the landing elevation, which provide a secure grip.

4. Ensure the side rails have a secure footing. The resting point for the side rails should be rigid and have ample strength to support the applied load. The top of the ladder should be secured to prevent movement.
5. When using two section wood or metal extension ladders, the two sections must have a minimum overlap of 3 feet (0.9 meter) for working lengths up to 36 feet (11 meters), 4 feet (1.2 meters) for working lengths up to 48 feet (14.6 meters), and 5 feet (1.5 meters) for working lengths up to 60 feet (18.3 meters).
6. When using two section fiberglass extension ladders, the two sections must have a minimum overlap of 3 feet (0.9 meter) for working lengths up to 32 feet (9.8 meters), and 4 feet (1.2 meters) for working lengths up to 36 feet (11 meters).
7. Do not permit anyone to stand on the top three rungs of a straight or extension ladder.
8. Do not take sections of extension ladders apart and use separately.
9. The lashing of ladders together to increase the length of the ladder is prohibited.
10. Do not paint ladders in a manner that hides the grain structure, deterioration, or defects (suitable transparent preservative materials may be used).

C. Stepladders

1. Always fully open and lock side braces when using stepladders.
2. Use straight or extension manufactured or job-built ladders for accessing elevations. Stepladders are meant to be used as temporary elevated working platforms only.
3. Do not place planks on the top of or on any steps of stepladders.
4. Never stand on the top two steps of a stepladder.
5. Never climb on the rear side of a stepladder.

URS SAFETY MANAGEMENT STANDARD
Ladders

6. Require that all four feet of the ladder have an even, solid footing.

D. Job-Built Ladders

1. Job-built ladders must be constructed for intended use. If a ladder is to provide the only means of access or exit from a working area for 25 or more employees, or simultaneous two-way traffic is expected, a double-cleated ladder shall be installed.
2. Double-cleated ladders must not exceed 24 feet (7.3 meters) in length.
3. The width of single-cleat ladders will be at least 15 inches (38 cm), but not more than 20 inches (50 cm), between rails at the top.
4. Side rails will be parallel or flared top to bottom by not more than $\frac{1}{4}$ inch (0.6 cm) for each 2 feet (0.6 meters) of length.
5. It is preferable that side rails be continuous. If splicing is necessary to attain the required length, however, the splice must develop the full strength of a continuous side rail of the same length.
6. Two-inch (5 cm) by 4-inch (10 cm) lumber will be used for side rails of single cleat ladders up to 16 feet (4.9 meters) long; 2-inch (5 cm) by 6 inch (15 cm) lumber will be used for single-cleat ladders from 16 feet (4.9 meters) to 30 feet (9.1 meters) in length.
7. Two inch (5 cm) by 4-inch (10 cm) lumber will be used for side and middle rails of double-cleat ladders up to 12 feet (3.7 meters) in length; 2-inch (5 cm) by 6-inch (15 cm) lumber for double-cleat ladders from 12 (3.7 meters) to 24 feet (7.3 meters) in length.
8. Wood cleats up to and including 20 inches (50 cm) wide will be $\frac{3}{4}$ inches (1.9 cm) in thickness and 3 inches (7.5 cm) in width. Wood cleats over 20 inches (50 cm) wide will be $\frac{3}{4}$ " in (1.9 cm) thickness and 3 $\frac{3}{4}$ inches (9.5 cm) in width.
9. Inset cleats into the edges of the side rails $\frac{1}{2}$ inch (1.2 cm), or use filler blocks on the rails between the cleats. Secure the cleats to each rail with three 10d common wire nails or other fasteners of equivalent strength. Uniformly space cleats at 12 inches (30.5 cm) top-to-top.
10. Additional information on job-built ladders is provided in Supplemental Information A.

URS SAFETY MANAGEMENT STANDARD
Ladders

E. Training

Train each employee in the safe and proper use of ladders, including the following:

1. Do not carry materials while ascending or descending the ladder; use a hand line or hoisting equipment.
2. Face the ladder when ascending or descending.
3. Maintain three points of contact at all times when ascending or descending.
4. Position the ladder at the proper pitch.
5. Secure the top and bottom of the ladder to prevent displacement.
6. Require proper extension (3 feet/0.9 m) above landing.
7. Never overreach; work only within an arm's length of the ladder.
8. Allow only one person on a ladder at a time.

E. Inspections

1. Assign a competent person to perform all ladder inspections.
2. Conduct thorough periodic inspections (monthly recommended) of all ladders to identify cracks, broken rungs, and deterioration. Ladders found to be in an unsafe condition must be removed from the workplace immediately. When immediate removal is not possible, the ladder must be conspicuously tagged "DANGER – DO NOT USE" until such time as removal is possible.
3. Inspect each ladder for unsafe conditions before each use. Ensure that the marking system remains legible between inspections. Ladders with illegible marking systems will be considered unsafe and will be removed from service.
4. Inspect ladders for any occurrence that could affect their safe use (e.g., ladder falls, damage by external forces, etc.).

URS SAFETY MANAGEMENT STANDARD

Ladders

5. Documentation Summary

The following information will be maintained in the project file:

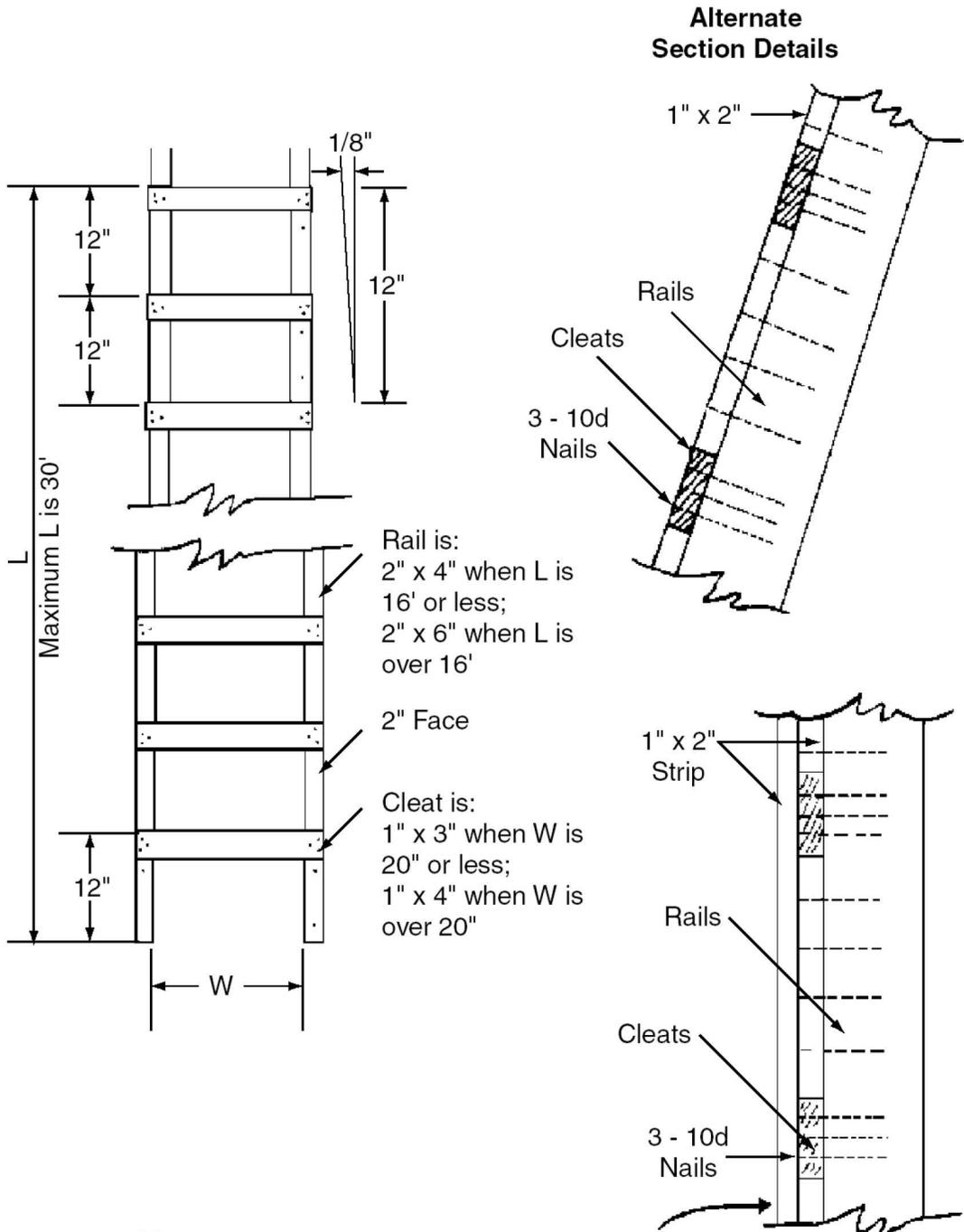
1. Site safety briefings regarding ladder use and inspection.
2. Records of ladders taken out of service and/or removed from the site.

6. Resources

- A. U.S. Occupational Safety and Health Administration (OSHA) Construction Standard – Ladder – [29 CFR 1926, Subpart X](#)
- B. U.S. OSHA Standard – Walking-Working Surfaces – 29 Code of Federal Regulations [\(CFR\) 1910, Subpart D](#)
- C. [ANSI](#) A.14.1-2000, Wood Ladders Safety Requirements
- D. [ANSI](#) A.14.2-2000, Portable Metal Ladders Safety Requirements
- E. ANSI A.14.5-1982, Reinforced Plastic Ladders Safety Requirements

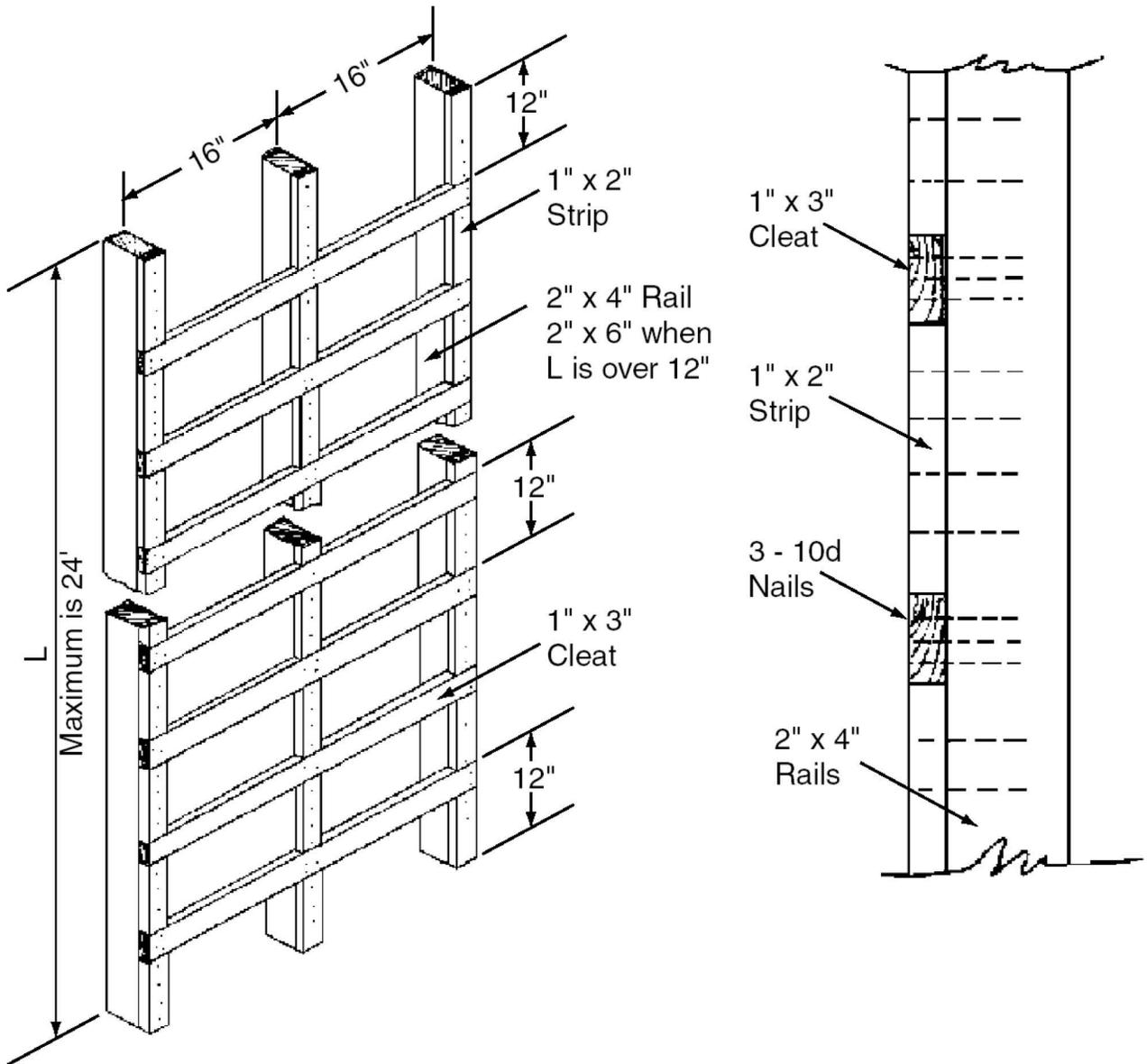
7. Supplemental Information

- A. [Construction Specifications for Job-Built Ladders](#)



Notes:

- (A) All materials to be thoroughly seasoned and straight grained and free from shakes, checks, knots, decay etc.
- (B) Rails to be made from Eastern or Sitka Spruce or equivalent.
- (C) Cleats to be made of White Ash, Oak, Hickory or equivalent.
- (D) All lumber sizes shown are nominal.
- (E) These drawings and specifications are for made-on-the-job ladders and are not intended to apply to manufactured ladders.



Notes:

- (A) All materials to be thoroughly seasoned and straight grained and free from shakes, checks, knots, decay etc.
- (B) Rails to be made from Eastern or Sitka Spruce or equivalent.
- (C) Cleats to be made of White Ash, Oak, Hickory or equivalent.
- (D) All lumber sizes shown are nominal.
- (E) These drawings and specifications are for made-on-the-job ladders and are not intended to apply to manufactured ladders.

URS Safety Management Standard

Personal Protective Equipment

1. Applicability

This standard applies to all operations of URS Corporation and its subsidiary companies where the use of personal protective equipment (PPE) is anticipated.

2. Purpose and Scope

The purpose of this standard is to provide information on recognizing those conditions that require PPE. PPE is designed to protect the employee from health and safety hazards that cannot be practically removed from the work environment.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility, site, or project location.

4. Requirements

- A. Perform hazard assessments for those work activities that are likely to require the use of PPE.
 - 1. Use Attachment 029-1 AMER to perform the assessment.
 - 2. Reevaluate completed hazard assessments when job conditions or duties change.
- B. Eliminate the hazards identified in Attachment 029-1 AMER, if possible, through engineering or administrative controls.
- C. Select PPE that will protect employees if hazards cannot be controlled or eliminated.
 - 1. See Attachment 029-1 AMER for recommended PPE.
 - 2. Review Safety Data Sheets for chemicals used for PPE recommendations.
 - 3. If needed, consult with the applicable safety representative for assistance in selecting PPE.
- D. Provide required PPE to employees free of charge (excluding, in some instances, components of standard work attire such as steel-toed boots and prescription safety glasses), assuring proper fit, in compliance with

URS Safety Management Standard **Personal Protective Equipment**

applicable consensus standards or national standards, and providing a choice if more than one type of PPE is available. Where applicable, the local policy (office or project) regarding reimbursement for PPE will prevail.

- E. Provide the employees with the appropriate PPE whenever a hazard is recognized and PPE is required. However, when PPE is not required and the employee elects to wear his or her own PPE, the manager directing activities must ensure that the employee is properly trained in the fitting, donning, doffing, cleaning, and maintenance of his or her employee-owned equipment.
- F. Make employees of aware that they are responsible for PPE maintenance, care, and proper use. Employees must inform their supervisors when a need arises to use PPE for which the employee has not received training, or when a condition exists where adequate PPE is not available.
- G. Conduct and document employee training.
 - 1. Train all employees who are required to wear PPE.
 - 2. Require that training includes:
 - a. When PPE is to be worn.
 - b. The type of PPE necessary for the task to be completed.
 - c. How to properly don, doff, adjust, and wear PPE.
 - d. Limitations of PPE.
 - e. Proper care, maintenance, useful life and disposal of PPE.
 - 3. Conduct training before PPE is assigned.
 - 4. Provide refresher training when:
 - a. The workplace changes, rendering previous PPE and training obsolete.
 - b. New types of PPE are assigned to the worker.
 - c. The worker cannot demonstrate competency in PPE use.

URS Safety Management Standard **Personal Protective Equipment**

5. Keep written records of the employees trained and type of training provided, including the date of training.

H. PPE Specific Information

1. Head Protection

- a. Use hard hats in areas where there is the possible danger of head injury from the impact of falling or flying objects, striking against objects, electrical shock and/or burns, or any combination of these hazards. Hard hats will be worn when required by site safety procedures, client/site requirements, or when posted as an entry requirement.
- b. Adjust the hard hat suspension to fit the wearer and to keep the shell a minimum of 1.25 inches (3.2 cm) above the wearer's head. Do not store materials in the suspension. Cold weather liners and perspiration control bands may be utilized within the hard hat unless specifically excluded by the manufacturer.
- c. Wear hard hats in the forward position unless written verification and instructions from the hard hat manufacturer indicate your hard hat model has been tested and found to be compliant when worn backwards.
- d. Type I helmets are designed to protect the employee from impact and penetration caused by objects hitting the top of the head; Type II helmets extend this protection to the sides of the head as well.
- e. Class G (General) helmets provide protection against impact, penetration, and limited electrical hazards up to 2,200 volts. Class E (Electrical) helmets meet the same criteria, but electrical protection is increased to 20,000 volts. Class C (Conductive) helmets only provide impact and penetration protection.
- f. Do not use bump caps as protection against head injury, except when the only potential hazard is striking against objects and the use has been approved a Business, Country, Group, Regional Business Unit (RBU), or Strategic Business Unit (SBU) Safety Manager.

URS Safety Management Standard
Personal Protective Equipment

- g. Do not alter hard hats in a way that will downgrade their efficiency. Typical prohibited alterations include painting, drilling holes in shell, application of metal jewelry, etc. Replace hats with these alterations or with excessive scratches.
 - h. Wear integral chinstraps when working in high-wind conditions or near helicopters.
 - i. Inspect hard hats before use and remove from service if any of the following are observed: cracking, tearing, fraying, chalking, flaking, and damaged suspension systems.
 - j. Remove hard hats and their components from service and replace as recommended by the manufacturer. Hard hats must be replaced after no more than 5 years.
 - k. White should be the standard color for hard hats worn by URS employees unless a different color is required by a site, client or industry. Approved URS logoed hardhats are available from the URS safety equipment vendor found on the Safety page of the Source.
2. Hearing Protection
- a. Provide hearing protection in any location where powered or motorized equipment or any other noise source could reasonably be expected to exceed 85 dBA. Each task in the work area will be evaluated for potential worker noise exposure as required.
 - b. Review SMS 026 – Noise and Hearing Conservation – for additional information.
3. Eye and Face Protection
- a. Use eye and/or face protection when machines or operations create the risk of eye and/or face injuries due to physical, chemical, and/or radiation sources. Safety glasses will be worn when required by site safety procedures, client/site requirements, or when posted as an entry requirement.
 - b. Provide safety glasses that can be worn over corrective spectacles for employees whose vision requires the use of corrective lenses. Employees will consult with the applicable

URS Safety Management Standard **Personal Protective Equipment**

safety representative or project managers for policies on reimbursement for prescription safety glasses.

- c. Do not use of sunglasses in place of required safety glasses. Heavily tinted safety glasses will only be used in outdoor areas with suitable lighting. Colored or lightly tinted or gradient lenses may be used indoors as appropriate to the work conditions.
- d. Tasks involving potential projectiles (e.g., chipping, grinding and cutting) will require face shields over safety goggles. Tasks requiring power washing or handling corrosive chemicals will require a face shield over safety goggles. Tasks requiring eye protection and involving overhead work will require safety goggles or face shield over safety glasses. For welding tasks, refer to Supplemental Information B for lens selection criteria.
- e. Consult Supplemental Information A for additional information on types of eye and face protection and their various uses.

4. Hand Protection

- a. Wear gloves when the hands are exposed to hazards such as, but not limited to, chemical absorption, cuts or lacerations, abrasions, punctures, chemical burns, thermal burns, vibration, or temperature extremes.
- b. Gloves must always be provided to workers for tasks with potential hand hazards and workers assigned to those tasks shall always wear appropriate gloves.
- c. Identify hand hazards during job or task hazard analysis. A supply of appropriate gloves in various sizes must be provided to workers assigned to work on that task.
- d. Inspect chemical gloves for degradation or tears prior to use. Do not remove chemical gloves from the work area if it is visibly contaminated. Chemical gloves may be decontaminated or disposed of according to specified procedures. In some cases, inner disposable chemical gloves (e.g., nitrile) will be required for protection of hands during removal of contaminated gloves.

URS Safety Management Standard
Personal Protective Equipment

- e. Select chemical-resistant gloves using manufacturer's hazard-based selection programs or other published guides that identify compatibility of glove material with chemical hazards. Selection must also consider physical requirements of the task with regard to puncture resistance and need for flexibility and dexterity in performing the task.
 - f. Review SMS 064 – Hand Safety – for additional information.
5. Foot Protection
- a. Wear appropriate specialized protective footwear in the following environments:
 - i. Using harmful corrosive substances or processes.
 - ii. Having a high probability of puncture or crushing injuries.
 - iii. Performing regular assembly or disassembly of heavy system components.
 - iv. Working in wet conditions.
 - v. Working in extreme cold.
 - vi. Working around exposed electrical wires or connections.
 - vii. When using hand-operated compactors, snow blowers, pressure washers, or steam cleaners.
 - viii. Other activities or areas as designated by supervisors or safety personnel.
 - b. Employees assigned to field projects who are not required to wear specified protective footwear (e.g., steel-toed boots, metatarsal protection, rubber boots, chemical resistant boots, insulated boots, etc.) will wear substantial leather, high-sided work boots. Shoes (leather, canvas, tennis, deck, or other types of material), sandals, high-heeled shoes, etc., are not allowed on field project sites. In some cases protective over-boots may be required for specific-site access.

URS Safety Management Standard **Personal Protective Equipment**

I. Maintain Protective Equipment

1. Check PPE for damage, cracks, and wear prior to each use. Replace or repair equipment not found in good condition.
2. Decontaminate non-disposable PPE with appropriate cleaner, as necessary, to prevent degradation of the equipment. Staff will remove any non-impermeable PPE/clothing that becomes contaminated with hazardous substances. These instructions are reiterated in the emergency decontamination procedures in the Health and Safety Plans.

- J. Periodically inspect worksites where employees are using PPE using Attachment 029-2 AMER. Regularity of inspections should be determined by the project manager and/or site safety representative.

5. Documentation Summary

The following information will be maintained in the project file:

- A. Completed Hazard Assessment Certification Forms (Attachment 029-1 AMER).
- B. Completed Personal Protective Equipment Inspection Sheet (Attachment 029-2 AMER).
- C. Documentation of employee training.

6. Resources

- A. U.S. Occupational Safety and Health Administration (OSHA) Standards – [Personal Protective Equipment – 29 Code of Federal Regulations \(CFR\)1910, Subpart I](#)
- B. U.S. OSHA Construction Standard - [Personal Protective Equipment – 29 CFR 1926 Subpart E](#)
- C. [U.S. OSHA Technical Links – Personal Protective Equipment](#)
- D. American National Standards Institute – [ANSI Z89.1-2003](#), Protective Headwear
- E. American National Standards Institute – ANSI Z87.1-2003 – Eye and Face Protection

URS Safety Management Standard **Personal Protective Equipment**

- F. American National Standards Institute /International Safety Equipment Association, ANSI/ISEA 107 - 2004 – Standard for High-Visibility Safety Apparel
- G. American National Standards Institute – ANSI Z41-1991, Protective Footwear Requirements, American Society for Testing and Materials, ASTM F-2414-2005, Standard Test Methods for Foot Protection, ASTM F-2413-2005, Standard Specification for Performance Requirements for Protective Footwear
- H. American National Standards Institute/International Safety Equipment Association (ANSI/ISEA) – 105-2011 – American National Standard for Hand Protection Selection Criteria"
- I. *Quick Selection Guide to Chemical Protective Clothing*, K Forsberg and S.Z. Mansdorf, Wiley Interscience, 2002
- J. Best Manufacturing Co. <http://www.bestglove.com/>. Information on chemical resistant gloves.
- K. [SMS 040](#) – Fall Protection
- L. [SMS 026](#) – Noise and Hearing Conservation
- M. [SMS 064](#) – Hand Safety
- N. [Attachment 029-1 AMER](#) – Hazard Assessment Form
- O. [Attachment 029-2 AMER](#) – Personal Protective Equipment Inspection Form

7. Supplemental Information

- A. [Welding Lens Selector](#)
- B. [Traffic Control Class Guidelines and Scenarios](#)



Safety Management Standard
HAZARD ASSESSMENT
CERTIFICATION FORM

Attachment 029-1 AMER

Issue Date: July 2000
Revision 10: September 2013

Location: _____ Job No.: _____

Date: _____ Assessment conducted by: _____

Specific tasks performed at this location: _____

If any of the indicated hazards are present, eliminate the hazard or use the indicated PPE.

Overhead Hazards

- | | | |
|---|--|---|
| 1. Suspended/elevated loads, beams, or objects that could fall or strike head | <input type="checkbox"/> Yes <input type="checkbox"/> No | Hard hat, ANSI Z89, Class G, E or C |
| 2. Flying objects that could strike head | <input type="checkbox"/> Yes <input type="checkbox"/> No | Hard hat, ANSI Z89, Class G, E or C |
| 3. Energized wires or equipment that could strike head | <input type="checkbox"/> Yes <input type="checkbox"/> No | Hard hat, ANZI Z89, Class G or E (dependent on potential voltage) |
| 4. Sharp objects or corners at head level | <input type="checkbox"/> Yes <input type="checkbox"/> No | Hard hat, ANSI Z89, Class G, E or C |

Eye Hazards

- | | | |
|--|--|--|
| 5. Chemical splashes or irritating mists | <input type="checkbox"/> Yes <input type="checkbox"/> No | See Supplemental Information A for additional information |
| 6. Excessive dust | <input type="checkbox"/> Yes <input type="checkbox"/> No | Safety glasses or goggles |
| 7. Smoke and/or fumes | <input type="checkbox"/> Yes <input type="checkbox"/> No | Safety goggles |
| 8. Welding operations | <input type="checkbox"/> Yes <input type="checkbox"/> No | Welding goggles; See Supplemental Information A and B for additional information |
| 9. Lasers/optical radiation | <input type="checkbox"/> Yes <input type="checkbox"/> No | Have URS Safety Representative assist you in proper selection |
| 10. Projectiles | <input type="checkbox"/> Yes <input type="checkbox"/> No | Safety goggles plus face shield |
| 11. Sawing, cutting, chipping, and/or grinding | <input type="checkbox"/> Yes <input type="checkbox"/> No | Safety goggles plus face shield; See Supplemental Information A for additional information |

Face Hazards

- | | | |
|---|--|---|
| 12. Chemical splashes or irritating mists | <input type="checkbox"/> Yes <input type="checkbox"/> No | Safety goggles; See Supplemental Information A for more information; add face shield if irritating or corrosive |
| 13. Welding operations | <input type="checkbox"/> Yes <input type="checkbox"/> No | Welding goggles or welding helmet; see Supplemental Information A and B for additional information |
| 14. Projectiles | <input type="checkbox"/> Yes <input type="checkbox"/> No | Safety goggles plus face shield |

Hand Hazards

- | | | |
|----------------------------------|--|---|
| 15. Chemical exposure | <input type="checkbox"/> Yes <input type="checkbox"/> No | Use chemical-resistant gloves specific to hazard; consult MSDS, chemical hazard guide, or Safety Representative |
| 16. Sharp edges, splinters, etc. | <input type="checkbox"/> Yes <input type="checkbox"/> No | Leather or Kevlar gloves |
| 17. Temperature extremes – heat | <input type="checkbox"/> Yes <input type="checkbox"/> No | Leather gloves, welder's gloves, hot mill gloves |



Safety Management Standard
HAZARD ASSESSMENT
CERTIFICATION FORM

Attachment 029-1 AMER

Issue Date: July 2000
Revision 10: September 2013

If any of the indicated hazards are present, eliminate the hazard or use the indicated PPE.

- | | | |
|--|--|--|
| 18. Temperature extremes – cold | <input type="checkbox"/> Yes <input type="checkbox"/> No | Insulated gloves |
| 19. Blood, fungus, biological agents | <input type="checkbox"/> Yes <input type="checkbox"/> No | Nitrile gloves |
| 20. Exposure to live electrical currents | <input type="checkbox"/> Yes <input type="checkbox"/> No | Electrical gloves; consult Safety representative |
| 21. Sharp tools, machine parts, etc. | <input type="checkbox"/> Yes <input type="checkbox"/> No | Leather or Kevlar gloves |
| 22. Material handling | <input type="checkbox"/> Yes <input type="checkbox"/> No | Leather gloves |

Foot Hazards

- | | | |
|---|--|--|
| 23. Heavy materials (greater than 50 pounds) handled by employees | <input type="checkbox"/> Yes <input type="checkbox"/> No | Safety shoes or boots |
| 24. Potential to crush whole foot | <input type="checkbox"/> Yes <input type="checkbox"/> No | Safety shoes or boots with metatarsal guard |
| 25. Sharp edges or points (puncture risk) | <input type="checkbox"/> Yes <input type="checkbox"/> No | Safety shoes or boots |
| 26. Exposure to electrical hazards | <input type="checkbox"/> Yes <input type="checkbox"/> No | Safety shoes or boots with:

Conductive - Protects the wearer in an environment where the accumulation of static electricity on the body is a hazard.

Static dissipative - Reduces the accumulation of excess static electricity by conducting body charge to ground while maintaining a sufficiently high level of resistance.

Electrical hazard - Provides a secondary source of protection against accidental contact with live electrical circuits, electrically energized conductors, parts or apparatus, and is manufactured with non-conductive electrical shock resistant soles and heels. |
| 27. Slippery conditions | <input type="checkbox"/> Yes <input type="checkbox"/> No | Rubber-soled boots or grips |
| 28. Chemical contamination | <input type="checkbox"/> Yes <input type="checkbox"/> No | Rubber, PVC, or polyurethane boots or boot covers with puncture and protective toe if task required |
| 29. Wet conditions | <input type="checkbox"/> Yes <input type="checkbox"/> No | Rubber boots or boot covers |
| 30. Construction/demolition | <input type="checkbox"/> Yes <input type="checkbox"/> No | Safety boots with metatarsal guard if foot-crushing hazard exists |

Fall Hazards

- | | | |
|---|--|---------------------------------------|
| 31. Elevations above 4 feet (general industry) or 6 feet (construction) without guardrails | <input type="checkbox"/> Yes <input type="checkbox"/> No | ANSI A-10.14 Type 1 full-body harness |
| 32. Suspended scaffolds, boatswain's chairs, float scaffolds, or suspended staging | <input type="checkbox"/> Yes <input type="checkbox"/> No | ANSI A-10.14 Type 1 full-body harness |
| 33. Working in trees | <input type="checkbox"/> Yes <input type="checkbox"/> No | ANSI A-10.14 Type 1 full-body harness |
| 34. Working in vehicle-mounted elevating work platforms (e.g., bucket trucks, aerial lifts) | <input type="checkbox"/> Yes <input type="checkbox"/> No | ANSI A-10.14 Type 1 full-body harness |



**Safety Management Standard
HAZARD ASSESSMENT
CERTIFICATION FORM**

Attachment 029-1 AMER

Issue Date: July 2000
Revision 10: September 2013

Water Hazards

35. Working on or above water where a risk of drowning exist Yes No U.S. Coast Guard approved personal floatation device; Type I, II, or III

Excessive Heat or Flame

36. Full body chemical protective clothing in temperatures greater than 80 °F Yes No Cooling vest
37. Work around molten metal or flame Yes No Nomex or heat reflective clothing
38. Welding activities Yes No Welding leathers for those areas that are exposed to flame, spark, or molten metal

Respiratory Hazards

39. Airborne particulates, gases, vapors, or mists in excess of established exposure limits Yes No Refer to SMS 042 or URS Safety Representative for respirator selection guidance

Excessive Noise

40. Exposure to noise Yes No Ear plugs, muffs or both

Body and Leg Protection

41. Chemical exposure Yes No Contact URS Safety Representative for assistance in proper selection
42. Using chainsaw, cutting brush Yes No Chainsaw chaps
43. Exposure to snakes Yes No Snake chaps
44. Exposure to vehicle traffic or heavy equipment Yes No See SMS 032 and SMS 029 AMER – Supplemental Information C for additional guidance

I certify that the above inspection was performed to the best of my knowledge and ability, based on the hazards present on: _____

Name _____ Signature _____



Safety Management Standard
PERSONAL PROTECTIVE EQUIPMENT
INSPECTION SHEET

Attachment 029-2 AMER

Issue Date: July 2000
Revision 10: September 2013

Name of Inspector _____ Date Inspected _____

Hard Hats	
1. The brim or shell does not show signs of exposure and excessive wear, loss of surface gloss, chalking, or flaking.	<input type="checkbox"/> Yes <input type="checkbox"/> No
2. Suspension system in hard hat does not show signs of deterioration, including cracking, tearing, or fraying.	<input type="checkbox"/> Yes <input type="checkbox"/> No
3. The brim or shell is not cracked, perforated, or deformed.	<input type="checkbox"/> Yes <input type="checkbox"/> No
4. Employees use hard hats in marked areas.	<input type="checkbox"/> Yes <input type="checkbox"/> No
5. Areas requiring hard hat usage are marked.	<input type="checkbox"/> Yes <input type="checkbox"/> No
Safety Shoes	
6. Safety shoes used by employees do not show signs of excessive wear.	<input type="checkbox"/> Yes <input type="checkbox"/> No
7. Areas requiring safety shoes are marked.	<input type="checkbox"/> Yes <input type="checkbox"/> No
Work Gloves	
8. Gloves are available and worn when needed.	<input type="checkbox"/> Yes <input type="checkbox"/> No
9. Gloves are appropriate for the task.	<input type="checkbox"/> Yes <input type="checkbox"/> No
10. Gloves do not show signs of excessive wear such as cracks, scrapes, or lacerations, thinning or discoloration, or break-through to the skin.	<input type="checkbox"/> Yes <input type="checkbox"/> No
Protective Clothing	
11. Protective clothing (including traffic control apparel) is worn by employees when required.	<input type="checkbox"/> Yes <input type="checkbox"/> No
Hearing Protection	
12. Noise hazard areas are posted.	<input type="checkbox"/> Yes <input type="checkbox"/> No
13. Employees are using earplugs or muffs when using noise producing equipment or working in posted noise hazard areas.	<input type="checkbox"/> Yes <input type="checkbox"/> No
Safety Glasses/Goggles	
14. Eye hazard areas are marked or posted.	<input type="checkbox"/> Yes <input type="checkbox"/> No
15. Employees use safety glasses/goggles when working in eye hazard areas or working with equipment that produces an eye hazard.	<input type="checkbox"/> Yes <input type="checkbox"/> No
16. Face shields are used when required and worn over safety goggles.	<input type="checkbox"/> Yes <input type="checkbox"/> No

REMARKS (All "No" answers indicate a hazard which needs to be fixed.)



Safety Management Standard
WELDING LENS SELECTION

SMS 029 AMER
Supplemental Information A
Issue Date: February 2009
Revision 2: March 2012

Operations	Electrode Size (1/32")	Arc Current	Minimum Protective Shade
Shielded metal arc welding (SMAW)	Less than 3	Less than 60	7
SMAW	3 – 5	60 – 160	8
SMAW	5 – 8	160 – 250	10
SMAW	More than 8	250 – 550	11
Gas metal arc welding and flux cored arc welding		Less than 60	7
Gas metal arc welding and flux cored arc welding		60 - 160	10
Gas metal arc welding and flux cored arc welding		160 – 250	10
Gas metal arc welding and flux cored arc welding		250 - 500	10
Gas tungsten arc welding		Less than 50	8
Gas tungsten arc welding		50 – 150	8
Gas tungsten arc welding		150 - 500	10
Air carbon arc cutting	(light)	Less than 500	10
Air carbon arc cutting	(heavy)	500 – 1000	11
Gas tungsten arc welding		Less than 20	8
Gas tungsten arc welding		20 – 100	8
Gas tungsten arc welding		100 – 400	10
Gas tungsten arc welding		400 – 800	11
Plasma arc cutting	(light)	Less than 300	8
Plasma arc cutting	(medium)	300 – 400	9
Plasma arc cutting	(heavy)	400 -800	10
Torch blazing			3
Torch soldering			2
Carbon arc welding			14
Gas welding			5 – 6
Oxygen cutting			3 - 5

	Safety Management Standard TRAFFIC CONTROL CLASS GUIDELINES AND SCENARIOS	SMS 029 AMER Supplemental Information B Issue Date: February 2009 Revision 2: March 2012
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A. Class 1 Safety Apparel

1. Class 1 safety apparel provides the minimum amount of required material to differentiate the wearer from the work environment.
2. At a minimum, this shall include 217 square inches (in²), or 0.14 square meters (m²), of fluorescent yellow-green, orange-red, or red background materials combined with 155 in² (0.10 m²) retro-reflective material. As an alternative, the apparel can have 310 in² (0.20 m²) of combined-performance material (i.e., materials that are both retro-reflective and fluorescent).
3. Class 1 safety apparel typically consists of a sleeveless traffic vest with retro-reflective bands no less than 0.98 inches (25 mm) in width.
4. Those occupational activities under which Class 1 safety apparel is typically used:
 - a. Permit full and undivided attention to approaching traffic;
 - b. Provide ample separation of the pedestrian worker from conflicting vehicle traffic; and
 - c. Permit optimum conspicuity in backgrounds that are not complex with vehicle and moving equipment speeds not exceeding 25 miles per hour (mph), or 40 kilometers per hour (kph).
5. Examples of pedestrian workers who could work in these situations may include:
 - a. Workers directing vehicle operators to parking/service locations;
 - b. Workers exposed to the hazards of warehouse equipment traffic;
 - c. Roadside “right-of-way” or sidewalk maintenance workers; and
 - d. Delivery vehicle drivers.

B. Class 2 Safety Apparel

1. Class 2 safety apparel provides superior visibility for the wearers by the additional coverage of the torso and is more conspicuous than Class 1.
2. At a minimum, this shall include 775 in² (0.50 m²) of fluorescent yellow-green, orange-red, or red background materials combined with 201 in² (0.13 m²) retro-reflective material. Combined-performance materials may not be used without background materials in Class 2.
3. Class 2 safety apparel typically consists of a full-torso sleeveless traffic vest with retro-reflective bands no less than 1.38 inches (35 mm) in width.
4. Those occupational activities under which Class 2 safety apparel is typically used:
 - a. Greater visibility is desired during inclement weather conditions;
 - b. Complex backgrounds are present;
 - c. Employees are performing tasks which divert attention from approaching vehicle traffic;

	<p style="text-align: center;">Safety Management Standard</p> <p style="text-align: center;">TRAFFIC CONTROL CLASS GUIDELINES AND SCENARIOS</p>	<p style="text-align: right;">SMS 029 AMER Supplemental Information B</p> <p style="text-align: right;">Issue Date: February 2009 Revision 2: March 2012</p>
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- d. Work activities take place in close proximity to vehicle traffic; and
 - e. Vehicle and moving equipment speeds exceed 25 mph (40 kph).
5. Examples of pedestrian workers who could work in these situations may include:
- a. Roadway construction workers;
 - b. Utility workers;
 - c. Survey crews;
 - d. Railway workers;
 - e. Forestry workers;
 - f. Parking and/or toll gate personnel;
 - g. Airport baggage handlers/ground crew;
 - h. Emergency response personnel;
 - i. Law enforcement personnel; and
 - j. Accident site investigators.

C. Class 3 Safety Apparel

1. Class 3 safety apparel offers greater visibility to the wearer in both complex backgrounds and through a full range of body movements. Visibility is enhanced beyond Class 2 by the enhancement of background and reflective materials to the arms and/or legs.
2. At a minimum, this shall include 1240 in² (0.80 m²) of fluorescent yellow-green, orange-red, or red background materials combined with 310 in² (0.20 m²) retro-reflective material. Combined-performance materials may not be used without background materials in Class 3.
3. Class 3 safety apparel typically consists of a coveralls, jumpsuits, long or short-sleeved jackets, or long-sleeved shirts with retro-reflective bands no less than 1.97 inches (50 mm) in width. A sleeveless garment or vest alone shall not be considered Class 3 apparel.
4. Those occupational activities under which Class 3 safety apparel is typically used:
 - a. Workers are exposed to significantly high vehicle speeds and/or reduced sight distances (note that several sources have interpreted the vehicle speed requirements as 50 mph (80 kph) or more);
 - b. The worker and vehicle operator have high task loads, clearly placing the worker in danger; or
 - c. The wearer must be conspicuous through a full range of body motions at a minimum of 1280 feet (390 m) and must be identifiable as a person.
5. Examples of pedestrian workers who could work in these situations may include:
 - a. Roadway construction personnel;
 - b. Utility workers;

	<p style="text-align: center;">Safety Management Standard</p> <p style="text-align: center;">TRAFFIC CONTROL CLASS GUIDELINES AND SCENARIOS</p>	<p style="text-align: right;">SMS 029 AMER Supplemental Information B</p> <p style="text-align: right;">Issue Date: February 2009 Revision 2: March 2012</p>
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- c. Survey crews;
- d. Emergency response personnel; and
- e. Flagging crews.

D. Class E Safety Apparel

1. Class E apparel includes trousers or shorts which are part of a Class 3 apparel ensemble. Frequently a Class 2 vest is paired with Class E trousers, creating an overall ensemble which meets Class 3 apparel requirements. Class E garments are not intended to be worn without Class 2 or 3 garments.
2. At a minimum, Class E trousers shall have 465 in² (0.30 m²) of fluorescent yellow-green, orange-red, or red background materials combined with 108 in² (0.07 m²) retro-reflective material. Retro-reflective material shall encircle each leg (360° of visibility) and be placed not less than 1.97 inches (50 mm) above the bottom leg of the trouser.
3. At a minimum, Class E shorts shall have 465 in² (0.30 m²) of fluorescent yellow-green, orange-red, or red background materials combined with 108 in² (0.07 m²) retro-reflective material. Retro-reflective material shall encircle each leg.

E. Headwear

1. Headwear is considered an important accessory and compliments the overall visibility of the wearer. High-visibility headwear enhances visibility to the head of a moving worker in daylight and helps define the shape of the human form during nighttime exposures.
2. At a minimum, high-visibility headwear shall have 78 in² (0.05 m²) of fluorescent yellow-green, orange-red, or red background materials combined with 10 in² (0.0065 m²) retro-reflective material. As an alternative, the headwear can have 78 in² (0.05 m²) of combined-performance material.

URS SAFETY MANAGEMENT STANDARD

Sanitation

1. Applicability

This standard applies to the operations of URS Corporation and its subsidiary companies.

2. Purpose and Scope

The purpose of this standard is to provide employees with appropriate personal hygiene facilities, including toilets, wash rooms, and eating facilities, to protect employees from unsanitary conditions.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility or site.

4. Requirements

A. Prior to the start of site activities, ensure the availability of adequate toilet and wash facilities. Note: Mobile crews having transportation readily available (within 5 minute travel time) to nearby toilet facilities need not be provided with facilities.

1. Flush toilets will be used where available.
2. For job sites without flush toilets readily available, one of the following must be provided:
 - a. Chemical toilets.
 - b. Combustion toilets.
 - c. Recirculation toilets.
3. Other than construction sites, toilets will be provided for employees of each sex at sites according to the following ratio:

Number of Employees	Minimum # of toilets ⁽¹⁾
1 to 15	1
16 to 35	2
36 to 55	3
56 to 80	4
81 to 110	5
111 to 150	6
Over 150	⁽²⁾

Notes:

(1) Where toilet facilities will not be used by women, urinals may be provided instead of the minimum specified.

(2) One (1) additional fixture for each additional 40 employees.

URS SAFETY MANAGEMENT STANDARD
Sanitation

- B. A means for washing hands must be provided next to or near toilet areas.
- C. For facilities under URS control:
 - 1. Maintain toilets and toilet area in good repair and in a clean and sanitary condition. Refer to SMS 021 – Housekeeping.
 - 2. Provide paper towels and soap or other suitable sanitizing material for washing hands.
 - 3. Construct toilets so that the interior is lighted, by artificial or natural light, adequate ventilation is provided, and all windows and vents are screened.
- D. Maintain availability and cleanliness of drinking (potable) water.
 - 1. Use backflow prevention devices, testing, and administrative controls for all potable water supply branches. Maintain backflow prevention devices in a sanitary condition.
 - 2. Keep water coolers and water dispensers in a sanitary condition and filled only with potable water. Clearly mark potable drinking water containers as “Drinking Water.”
 - 3. Clean and sanitize water containers daily. Tightly close, seal, date, and mark containers as to the contents. Provide containers with a tap, and refill daily.
 - 4. Provide fountain-type dispensers or one-use cups at each water dispenser. Provide a waste receptacle where disposable cups are used.
 - 5. Do not use common drinking cups.
 - 6. Conspicuously post outlets for non-potable water such as water for industrial or firefighting purposes (e.g., Danger – Water Unfit for Drinking, Washing, or Cooking).
 - 7. Laboratory-test drinking water obtained from streams, wells, or other temporary sources in accordance with federal, state, or local regulations, or often enough to ensure it is suitable for consumption. Maintain records of testing reports and results.

URS SAFETY MANAGEMENT STANDARD
Sanitation

E. Eating Facilities

1. Operate and maintain food dispensing facilities established by URS in compliance with applicable health and sanitation regulations.
2. Ensure that buildings housing these facilities are floored completely, painted, well lighted, heated, ventilated, fly proof, and sanitary. Equip doors and windows with screens.
3. Use microwave ovens for food only.
4. Use refrigerators designated for food storage for food only (i.e., no chemical or samples storage).
5. Prohibit workers from eating and drinking or storing foods and drinks in areas where there is a potential for contamination.
6. Take positive control measures for protection against vermin, insects, and rodents.
7. Provide an ample supply of hot and cold water at all times in mess halls.
8. Clean break rooms /lunchrooms periodically. Refer to SMS 021 – Housekeeping.

F. Washing Facilities

1. Maintained each washing facility in a sanitary condition, and provide adequate water, soap, individual towels of cloth or paper, and covered receptacles for disposal of waste.
2. Provide emergency showers and eyewash facilities as required. Refer to SMS 065 – Injury Management.
3. Provide at least one shower for each 30 employees in construction camps. The use of a common towel is prohibited.

G. Waste Management:

1. Release sanitary sewage into sanitary sewer lines or to other proper disposal channels.
2. Do not dispose of garbage, refuse, or sewage in lakes, reservoirs, rivers, streams, or ditches.

URS SAFETY MANAGEMENT STANDARD
Sanitation

3. Do not discharge hazardous waste into the sanitary sewer or storm sewer system.
4. Collect garbage and trash daily.
 - a. Provide lids for garbage containers located outside buildings, and keep them closed. Transport garbage offsite at least weekly.
 - b. Remove garbage from the site daily at remote field sites where wild animals are a hazard. Do not let garbage remain on site overnight.

H. Change Rooms

Provide heated and ventilated change rooms for changing, hanging, and/or drying clothing for operations subjecting workers to prolonged wetting or contact with hazardous materials.

I. Sleeping Facilities

1. Keep temporary sleeping quarters heated, ventilated, lighted, and clean. Screen all doors and windows.
2. Keep clean and sanitary, and periodically disinfect bunkhouses, bedding, and furniture.

J. Notify property manager of sanitation issues for sites not under URS control.

K. Personal Hygiene

Wash hands and face before eating, drinking, smoking, and using facilities.

L. Inspect work sites periodically in accordance with Attachment 030-1 NA.

5. Documentation Summary

The following information will be maintained in the project file:

- A. Completed inspection sheets.

URS SAFETY MANAGEMENT STANDARD
Sanitation

6. Resources

- A. U.S. Occupational Safety and Health Administration (OSHA) Construction Standard – [Sanitation – 29 Code of Federal Regulations \(CFR\) 1926.51](#)
- B. U.S. OSHA General Industry Standard – [Sanitation – 29 CFR 1910.141](#)
- C. [SMS 021](#) - Housekeeping
- D. [SMS 065](#) – Injury Management
- E. [Attachment 030-1 NA](#) - Sanitation Inspection Sheet



Health, Safety and Environment
SANITATION INSPECTION SHEET

Attachment 030-1 NA
Issue Date: June 1999
Revision 4: September 2011

Location: _____ Job No: _____

Date Inspected: _____ Name of Inspector: _____

Toilets

- 1. Are there an adequate number of toilets on site? Yes No NA
1 to 15 employees = 1 toilet
16 to 35 employees = 2 toilets
36 to 55 employees = 3 toilets
56 to 80 employees = 4 toilets
81 to 110 employees = 5 toilets
- 2. Toilets are in clean condition. Yes No NA
- 3. Toilet paper is provided. Yes No NA
- 4. Toilet areas are clean and sanitary. Yes No NA

Hand Washing Facilities

- 5. Hand washing facilities are provided near toilets. Yes No NA
- 6. Paper towels and soap are provided. Yes No NA

Drinking Water

- 7. Drinking water is provided on site. Yes No NA
- 8. Disposable cups are provided or fountain-type dispenser is provided. Yes No NA
- 9. Drinking water containers are kept clean and tightly closed or covered. Yes No NA

Break Rooms

- 10. Break rooms or eating areas are kept clean. Yes No NA
- 11. Microwaves are used for food only. Yes No NA
- 12. Microwave ovens are kept clean. Yes No NA
- 13. Refrigerators are kept clean. Yes No NA
- 14. Refrigerators are used to store food only. Yes No NA

Vermin

- 15. Rats, mice, and other vermin are not living within buildings. Yes No NA
- 16. Cockroaches and fleas are not thriving within buildings. Yes No NA

Employee Compliance

- 17. Employees only eat/drink in areas free from contamination. Yes No NA
- 18. Employees wash hands/face prior to eating, drinking, smoking. Yes No NA

REMARKS:

URS SAFETY MANAGEMENT STANDARD

Work Zone Traffic Control

1. Applicability

This standard applies to those activities of URS Corporation and its subsidiary companies involving work performed on roads, highways, and similar areas where motor vehicles may be a hazard, and where URS is responsible for traffic control.

2. Purpose and Scope

This standard is intended to protect personnel from the hazards associated with work performed on or next to highways and roads.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility, site, or project location.

4. Requirements

- A. Review the project in the planning phase to determine if any work will be performed on or adjacent to any road that will disrupt normal traffic flow.
- B. Where project operations will be performed on or adjacent to roadways, plan work to interfere as little as possible with traffic, and to provide and maintain ingress and egress for all residences and places of business that may be impacted.
- C. When required by local regulations or when there is a potential to disrupt traffic, a traffic control plan, in detail appropriate to the complexity of the project, must be prepared by a competent person and understood by all responsible parties before activities begin. Any changes in the traffic control plan should be approved by an official trained in safe traffic control practices.
 1. Competent persons are those who are knowledgeable about the fundamental principles of temporary traffic control and the work activities to be performed, and who have the authority to propose and implement corrective measures to eliminate hazardous situations associated with temporary traffic control.
 2. Design traffic control plans to meet requirements set forth in Part 6 of the *Manual on Uniform Traffic Control Devices (MUTCD)*, as well as those rules set by state, county, and cities in which work is

URS SAFETY MANAGEMENT STANDARD
Work Zone Traffic Control

performed. At a minimum, the plan will include information on the following, as needed:

- a. Pedestrian and worker safety;
 - b. Temporary traffic control elements, including (but not limited to) temporary traffic control zones, advance warning zones, transition areas, activity areas, termination areas, tapers, buffers, detours, etc.;
 - c. Flagger controls, including high-visibility safety apparel, hand-signaling devices, and flagger procedures;
 - d. Temporary traffic control zone devices, including (but not limited to) signs, illuminated/flashing panels, warning devices, channelizing devices, drums, barricades, pavement markings; and
 - e. Temporary traffic control zone activities, including scope of work, duration, location, and portions of the roadway/shoulder affected.
- D. Submit the traffic control plan to the applicable road authority for approval.
- E. A Worksite Traffic Control Supervisor, certified by the American Traffic Safety Services Association (ATSSA) or an equivalent organization will be responsible for initiating, installing, and maintaining all traffic control devices. The Worksite Traffic Control Supervisor will also directly supervise all project flaggers.
1. Certified flaggers must attend an 8-hour work-zone traffic control course as taught by an ATSSA certified instructor (or equivalent).
- F. Execute the traffic control plan developed for the job site.
- G. Require all personnel exposed to the risks of moving roadway traffic or construction equipment to wear hardhats, safety glasses, sleeved shirts, long pants, work boots, and the appropriate class of high-visibility safety apparel. Safety apparel background material must be either fluorescent orange-red or fluorescent yellow-green, with accompanying reflective material of orange, yellow, white, silver, or yellow-green, or fluorescent versions of these colors.

URS SAFETY MANAGEMENT STANDARD

Work Zone Traffic Control

H. Wear high-visibility clothing as follows:

1. Class 2 safety apparel (as defined by American National Standards Institute/International Safety Equipment Association [ANSI/ISEA]) is required for all activities where employees could be exposed to traffic or construction equipment in work zones.
2. Apparel must be upgraded to Class 3 during night work and where visibility is impaired due to weather, limited sight distances, complicated background or other causes.
3. Refer to SMS 029 – Personal Protective Equipment for suggested apparel for each class.

F. Perform inspection and maintenance of the Traffic Control devices using Attachment 032-1 NA daily, or at the beginning of each shift.

5. Documentation Summary

The following information will be maintained in the project file:

- A. Copies of traffic control plans used on site.
- B. Training certificates for Traffic Control Supervisors and flaggers.
- C. Inspection records (Attachment 032-1 NA).

6. Resources

- A. Part VI of the [Manual on Uniform Traffic Control Devices](#) (MUTCD) – 2009 Edition
- B. [American Traffic Safety Services Association](#)
- C. [ATTSA Flagger Train-the-Trainer Program](#)
- D. [ANSI/ISEA 107-2004](#) – Standard for High-Visibility Safety Apparel
- E. [High Visibility Apparel in Work Zones](#) – Work Zone Safety
- F. [SMS 029](#) – Personal Protective Equipment
- I. [Attachment 032-1](#) – Traffic Control Device Inspection Checklist



Health, Safety, and Environment
**TRAFFIC CONTROL DEVICE
INSPECTION CHECKLIST**

Attachment 032-1 NA

Issue Date: June 1999
Revision 4: September 2012

Project Name: _____

Project Number: _____

Location Inspected: _____

1. **Are any devices missing?** Yes No

Do any devices need repair? Yes No

Were all replaced or repaired? Yes No

Notes:

2. **Are any lights (flashers, etc.) not functioning?** Yes No

Were they all replaced or repaired? Yes No

Notes:

3. **Are any devices improperly placed?** Yes No

Were all positions corrected? Yes No

Notes:

4. **Do any devices need cleaning?** Yes No

Were all devices cleaned? Yes No

Notes:

5. **Are flaggers certified and flagging appropriately?** Yes No

Notes:

Additional Comments:

The above check was completed by: _____

Date: _____ Time: _____

URS SAFETY MANAGEMENT STANDARD

Utility Clearances and Isolation

1. Applicability

This standard applies to URS Corporation and its subsidiary companies where personnel may encounter subsurface or overhead utilities.

2. Purpose and Scope

Many field activities are conducted near aboveground and underground utilities. The primary purpose of this standard is to establish operating requirements that will permit employees to work safely in the vicinity of electrical, natural gas, fuel, water, and other utility systems and installations. The secondary purpose is to prevent economic damage to utility systems from operations associated with project-related activities.

The term *utility clearance* includes the following:

- A. The positive locating of utility systems in or near the work area.
- B. A signed statement by an appropriate representative attesting to the location of underground utilities and/or the positive de-energizing (including lockout) and testing of electrical utilities.

In some cases, utility representatives may deem it appropriate or necessary to use insulating blankets to isolate a power line. This is an acceptable alternative to positive de-energizing; however, only utility representatives can make the determination.

"Contact" with overhead power lines is considered to occur when equipment is closer to power lines than permitted by the criteria in the table in Section 4.C.2.b. (See note for operations in the United Kingdom).

On-site utilities, including emergency shut-off locations, shall be depicted on a utility drawing or plot plan. Emergency shut-off locations shall be verified before work activities commence.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility, site, or project location.

4. Requirements

- A. Time for Completion

Complete utility clearances prior to the start of any work in the area of the utility that could feasibly result in contact with or damage to that utility.

URS SAFETY MANAGEMENT STANDARD

Utility Clearances and Isolation

B. Local Regulations

Research local and state codes and regulations regarding utility locating and isolation requirements. Utility companies and locating services are among the appropriate resources.

C. Overhead Power Lines

1. Proximity to Power Lines

No work is to be conducted within 50 feet (15 meters) of overhead power lines without first contacting the utility company to determine the voltage of the system and the height (at the lowest point) of the line has been measured. No aspect of any piece of equipment is to be operated within 50 feet (15 meters) of overhead power lines without first making this determination.

An exclusion zone shall be created at ground level beneath and 50 feet (15 meters) perpendicular to the overhead power lines on each side. This exclusion zone shall be demarcated with visual indicators (e.g., signage, flagging, paint, cones). No equipment shall enter the exclusion zone without approval from URS site management.

2. Operations adjacent to overhead power lines are *prohibited* unless one of the following conditions is satisfied:

- a. Power has been shut off, positive means (such as lockout) have been taken to prevent the lines from being energized, lines have been tested to confirm the outage, and the utility company has provided a signed certification of the outage.
- b. The minimum clearance from energized overhead lines is presented in the following table, or the equipment will be repositioned and blocked so that no part, including cables, can come within the minimum clearances listed in the table.

Minimum Distances from Power Lines	
Nominal System (kilovolt, kV)	Minimum Required Distance
0–50	10 feet (3 meters)
51–100	12 feet (3.6 meters)
101–200	15 feet (4.6 meters)
201–300	20 feet (6.1 meters)
301–500	25 feet (7.6 meters)
501–750	35 feet (10.7 meters)
751–1000	45 feet (13.7 meters)

URS SAFETY MANAGEMENT STANDARD

Utility Clearances and Isolation

Note: For operations in the United Kingdom, the specific safe distance is determined by the utility company.

- c. The power line(s) has been isolated through the use of insulating blankets, which have been properly placed by the utility. If insulating blankets are used, the utility will determine the minimum safe operating distance; get this determination in writing with the utility representative's signature.
3. All inquiries regarding electric utilities must be made in writing and a written confirmation of the outage/isolation must be received by the appropriate URS representative prior to the start of the task that may impact the utility.

D. Underground Utilities

1. Do not begin subsurface work (e.g., trenching, excavation, drilling, etc.) until a check for underground utilities and similar obstructions has been conducted. The use of as-built drawings must be confirmed with additional geophysical or other surveys. Attachment 034-1 NA may be used to verify all utilities have been located prior to performing subsurface work.
2. Contact utility companies or the state/regional utility protection service at least two (2) working days prior to excavation activities to advise them of the proposed work and to ask them to establish the location of the underground utility installations prior to the start of actual excavation. One Call utility location service is available throughout the United States by calling 811. Where these services are unavailable (e.g., private properties), contract with an independent utility locating service to perform an evaluation of subsurface utilities.
3. Obtain utility clearances for subsurface work on both public and private property. Clearances are to be in writing and signed by the party conducting the clearance.
4. Protect and preserve the markings of approximate locations of facilities until the markings are no longer required for safe and proper excavations. If the markings of utility locations are destroyed or removed before excavation commences or is completed, the URS representative must notify the utility company, utility protection service, or the utility locating service to inform them that the markings have been destroyed.

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Utility Clearances and Isolation

5. Do not conduct mechanical-assisted subsurface work (e.g., work using a powered drill rig, mechanical excavator, etc.) within five (5) feet (1.5 meters) of a confirmed or suspected utility or other subsurface structure. Confirm minimum distances for mechanical-assisted subsurface work with the utility owner, as distances beyond this five-foot minimum may be required.
6. Nondestructive clearance techniques (e.g., vacuum extraction or other hand clearing means) are required prior to drilling/excavating in higher risk locations, including chemical plants, retail service stations, or other locations with complex underground utility systems.
7. Subsurface work within five feet (1.5 meters) of a confirmed or suspected utility or other subsurface structure must be done by nondestructive clearing techniques to the point where the obstruction is visually located and exposed. Once the obstruction location is confirmed in this manner, mechanical-assisted work may begin.
8. Reference SMS 013 – Excavation Safety for additional information regarding subsurface operations.

E. Utility Strikes

1. Utility strikes (unplanned contact with utilities resulting in damage to the utility or its protective coating) shall be reported in accordance with SMS 049 – Injury/Illness/Incident Reporting & Notifications.
2. All damaged utilities shall be repaired by a qualified and/or licensed professional.

F. Training

Conduct a briefing for site employees regarding the hazards associated with working near the utilities and the means by which the operation will maintain a safe working environment. Detail the method used to isolate the utility and the hazards presented by breaching the isolation.

5. Documentation Summary

The following documentation will be maintained in the project file:

- A. Documents requesting utility clearance.
- B. Documents confirming utility clearance.

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Utility Clearances and Isolation

C. Training/briefing documentation of each isolation.

6. Resources

- A. Utility Locating Services (typically under "Utility" in the Yellow Pages)
- B. National Institute for Occupational Safety and Health (NIOSH) Alert – [Preventing Electrocutions from Contact Between Cranes and Power Lines](#)
- C. [One Call Utility Locating List](#)
- D. [National Utility Locating Contractor's Association](#)
- E. [Attachment 034-1](#) – Utility Clearance Checklist
- F. [SMS 013](#) – Excavation Safety
- G. [SMS 049](#) – Injury/Illness/Incident Reporting



Health, Safety and Environment
UTILITY CLEARANCE CHECKLIST

Attachment 034-1 NA

Issue Date: June 1999
Revision 6: September 2011

Project Name:	Project Number:
Project Location:	Client Name:
URS Project Manager Name:	Date Completed:

For any item answered 'No', Project Manager approval required before work can proceed.	
Within the last 10 days, and not less than 72 hours from the initiation of the task, contacts were notified that the public utility locate service (One Call) was made.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Available records have been referenced and a plot plan indicating the location of all underground utilities have been provided and are available for reference at the work site.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A

Completed Site Walk Over With Site Personnel (site manager, property owner or tenant representative)			
Site Personnel Name:	Site Personnel Signature:		
Does Site Personnel have any additional information regarding site utilities?	<input type="checkbox"/> Yes <input type="checkbox"/> No	Comment:	
Building Utility Service Line Connections Identified:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Cleared:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A

Field Observations – Any ** responses must be explained in box below.	
Field walk completed and utilities identified on page 2 of this form are cleared?	<input type="checkbox"/> Yes <input type="checkbox"/> No**
Apparent saw cuts or patches in concrete/pavement?	<input type="checkbox"/> Yes** <input type="checkbox"/> No
Piping along building exterior? Identify purposed and layout.	<input type="checkbox"/> Yes** <input type="checkbox"/> No <input type="checkbox"/> N/A
Manholes, vault covers, drains, pipes present?	<input type="checkbox"/> Yes** <input type="checkbox"/> No
Piping inside of manholes correlate to utility markings?	<input type="checkbox"/> Yes <input type="checkbox"/> No** <input type="checkbox"/> N/A
Clear line-of-sight (equipment/vehicles/snow not blocking view or potential utilities)?	<input type="checkbox"/> Yes <input type="checkbox"/> No**
Work between potential utilities or manholes?	<input type="checkbox"/> Yes** <input type="checkbox"/> No
Work areas clear of overhead utilities?	<input type="checkbox"/> Yes <input type="checkbox"/> No**
All known utilities located on plot/site map for personnel to review?	<input type="checkbox"/> Yes <input type="checkbox"/> No**
Explanations:	

Public Utility Locate (OneCall)			
Date Called:		Called By:	
Ticket Number:		Valid Until:	
Area Requested To Be Cleared:			

Private Utility Locate		
Company Performing Locate:		Date Completed:
Area(s) Requested To Be Cleared (including distance around marked locations):		
Method(s) Used (e.g., GPR, EM):		
Confirm Area(s) Cleared:		



UTILITY CLEARANCE CHECKLIST

OneCall Utilities			Field Observation
Utility	Notified by	Comments	Marked (mains and services)
Electric (Red)	<input type="checkbox"/> OneCall <input type="checkbox"/> Other		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above
Gas/Petroleum Pipeline (Yellow)	<input type="checkbox"/> OneCall <input type="checkbox"/> Other		<input type="checkbox"/> Yes <input type="checkbox"/> No
Sewer/Drainage (Green)	<input type="checkbox"/> OneCall <input type="checkbox"/> Other		<input type="checkbox"/> Yes <input type="checkbox"/> No
Water (Blue)	<input type="checkbox"/> OneCall <input type="checkbox"/> Other		<input type="checkbox"/> Yes <input type="checkbox"/> No
Communications (Orange)	<input type="checkbox"/> OneCall <input type="checkbox"/> Other		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above
Other	<input type="checkbox"/> OneCall <input type="checkbox"/> Other		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above

Utilities Not Identified By OneCall (Includes both Public and Private along with Regional and Site Utilities)			Field Observation
Utility (Colors may vary)	Owner / Contact / Phone #	Notified	Marked
Communications: (Orange) TV, computer, phone, cell towers, site communication, cameras, security, etc.		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above
Electricity: (Red) Mains / Supplies / Interior / Exterior (signs, fuel pumps, low voltage security perimeters, gates, property light posts, equipment, substations, etc.)		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above
Gas: (Yellow) Mains / Supplies / Equipment / Pipelines (Natural, Process, Oil, Crude, Refined (Gas, Diesel, Jet), etc.)		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above
Steam (Yellow)		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above
Structures: Possible horizontally installed facilities, vaults, basements, tunnels, sub-grade structures, foundations, overhead obstructions, etc.		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above
UST Systems (Tanks / piping / electric)		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Sewer: (Green) Sanitary, storm, combined, septic, drainage (parking, buildings, fields), irrigation		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Water: (Blue) Process, Plant, potable, well, cooling, return/makeup, fire, sprinkler, landscape irrigation, reclaim (Purple) other		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above
Other: Abandoned Lines, invisible dog fences, shopping cart perimeter monitoring, traffic lights		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above

If subsurface work is within five feet (1.5 meters) of a confirmed or suspected utility or other subsurface structure, nondestructive clearing techniques (e.g., air knife, vacuum excavation, hand auger) must be completed to visually locate and expose the utility.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Precautions have been taken to prevent contact with overhead or underground utilities.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A

Printed Name of Person Completing Checklist:	Signature:
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URS SAFETY MANAGEMENT STANDARD

Cranes and Derricks

1. Applicability

This standard applies to URS Corporation and its subsidiary companies where cranes and derricks are used.

2. Purpose and Scope

The purpose of this standard is to establish general practices for the operation and maintenance of cranes in order to minimize the potential for personal injury and property damage. These general practices must be supplemented by applicable regulatory requirements, and any practices, procedures, and/or operational requirements outlined by the crane manufacturer.

3. Implementation

Implementation of this standard is the responsibility of the manager directing activities of the facility, site, or project location.

4. Requirements

A. Introduction

1. The Cranes and Derricks standard has been revised to include the new ASME/ANSI 30.5 Standards, effective March 2009. This revised standard includes checklists and sample documents to better assist with planning for all their crane and derrick needs.
2. These procedures include the minimum requirements set forth by ASME/ANSI, and other federal and state agencies. Best practices are included that were proven to reduce the number of incidents that involve the use of hoisting, rigging, and cranes.
3. Planning is the key to successful and safe hoisting operations and the prevention of accidents and incidents. Proper planning includes, at a minimum:
 - a. Development, training, and implementation of a Job Hazard Analysis for each of the tasks to be performed during each lift.
 - b. Using the Project Lift Classification Checklist (Attachment 038-2 AMER). The Project Lift Classification Checklist should be used to determine the type of lift being made.
 - c. Correctly identifying when a lift is considered "critical," as defined by this Standard.

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Cranes and Derricks

- d. Addressing ground conditions and power line safety in the lift pre-planning.
- e. Using the Critical Lift Plan (Attachment 038-3 AMER) as an aid to assure that proper preparation was made for the lift.

B. Definitions

A full listing of Definitions is provided in Attachment 038-1 AMER.

C. Ground Conditions

1. Do not assemble or use the equipment unless ground conditions are firm, drained (except for marshes/wetlands), and graded to a sufficient extent that, in conjunction with the use of supporting materials (if necessary), the equipment manufacturer's specifications for adequate support and degree of equipment level are met.
2. Controlling entity means a prime contractor, general contractor, or construction manager, or any other legal entity having the overall planning, quality, and completion responsibility for the construction of the project. The controlling entity must:
 - a. Ensure that ground preparations necessary to meet the requirements in paragraph 1 of this section are provided.
 - b. 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) that are identified in documents (such as site drawings, as-built drawings, and soil analyses) if they are available to the controlling entity.
3. If the assembly/disassembly (A/D) supervisor determines that ground conditions do not meet the requirements for safe lifting, that project manager (or his/her designee) must notify the controlling entity regarding the ground preparations that are needed.

D. Assembly/Disassembly – General Requirements

1. Supervision
 - a. Assembly/disassembly must be supervised 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 (A/D supervisor). The

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- supervisor must be experienced in working with the make and model of equipment being assembled or disassembled.
- b. Where the assembly/disassembly is being performed by only one person, that person must meet the criteria for both a competent person and a qualified person.
2. Knowledge of procedures.
 - a. The A/D supervisor must understand the applicable assembly/disassembly procedures.
 3. Review of procedures.
 - a. The A/D supervisor must review the applicable assembly/disassembly procedures, Job Safety Analysis (JSA) for each task, or a written Assembly/Disassembly Procedure (Supplemental Information F). This review will be completed immediately prior to the commencement of assembly/disassembly, unless the A/D supervisor has applied them to the same type and configuration of equipment (including accessories, if any) so that they are already known and understood.
 4. Develop crew instructions for assembly/disassembly operation by using the minimum of a JSA for each task to be performed.
 - a. Before commencing assembly/disassembly operations, the A/D supervisor must determine that the crew members understand the following:
 - i. Their tasks;
 - ii. The hazards associated with their tasks; and
 - iii. The hazardous position/locations that they need to avoid.
 - b. During assembly/disassembly operations, before a crew member takes on a different task, or when adding new personnel during the operations, the requirements in paragraph 4.a of this section must be met with respect to the crew member's understanding regarding that task.
 5. Protecting assembly/disassembly crew members out of operator view.

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- a. Before a crew member goes to a location that is out of view of the operator and is either in, on, under, or near the equipment (or load) where the crew member could be injured by movement of the equipment (or load), the crew member must inform the operator that he/she is going to that location.
 - b. Where the operator knows that a crew member went to a location covered by paragraph 5.a of this section, the operator will not move any part of the equipment (or load) until the operator is informed in accordance with a pre-arranged system of communication that the crew member is in a safe position.
6. Working under the boom, jib, or other components.
- a. When pins (or similar devices) are being removed, workers must not be under the boom, jib, or other components, except where the requirements of paragraph 6.b of this section are met.
 - b. Where the project manager (or his/her designee) demonstrates that site constraints require one or more workers to be under the boom, jib, or other components when pins (or similar devices) are being removed, the A/D supervisor must implement procedures that minimize the risk of unintended dangerous movement, and minimize the duration and extent of exposure under the boom.
7. Capacity limits. During all phases of assembly/disassembly, rated capacity limits for loads imposed on the equipment, equipment components (including rigging), lifting lugs, and equipment accessories must not be exceeded for the equipment being assembled/disassembled.
8. Addressing specific hazards. The A/D supervisor must address the hazards associated with the operation with methods to protect the workers from them, as follows:
- a. Site and ground-bearing conditions. Site and ground conditions must be adequate for safe assembly/disassembly operations and to support the equipment during assembly/disassembly.
 - b. Blocking material. The size, amount, condition, and method of stacking blocking must be sufficient to sustain the loads

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- and maintain stability.
- c. Proper location of blocking. When used to support lattice booms or components, blocking must be appropriately placed to:
 - i. Protect the structural integrity of the equipment; and
 - ii. Prevent dangerous movement and collapse.
 - d. Verifying assist crane loads. When using an assist crane, the loads that will be imposed on the assist crane at each phase of assembly/disassembly must be verified before assembly/disassembly begins, in order to prevent exceeding rated capacity limits for the assist crane.
 - e. Boom and jib pick points. The point(s) of attachment of rigging to a boom (or boom sections, or jib or jib sections) must be suitable for preventing structural damage and facilitating safe handling of these components.
 - f. Center of gravity
 - i. Identify the center of gravity of the load if necessary for the method used for maintaining stability.
 - ii. Where there is insufficient information to accurately identify the center of gravity, use measures designed to prevent unintended dangerous movement resulting from an inaccurate identification of the center of gravity.
 - g. Stability upon pin removal. Rig or support the boom sections, boom suspension systems (such as gantry A-frames and jib struts), or components to maintain stability upon the removal of the pins.
 - h. Snagging. Do not allow suspension ropes and pendants to catch on the boom or jib connection pins or cotter pins (including keepers and locking pins).
 - i. Struck by counterweights. Prevent the potential for unexpected movement from inadequately supported counterweights and from hoisting counterweights.

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- j. Boom-hoist brake failure. Where reliance is placed on the boom-hoist brake to prevent boom movement during assembly/disassembly, the brake will be tested to determine if it is sufficient to prevent boom movement. If it is not sufficient, a boom hoist pawl, other locking device/back-up braking device, or another method of preventing dangerous movement of the boom (such as blocking or using an assist crane) from a boom-hoist brake failure will be used.
 - k. Loss of backward stability. Consider backward stability before swinging the upper works, travel, and the attaching or removing equipment components.
 - l. Wind speed and weather. Consider wind speed and weather so that the safe assembly/disassembly of the equipment is not compromised.
- 9. Cantilevered boom sections. Do not exceed manufacturer's limitations on the maximum amount of boom supported only by cantilevering. When such limitations are not available, a registered professional engineer familiar with the type of equipment involved will determine this limitation in writing: this limit must not be exceeded.
- 10. Weight of components. The weight of the components must be readily available.
- 11. Components and configuration
 - a. The selection of components and configuration of the equipment that affects the capacity or safe operation of the equipment must be in accordance with:
 - i. Manufacturer's instructions, limitations, and specifications. Where these are unavailable, a registered professional engineer familiar with the type of equipment involved must approve, in writing, the selection and configuration of components; or
 - ii. Approved modifications that meet the equipment requirements.
 - b. Post-assembly inspection. Upon completion of assembly, inspect the equipment to ensure compliance with the URS initial and annual crane inspection and load testing.

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12. Manufacturer's prohibitions. The project manager (or his/her designee) must comply with applicable manufacturer's prohibitions.
13. Shipping pins. Remove reusable shipping pins, straps, links, and similar equipment, and store so that they do not present a falling-object hazard.
14. Pile driving. Equipment used for pile driving must not have a jib attached during pile-driving operations.
15. Outriggers. When the load to be handled and the operating radius require the use of outriggers, or at any time when outriggers are used, the following requirements must be met:
 - a. The outriggers must be either fully extended; or, if the manufacturer's procedures permit, deployed as specified in the load chart.
 - b. The outrigger must be set with the machine-supported level, on fully extended outriggers with all tires free of the supporting surface (clear of the surface), except for locomotive cranes (see paragraph 15.f of this section for use of outriggers on locomotive cranes).
 - c. When outrigger floats are used, they must be attached to the outriggers.
 - d. Each outrigger must be visible to the operator or to a signal person during extension and setting.
 - e. Outrigger blocking must:
 - i. Meet the requirements in paragraphs 8.b and 8.c of this section.
 - ii. Be placed only under the outrigger float, and/or the outrigger jack. Where the outrigger is designed without a jack, the blocking must be placed under the outer bearing surface of the extended outrigger beam.
 - f. For locomotive cranes, when using outriggers to handle loads, the manufacturer's procedures must be followed. When lifting loads without using outriggers, the manufacturer's procedures will be met regarding truck wedges or screws.

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E. Assembly/Disassembly – Additional Requirements for Booms and Jibs

1. Do not remove any of the pins in the pendants (partly or completely) when the pendants are in tension.
2. Do not remove any of the pins (top and bottom) on boom sections located between the uppermost boom section and the crane/derrick body (partly or completely) when the boom is being supported by the uppermost boom section resting on the ground (or other support).
3. Do not remove any of the top pins on boom sections located on the cantilevered portion of the boom being removed (the portion being removed ahead of the pendant attachment points) (partly or completely) until the cantilevered section to be removed is fully supported.

F. Assembly/Disassembly – Project Manager Procedures

1. When using the project manager's (or his/her designee's) procedures instead of the manufacturer's procedures for assembling or disassembling, the project manager (or his/her designee) must ensure that the procedures are designed to:
 - a. Prevent unintended dangerous movement, and prevent collapse of all parts of the equipment.
 - b. Provide adequate support and stability of all parts of the equipment during the assembly/disassembly process.
 - c. Position workers involved in the assembly/disassembly operation so that their exposure to unintended movement or collapse of part or all of the equipment is minimized.
2. Project manager's procedures must be developed by a qualified person.

G. Assembly/Disassembly – Power-Line Safety (up to 350 kilovolts [kV])

1. Users of this standard should also refer to ANSI 30.5-3.4.5.
2. Before assembling or disassembling equipment, the project manager (or his/her designee) must determine if any part of the equipment, load line, or load (including rigging and lifting accessories) could get closer than 20 feet to a power line during the assembly/disassembly process. If so, the project manager (or

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his/her designee) must meet the requirements in Option 1, Option 2, or Option 3, as follows:

- a. Option 1 – De-energize and ground. Confirm from the utility owner/operator that the power line has been de-energized and visibly grounded at the worksite.
 - b. Option 2 – 20-foot clearance. Ensure that no part of the equipment, load line, or load (including rigging and lifting accessories), gets closer than 20 feet to the power line by implementing the measures specified in paragraph (b) of this section.
 - c. Option 3 – Clearance
 - i. Determine if any part of the equipment, load line, or load (including rigging and lifting accessories) could get closer than the minimum approach distance to the power line permitted under the table provided in Attachment 038-4 AMER – Required Clearance for Normal Voltage. If so, then the project manager (or his/her designee) must follow the requirements in paragraph b of this section to ensure that no part of the equipment, load line, or load (including rigging and lifting accessories), gets closer to the line than the minimum approach distance.
3. Prevent encroachment/electrocution. Where encroachment precautions are required under Option 2 or Option 3, the following requirements must be met:
- a. Conduct a planning meeting with the A/D supervisor, operator, A/D crew, and the other workers who will be in the A/D area to review the location of the power line(s), and the steps that will be implemented to prevent encroachment/electrocution.
 - b. Use only non-conductive tag lines.
 - c. At least one of the following additional measures must be in place:
 - i. Use of a dedicated spotter who is in continuous contact with the equipment operator. The dedicated spotter must:

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- a. 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).
 - b. Be positioned to effectively gauge the clearance distance.
 - c. Where necessary, use equipment that enables the dedicated spotter to communicate directly with the operator (radio, telephone, or other electronic transmission of signals).
 - d. Give timely information to the operator so that the required clearance distance can be maintained.
- ii. Set a proximity alarm to give the operator sufficient warning to prevent encroachment.
 - iii. Employ a device that automatically warns the operator when to stop movement, such as a range control warning device. Set the device to give the operator sufficient warning to prevent encroachment.
 - iv. Employ a device that automatically limits range of movement, set to prevent encroachment.
 - v. Employ an elevated warning line, barricade, or line of signs, in view of the operator, equipped with flags or similar high-visibility markings.
4. Assembly/disassembly below power lines prohibited. No part of a crane/derrick, load line, or load (including rigging and lifting accessories), whether partially or fully assembled, is allowed below a power line unless the project manager (or his/her designee) has confirmed that the utility owner/operator has de-energized and visibly grounded the power line (at the worksite).
 5. Assembly/disassembly inside clearance limits prohibited. No part of a crane/derrick, load line, or load (including rigging and lifting accessories), whether partially or fully assembled, is allowed closer

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than the minimum approach distance listed in Attachment 038-4 AMER to a power line unless the project manager (or his/her designee) has confirmed that the utility owner/operator has de-energized and (at the worksite) visibly grounded the power line.

6. Voltage information. Where Option 3 of this section is used, the utility owner/operator of the power lines must provide the requested voltage information within 2 working days of the project manager's (or his/her designee's) request.
7. The project manager (or his/her designee) must assume that all power lines are energized unless the utility owner/operator confirms that the power line has been and continues to be de-energized and visibly grounded at the worksite.
8. There must be at least one electrocution hazard warning conspicuously posted in the cab so that it is in view of the operator and tower(except for overhead gantry).

H. Crane Inspection Procedures

1. Prior to using any cranes, an Initial/Annual Inspection and a Crane Load Test (see Attachment 038-5 AMER for procedures) must be made on such equipment. This inspection must be made by a qualified person designated by management, or by a third-party firm qualified to perform such work.
2. Modified equipment
 - a. Equipment that has modifications or additions that affect the safe operation of the equipment (such as modifications or additions involving a safety device or operator aid, critical part of a control system, power plant, braking system, load-sustaining structural components, load hook, or in-use operating mechanism) or capacity must be inspected by a qualified person after such modifications/additions have been completed, prior to initial use. The inspection must meet the following requirements:
 - i. Ensure that modifications or additions have been done in accordance with the approval obtained.
 - ii. Prior to initial use, and under the direction of a qualified person, load-test all cranes in which load-sustaining parts have been altered, replaced, or repaired. The replacement of wire rope is specifically excluded from this requirement; however, a functional

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test of the crane under a normal operating load will be made prior to putting the crane back into service.

- b. Do not use equipment until an inspection under this paragraph demonstrates that the requirements of paragraph 2.a.i of this section have been met.

3. Repaired/adjusted equipment

- a. Equipment that has had a repair or adjustment relating to safe operation (such as a repair or adjustment to a safety device or operator aid, or to a critical part of a control system, power plant, braking system, load-sustaining structural components, load hook, or in-use operating mechanism) must be inspected by a qualified person after such a repair or adjustment has been completed, prior to initial use. The inspection must meet the following requirements:
 - i. The qualified person will determine if the repair/adjustment meets manufacturer's equipment criteria.
 - ii. Prior to use after repair or adjustment of equipment, all cranes in which load-sustaining parts have been altered, replaced, or repaired must be load-tested by, or under the direction of, a qualified person. The replacement of wire rope is specifically excluded from this requirement; however, a functional test of the crane under a normal operating load will be made prior to putting the crane back into service.
- b. Do not use equipment until an inspection under this paragraph demonstrates that the repair/adjustment meets the requirements of this section.

4. Post-Assembly

- a. Upon completion of assembly, the equipment must be inspected by a qualified person to assure that it is configured in accordance with the manufacturer's equipment criteria.
- b. Do not use equipment until an inspection under this paragraph demonstrates that the equipment is configured in accordance with the applicable criteria.

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5. Each Shift

- a. A competent person must begin a visual inspection prior to each shift or operation using the attached Daily Inspection Checklist (see Attachment 038-6 AMER for procedures) to provide adequate documentation of the inspection. The inspection will consist of observation for apparent deficiencies. Disassembly is not required as part of this inspection unless the results of the visual inspection or trial operation indicate that further investigation necessitating disassembly is needed. Determinations made in conducting the inspection will be reassessed in light of observations made during operation.

6. Monthly

- a. Each month the equipment is in service, it must be inspected by a qualified person using Monthly Crane Inspection Form (Attachment 038-7 AMER).
- b. Equipment must not be used until an inspection under this paragraph demonstrates that no deficiencies are found.
- c. Documentation. Maintain all inspection forms on file at the job site for review by interested parties for the duration of the project.

7. Initial/Annual/Comprehensive

- a. Prior to any crane being used, conduct the Initial and Annual Inspection (see Attachment 038-5 AMER). This inspection must be made by a qualified person; preferably, a third-party firm qualified to perform such work. At least every 12 months, the equipment must be inspected by a qualified person in accordance with paragraph 4 of this section, except that the corrective action set forth in this paragraph will apply.
- b. In addition, at least every 12 months, the equipment must be inspected by a qualified person using the Initial and Annual Inspection Form (see Attachment 038-5 AMER).

8. Where the severity of use/conditions is such that there is a reasonable probability of damage or excessive wear (such as loading that may have exceeded rated capacity, shock loading that

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may have exceeded rated capacity, or prolonged exposure to a corrosive atmosphere), the project manager (or his/her designee) must stop using the equipment, and a qualified person must inspect the equipment for structural damage, as well as any items/conditions listed in paragraph 7 of this section.

9. Equipment that has been idle for 3 months or more must be inspected by a qualified person in accordance with the requirements of the Initial and Annual Inspection Form (Attachment 038-5 AMER).
 10. Any part of the manufacturer's procedures regarding inspections relating to safe operation (i.e., safety device or operator aid, critical part of a control system, load-sustaining structural components, load hook, or in-use operating mechanism) that is more comprehensive or has a more frequent schedule than the requirements of this section will be followed. Additional documentation requirements by the manufacturer are not required.
- I. Wire Rope – Inspection
1. Shift Inspection
 - a. A competent person will conduct a visual inspection of wire ropes prior to each shift. They will observe wire ropes (running and standing) that are reasonably likely to be used during the shift for apparent deficiencies, including those listed below. Untwisting (opening) of wire rope or booming down is not required as part of this inspection.
 - b. Apparent Deficiencies
 - i. Category I
 - a. Significant distortion of the wire rope structure such as kinking, crushing, unstranding, bird caging, signs of core failure, or steel core protrusion between the outer strands.
 - b. Significant corrosion.
 - c. Electric arc (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).

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ii. Category II

a. Visible broken wires, as follows:

- In running wire ropes: Six randomly distributed broken wires in one rope lay, or three broken wire 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.
- In rotation-resistant ropes: Two randomly distributed broken wires in six rope diameters, or four randomly distributed broken wires in 30 rope diameters.
- 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 percent from nominal diameter.

iii. Category III

- a. In rotation-resistant wire rope, core protrusion or other distortion indicating core failure.
- b. Electrical contact with a power line.
- c. A broken strand.

c. Critical review items. The competent person will pay particular attention to:

- i. Rotation-resistant wire rope in use.
- ii. Wire rope being used for boom hoists and luffing hoists, particularly at reverse bends.
- iv. Wire rope at flange points, crossover points, and repetitive pickup points on drums.
- v. Wire rope adjacent to end connections.

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vi. Wire rope at, and on, equalizer sheaves.

d. Removal from service

- i. If a deficiency in Category I (see paragraph 1.b.i of this section) is identified, an immediate determination will 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 will be prohibited until:
 - a. The wire rope is replaced; or
 - b. 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.
- ii. If a deficiency in Category II (see paragraph 1.b.ii of this section) is identified, the project manager (or his/her designee) will comply with Option A or Option B, as follows:
 - a. Option A. Consider the deficiency to constitute a safety hazard where it meets the wire rope manufacturer's established criterion for removal from service, or meets a different criterion that the wire rope manufacturer has approved in writing for that specific wire rope. If the deficiency is considered a safety hazard, operations involving use of the wire rope in question will be prohibited until the wire or the damage is removed, in accordance with all of the requirements and restrictions in paragraph 1.d.i.b of this section.
 - b. Option B. Institute the alternative measures specified in paragraph 1.d.ii of this section.
- iii. If a deficiency in Category III is identified, operations involving use of the wire rope in question will be prohibited until:
 - a. The wire rope is replaced; or

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- b. 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.
 - iv. 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 will be tagged-out, in accordance with this procedure, until the wire rope is repaired or replaced.
2. Monthly Inspection
- a. Each month an inspection will be conducted in accordance with the monthly crane inspection. For additional information and forms, see Attachment 038-8 AMER – Monthly Wire Rope and Hook Inspection.
 - b. In addition, at least every 12 months, the wire ropes in use on equipment will be inspected by a qualified person for the types of deficiencies listed below
 - i. The inspection will be complete and thorough, covering the surface of the entire length of the wire ropes, with particular attention given to:
 - a. Categories 1, 2, and 3 and critical review items.
 - b. Those sections that are normally hidden during shift and monthly inspections.
 - c. Wire rope in contact with saddles, equalizer sheaves, or other sheaves where rope travel is limited.
 - d. Wire rope subject to reverse bends.
 - e. Wire rope passing over sheaves.
 - f. Wire rope at or near terminal ends.
 - ii. In the event an inspection under paragraph 3.b of this section is not feasible due to existing set-up and configuration of the equipment (such as where an

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assist crane is needed) or due to site conditions (such as a dense urban setting), such inspections will be conducted as soon as they becomes feasible, but no longer than an additional 6 months for running ropes; and for standing ropes, at the time of disassembly.

- c. If a deficiency is identified, an immediate determination will be made by the qualified person as to whether the deficiency constitutes a safety hazard.
 - i. If the deficiency is determined to constitute a safety hazard, operations involving use of the wire rope in question will be prohibited until:
 - a. The wire rope is replaced; or
 - b. 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.
 - ii. If the qualified person determines that, although not currently a safety hazard, the deficiency needs to be monitored, the project manager (or his/her designee) must ensure that the deficiency is checked in the monthly inspections.
 - d. The inspection must be documented in accordance with this standard.
3. Do not use rope lubricants that are of the type that hinder inspection.

J. Wire Rope – Selection and Installation Criteria

- 1. Select replacement wire rope in accordance with the requirements of this section, and the recommendations of the wire rope manufacturer, the equipment manufacturer, or a qualified person.
- 2. Boom-hoist reeving
 - a. Do not use fiber core ropes for boom-hoist reeving, except for derricks.
 - b. Use rotation-resistant ropes for boom-hoist reeving only where the requirements of paragraph 3 below are met.

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3. Rotation-resistant ropes

a. Definitions

- i. Type I rotation-resistant rope is stranded rope constructed to have little or no tendency to rotate; or, if guided, transmits little or no torque. It has at least 15 outer strands and comprises an assembly of at least three layers of strands laid helically over a center in two operations. The direction of lay of the outer strands is opposite to that of the underlying layer.
- ii. Type II rotation-resistant rope is stranded rope constructed to have significant resistance to rotation. It has at least 10 outer strands and comprises an assembly of two or more layers of strands laid helically over a center in two or three operations. The direction of lay of the outer strands is opposite to that of the underlying lay.

b. Requirements

- i. Do not use Types II and III with an operating design factor of less than five for duty cycle or repetitive lifts.
 - ii. Use rotation-resistant ropes (including Types I, II, and III) with an operating design factor of no less than 3.5.
 - iii. Type I must have an operating design factor of no less than five, except where the wire rope manufacturer and the equipment manufacturer approves the design factor, in writing.
 - iv. Types II and III must have an operating design factor of no less than five, except where the requirements of this section are met, as listed below.
- c. When Types II and III with an operating design factor of less than five are used (for non-duty cycle, non-repetitive lifts), the following requirements must be met for each lifting operation:
- i. A qualified person must inspect the rope in accordance with this procedure. The rope may be used only if the qualified person determines that there are no deficiencies constituting a hazard. In making this determination, more than one broken wire in any

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one rope lay will be considered a hazard.

- ii. Conduct operations in such a manner and at such speeds as to minimize dynamic effects.
- iii. Each lift made under these provisions will be recorded in the monthly and annual inspection documents. Such prior uses will be considered by the qualified person in determining whether to use the rope again.

d. Additional requirements

- i. Do not use rotation-resistant ropes for boom-hoist reeving, except where the requirements of this section are met, as listed below.
- ii. Rotation-resistant ropes may be used as boom-hoist reeving when load hoists are used as boom hoists for attachments such as luffing attachments or boom and mast attachment systems. Under these conditions, the following requirements must be met:
 - a. The drum must provide a first-layer rope-pitch diameter of not less than 18 times the nominal diameter of the rope used.
 - b. The requirements in this standard (regardless of the date of manufacture of the equipment).
 - c. The requirements in ASME B30.5-2007, Section 5-1.3.2(a), (a)(2) through (a)(4), (b) and (d), except that the minimum pitch diameter for sheaves used in multiple-rope reeving is 18 times the nominal diameter of the rope used, instead of the value of 16 specified in Section 5-1.3.2(d).
 - d. All sheaves used in the boom-hoist reeving system must have a rope-pitch diameter of not less than 18 times the nominal diameter of the rope used.
 - e. The operating design factor for the boom-hoist reeving system cannot be less than 5.
 - f. The operating design factor for these ropes will be the total minimum breaking force of all parts of rope in the system divided by the load imposed on the rope system when supporting

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the static weights of the structure, and the load within the equipment's rated capacity.

- g. When provided, a power-controlled lowering system must be capable of handling rated capacities and speeds as specified by the manufacturer.
4. Socketing will be done in the manner specified by the manufacturer of the wire rope or fitting.
 5. Prior to cutting a wire rope, place seizings on each side of the point to be cut. The length and number of seizings will be in accordance with the wire-rope manufacturer's instructions.

K. Safety Devices

1. The following safety devices are required on all equipment covered by this procedure, unless otherwise specified:
 - a. Crane-level indicator
 - i. The equipment will have a crane-level indicator that is either built into the equipment or is available on the equipment.
 - ii. If a built-in crane-level indicator is not working properly, it will be tagged-out or removed.
 - iii. This requirement does not apply to portal cranes, derricks, floating cranes/derricks, and land cranes/derricks on barges, pontoons, vessels, or other means of flotation.
 - b. Boom stops, except for derricks and hydraulic booms.
 - c. Jib stops (if jib is attached), except for derricks.
 - d. Equipment with foot-pedal brakes will have locks, except for portal cranes and floating cranes.
 - e. Hydraulic outrigger jacks will have an integral holding device/check valve.
 - f. Equipment on rails will have rail clamps and rail stops, except for portal cranes.

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2. Proper Operation Required

- a. Operations may not begin unless the devices listed in this section are in proper working order. If a device stops working properly during operations, the operator will safely stop operations. Do not resume operations until the device is working properly. Alternative measures are not permitted to be used.

L. Operational Aids for Mobile and Locomotive Cranes

1. Operational aids refer to ASME B30.5-2007, Paragraphs 5-1.9.9 and 5.3.2.1.2.
2. Two-blocking features refer to ASME B30.5-2007, Paragraph 5-1.9.9.1.
3. Load indicators, rated capacity indicators, and rated capacity limiters refer to ASME B30.5-2007, Paragraph 5-1.9.9.2.
4. Boom angle or radius indicator refers to ASME B30.5-2007, Paragraph 5-1.9.9.3.
5. Boom-hoist disconnect, shut-off, or hydraulic relief refers to ASME B30.5-2007, Paragraph 5-1.9.9.4.
6. Boom-length indicator refers to ASME B30.5-2007, Paragraph 5-1.9.9.5.
7. Crane-level indicator refers to ASME B30.5-2007, Paragraph 5-1.9.9.6.
8. Drum-rotation indicator refers to ASME B30.5-2007, Paragraph 5-1.9.9.7.

M. Tower-Crane Operational Aids

1. Do not begin operations unless the operational aids are in proper working order, except where the project manager (or his/her designee) meets the specified temporary alternative measures. Follow more protective alternative measures specified by the tower crane manufacturer, if any.
2. If an operational aid stops working properly during operations, the operator will safely stop operations until the temporary alternative measures are implemented or the device is again working properly.

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If a replacement part is no longer available, the use of a substitute device that performs the same type of function is permitted, and is not considered a modification under this procedure.

3. Category I operational aids and alternative measures. Operational aids listed in this paragraph that are not working properly must be repaired no later than 7 days after the deficiency occurs.
Exception: If the project manager (or his/her designee) documents that he/she has ordered the necessary parts within 7 days of the occurrence of the deficiency, the repair will be completed within 7 days of receipt of the parts.
 - a. Trolley-travel-limiting device. Restrict the travel of the trolley at both ends of the jib by a trolley-travel-limiting device to prevent the trolley from running into the trolley end-stops.
Temporary alternative measures:
 - i. Option A. Mark the trolley rope (so it can be seen by the operator) at a point that will give the operator sufficient time to stop the trolley prior to the end-stops.
 - ii. Option B. Use a spotter when operations are conducted within 10 feet of the outer or inner trolley end-stops.
 - b. Boom-hoist-limiting device. Limit the range of the boom at the minimum and maximum radius. Temporary alternative measures: Clearly mark the cable (so it can be seen by the operator) at a point that will give the operator sufficient time to stop the boom within the minimum and maximum boom radius, or use a spotter.
 - c. Anti-two-blocking device. Equip the tower crane with a device that automatically prevents damage from contact between the load block, overhaul ball, or similar component, and the boom tip (or fixed upper block or similar component). The device(s) must prevent such damage at all points where two-blocking could occur. As a temporary alternative, measure and clearly mark the cable so it can be seen by the operator at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking; or use a spotter.
 - d. Hoist-drum-lower-limiting device. Equip tower cranes manufactured more than 1 year after the effective date of this procedure with a device that prevents the last tow wraps

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- of hoist cable from being spooled off the drum. As a temporary alternative measure, clearly mark the cable so it can be seen by the operator at a point that will give the operator sufficient time to stop the hoist prior to the last two wraps of hoist cable being spooled off the drum, or use a spotter.
- e. Load-moment-limiting device. Provide the tower crane with a device that prevents moment overloading. As a temporary alternative measure, use a radius-indicating device (if the tower crane is not equipped with a radius-indicating device, measure the radius to ensure the load is within the rated capacity of the crane). In addition, determine the weight of the load from a reliable source such as the load's manufacturer), by a reliable calculation method (such as calculating a steel beam from measured dimensions and a known per-foot weight, or by other equally reliable means. Provide this information to the operator prior to the lift.
 - f. Hoist-line pull-limiting device. Limit the capacity of the hoist to prevent overloading, including each individual gear ratio if equipped with a multiple-speed hoist transmission. As a temporary alternative measure, the operator will ensure that the weight of the load does not exceed the capacity of the hoist (including for each individual gear ratio if equipped with a multiple-speed hoist transmission).
 - g. Rail-travel-limiting device. Limit the travel distance in each direction to prevent the travel bogies from running into the end stops or buffers. As a temporary alternative measure, use a spotter when operations are conducted within 10 feet of either end of the travel rail end stops.
 - h. Boom-hoist-drum positive locking device. Equip the boom-hoist drum with a device to positively lock the boom-hoist drum. As a temporary alternative measure, manually set the device when required if an electric, hydraulic, or automatic type is not functioning.
4. Category II operational aids and alternative measures. Repair operational aids listed in this paragraph that are not working properly no later than 30 days after the deficiency occurs. Exception: If the project manager (or his/her designee) documents that he/she has ordered the necessary part within 7 days of the occurrence of the deficiency, and the part is not received in time to

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complete the repair in 30 days, complete the repair within 7 days of receipt of the parts.

- a. Boom-angle or hook-radius indicator.
 - i. Ensure luffing boom-tower cranes have a boom-angle indicator readable from the operator's station.
 - ii. Ensure hammerhead tower cranes manufactured more than 1 year after the effective date of this subpart have a hook-radius indicator readable from the operator's station.
 - iii. Temporary alternative measure: Determine hook radii or boom angle by measuring the hook radii or boom angle with a measuring device.
- b. Trolley-travel deceleration device. The trolley speed will be automatically reduced prior to the trolley reaching the end limit in both directions. Temporary alternative measure: the operator will reduce the trolley speed when approaching the trolley end limits.
- c. Boom-hoist deceleration device. The boom speed will be automatically reduced prior to the boom reaching the minimum or maximum radius limit. Temporary alternative measure: the operator will reduce the boom speed when approaching the boom maximum or minimum end limits.
- d. Load-hoist deceleration device. The load speed will be automatically reduced prior to the hoist reaching the upper limit. Temporary alternative measure: the operator will reduce the hoist speed when approaching the upper limit.
- e. Wind-speed indicator. Provide a device to display the wind speed, and mount above the upper rotating structure on tower cranes. On self-erecting cranes, mount at or above the jib level. Temporary alternative measure: use wind-speed information from a properly functioning indicating device on another tower crane on the same site; or have a qualified person estimate the wind speed.
- f. Load-indicating device. Cranes manufactured more than 1 year after the effective date of this procedure must have a device that displays the magnitude of the load on the hook. Displays that are part of load-moment-limiting devices that display the load on the hook meet this requirement.

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- g. Temporary alternative measures: Determine the weight of the load from a reliable source (such as the load's manufacturer), by a reliable calculation method (such as calculating a steel beam from measured dimensions and a known per-foot weight); or by other equally reliable means. Provide this information to the operator prior to the lift.

N. Operator Qualifications and Certification

1. It is the responsibility of the manager directing activities of the facility or site to ensure proper qualification and certification of Crane Operators prior to the operation or start-up of any crane. They must also ensure compliance with certification and qualification from state, local, or other licensing and certifying agencies.
2. The company or project manager (or his/her designee) of the operator must ensure that, prior to operating any equipment covered under this procedure, the operator is either qualified or certified to operate the equipment in accordance with one of the options listed below, or is operating the equipment during a training period. The company or project manager (or his/her designee) of the operator must verify certification and have evidence of certification on file at the project. Note that operator's qualification or certification under this section is not required for operators of derricks, side-boom cranes, and equipment with a rated hoisting/lifting capacity of 2,000 pounds or less.
3. Option 1 – Certification by an accredited crane/derrick operator testing organization.
 - a. For a testing organization to be considered accredited to certify operators under this procedure, it must:
 - i. Be accredited by a nationally recognized accrediting agency based on that agency's determination that industry-recognized criteria for written testing materials, practical examinations, test administration, grading, facilities/equipment, and personnel have been met.
 - ii. Administer written and practical tests that:
 - a. Assess the operator applicant regarding relevant knowledge and skills.

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- b. Provide different levels of certification based on equipment capacity and type.
 - iii. Have procedures for operators to re-apply and be re-tested in the event an operator applicant fails a test or is de-certified.
 - iv. Have testing procedures for re-certification designed to ensure that the operator continues to meet applicable technical knowledge and skill requirements.
 - v. Have its accreditation reviewed by the nationally recognized accrediting agency at least every 3 years.
 - b. A certification issued under this option is portable.
 - c. A certification issued under these criteria is valid for 5 years.
- 4. Option 2 – Licensing by a government entity
 - a. For purposes of this section, a government licensing department/office that issues operator licenses for operating equipment covered by this standard is considered a government-accredited crane/derrick operator testing organization if the criteria in the next paragraph are met.
 - b. Licensing criteria
 - i. The requirements for obtaining the license include an assessment, by written and practical tests, of the operator applicant regarding, at a minimum, the knowledge and skills listed in paragraph 8 of this section.
 - ii. The testing meets industry-recognized criteria for written testing materials, practical examinations, test administration, grading, facilities/equipment, and personnel.
 - iii. The government authority that oversees the licensing department/office has determined that the requirements in the preceding two paragraphs have been met.
 - iv. The licensing department/office has testing procedures for re-licensing designed to ensure that the operator continues to meet applicable technical

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- knowledge and skills requirements.
- c. A license issued by a government-accredited crane/derrick operator testing organization that meets the requirements of this option:
 - i. Meets the operator-qualification requirements of this section for operation of equipment only within the jurisdiction of the government entity.
 - ii. Is valid for the period of time stipulated by the licensing department/office, but no longer than 5 years.
5. Pre-qualification/certification training period – All training of all apprentices or other uncertified operators must be approved by the project/facility manager.
- a. A worker who is not qualified or certified under this section is permitted to operate equipment where the requirements of following paragraph are met.
 - b. A worker who has not passed both the written and practical tests required under this section is permitted to operate equipment as part of his/her training where the following requirements are met
 - i. The worker (“trainee/apprentice”) will be provided with sufficient training prior to operating the equipment to enable the trainee to operate the equipment safely under limitations established by this section (including continuous supervision) and any additional limitations established by the project manager (or his/her designee).
 - ii. The tasks performed by the trainee/apprentice while operating the equipment will be within the trainee’s ability.
 - iii. Supervisor. While operating the equipment, the trainee/apprentice must be continuously supervised by an individual (operator’s supervisor) who meets the following requirements:
 - a. The operator’s supervisor is a worker or agent of the trainee’s/apprentice’s project manager (or his/her designee).

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- b. The operator's supervisor is either a certified operator under this section, or has passed the written portion of a certification test under one of the options in paragraphs 2 through 5 of this section, and is familiar with the proper use of the equipment's controls.
 - c. While supervising the trainee/apprentice, the operator's supervisor performs no tasks that detract from the supervisor's ability to supervise the trainee/apprentice.
 - d. For equipment other than tower cranes, the operator's supervisor and the trainee/apprentice must be in direct line of sight of each other, and will communicate verbally or by hand signals. For tower cranes, the operator's supervisor and the trainee/apprentice will be in direct communication with each other.
- iv. Continuous supervision. The trainee/apprentice must be supervised by the operator's supervisor at all times, except for short breaks where the following are met:
- a. The break lasts no longer than 15 minutes and there is no more than 1 break per hour.
 - b. Immediately prior to the break, the operator's supervisor informs the trainee/apprentice of the specific tasks that the trainee/apprentice is to perform, and limitations that he/she is to adhere to during the operator supervisor's break.
 - c. The specific tasks that the trainee/apprentice will perform during the operator supervisor's break are within the trainee/apprentice's abilities.
- v. The trainee/apprentice may not operate the equipment in any of the following circumstances:
- a. If any part of the equipment, load line, or load (including rigging and lifting accessories), if operated up to the equipment's maximum

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- 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.
 - b. The equipment is used to hoist personnel.
 - c. The equipment is used over a shaft, cofferdam, or in a tank farm.
 - d. For multiple-lift rigging, except where the operator's supervisor determines that the trainee's/apprentice's skills are sufficient for this high-skill work.
- 6. A testing entity is permitted to provide training as well as testing services as long as the criteria of the applicable accrediting agency (in the option selected) for an organization providing both services are met.
- 7. Written tests under this section are permitted to be administered verbally, with answers given verbally, where the operator candidate:
 - a. Passes a written demonstration of literacy relevant to the work.
 - b. Demonstrates the ability to use the type of written manufacturer's procedures applicable to the class/type of equipment for which the candidate is seeking certification.
- 8. Certification criteria. Qualifications and certifications must be based, at a minimum, on the following:
 - a. A determination through a written test that:
 - i. The individual knows the information necessary for safe operation of the specific type of equipment the individual will operate, including the following:
 - a. The controls and operational/performance characteristics.
 - b. Use of, and the ability to calculate (manually or with a calculator), load/capacity information on a variety of configurations of the equipment.

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- c. Procedures for preventing and responding to power line contact.
 - d. Technical knowledge similar to the subject matter criteria listed in Supplemental Information A of this standard applicable to the specific type of equipment the individual will operate.
 - e. Technical knowledge applicable to:
 - The suitability of the supporting ground and surface to handle expected loads.
 - Site hazards.
 - Site access.
 - f. This procedure, including applicable incorporated materials.
 - ii. The individual is able to read and locate relevant information in the equipment manual and other materials containing information referred to in paragraph 8.a.i of this section.
 - b. A determination through a practical test that the individual has the skills necessary for safe operation of the equipment, including the following:
 - i. Ability to recognize, from visual and audible observation, the items listed in shift inspection.
 - ii. Operational and maneuvering skills.
 - iii. Application of load chart information.
 - iv. Application of safe shut-down and securing procedures.
- O. Signal Person Qualifications
- 1. The project manager (or his/her designee) of the signal person must ensure that each signal person meets the qualification requirements prior to giving any signals. This requirement will be met by using either of the following options:
 - a. Option 1 – Third-party–qualified evaluator: The signal person has documentation from a third-party qualified

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- evaluator showing that the signal person meets the Qualification Requirements (see paragraph 3 of this section).
- b. Option 2 – Project manager’s (or his/her designee’s) qualified evaluator: The project manager (or his/her designee) has its qualified evaluator assess the individual and determine that the individual meets the Qualification Requirements (see paragraph 3 of this section) and provides documentation of that determination. An assessment by a project manager’s (or his/her designee’s) qualified evaluator under this option is not portable – other project managers (or their designees) are not permitted to use it to meet the requirements of this section.
 - c. The documentation for whichever option is used will be available while the signal person is employed by the project manager (or his/her designee).
2. If subsequent actions by the signal person indicate that the individual may not meet the Qualification Requirements (see paragraph 3 of this section), the project manager (or his/her designee) must not allow the individual to continue working as a signal person until retraining is provided and a reassessment is made in accordance with paragraph 1 of this section, which confirms that the individual meets the Qualification Requirements.
3. Qualification Requirements. Each signal person must:
- a. Know and understand the type of signals used. If hand signals are used, the signal person must know and understand the Standard Method for hand signals (see Supplemental Information B).
 - b. Be competent in the application of the type of signals used.
 - c. Have a basic understanding of equipment operation and limitations, including the crane dynamics involved in swinging and stopping loads, and boom deflection from hoisting loads.
 - d. Know and understand the relevant requirements of this procedure.
 - e. Demonstrate that he/she meets the requirements in paragraph 3.a through 3.d of this section through a verbal or written test and through a practical test.

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P. Maintenance and Repair Workers' Qualifications

Maintenance, inspection, and repair personnel are permitted to operate the equipment only if the following requirements are met:

1. The operation is limited to those functions necessary to perform maintenance, and to inspect or verify the performance of the equipment.
2. The personnel either:
 - a. Operate the equipment under the direct supervision of an operator who meets the requirements of Section 4.N (Operator Qualifications and Certification) of this standard; or
 - b. Are familiar with the operation, safe limitations, characteristics, and hazards associated with the type of equipment.
3. Maintenance and repair personnel must meet the definition of a qualified person with respect to the equipment and maintenance/repair tasks performed.

Q. Power-Line Safety (up to 350 kV) – Assembly and Disassembly

When involved in assembly/disassembly operations in or around power lines, refer to Section 4.G (Crane Assembly/Disassembly – Power Line Safety (up to 350 kV)) for instructions.

R. Power Line Safety (up to 350 kV) – Equipment Operations

1. Hazard assessments and precautions inside the work zone. Before beginning equipment operations, the project manager (or his/her designee) must:
 - a. Identify the work zone by either:
 - i. Defining a work zone by demarcating boundaries (such as with flags, or a device such as a range-limit device or range-control warning device) and prohibit the operator from operating the equipment past those boundaries; or
 - ii. Defining the work zone as the area 360 degrees around the equipment, up to the equipment's maximum working radius.

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- b. Determine 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 closer than 20 feet to a power line. If so, the project manager (or his/her designee) must meet the requirements in Option 1, Option 2, or Option 3, as follows:
 - i. Option 1 – De-energize and ground. Confirm from the utility owner/operator that the power line has been de-energized and visibly grounded at the worksite.
 - ii. Option 2 – 20-foot clearance. Ensure that no part of the equipment, load line, or load (including rigging and lifting accessories), gets closer than 20 feet to the power line by implementing the measures specified in paragraph (b) of this section.
 - iii. Option 3 – Clearance.
 - a. Determine the line's voltage and the minimum approach distance permitted under the table provided in Attachment 038-4 AMER.
 - b. Determine if any part of the equipment, load line, or load (including rigging and lifting accessories), while operating up to the equipment's maximum working radius in the work zone, could get closer than the minimum approach distance of the power line permitted under Attachment 038-4 AMER. If so, then the project manager (or his/her designee) must follow the requirements in paragraph (b) of this section to ensure that no part of the equipment, load line, or load (including rigging and lifting accessories), gets closer to the line than the minimum approach distance.
2. Preventing encroachment/electrocution. Where encroachment precautions are required under Option 2 or Option 3 (see paragraphs 1.b.ii and 1.b.iii of this section), the following requirements must be met:
 - a. 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.

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- b. If tag lines are used, they must be non-conductive.
- c. 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 2, see paragraph 1.b.ii of this section).
- d. 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:
 - a. 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; or 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).
 - b. Be positioned to effectively gauge the clearance distance.
 - c. Where necessary, use equipment that enables the dedicated spotter to communicate directly with the operator (radio, telephone, or other electronic transmission of signals).
 - d. 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.
 - v. An insulating link/device installed at a point between the end of the load line (or below) and the load.

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3. Voltage information. Where Option 3 of this section is used, the utility owner/operator of the power lines must provide the requested voltage information within 2 working days of the project manager's (or his/her designee's) request.
4. Operations below power lines.
 - a. No part of the equipment, load line, or load (including rigging and lifting accessories) is allowed below a power line unless the project manager (or his/her designee) has confirmed that the utility owner/operator has de-energized and (at the worksite) visibly grounded the power line, with the exceptions listed below.
 - b. Exceptions. Paragraph 4.a of this section is inapplicable where the project manager (or his/her designee) demonstrates that one of the following applies:
 - i. For equipment with non-extensible booms: The uppermost part of the equipment, with the boom at true vertical, would be more than 20 feet below the plane of the power line, or more than the minimum clearance distance (provided in the table in Attachment 038-4 AMER) below the plane of the power line.
 - ii. For equipment with articulating or extensible booms: The uppermost part of the equipment, with the boom in the fully extended position, at true vertical, would be more than 20 feet below the plane of the power line, or more than the minimum clearance distance (provided in the table in Attachment 038-4 AMER) below the plane of the power line.
 - iii. The project manager (or his/her designee) demonstrates that compliance with paragraph 4.a of this section is infeasible.
5. The project manager (or his/her designee) must assume that all power lines are energized unless the utility owner/operator confirms that the power line has been and continues to be de-energized and visibly grounded at the worksite.
6. 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 will be

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de-energized, or the following precautions will be taken when necessary to dissipate induced voltages:

- a. Provide the equipment with an electrical ground.
- b. Use non-conductive rigging or an insulating link/device.

7. Training

- a. Train operators and crew assigned to work with the equipment on the following:
 - i. The procedures to be followed in the event of electrical contact with a power line, including:
 - 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 for the potentially energized zone around the equipment.
 - e. The need for crew in the area to avoid approaching or touching the equipment.
 - f. Safe clearance distance from power lines.
 - ii. Power lines are presumed to be energized unless the utility owner/operator confirms that the power line has been and continues to be de-energized and visibly grounded at the worksite.
 - iii. Power lines are presumed to be un-insulated 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.
 - iv. The limitations of an insulating link/device, proximity alarm, and range control (and similar) device, if used.

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- b. Train persons working as dedicated spotters to enable them to effectively perform their task, including training on the applicable requirements of this section.
8. Devices originally designed by the manufacturer for use as: a safety device, operational aid, or a means to prevent power line contact or electrocution, when used to comply with this section, must meet the manufacturer's procedures for use and conditions of use.

S. Power Line Safety (Over 350 kV)

The requirements of this procedure apply to power lines over 350 kV, except that wherever the distance "20 feet" is specified, the distance "50 feet" will apply in its place.

T. Power Line Safety (All Voltages) – Equipment Operations

Equipment operations in which any part of the equipment, load line, or load, including rigging and lifting accessories, is closer than the minimum approach distance (provided in Attachment 038-4 AMER of this standard to an energized power line is prohibited, except where the project manager (or his/her designee) demonstrates that the following requirements are met:

1. The project manager (or his/her designee) determines that it is infeasible to do the work without breaching the minimum approach distance provided in Attachment 038-4 AMER of this standard.
2. The project manager (or his/her designee) determines that, after consultation with the utility owner/operator, it is infeasible to de-energize and ground the power line or relocate the power line.
3. Minimum clearance distance

The power line owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution determines the minimum clearance distance that must be maintained to prevent electrical contact in light of the on-site conditions. The factors that must be considered in making this determination include, but are not limited to: conditions affecting atmospheric conductivity; time necessary to bring the equipment, load line, and load (including rigging and lifting accessories) to a complete stop; wind conditions; degree of sway in the power line; lighting conditions; and conditions affecting the ability to prevent electrical contact.

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4. A planning meeting with the project manager (or his/her designee) and utility owner/operator (or a qualified person with respect to electrical power transmission and distribution) is held to determine the procedures that will be followed to prevent electrical contact and electrocution. At a minimum, these procedures will include:
 - a. If the power line is equipped with a device that automatically reenergizes the circuit in the event of a power line contact, the automatic reclosing feature of the circuit-interrupting device must be made inoperative before work begins.
 - b. A dedicated spotter who is in continuous contact with the operator. The dedicated spotter must:
 - i. 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 line painted on the ground; or a clearly visible line-of-sight landmark (such as a fence post behind the dedicated spotter, and a building corner ahead of the dedicated spotter).
 - ii. Be positioned to effectively gauge the clearance distance.
 - iii. Where necessary, use equipment that enables the dedicated spotter to communicate directly with the operator.
 - iv. Give timely information to the operator so that the required clearance distance can be maintained.
 - c. An insulating link/device installed at a point between the end of the load line (or below) and the load.
 - d. Non-conductive rigging if the rigging may be within the minimum approach distance (identified in Attachment 038-4 AMER) during the operation.
 - e. If the equipment has a device that automatically limits range of movement, it must be used, and set to prevent any part of the equipment, load line, or load (including rigging and lifting accessories) from breaching the minimum approach distance.
 - f. If a tag line is used, it must be of the non-conductive type.

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- g. Erect barricades to form a perimeter at least 10 feet away from the equipment to prevent unauthorized personnel from entering the work area. In areas where obstacles prevent the barricade from being at least 10 feet away, the barricade must be as far from the equipment as feasible.
 - h. Prohibit workers other than the operator from touching the load line above the insulating link/device and crane.
 - i. Permit only personnel essential to the operation to be in the area of the crane and load.
 - j. Properly ground the equipment.
 - k. Insulating-line hose or cover-up will be installed by the utility owner/operator except where such devices are unavailable for the line voltages involved.
5. The procedures developed to comply with this section are documented and immediately available on-site.
6. The equipment user and utility owner/operator will meet with the equipment operator and the other workers who will be in the area of the equipment or load to review the procedures that will be implemented to prevent breaching the minimum approach distance established in paragraph 3 of this section and prevent electrocution.
7. The procedures developed to comply with this section are implemented.
8. The utility owner/operator and all project managers (or their designees) of workers involved in the work will identify one person who will direct the implementation of the procedures, and will have the authority to stop work at any time to ensure safety.
9. If a problem occurs implementing the procedures to comply with this section, or indicating that those procedures are inadequate to prevent electrocution, the project manager (or his/her designee) must safely stop operations, and either develop new procedures to comply with this section, or have the utility owner/operator de-energize and visibly ground or relocate the power line before resuming work.
10. Devices originally designed by the manufacturer for use as a safety device, operational aid, or a means to prevent power line contact or

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electrocution, when used to comply with this section, must meet the manufacturer's procedures for use and conditions of use.

U. Power Line Safety – While Traveling

This section establishes procedures and criteria that must be met for equipment traveling under a power line on the construction site with no load.

1. The project manager (or his/her designee) must ensure that:
 - a. The boom/mast and boom/mast support system are lowered sufficiently to meet the requirements of this paragraph.
 - b. Maintain the clearances specified in Attachment 038-4AMER – Required Clearance for Normal Voltage.
 - c. The effects of speed and terrain on equipment movement (including movement of the boom/mast) are considered so that hose effects do not cause the minimum clearance distances specified in Attachment 038-4 AMER – Required Clearance for Normal Voltage, to be breached.
 - d. Dedicated spotter. If any part of the equipment will get closer than 20 feet to the power line while traveling, the project manager (or his/her designee) must ensure that a dedicated spotter who is in continuous contact with the operator is used. The dedicated spotter must:
 - i. Be positioned to effectively gauge the clearance distance.
 - ii. Where necessary, use equipment that enables the dedicated spotter to communicate directly with the operator.
 - iii. Give timely information to the operator so that the required clearance distance can be maintained.
 - e. When traveling at night, or in conditions of poor visibility, in addition to the measures specified in paragraphs 1.a through 1.d of this section, the project manager (or his/her designee) must ensure that:
 - i. The power lines are illuminated, or another means of identifying the location of the lines is used.
 - ii. A safe path of travel is identified and used.

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V. Equipment Modifications

1. Modifications or additions that affect the capacity or safe operation of the equipment are prohibited except where the requirements listed below apply.
2. Manufacturer's review and approval.
 - a. The manufacturer approves the modifications/additions in writing.
 - b. The load charts, procedures, instruction manuals, and instruction plates/tags/decals are modified as necessary to accord with the modification/addition.
 - c. The original safety factor of the equipment is not reduced.
3. Unavailable manufacturer. The manufacturer is unavailable and the requirements of paragraphs 1.a and 1.b of this section are met.

W. Design, Construction and Testing

1. The following requirements apply to equipment that has a manufacturer-rated hoisting/lifting capacity of more than 2,000 pounds.
2. Crawler, truck and locomotive cranes must meet the applicable requirements for design, construction, and testing as prescribed in ANSI B30.5-2007, "Crawler, Locomotive, and Truck Cranes," "PCSA Standard No. 2," or the applicable DIN standards that were in effect at the time of manufacture.
3. Mobile (including crawler and truck) and locomotive cranes must meet the following portions of ASME B30.5-2007, "Mobile and Locomotive Cranes," as applicable.

X. Fall Protection

All workers must follow the requirements of the Fall Protection Standard specified in SMS 040.

Y. Operation

1. The project manager (or his/her designee) will comply with all the manufacturer's procedures applicable to the operational functions of equipment, including its use with attachments. The project manager (or his/her designee) should consider the use of

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equipment that has all the manufacturer's procedures and information available during the planning stages of the project.

2. Operational procedures
 - a. All cranes arriving on site require pre-inspection, initial and annual inspections, load test, and verification of operator qualifications.
 - b. Prior to operation of crane on site, conduct pre-lift planning in accordance with the pre-lift checklist or assembly/disassembly procedures.
 - c. Equipment set-up.
 - i. Ensure the equipment will be uniformly level, within 1 percent of level grade, and located on footing that a qualified person has determined to be sufficiently firm and stable.
 - ii. Equipment with outriggers must have all outriggers extended and locked. The amount of extension must be the same for all outriggers, and in accordance with the manufacturer's procedures and load charts.
 - d. Procedures related to the capacity of the equipment must be developed and signed by a registered professional engineer familiar with the equipment.
3. Accessibility of procedures
 - a. The procedures applicable to the operation of the equipment, including rated capacities (load charts), recommended operating speeds, special hazard warnings, instructions, and operator's manual, must be readily available in the cab at all times for use by the operator.
 - b. Where rated capacities are available in the cab only in electronic form: in the event of a failure that makes the rated capacities inaccessible, the operator must immediately cease operations or follow safe shut-down procedures until the rated capacities are available.
4. The operator must not engage in any practice that diverts his/her attention while actually engaged in operating the crane, such as the use of cell phones (other than when used for signal communications) or other attention-diverting activities.

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5. Leaving the equipment unattended
 - a. The operator must not leave the controls while the load is suspended, except where the following are met:
 - i. The operator remains adjacent to the equipment and is not engaged in any other duties.
 - ii. The load is to be held suspended for a period of time exceeding normal lifting operations.
 - iii. 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 functions.
 - iv. Barricades or caution lines (and notices) are erected to prevent all workers from entering the fall zone. Do not permit workers in the fall zone.
 - b. The provisions in paragraph 5 of this section do not apply to working gear (such as slings, spreader bars, ladders, and welding machines) where the load is not suspended over an entrance or exit.
6. Tag-Out
 - a. Where the project manager (or his/her designee) has taken the equipment out of service, a tag must be placed in the cab stating that the equipment is out of service and is not to be used. Where the project manager (or his/her designee) has taken a function(s) out of service, a tag must be placed in a conspicuous position stating that the function is out of service and is not to be used.
 - b. Response to "Do Not Operate" tag-out signs
 - i. If there is a warning (tag-out or maintenance/do not operate) sign on the equipment or starting control, the operator must not activate the switch or start the equipment until the sign has been removed by a management person authorized to remove it. An inspection of the entire area must be completed, and all attempts must be made to locate the person who applied the tag or lock prior to any actions. If the person who applied the tag or lock cannot be located, the following steps must be adhered to. Management must determine that:

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- a. No one is servicing, working on, or otherwise in a dangerous position on the machine.
 - b. The equipment has been repaired and is working properly.
7. Before starting the engine, the operator must verify that all controls are in the proper starting position and that all personnel are in the clear.
8. When a local storm warning has been issued, the competent person will determine whether it is necessary to implement manufacturer's recommendations for securing the equipment.
9. The operator must be familiar with the equipment and its proper operation. If adjustments or repairs are necessary, the operator must promptly inform the person designated by the project manager to receive such information; and, where there are successive shifts, inform the next operator.
10. In all cases verified weights, measured radii, and manufacturer's loads and capacity chart/capacities and instructions will take precedence over operational aids when handling a load.
11. If the competent person determines that there is a slack rope condition requiring re-spooling of the rope, it will be verified (before starting to lift) that the rope is seated on the drum and in the sheaves as the slack is removed.
12. The competent person will consider the effect of wind, ice, and snow on equipment stability and rated capacity. Additional information on wind effects is provided in Supplemental Information C.
13. Compliance with rated capacity
 - a. Do not operate the equipment in excess of its rated capacity.
 - b. The operator will verify that the load is within the rated capacity of the equipment by at least one of the following methods:
 - i. The weight of the load will be determined from a reliable source (such as the load's manufacturer), by a reliable calculation method (such as calculating a steel beam from measured dimensions and a known per-foot weight), or by other equally reliable means.

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In addition, when requested by the operator, this information will be provided to the operator prior to the lift; or

- ii. The operator will begin hoisting the load to determine—using a load-weighing device—load-moment indicator, rated-capacity indicator, or rated-capacity limiter, if it exceeds 75 percent of the maximum rated capacity at the longest radius that will be used during the lift operation. If it does, the operator will not proceed with the lift until management verifies the weight of the load.
14. The boom or other parts of the equipment must not contact any obstruction.
15. Do not use the equipment to drag or pull loads sideways.
16. On wheel-mounted equipment, do not lift loads over the front area, except as permitted by the manufacturer.
17. The operator will test the brakes each time a load that is 90 percent or more of the maximum line pull is handled by lifting the load a few inches and applying the brakes. In duty cycle and repetitive lifts where each lift is 90 percent or more of the maximum line pull, this requirement applies to the first lift, but not to successive lifts.
18. Do not lower the load or the boom below the point where less than two full wraps of rope remain on their respective drums.
19. Traveling with a load.
 - a. Traveling with a load is prohibited if the practice is prohibited by the manufacturer.
 - b. Where traveling with a load, the project manager (or his/her designee) will ensure that:
 - i. A 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.
 - ii. The determinations of the competent person required in paragraph 19.b.i of this section are implemented.

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iii. For equipment with tires, maintain tire pressure specified by the manufacturer.

20. Rotational speed of the equipment must be such that the load does not swing out beyond the radius at which it can be controlled.

21. A tag or restraint line must be used if necessary to prevent rotation of the load that would be hazardous.

22. Adjust the brakes in accordance with the manufacturer's procedures to prevent unintended movement.

23. The operator must obey a stop (or emergency stop) signal, irrespective of who gives it.

24. A locomotive crane must not be swung into a position where it is reasonably foreseeable that railway cars on an adjacent track could strike it, until it is determined that cars are not being moved on the adjacent track, and that proper flag protection has been established.

25. Counterweight/Ballast

a. The following applies to equipment other than tower cranes:

i. Do not operate equipment without the counterweight or ballast in place, as specified by the manufacturer.

ii. Do not exceed the maximum counterweight or ballast specified by the manufacturer for the equipment.

26. Authority to Stop Operation

Whenever there is a safety concern, the operator or any other workers associated with the operation have the authority to stop, and refuse to handle loads until a qualified person has determined that safety has been assured.

Z. Swing Radius Hazards

1. The requirements in paragraph 2 of this section apply where there are accessible areas in which the equipment's rotating superstructure (whether permanently or temporarily mounted) poses a reasonably foreseeable risk of:

a. Striking and injuring a worker; or

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- b. Pinching/crushing a worker against another part of the equipment or another object.
 2. To prevent workers from entering these hazard areas, the project manager (or his/her designee) must:
 - a. Instruct workers assigned to work on or near the equipment (authorized personnel) in how to recognize struck-by and pinch/crush hazards areas posed by the rotating superstructure.
 - b. Erect and maintain control lines, warning lines, railings, or similar barriers to mark the boundaries of the hazard areas. Exception: where it is neither feasible to erect such barriers on the ground nor on the equipment, the hazards areas must be clearly marked by a combination of warning signs and high-visibility markings on the equipment that identify the hazard areas. In addition, the project manager (or his/her designee) must train the workers to understand what these markings signify.
3. Protecting Workers in the Hazard Area
 - a. Before a worker goes to a location in the hazard area that is out of view of the operator, the worker (or someone instructed by the worker) must ensure that the operator is informed that he/she is going to that location.
 - b. Where the operator knows that a worker went to a location covered by paragraph 1 of this section, the operator will not rotate the superstructure until the operator:
 - i. Gives a warning that is understood by the worker as a signal that the superstructure is about to be rotated and allows time for the worker to get to a safe position, or
 - ii. Is informed in accordance with a pre-arranged system of communication that the worker is in a safe position.
4. Multiple Equipment Coordination. Where any part of a crane/derrick is within the working radius of another crane/derrick, the controlling entity must institute a system to coordinate operations. If there is no controlling entity, the project manager (or his/her designee) must institute such a system.

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5. Keeping Clear of the Load
 - a. Where available, hoisting routes that minimize the exposure of workers to hoisted loads will be used, to the extent consistent with public safety.
 - b. Although the operator is not moving a suspended load, no worker will be within the fall zone, except for workers:
 - i. Engaged in hooking, unhooking, or guiding a load;
 - ii. Engaged in the initial attachment of the load to a component or structure; or
 - iii. Operating a concrete hopper or concrete bucket.
6. When workers are engaged in hooking, unhooking, or guiding the load, or in the initial connection of a load to a component or structure and are within the fall zone, the following criteria must be met:
 - a. Rig the materials being hoisted to prevent unintentional displacement.
 - b. Use hooks with self-closing latches or their equivalent. Exception: "J" hooks are permitted to be used for setting wooden trusses.
 - c. Ensure the materials are rigged by a qualified rigger.
7. Receiving a load. Only workers needed to receive a load will be permitted to be within the fall zone when a load is being landed.
8. During a tilt-up or tilt-down operation:
 - a. No worker will be directly under the load.
 - b. Only workers essential to the operation will be in the fall zone (but not directly under the load). Note: Boom free-fall is prohibited when a worker is in the fall zone of the boom or load, and load-line free-fall is prohibited when a worker is directly under the load.

AA. Free-fall and Controlled-Load Lowering

1. Boom free-fall prohibitions

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- a. The use of equipment in which the boom is designed to free-fall (live boom) is prohibited in each of the following circumstances:
 - i. A worker is in the fall zone of the boom or load.
 - ii. A worker is being hoisted.
 - iii. The load or boom is directly over a power line, or over any part of the area extending the minimum clearance distance (identified in Attachment 038-4 AMER) to each side of the power line.
 - iv. The load is over a shaft.
 - v. The load is over a cofferdam, except where there are no workers in the fall zone.
 - vi. Lifting operations are taking place in a refinery or tank farm.
 - b. The use of equipment in which the boom is designed to free-fall (live boom) is permitted only where none of the circumstances listed in paragraph 1.a of this section are present and:
 - i. The equipment was manufactured prior to October 31, 1984; or
 - ii. The equipment is a floating crane/derrick or a land crane/derrick on a vessel/flotation device.
2. Preventing boom free-fall. Where the use of equipment with a boom that is designed to free-fall (live boom) is prohibited, the boom hoist must have a secondary mechanism or device designed to prevent the boom from falling in the event the primary system used to hold or regulate the boom hoist fails, as follows:
- a. Friction drums; these must have:
 - i. A friction clutch and a braking device to allow for controlled boom lowering.
 - ii. A secondary braking or locking device, which is manually or automatically engaged, to back up the primary brake while the boom is held (such as a secondary friction brake or a ratchet and pawl device).

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- b. Hydraulic drums must have an integrally mounted holding device or internal static brake to prevent boom hoist movement in the event of hydraulic failure.
 - c. Neither clutches nor hydraulic motors will be considered brake or locking devices for purposes of this subpart.
 - d. Hydraulic boom cylinders must have an integrally mounted holding device.
3. Preventing uncontrolled retraction. Hydraulic telescoping booms must have an integrally mounted holding device to prevent the boom from retracting in the event of hydraulic failure
4. Load line free-fall. In each of the following circumstances, controlled-load lowering is required, and free-fall of the load-line hoist is prohibited:
 - a. A worker is directly over a power line, or over any part of the area extending the minimum clearance distance (as defined in Attachment 038-4 AMER) to each side of the power line.
 - b. The load is over a shaft or cofferdam.

BB. Signals – General Requirements

1. A signal person must be provided in each of the following situations:
 - a. The point of operation, meaning the load travel or the area near or at load placement, is not in full view of the operator.
 - b. When the equipment is traveling, the view in the direction of travel is obstructed.
 - c. Due to site-specific safety concerns, either the operator or the person handling the load determines that it is necessary.
2. Types of signals. Signals to operators must be by hand, voice or audible.
3. Hand signals. When using hand signals, the Standard Method must be used (see Supplemental Information B for additional information).
4. Signals other than hand, voice, or audible signals may be used where the project manager (or his/her designee) demonstrates that:

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- a. The new signals provide communication at least equally effective as voice, audible, or standard method hand signals;
or
 - b. There is a national consensus standard for the new signals.
 5. The signals used (hand, voice, audible, or new), and means of transmitting the signals to the operator (such as direct line of sight, video, radio, etc.), must be appropriate for the site conditions.
 6. During operations requiring signals, the ability to transmit signals between the operator and signal person must be maintained. If that ability is interrupted at any time, the operator will safely stop operations requiring signals until it is reestablished, and a proper signal is given and understood.
 7. If the operator becomes aware of a safety problem and needs to communicate with the signal person, the operator must safely stop operations. Operations may not resume until the operator and signal person agree that the problem has been resolved.
 8. Only one person gives signals to a crane/derrick at a time, unless anyone who becomes aware of a safety problem must alert the operator or signal person by giving the stop or emergency stop signal. Note that this procedure requires the operator to obey a stop or emergency stop signal.
 9. All directions given to the operator by the signal person must be given from the operator's direction perspective.
 10. Communication with multiple cranes/derricks. Where a signal person(s) is in communication with more than one crane/derrick, a system for identifying the crane/derrick each signal is for must be used, as follows:
 - a. For each signal, prior to giving the function/direction, the signal person will identify the crane/derrick the signal is for;
or
 - b. An equally effective method of identifying which crane/derrick the signal is for must be used.
- CC. Signals – Radio, Telephone, or other Electronic Transmission
1. Test the device(s) used to transmit signals on site before beginning operations to ensure that the signal transmission is clear and

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reliable.

2. Signal transmission must be through a dedicated channel.
Exception: Multiple cranes/derricks and one or more signal persons may share a dedicated channel for the purpose of coordinating operations.
3. The operator's reception of signals must be by a hands-free system.

DD. Signals – Voice

1. Prior to beginning operations, the operator, signal person, and lift supervisor (if there is one), will contact each other and agree on the voice signals that will be used. Once the voice signals are agreed upon, these workers need not meet again to discuss voice signals unless another worker is substituted; there is confusion about the voice signals; or a voice signal is to be changed.
2. Each voice signal must contain the following three elements, given in the following order: function (such as hoist, boom, etc.), direction (distance and/or speed); and the 'stop' command.
3. The operator, signal person, and lift supervisor (if there is one), must be able to effectively communicate in the language used.

EE. Signals – Hand Signal Chart

Hand signal charts must either be posted on the equipment, or readily available at the site.

FF. Training

1. The project manager (or his/her designee) must provide training as follows:
2. Overhead power lines. Train workers specified in Section 4.N of this standard in accordance with the requirements of that section.
3. Signal persons. Train workers who will be assigned to work as signal persons who do not meet the requirements of this section in the areas addressed in Section 4.O of this standard.
4. Operators.
 - a. Train operators who are not qualified or certified under the conditions within this standard in those areas addressed in

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this standard. Provide retraining if necessary for re-qualification or re-certification or if the operator does not pass a qualification or certification test.

- b. Train operators in the following practices:
 - i. On friction equipment, whenever moving a boom off a support, first raise the boom a short distance (sufficient to take the load off the boom) to determine if the boom hoist brake needs to be adjusted. On other types of equipment, the same practice is applicable, except that typically there is no means of adjusting the brake; if the brake does not hold, a repair is necessary.
 - ii. Where available, the manufacturer's emergency procedures for halting unintended equipment movement.
5. Competent persons and qualified persons. Train competent persons and qualified persons regarding the requirements of ASME B30 standards applicable to their respective roles.
6. Crush/pinch points. Instruct workers who work with the equipment to keep clear of holes, and crush/pinch points and the hazards addressed in this procedure (work area control).
7. Lock-out /Tag-out. Train operators and other workers authorized to start/energize equipment or operate equipment controls (such as maintenance and repair workers) in the tag-out measures in this procedure.
8. Training administration
 - a. The project manager (or his/her designee) must ensure that workers required to be trained under this procedure are evaluated to confirm that they understand the information provided in the training.
 - b. Provide refresher training in relevant topics when, based on the conduct of the worker or an evaluation of the worker's knowledge, there is an indication that retraining is necessary.

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GG. Critical Lifts

1. Critical lift identifies loads classified as requiring a formal, written plan. A critical lift is defined as a non-routine crane lift requiring detailed planning, and additional or unusual safety precautions. Critical lifts include lifts made when the load is greater than 75 percent of the rated capacity of the crane in the configuration that the lift will be made; lifts that require the load to be lifted, swung, or placed out of the operators view; lifts made with more than one crane; lifts involving non-routine or technically difficult rigging arrangements; lifts of long lead time permanent materials; lifts that involve lifting loads over structures or equipment; lifts taking place in a confined or limited access areas; hoisting personnel with a crane or derrick; or any lift that the lift supervisor thinks should be considered critical.
2. The following items should be documented/included with (critical) lift plans:
 - a. Copy of the completed Attachment 038-3 AMER – Critical Lift Plan Form (note: this same form may also be used for non-critical lifts).
 - b. Sketch of elevation view of the crane and load.
 - c. Sketch of plan view of crane and load indicating associated radius and distances, or setup and load.
 - d. Copy of the crane load chart.
 - e. Copy of the crane range diagram.
 - f. Copy of the crane outline dimensions.
 - g. Rigging diagram indicating minimum size of slings and shackles.
 - h. Calculation indicating adequacy of rigging.
3. Critical Lift Plan Requirements
 - a. A Critical Lift Plan consists of as many drawings, specifications, and procedures as necessary to accurately assess all important load factors and site factors relating to a Critical Lift. These items are included as a guide, but should not be interpreted as being all-inclusive in the analysis and

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preparation of a Critical or Pre-Engineered Lift. Sound engineering and planning is still the responsibility of the engineer and/or project supervisor associated with the lift. Supplemental Information D (Checklist for Lift Planning) summarizes those factors. Most lifts do not involve all of the factors listed there.

- b. The following is the minimum level of information required for completing an adequate critical lift plan:
 - i. Elevation View Drawing of the crane, load, and any nearby structures that could cause interference. This drawing must be made to scale and should note:
 - a. Crane manufacturer(s), model(s), and counterweight(s), if variable.
 - b. Boom length(s) and lifting radius.
 - c. Maximum load elevation during lifting procedure.
 - d. Any jibs or special lifting devices required.
 - e. Minimum number of parts of crane hoist line required for lifting the load.
 - f. All required slings, shackles, and other rigging components identified by capacity, size, length, and location.
 - g. Calculated center of gravity of load.
 - ii. Plan View Drawing of the crane, load, and nearby structures that could cause interference. This drawing must be made to scale and should note:
 - a. Route that transport will take to position the load for lifting.
 - b. Initial lifting position of the load, including radius. Lifting radius must be accurately determined.
 - c. Final placement position of the load, including radius. Lifting radius must be accurately determined.
 - d. Location of the crane(s), including tail swing limits.

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- e. Route that crane(s) will take if walking with the load, as well as associated matting requirements.
 - f. Any utilities located within the work zone. Underground facilities—piping, ducts, etc.—must be accurately located.
 - g. Space may be needed to assemble crane.
 - h. Planning must include load transportation considerations, such as how to get the load close enough to the crane. This may be a function of the type of crane being used, because some cranes perform better in certain sectors (quadrants) of operation than others.
- iii. Lift Analysis, including:
- a. Tabulation of the gross load weight, including the weight of all blocks and rigging tackle.
 - b. Rigging attachment points and special rigging requirements.
 - c. Gross rated capacity of the crane in the configuration specified.
 - d. Calculation of the percentage of the crane's rated capacity at which the lift will be made.
 - e. Crane-imposed soil loads must be determined. Soil analysis may be needed to verify crane-imposed loads can be safely supported.
 - f. Allowable weather conditions for the lift, and the effect of wind loading.
 - g. Sequence of work, including lift-off, steady-state conditions, and set-down of load (including positions where there is a shift in the location of the center of gravity, for the pick points).
 - h. Completed Critical Lift Plan (see Attachment 038-3 AMER).
 - i. Copy of crane range diagram.
 - j. Copy of crane load chart.

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- k. Copy of crane outline dimensions.
 - iv. All potential complicating issues for any lift must be addressed in the lift plan; however, for a relatively simple operation, the above items can provide sufficient information, and may even be organized onto one drawing.
- HH. Personnel Hoisting
1. Hoisting personnel is considered to be a Critical Lift. All of the following criteria must be observed and in place prior to any personnel hoisting. The Personnel Platform Lifting Form (see Attachment 038-9 AMER) with applicable signatures must be completed prior to lifting, as well as any criteria required in the Critical Lifts section of this standard. Additional information on hoisting personnel is provided in Supplemental Information E.
 2. Procedures
 - a. Personnel are only allowed to ride in a personnel platform supported by the crane load line attachment or boom-mounted platform when used in accordance with the requirements of ASME B30.23 and the crane manufacturer's instructions. The crane may not be used for other purposes while handling personnel.
 3. The requirements of this section are supplemental to the other requirements in this standard, and apply when one or more workers are hoisted.
 4. The use of equipment to hoist workers is prohibited except where the project manager (or his/her designee) demonstrates that the erection, use, and dismantling of conventional means of reaching the worksite, 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.
 5. Use of personnel platform:
 - a. When using equipment to hoist workers, the workers must be in a personnel platform that meets the requirements of paragraph 8 of this section.

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- b. Exceptions: A personnel platform is not required for hoisting workers:
 - i. Into and out of drill shafts that are up to and including 8 feet in diameter (see paragraph 16 of this section for requirements for hoisting these workers).
 - ii. In pile driving operations (see paragraph 17 of this section for requirements for hoisting these workers).
 - iii. Solely for transfer to or from a marine worksite in a marine hoisted-personnel transfer device (see paragraph 18 of this section for requirements for hoisting these workers).
 - iv. In storage tank (steel or concrete), shaft, and chimney operations (see paragraph 19 of this section for requirements for hoisting these workers).
6. Equipment set-up
- a. The equipment must be uniformly level, within 1 percent of level grade, and located on footing that a qualified person has determined to be sufficiently firm and stable.
 - b. Equipment with outriggers must have them all extended and locked. The amount of extension must be the same for all outriggers and in accordance with the manufacturer's procedures and load charts.
7. Equipment criteria
- a. Capacity – Use of suspended personnel platforms. The total load (with the platform loaded, including the hook, load line, and rigging) will not exceed 50 percent of the rated capacity for the radius and configuration of the equipment, except during proof testing.
 - b. Capacity – Use of boom-attached personnel platforms. The total weight of the loaded personnel platform will not exceed 50 percent of the rated capacity for the radius and configuration of the equipment, except during proof testing.
 - c. Capacity – Hoisting personnel without a personnel platform. When hoisting personnel without a personnel platform, the total load (including the hook, load line, rigging and any other equipment that imposes a load) will not exceed 50 percent of

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the rated capacity for the radius and configuration of the equipment, except during proof testing.

- d. When the occupied personnel platform is in a stationary working position, the load and boom hoist brakes, swing brakes, and operator-actuated secondary braking and locking features (such as pawls or dogs) or automatic secondary brakes must be engaged.
- e. Devices.
 - i. Equipment (except for derricks) with a variable-angle boom must be equipped with:
 - a. A boom angle indicator, readily visible to the operator.
 - b. A boom hoist limiting device.
 - ii. Equipment with a luffing jib must be equipped with:
 - a. A jib angle indicator, readily visible to the operator.
 - b. A jib hoist limiting device.
 - iii. Equipment with telescoping booms must be equipped with a device to indicate the boom's extended length clearly to the operator, or have measuring marks on the boom.
 - iv. Anti two-block. A device that automatically prevents damage and load failure from contact between the load block, overhaul ball, or similar component, and the boom tip (or fixed upper block or similar component) must be used. The device(s) must prevent such damage/failure at all points where two-blocking could occur.
 - v. Controlled load lowering. The load line hoist drum must have a system, other than the load line hoist brake, that regulates the lowering rate of speed of the hoist mechanism. This system or device must be used when hoisting personnel. Free-fall of the load line hoist is prohibited. The use of equipment in which the boom hoist mechanism can free-fall is prohibited.

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- vi. Proper operation required. Personnel hoisting operations will not begin unless the devices listed in this section are in proper working order. If a device stops working properly during such operations, the operator must safely stop operation. Personnel hoisting operations must not resume until the device is again working properly. Alternative measures are not permitted.
 - f. Direct attachment of a personnel platform to a luffing jib is prohibited.
8. Personnel platform criteria
- a. The personnel platform and attachment/suspension system must be designed for hoisting personnel by a qualified person familiar with structural design.
 - b. The system used to connect the personnel platform to the equipment must allow the platform to remain within 10 degrees of level, regardless of boom angle.
 - c. The suspension system must be designed to minimize tipping of the platform due to movement of workers occupying the platform.
 - d. The personnel platform itself (excluding the guardrail system and personal fall arrest system anchorages), must be capable of supporting, without failure, its own weight and at least five times the maximum intended load.
 - e. All welding of the personnel platform and its components must be performed by a certified welder familiar with the weld grades, types, and material specified in the platform design.
 - f. Equip the personnel platform with a guardrail system that meets the requirements of URS Fall Protection procedures as specified in SMS 040, and is enclosed at least from the toe-board to mid-rail with either solid construction material, or expanded metal having openings no greater than 1/2 inch (1.27 centimeters). Points to which personal fall arrest systems are attached must meet the anchorage requirements in URS Fall Protection procedures, as specified in SMS 040.

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- g. Install a grab rail inside the entire perimeter of the personnel platform except for access gates/doors.
 - h. Access gates/doors. If installed, access gates/doors of all types (including swinging, sliding, folding, or other types) will:
 - i. Not swing outward.
 - ii. Be equipped with a device that prevents accidental opening.
 - i. Ensure headroom is sufficient to allow workers to stand upright in the platform.
 - j. In addition to the use of hard hats, protect workers by overhead protection on the personnel platform when workers are exposed to falling objects.
 - k. All edges exposed to worker contact must be smooth enough to prevent injury.
 - l. Conspicuously post the weight of the platform and its rated capacity on the platform with a plate or other permanent marking.
9. Personnel platform loading
- a. Do not load the personnel platform in excess of its rated capacity.
 - b. Use.
 - i. Personnel platforms will be used only for workers, their tools, and the materials necessary to do their work. Platforms must not be used to hoist materials or tools when not hoisting personnel.
 - ii. Exception: materials and tools to be used during the lift, if secured and distributed in accordance with paragraph 9.c below of this section, may be in the platform for trial lifts.
 - c. Materials and tools must be:
 - i. Secured to prevent displacement.
 - ii. Evenly distributed within the confines of the platform while it is suspended.

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- d. The number of workers occupying the personnel platform will not exceed the maximum number the platform was designed to hold, or the number required to perform the work, whichever is less.

10. Attachment and rigging

- a. Dedicated rigging: Do not use the rigging used for hoisting personnel for any other hoisting activities such as materials or equipment.
- b. Hooks and other detachable devices.
 - i. Hooks used in the connection between the hoist line and the personnel platform (including hooks on overhaul ball assemblies, lower load blocks, bridle legs, or other attachment assemblies or components) must be:
 - a. Of a type that can be closed and locked, eliminating the throat opening.
 - b. Closed and locked when attached.
 - ii. Shackles used in place of hooks must be of the alloy anchor type, with either:
 - a. A bolt, nut, and retaining pin designed for the shackle, in place; or
 - b. Of the screw type, with the screw pin secured from accidental removal.
 - iii. Where other detachable devices are used, they must be of the type that can be closed and locked to the same extent as the devices addressed in paragraph 7.b.i and 7.b.ii of this section. Such devices must be closed and locked when attached.
- c. Rope bridle. When a rope bridle is used to suspend the personnel platform, each bridle leg must be connected to a master link or shackle (see paragraph 10 of this section) in a manner that ensures that the load is evenly divided among the bridle legs.
- d. Rigging hardware (including wire rope, shackles, rings, master links, and other rigging hardware) and hooks must be capable of supporting, without failure, at least five times the

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maximum intended load applied or transmitted to that component. Where rotation-resistant rope is used, the slings must be capable of supporting, without failure, at least ten times the maximum intended load.

- e. Fabricate eyes in wire rope slings with thimbles.
- f. Use bridles and associated rigging for suspending the personnel platform only for the platform and the necessary workers, their tools, and materials necessary to do their work, and do not use for any other purpose when not hoisting personnel.

11. Trial lift and inspection

- a. Make a trial lift with the unoccupied personnel platform loaded at least to the anticipated lift weight from ground level, or any other location where workers will enter the platform, to each location at which the platform is to be hoisted and positioned. Where there is more than one location to be reached from a single set-up position, perform either individual trail lifts for each location, or a single trail lift for all locations.
- b. Perform the trial lift immediately prior to each shift in which personnel will be hoisted. In addition, repeat the trial lift prior to hoisting workers in each of the following circumstances:
 - i. The equipment is moved and set up in a new location or returned to a previously used location.
 - ii. The lift route is changed, unless the competent person determines that the new route presents no new factors affecting safety.
- c. The competent person must determine that:
 - i. Safety devices and operational aids required by this section are activated and functioning properly. Other safety devices and operational aids must meet the requirements of this procedure.
 - ii. Nothing interferes with the equipment or the personnel platform in the course of the trial lift.
 - iii. The lift will not exceed 50 percent of the equipment's rated capacity at any time during the lift.

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- iv. The load radius to be used during the lift has been accurately determined.
- d. Immediately after the trial lift, the competent person must:
 - i. Conduct a visual inspection of the equipment, base support or ground, and personnel platform to determine whether the trial lift has exposed any adverse effect.
 - ii. Confirm that, upon the completion of the trail lift process, the test weight has been removed.
- e. Immediately prior to each lift:
 - i. Hoist the platform a few inches and have it inspected by a competent person to ensure that it is secure and properly balanced.
 - ii. The following conditions must be determined to exist by a competent person before the lift of personnel proceeds:
 - a. Hoist ropes are free of deficiencies in accordance with this procedure.
 - b. Multiple part lines are not twisted around each other.
 - c. The primary attachment is centered over the platform.
 - d. If the load rope is slack, the hoisting system must be inspected to ensure that all ropes are properly seated on drums and in sheaves.
- f. Any condition found during the trial lift and subsequent inspection(s) that fails to meet a requirement of this procedure or otherwise creates a safety hazard must be corrected before hoisting personnel.

12. Proof testing

- a. At each jobsite, prior to hoisting workers on the personnel platform, and after any repair or modification, the platform and rigging must be proof-tested to 125 percent of the platform's rated capacity. The proof test may be done concurrently with the trial lift.

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- b. The platform must be lowered by controlled load lowering; braked; and held in a suspended position for a minimum of 5 minutes with the test load evenly distributed on the platform.
- c. After proof testing, a competent person must inspect the platform and rigging to determine if the test has been passed. If any deficiencies are found that pose a safety hazard, the platform and rigging cannot be used to hoist personnel unless the deficiencies are corrected; the test is repeated; and a competent person determines that the test has been passed.
- d. Do not conduct personnel hoisting until the competent person determines that the platform and rigging have successfully passed the proof test.

13. Work practices

- a. Perform the hoisting of the personnel platform in a slow, controlled, cautious manner, with no sudden movements of the equipment or the platform.
- b. Platform occupants must:
 - i. Keep all parts of the body inside the platform during raising, lowering, and horizontal movement. This provision does not apply to an occupant of the platform when necessary to position the platform or while performing the duties of a signal person.
 - ii. Not stand, sit on, or work from the top or intermediate rail or toe board, or use any other means/device to raise their working height.
 - iii. Not pull the platform out of plumb in relation to the hoisting equipment.
- c. Before workers exit or enter a hoisted personnel platform that is not landed, the platform must be secured to the structure where the work is to be performed, unless securing to the structure would create a greater hazard.
- d. If the platform is tied to the structure, the operator must not move the platform until the operator receives confirmation that it is freely suspended.

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- e. Use tag lines when necessary to control the platform.
- f. Platforms without controls. Where the platform is not equipped with controls, the equipment operator must remain at the equipment controls at all times while the platform is occupied.
- g. Platforms with controls. Where the platform is equipped with controls, the following must be met at all times while the platform is occupied:
 - i. The occupant using the controls in the platform must be a qualified person with respect to their use, including the safe limitations of the equipment and hazards associated with its operation.
 - ii. The equipment operator must be at the equipment controls, or in the personnel platform, or on site and in view of the equipment.
 - iii. The platform operating manual must be in the platform or on the equipment.
- h. Environmental conditions.
 - i. Wind. 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 will not begin (or, if already in progress, will be terminated).
 - ii. Other weather and environmental conditions. A qualified person must determine if, in light of indications of dangerous weather conditions, or other impending or existing danger, it is not safe will not begin (or, if already in progress, will be terminated).
- i. Workers being hoisted must remain in direct communication with the signal person (where used), or the operator.
- j. Fall protection
 - i. Except over water, workers occupying the personnel platform must be provided and use a personal fall arrest system. The system must be attached to a structural member within the personnel platform.

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- ii. The fall arrest system, including the attachment point (anchorage) used to comply with paragraph 10.j.i of this section, must meet the requirements of SMS 040 – Fall Protection.

- k. Other load lines

- i. Do not make lifts on any other of the equipment's load lines while personnel are being hoisted, except in pile driving operations.
- ii. Factory-produced boom-mounted personnel platforms that incorporate a winch as original equipment: Loads are permitted to be hoisted by such a winch while workers occupy the personnel platform only where the load on the winch line does not exceed 500 pounds, and does not exceed the rated capacity of the winch and platform.

- l. Traveling – Equipment other than derricks

Hoisting of workers while the equipment is traveling is prohibited.

- m. Traveling – Derricks.

Derricks are prohibited from traveling while personnel are hoisted.

14. Pre-lift meeting. A pre-lift meeting will be:

- a. Held to review the applicable requirements of this section and the procedures that will be followed.
- b. Attended by the equipment operator, signal person (if used for the lift), workers to be hoisted, and the person responsible for the task to be performed.
- c. Held prior to the trial lift at each new work location, and repeated for any workers newly assigned to the operation.

15. Hoisting personnel near power lines. Hoisting personnel within 20 feet of a power line that is up to 350 kV, and hoisting personnel within 50 feet of a power line that is over 350 kV, is prohibited.

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16. Hoisting personnel in drill shafts. When hoisting workers into and out of drill shafts that are up to and including 8 feet in diameter, the following requirements must be met:
- a. The worker must be in either a personnel platform or on a boatswain's chair.
 - b. If using a personnel platform, paragraphs (a) through (n) of this section apply.
 - c. If using a boatswain's chair:
 - i. The following paragraphs of this section apply: 4; 6; 7.a; 7.c; 7.d; 8.a through 8.c; 9.a; 9.b.i; 9.c.i; 10; 11; 13.a; 13.f; 13.h; 13.i; 13.k.i; 14; and 15. Where the terms "personnel platform" or "platform" are used in these paragraphs, the term "boatswain's chair" applies in their place.
 - ii. Station a signal person at the shaft opening.
 - iii. Hoist the worker in a slow, controlled descent and ascent.
 - iv. The worker must use personal fall protection equipment, including a full body harness, attached independent of the crane/derrick.
 - v. The fall protection equipment must meet the applicable Fall Protection requirements (SMS 040).
 - vi. The boatswain's chair itself (excluding the personal fall arrest system anchorages), must be capable of supporting, without failure, its own weight and at least five times the maximum intended load.
 - vii. No more than one person will be hoisted at a time.
17. Hoisting personnel for pile-driving operations. When hoisting a worker in pile-driving operations, the following requirements must be met:
- a. The worker must be in a personnel platform or boatswain's chair.
 - b. For lattice-boom cranes, clearly mark the cable (so that it can easily be seen by the operator) at a point that will give

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the operator sufficient time to stop the hoist to prevent two-blocking, and use a spotter.

- c. If using a personnel platform, paragraphs 4 through 15 of this section apply.
- d. If using a boatswain's chair:
 - i. "Platform" is used in these paragraphs; the term "boatswain's chair" applies in their place.
 - ii. Worker must be hoisted in a slow, controlled descent and ascent.
 - iii. The worker must use personal fall protection equipment, including a full body harness, independently attached to the lower load block or overhaul ball.
 - iv. The fall protection equipment must meet the applicable Fall Protection requirements as specified in SMS 040.

18. Hoisting personnel for marine transfer. When hoisting workers solely for transfer to or from a marine worksite, the following requirements must be met:

- a. The worker must be in either a personnel platform or a marine-hoisted personnel transfer device.
- b. If using a personnel platform, paragraphs 4 through 15 of this section apply.
- c. If using a marine-hoisted personnel transfer device:
 - i. The following paragraphs of this section apply: 4; 6.b; 7.a; 7.c; 7.d; 8.a through 8.e; 8.l; 9.a; 10; 11; 12; 13.a; 13.f; 13.h; 13.i; 13.j.ii; 13.k.i; 13.l; 14; and 15. Where the terms "personnel platform" or "platform" are used in these paragraphs, the term "marine-hoisted personnel transfer device" applies in their place.
 - ii. The transfer device will be used only for transferring workers.
 - iii. The number of workers occupying the transfer device will not exceed the maximum number it was designed to hold.

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- iv. Each worker must wear a U.S. Coast Guard personal flotation device approved for industrial use.
19. Hoisting personnel for storage tank (steel or concrete), shaft, and chimney operations. When hoisting a worker in storage tank (steel or concrete) shaft, and chimney operations, the following requirements must be met:
- a. The worker must be in a personnel platform, except where use of a personnel platform is infeasible; in such a case, a boatswain's chair will be used.
 - b. If using a personnel platform, paragraphs 4 through 15 of this section apply.
 - c. If using a boatswain's chair:
 - i. The following paragraphs of this section apply: 4; 6; 7.a; 7.c; 7.d; 8.a; 8.b; 8.c; 9.a; 9.b.i; 9.c.i; 10; 11; 13.a; 13.f; 13.h; 13.i; 13.k.i; 14; and 15. Where the terms "personnel platform" or "platform" are used in these paragraphs, the term "boatswain's chair" applies in their place.
 - ii. The worker must be hoisted in a slow, controlled descent and ascent.
 - iii. The worker must use personal fall protection equipment, including a full-body harness, attached independent of the crane/derrick.
 - iv. The fall protection equipment must meet the applicable requirements as specified in SMS 040 – Fall Protection.
 - v. The boatswain's chair itself (excluding the personal fall arrest system anchorages), must be capable of supporting, without failure, its own weight and at least five times the maximum intended load.
 - vi. Do not hoist more than one person at a time.
- II. Floating Cranes/Derricks and Land Cranes/Derricks on Barges
- 1. This section contains supplemental requirements for floating cranes/derricks and land cranes/derricks on barges, pontoons, vessels, or other means of flotation (vessel/flotation device). The requirements of this section do not apply when using jacked barges

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when the jacks are deployed to the river/lake/sea-bed, and the barge is fully supported by the jacks.

2. Work area control. The project manager (or his/her designee) must either:
 - a. Erect and maintain control lines, warning lines, railings, or similar barriers to mark the boundaries of the hazard areas; or
 - b. The hazard areas must be clearly marked by a combination of warning signs and high-visibility markings on the equipment that identify the hazard areas. In addition, the project manager (or his/her designee) must train the workers to understand what these markings signify.
3. Keep clear of the load.
4. Additional Safety devices. In addition to the safety devices listed in this procedure, the following safety devices are required:
 - a. Barge, pontoon, vessel, or other means of flotation list and trim device will be located in the cab; or, where there is no cab, at the operator's station.
 - b. Horn.
 - c. Positive equipment house lock.
 - d. Wind speed and direction indicator. A competent person will determine if wind is a factor that needs to be considered; if so, a wind speed and direction indicator will be used.
5. Operational aids.
 - a. An anti-two-block device is required only when hoisting personnel or hoisting over an occupied cofferdam or shaft.
 - b. Section (load weighing and similar devices) does not apply to dragline, clamshell (grapple), magnet, drop ball, container handling, concrete bucket, and pile driving work.
6. Accessibility of procedures applicable to equipment operation. If the crane/derrick has a cab, the requirements of this procedure apply. If the crane/derrick does not have a cab:

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- a. Rated capacities (load charts) must be posted at the operator's station. If the operator's station is moveable (such as with pendant-controlled equipment), the load charts must be posted on the equipment.
 - b. Procedures applicable to the operation of the equipment (other than load charts), recommended operating speeds, special hazard warnings, instructions and operators manual, must be readily available on board.
7. Inspections. In addition to meeting the requirements of this procedure for inspecting the crane/derrick, the project manager (or his/her designee) must ensure that the barge, pontoons, vessel, or other means of flotation used to support a floating crane/derrick or land crane/derrick is inspected as follows:
- a. Shift. The means used to secure/attach the equipment to the vessel/flotation device must be inspected for wear, corrosion, loose or missing fasteners, defective welds, and, where applicable, insufficient tension.
 - b. Monthly. Inspect the vessel/flotation device used as follows:
 - i. The means used to secure/attach the equipment to the vessel/flotation device must be inspected for wear, corrosion, loose or missing fasteners, defective welds, and, where applicable, insufficient tension.
 - ii. Taking on water.
 - iii. Deck load for proper securing.
 - iv. Chain lockers, storage, fuel compartments and battening of hatches for serviceability as a water-tight appliance.
 - v. Firefighting and lifesaving equipment in place and functional.
 - c. The shift and monthly inspections must be conducted by a competent person. If any deficiency is identified, an immediate determination will be made by a qualified person as to whether the deficiency constitutes a hazard. If the deficiency is determined to constitute a hazard, the vessel/flotation device must be removed from service until it has been corrected.

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- d. Annual: External vessel/flotation device inspection.
 - i. The external portion of the barge, pontoons, vessel, or other means of flotation used must be inspected annually by a qualified person who has expertise with respect to vessels/flotation devices. The inspection must include the following items:
 - a. The items identified in paragraphs 6.a and 6.b of this section.
 - b. Cleats, bits, chocks, fenders, capstans, ladders, and stanchions for significant corrosion, wear, deterioration, and deformation.
 - c. External evidence of leaks and structural damage.
 - d. Four-corner draft readings.
 - e. Firefighting equipment for serviceability.
 - ii. Rescue skiffs, lifelines, work vests, life preservers and ring buoys must be inspected for proper condition.
 - iii. If any deficiency is identified, an immediate determination will be made by the qualified person as to whether the deficiency constitutes a hazard; or, although not yet a hazard, needs to be monitored in the monthly inspections. If the deficiency is determined to constitute a hazard, the vessel/flotation device must be removed from service until it has been corrected.
 - iv. If the qualified person determines that, although not currently a hazard, the deficiency needs to be monitored, the project manager (or his/her designee) must ensure that the deficiency is checked in the monthly inspections.
- e. Quadrennial: Internal vessel/flotation device inspection:
 - i. The internal portion of the barge, pontoons, vessel, or other means of flotation used must be surveyed once every 4 years by a marine engineer, marine architect, licensed surveyor, or other qualified person who has expertise with respect to vessels/flotation devices.

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- ii. If any deficiency is identified, an immediate determination will be made by the surveyor as to whether the deficiency constitutes a hazard; or, although not yet a hazard, needs to be monitored in the monthly inspections as appropriate.
 - iii. If the deficiency is determined to constitute a hazard, the vessel/flotation device must be removed from service until it has been corrected.
 - iv. If the surveyor determines that, although not currently a hazard, the deficiency needs to be monitored, the project manager (or his/her designee) must ensure that the deficiency is checked in the monthly or annual inspections as appropriate.
- f. Documentation. The monthly and annual inspections required in paragraphs 6.a and 6.d of this section must be documented in accordance with this procedure. The quadrennial inspection required in paragraph 6.e of this section must be documented in accordance with this procedure, except that the documentation for that inspection will be retained for a minimum of 4 years.
8. Working with a diver. The following additional requirements apply when working with a diver in the water:
- a. If a crane/derrick is used to get a diver into and out of the water, it cannot be used for any other purpose until the diver is back on board. When used for more than one diver, it cannot be used for any other purpose until all divers are back on board.
 - b. The operator must remain at the controls of the crane/derrick at all times.
 - c. In addition to the signals requirements in this procedure (Sections BB through EE); either:
 - i. A clear line of sight must be maintained between the operator and tender, or
 - ii. The signals between the operator and tender must be transmitted electronically.

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- d. The means used to secure the crane/derrick to the vessel/flotation device cannot allow any amount of shifting in any direction.
9. The project manager (or his/her designee) must ensure that the manufacturer's specifications and limitations with respect to environmental, operational, and in-transit load for the barge, pontoons, vessel, or other means of flotation are not exceeded or violated.
10. Floating cranes/derricks. For equipment designed by the manufacturer (or project manager or his/her designee) for marine use by permanent attachment to barges, pontoons, vessels, or other means of flotation:
- a. Load Charts
 - i. The manufacturer's load charts applicable to operations on water cannot be exceeded. When using these charts, the project manager (or his/her designee) must comply with all parameters and limitations (such as dynamic/environmental parameters) applicable to the use of the charts.
 - ii. The load charts will take into consideration a minimum wind speed of 40 miles per hour.
 - b. The requirements for maximum allowable list and maximum allowable trim as specified below must be met.

Rated Capacity	Maximum Allowable List	Maximum Allowable Trim
Equipment designed for marine use by permanent attachment (other than derricks):		
25 tons or less	5 degrees	5 degrees
Over 25 tons	7 degrees	7 degrees
Derricks designed for marine use by permanent attachment:		
Any rated capacity	10 degrees	10 degrees

- c. If the equipment is project manager (or his/her designee)-made, it cannot be used unless the project manager (or his/her designee) has documents demonstrating that the load charts and applicable parameters for use meet the requirements of paragraphs 11.a through 11.c of this section. Such documents must be signed by a registered professional engineer who is a qualified person with respect

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to the design of this type of equipment (including the means of flotation).

- d. The barge, pontoons, vessel, or other means of flotation used must:
 - i. Be structurally sufficient to withstand the static and dynamic loads of the crane/derrick when operating at the crane/derricks' maximum-rated capacity with all anticipated deck loads and ballasted compartments.
 - ii. Have a subdivided hull with one or more longitudinal watertight bulkheads for reducing the free-surface effect.
 - iii. Have access to void compartments to allow for inspection and pumping.

11. Land cranes/derricks. For land cranes/derricks used on barges, pontoons, vessels, or other means of flotation:

- a. The rated capacity of the equipment (load charts) applicable for use on land must be reduced to:
 - i. Account for increased loading from list, trim, wave action, and wind.
 - ii. Be applicable to a specified location(s) on the specific barge, pontoons, vessel, or other means of flotation that will be used, under the expected environmental conditions.
 - iii. Ensure that the conditions required in paragraphs 11.c and 11.d of this section are met.
- b. The rated capacity modification required in paragraph 11.b of this section must be done by the equipment manufacturer, or a qualified person who has expertise with respect to both land crane/derrick capacity, and the stability of vessels/flotation devices.
- c. List and trim.
 - i. The maximum allowable list and the maximum allowable trim for the barge, pontoon, vessel, or other means of flotation cannot exceed the amount necessary to ensure that the conditions in paragraph 11.d of this section are met. In addition, the

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- maximum allowable list and the maximum allowable trim cannot exceed the least of the following:
5 degrees, the amount specified by the crane/derrick manufacturer; or, where an amount is not so specified, the amount specified by the qualified person.
- ii. The maximum allowable list and the maximum allowable trim for the land-crane derrick cannot exceed the amount specified by the crane/derrick manufacturer; or, where an amount is not so specified, the amount specified by the qualified person.
- d. The following conditions must be met:
- i. All deck surfaces of the barge, pontoons, vessel, or other means of flotation used must be above water.
 - ii. The entire bottom area of the barge, pontoons, vessel, or other means of flotation used must be submerged.
- e. Physical attachment, corraling, rails system, and centerline cable system. The project manager (or his/her designee) must meet the requirements in Option 1, Option 2, Option 3, or Option 4, as follows. Whichever option is used, the requirements of paragraph 11.e.v of this section must also be met.
- i. Option 1 – Physical attachment. The crane/derrick must be physically attached to the barge, pontoons, vessel, or other means of flotation. Methods of physical attachment include crossed-cable systems attached to the crane/derrick and vessel flotation device (this type of system allows the crane/derrick to lift up slightly from the surface of the vessel/means of flotation), bolting or welding the crane/derrick to the vessel/flotation device, strapping the crane/derrick to the vessel/flotation device with chains, or other methods of physical attachment.
 - ii. Option 2 – Corraling. The crane/derrick must be prevented from shifting by installing barricade restraints (a corraling system). Corraling systems must not allow any amount of shifting in any direction by the equipment.

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- iii. Option 3 – Rails. The crane/derrick must be prevented from shifting by being mounted on a rail system. Rail clamps and rail stops are required unless the system is designed to prevent movement during operation by other means.
- iv. Option 4 – Centerline cable system. The crane/derrick must be prevented from shifting by being mounted to a wire rope system. The wire rope system must meet the following requirements:
 - a. The wire rope and attachments must be of sufficient size/strength to support the side load of crane/derrick.
 - b. The wire rope must be physically attached to the vessel/flotation device.
 - c. The wire rope must be attached to the crane/derrick by appropriate attachment methods (such as shackles or sheaves) on the undercarriage, which will allow the crew to secure the crane/derrick from movement during operation, and to move the crane/derrick longitudinally along the vessel/flotation device for repositioning.
 - d. A method will be employed to prevent the crane/derrick from passing the forward or aft end of the wire rope attachments.
 - e. The crane/derrick must be secured from movement during operation.
- v. The systems/means used to comply with Option 1, Option 2, Option 3, or Option 4 will be designed by a marine engineer, registered professional engineer familiar with floating crane/derrick design, or qualified person familiar with floating crane/derrick design.
- vi. Exception. For mobile auxiliary cranes used on the deck of a floating crane/derrick, the requirement to use Option 1, Option 2, Option 3, or Option 4 of this section does not apply where the project manager (or his/her designee) demonstrates implementation of a plan and procedures that meet the following requirements:

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- a. A marine engineer or registered professional engineer familiar with floating crane/derrick design develops and signs a written plan for the use of the mobile auxiliary crane.
 - b. The plan must be designed so that the applicable requirements of this section will be met despite the position, travel, operation, and lack of physical attachment (or corralling, use of rails, or cable system) of the mobile auxiliary crane.
 - c. The plan must specify the areas of the deck where the mobile auxiliary crane is permitted to be positioned, travel, and operate, and the parameters/limitations of such movement and operation.
 - d. The deck must be marked to identify the permitted areas for positioning, travel, and operation.
 - e. The plans all specify the dynamic/environmental conditions that must be present for use of the plan.
 - f. If the dynamic/environmental conditions in paragraph 11.e.vi.5 of this section are exceeded, the mobile auxiliary crane must be physically attached or corralled in accordance with Option 1, Option 2, Option 3, or Option 4 (see paragraphs 11.d.i, 11.d.ii, and 11.d.iv of this section).
- f. The barge, pontoons, vessel, or other means of flotation used must:
- i. Be structurally sufficient to withstand the static and dynamic loads of the crane/derrick when operating at the crane/derrick's maximum rated capacity with all anticipated deck loads and ballasted compartments.
 - ii. Have a subdivided hull with one or more longitudinal watertight bulkheads for reducing the free surface effect.
 - iii. Have access to void compartments to allow for inspection and pumping.

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JJ. Dedicated pile drivers.

1. The provisions of this standard apply to dedicated pile drivers, except as specified in this section.
2. Information provided elsewhere in this standard on anti two-block devices does not apply.
3. Section 4.N (Operator Qualification and Certification) applies, except that the qualification or certification will be for operation of either dedicated pile drivers, or equipment that is the most similar to dedicated pile drivers.

KK. Overhead and Gantry Cranes

1. Permanently installed overhead and gantry cranes.
 - a. This paragraph applies to the following equipment when used in construction and permanently installed in a facility: Overhead and gantry cranes, including semi-gantry, cantilever gantry, wall cranes, storage bridge cranes, and others having the same fundamental characteristics.
 - b. The requirements of this procedure apply to the equipment identified in paragraph 1.a of this section.
2. Overhead and gantry cranes that are not permanently installed in a facility.
 - a. This paragraph applies to the following equipment when used in construction and not permanently installed in a facility: overhead and gantry cranes, overhead/bridge cranes, semi gantry, cantilever gantry, wall cranes, storage bridge cranes, launching gantry cranes, and similar equipment, irrespective of whether it travels on tracks, wheels, or other means.
 - b. For equipment manufactured on or after September 19, 2001, the following sections of ASME B.30.2-2007 apply: 2-1.3.1; 2-1.3.2; 2-1.4.1; 2-1.6; 2-1.7.2; 2-1.8.2; 2-1.9.1; 2-1.91.2; 2-1.11; 2-1.12.2; 2-1.13.7; 2-1.14.2; 2-1.14.3; 2-1.14.5; 2-1.15; 2-2.2.2; 2-2.3.2.1.1. In addition, 2-3.5 applies, except in 2-3.5.1(b), "so CFR 1910.147" applies in place of "ANSI Z244.1."

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LL. Derricks

1. This section contains supplemental requirements for derricks, whether temporarily or permanently mounted; all sections of this procedure apply to derricks unless specified otherwise. A derrick is powered equipment consisting of a mast or equivalent member that is held at or near the end by guys or braces, with or without a boom, and its hoisting mechanism. The mast/equivalent member and/or the load are moved by the hoisting mechanism (typically base-mounted) and operating ropes. Derricks include A-frame, basket, breast, Chicago boom, gin pole (except gin poles used for erection of communication towers), guy, shear leg, and variations of such equipment.
2. Operation
 - a. "Operation" applies except for "accessibility of procedures".
 - b. Load chart contents. Load charts must contain at least the following information:
 - i. Rated capacity at corresponding ranges of boom angle or operating radii.
 - ii. Specific lengths of components to which the rated capacities apply.
 - iii. Required parts for hoist reeving.
 - iv. Size and construction of rope will be included on the load chart or in the operating manual.
 - c. Load chart location.
 - i. Permanent installations. For permanently installed derricks with fixed lengths of boom, guy, and mast, a load chart must be posted where it is visible to personnel responsible for the operation of the equipment.
 - ii. Non-permanent installations. For derricks that are not permanently installed, the load chart must be readily available at the job site to personnel responsible for the operation of the equipment.
3. Construction
 - a. General requirements.

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- i. Derricks must be constructed to meet all stresses imposed on members and components when installed and operated in accordance with the manufacturer's/builder's procedures, and within its rated capacity.
 - ii. Welding of load-sustaining members must conform to recommended practices in ANSI/AWSD 14.3-94 or D1.1-02.
- b. Guy derricks.
- i. The minimum number of guys will be six, with equal spacing, except where a qualified person or derrick manufacturer approves variations from these requirements and revises the rated capacity to compensate for such variations.
 - ii. Guy derricks will not be used unless the project manager (or his/her designee) has the following guy information:
 - a. The number of guys.
 - b. The spacing around the mast.
 - c. The size, grade, and construction of rope to be used for each guy.
 - iii. For guy derricks manufactured after December 18, 1970, in addition to the information required in paragraph 3.b.ii of this section, the project manager (or his/her designee) must have the following guy information:
 - a. The amount of initial sag or tension.
 - b. The amount of tension in guy line rope at anchor.
 - iv. The mast base must permit the mast to rotate freely, with allowance for slight tilting of the mast caused by guy slack.
 - v. The mast cap must:
 - a. Permit the mast to rotate freely.
 - b. Withstand tilting and cramping caused by the guy loads.

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- c. Be secured to the mast to prevent disengagement during erection.
 - d. Be provided with means for attaching guy ropes.
- c. Stiff leg derricks.
 - i. The mast will be supported in the vertical position by at least two stiff legs: one end of each will be connected to the top of the mast, and the other end securely anchored.
 - ii. The stiff legs must be capable of withstanding the loads imposed at any point of operation within the load chart range.
 - iii. The mast base must:
 - a. Permit the mast to rotate freely (when necessary).
 - b. Permit deflection of the mast without binding.
 - iv. The mast must be prevented from lifting out of its socket when the mast is in tension.
 - v. The stiff leg connecting member at the top of the mast must:
 - a. Permit the mast to rotate freely (when necessary).
 - b. Withstand the loads imposed by the action of the stiff legs.
 - c. Be secured so as to oppose separating forces.
- d. Gin pole derricks.
 - i. Guy lines must be sized and spaced so as to make the gin pole stable in both boomed and vertical positions. Exception: Where the size and/or spacing of guy lines do not result in the gin pole being stable in both boomed and vertical positions, the project manager (or his/her designee) must ensure that the derrick is not used in an unstable position.
 - ii. The base of the gin pole must permit movement of the pole (when necessary).

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- iii. The gin pole must be anchored at the base against horizontal forces (when such forces are present).
 - e. Chicago boom derricks. The fittings for stepping the boom and for attaching the topping lift must be arranged to:
 - i. Allow the derrick to swing at all permitted operating radii and mounting heights between fittings.
 - ii. Accommodate attachment to the upright member of the host structure.
 - iii. Withstand the forces applied when configured and operated in accordance with the manufacturer's/builder's procedures, and within its rated capacity.
 - iv. Prevent the boom or topping lift from lifting out under tensile forces.
- 4. Anchoring and guying
 - a. Load anchoring data developed by the manufacturer or a qualified person must be used.
 - b. Guy derricks.
 - i. Anchor the mast base.
 - ii. Secure the guys to the ground or other firm anchorage.
 - iii. Design the anchorage and guying to withstand maximum horizontal and vertical forces encountered when operating within rated capacity with the particular guy slope and spacing specified for the application.
 - c. Stiff Leg derricks.
 - i. Anchor the mast base and stiff legs.
 - ii. Design the anchorage and guying to withstand maximum horizontal and vertical forces encountered when operating within rated capacity with the particular stiff leg spacing and slope specified for the application.

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5. Swingers and hoists

a. The boom, swinger mechanisms, and hoists must be suitable for the derrick work intended, and must be anchored to prevent displacement from the imposed loads.

b. Base-mounted drum hoists.

i. Base-mounted drum hoists must meet the requirements in the following sections of ASME B30.7-2001:

a. Sections 7-1.1 (Load ratings and markings).

b. Section 7-1.2 (Construction), except: 7-1.2.13 (Operator's cab); 7-1.2.15 (Fire extinguishers).

c. Section 7-1.3 (Installation).

d. Applicable terms in Section 7-0.2 (Definitions).

ii. Load tests for new hoists. The project manager (or his/her designee) must ensure that new hoists are load tested to a minimum of 110 percent of rated capacity, but not more than 125 percent of rated capacity, unless otherwise recommended by the manufacturer. This requirement is met where the manufacturer has conducted this testing.

iii. Repaired or modified hoists. Hoists that have had repairs, modifications, or additions affecting their capacity or safe operation must be evaluated by a qualified person to determine if a load test is necessary. If it is, load testing will be conducted in accordance with paragraphs 5.b.ii and 5.b.iv of this section.

iv. Load test procedure. Load tests required by paragraphs 5.b.ii or 5.b.iii of this section must be conducted as follows:

a. Hoist the test load a vertical distance to assure that the load is supported by the hoist and held by the hoist brake(s).

b. The test load will be lowered, stopped, and held with the brake(s).

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- c. Do not use the hoist unless a competent person determines that the test has been passed.

6. Operational Aids

- a. Section 4.L (Operational Aids) applies, except for “Boom hoist limiting device” and “Boom angle or radius indicator” and “Load weighing and similar devices.”
- b. Boom angle aid. The project manager (or his/her designee) must ensure that either:
 - i. The boom hoist cable is marked with caution and stop marks. The stop marks correspond to maximum and minimum allowable boom angles. The caution and stop marks are in view of the operator, or a spotter who is direct communication with the operator; or
 - ii. An electronic or other device that signals the operator in time to prevent the boom from moving past its maximum and minimum angles, or automatically prevents such movement, is used.
- c. Load weight/capacity devices. Derricks manufactured more than 1 year after the effective date of this procedure with a maximum rated capacity over 6,000 pounds must have at least one of the following: load weighing device, load moment indicator, rated capacity indicator, or rated capacity limiter. Temporary alternative measures: the weight of the load must be determined from a reliable source (such as the load’s manufacturer), by a reliable calculation method (such as calculating a steel beam from measured dimensions and a known per-foot weight), or by other equally reliable means. This information will be provided to the operator prior to the lift.

7. Post-assembly approval and testing – new or reinstalled derricks

- a. Anchorages
 - i. Anchorages, including the structure to which the derrick is attached (if applicable), must be approved by a qualified person.
 - ii. If using a rock or hairpin anchorage, the qualified person must determine if any special testing of the

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- anchorage is needed. If so, it will be tested accordingly.
- b. Functional test. Prior to initial use, new or reinstalled derricks must be tested by a competent person with no hook load to verify proper operation. This test must include:
- i. Lifting and lowering the hook(s) through the full range of hook travel.
 - ii. Raising and lowering the boom through the full range of boom travel.
 - iii. Swinging in each direction through the full range of swing.
 - iv. Actuating the anti-two-block and boom-hoist-limit devices (if provided).
 - v. Actuating locking, limiting, and indicating devices (if provided).
- c. Load test. Prior to initial use, new or reinstalled derricks must be load tested by a competent person. The test load must meet the following requirements:
- i. Test loads must be at least 100 percent, and no more than 110 percent, of the rated capacity, unless otherwise recommended by the manufacturer or qualified person, but in no event must the test load be less than the maximum anticipated load.
 - ii. The test must consist of:
 - a. Hoisting the test load a few inches and holding to verify that the load is supported by the derrick and held by the hoist brake(s).
 - b. Swinging the derrick, if applicable, the full range of its swing, at the maximum allowable working radius for the test load.
 - c. Lowering, stopping, and holding the load with the brake(s).
 - iii. The derrick cannot be used unless the competent person determines that the test has been passed.

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- d. Documentation. Tests conducted under this paragraph will be documented. The document will be retained until the derrick is re-tested or dismantled, whichever occurs first.
8. Load testing repaired or modified derricks. Derricks that have had repairs, modifications for additions affecting the derrick's capacity or safe operation must be evaluated by a qualified person to determine if a load test is necessary. If it is, load testing must be conducted and documented in accordance with paragraph (g) for this section.
 9. Power failure procedures. If power fails during operations, the derrick operator must safely stop operations. This includes:
 - a. Setting all brakes or locking devices.
 - b. Moving all clutch and other power controls to the off position.
 10. Use of winch heads
 - a. Do not handle ropes on a winch head without the knowledge of the operator.
 - b. While a winch head is being used, the operator must be within reach of the power unit control lever.
 11. Securing the boom
 - a. When the boom is being held in a fixed position, engage dogs, pawls, or other positive holding mechanisms on the boom hoist.
 - b. When taken out of service for 30 days or more, secure the boom by one of the following methods:
 - i. Lay it down.
 - ii. Secure it to a stationary member, as nearly under the head as possible, by attachment of a sling to the load block.
 - iii. For guy derricks, lift to a vertical position and secure to the mast.
 - iv. For stiff leg derricks, secure against the stiff leg.
 12. The process of jumping the derrick must be supervised by the A/D supervisor.

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13. Derrick operations must be supervised by a competent person.

14. Inspections. In addition to the requirements in this procedure, the following additional items must be included in the inspections of Tower and Cableway Cranes:

- a. Daily: Guys for proper tension.
- b. Monthly.
- c. Annual.
 - i. Gudgeon pin for cracks, wear, and distortion.
 - ii. Foundation supports for continued ability to sustain the imposed loads.

MM. Side-Boom Cranes

1. All provisions of this standard apply, except 4.C (Ground Conditions), 4.K (Safety Devices), 4.L (Operational Aids), and 4.N (Operator Qualification and Certification).
2. Section 4.AA (Free-fall and Controlled-Load Lowering) applies, except when side boom cranes in which the boom is designed to free-fall (live boom) are permitted only if manufactured prior to January 2009.
3. Side-boom cranes mounted on wheel or crawler tractors must meet the following requirements of ASME B30.14-2004 (Side-Boom Tractors):
 - a. Section (Load Ratings).
 - b. Section (Side Boom Tractor Travel).
 - c. Section (Ropes and Reeving Accessories)
 - d. Section (Booms).
 - e. Section (General Requirements – Exhaust Gases).
 - f. Section (General Requirements – Stabilizers (Wheel-Type Side-Boom Tractors)).
 - g. Section (General Requirements – Welded Construction).

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- h. Selection (General Requirements – Clutch and Brake Protection).
 - i. Section (Testing – Rated Load Test) except that it applies only to equipment that has been modified or repaired.
 - j. In Section (Operator Qualifications), paragraph (a), except the phrase “When required by law.”
 - k. In Section (Operating Practices), paragraphs (5), (6)(a) – (d), (f), (g); (8), and (9).
 - l. In Section (Moving the Load), paragraphs (9), (10), and (11m).
- NN. Boom-Truck Procedures
- 1. Prior to the manipulation of any controls, operators are to ensure that all personnel are clear of all moving parts. Workers working with boom truck operators must review the boom-truck hazard check list to heighten awareness while working on and around the boom truck. Access has been improved on boom trucks; these are the ONLY approved access and egress on/off the bed of the truck.
 - 2. The operator is in control of ALL operations associated with this equipment. The operator will ensure the following items have been performed and reviewed and signed by all parties working with boom truck PRIOR TO THE START OF OPERATIONS. The completed form (see Attachment 038-10) will be returned to the safety department at the end of each shift.
- OO. Equipment with Rated Hoisting/Lifting Capacity of 2,000 pounds or Less
- 1. For equipment with a maximum manufacturer-rated hoisting/lifting capacity of 2,000 pounds or less:
 - 2. The following sections of this standard apply: 4.B, 4.C, 4.I, 4.J, 4.K, 4.M, 4.Q through 4.U, 4.V, 4.X, 4.AA, 4.BB through 4.EE, 4.GG, 4.II, 4.KK, and 4.LL.
 - 3. Assembly/Disassembly
 - a. Section 4.F of this standard applies.
 - b. Components and configuration.

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- i. The selection of components and configuration of the equipment that affects the capacity or safe operation of the equipment must be in accordance with:
 - a. Manufacturer's instructions, recommendations, limitations, and specifications. Where these are unavailable, a registered professional engineer familiar with the type of equipment involved must approve, in writing, the selection and configuration of components; or
 - b. Approved modifications that meet the requirements of Section 4.V of this standard.
 - ii. Post-assembly inspection. Upon completion of assembly, the equipment must be inspected to ensure compliance with paragraph 2.b.i of this section for post-assembly inspection requirements.
 - c. Manufacturing prohibitions. The project manager (or his/her designee) must comply with applicable manufacturer prohibitions.
4. Operation
 - a. The project manager (or his/her designee) must comply with all the manufacturer's procedures applicable to the operational functions of the equipment, including its use with attachments.
 - b. Unavailable Operation Procedures
 - i. Where the manufacturer's procedures are unavailable, the project manager (or his/her designee) will develop and ensure compliance with all procedures necessary for the safe operation of the equipment and attachments.
 - ii. Procedures for the operational controls must be developed by a qualified person.
 - iii. Procedures related to the capacity of the equipment must be developed and signed by a registered professional engineer familiar with the equipment.
 - c. Accessibility

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- i. The load chart will be available to the operator at the control station.
 - ii. 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.
 - iii. Where rated capacities are available at the control station only in electronic form, in the event of a failure that makes the rated capacities inaccessible, the operator must immediately cease operations or follow safe shut-down procedures until the rated capacities (in electronic or other form) are available.
5. Safety Devices and Operational Aids
 - a. Originally equipped safety devices and operational aids must be maintained in accordance with the manufacturer's procedures.
 - b. Anti-two-blocking. Equipment covered by this section manufactured more than 1 year after the effective date of this standard will have either an anti-two-block device, or will be designed so that, in the event of a two-block situation, no damage will occur, and there will be no load failure (such as where the power unit will stall in the event of a two-block).
6. Operator qualifications. The project manager (or his/her designee) must ensure that, prior to operating the equipment, the operator is trained on the safe operation of the type of equipment the operator will be using.
7. Signal person qualifications. The project manager (or his/her designee) must ensure that signal persons are trained in the proper use of signals applicable to the use of the equipment.
8. Inspections. The equipment will be inspected in accordance with the manufacturer's procedures.
9. Hoisting personnel. Hoisting personnel using equipment covered by this section is prohibited.
10. Design. The equipment will be designed by a qualified engineer.

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5. Documentation Summary

- A. Complete checklists at intervals required by standard.
- B. Document training of operators, signal persons, and repair/maintenance staff.

6. Resources

- A. American Society of Mechanical Engineers (ASME) [B30.2-2005 – Overhead and Gantry Cranes](#)
- B. American National Standards Institute (ANSI)/[ASME B30.3-2004 – Construction Tower Cranes](#)
- C. ANSI/[ASME B30.4-2003 – Portal, Tower, and Pedestal Cranes](#)
- D. ANSI/[ASME B30.5-2007 – Mobile and Locomotive Cranes](#)
- E. [ASME B30.6-2003](#) - Derricks
- F. ANSI/[ASME B30.8-2004 – Floating Cranes and Floating Derricks](#)
- G. ANSI/[ASME B30.11-2004 – Monorails and Underhung Cranes](#)
- H. [ASME B30.14-2004](#) – Side-Boom Tractors
- I. ANSI/[ASME B30.22-2005](#) – Articulating Boom Cranes
- J. ANSI/[ASME B30.23-2005 – Personnel Lifting Systems](#)
- K. Power Crane Shovel Association (PCSA) [Mobile Hydraulic Crane Standard](#)
- L. [Attachment 038-1 AMER](#) – Definitions
- M. [Attachment 038-2 AMER](#) – Project Lift Classification Checklist
- N. [Attachment 038-3 AMER](#) – Critical Lift Plan
- O. [Attachment 038-4 AMER](#) – Required Clearance for Normal Voltage
- P. [Attachment 038-5 AMER](#) – Crane Safety Inspection – Initial and Annual
- Q. [Attachment 038-6 AMER](#) – Daily Crane Inspection Checklist
- R. [Attachment 038-7 AMER](#) – Monthly Crane Inspection Checklist

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- S. [Attachment 038-8 AMER](#) – Monthly Wire Rope and Hook Inspection
- T. [Attachment 038-9 AMER](#) – Personnel Platform Lifting Form
- U. [Attachment 038-10 AMER](#) – Boom Truck Hazard Checklist

7. Supplemental Information

- A. [Criteria for Developing a Written Exam](#)
- B. [Standard Hand Signals](#)
- C. [Wind Pressure Formula](#)
- D. [Checklist for Lift Planning](#)
- E. [Determining if Hoisting Personnel is Permissible](#)
- F. [Assembly/Disassembly Sample Procedure](#)
- G. [Crane Operator Skill Evaluation](#)

DEFINITIONS

1. Altered means any change to the original manufacturers design configuration, such as replacement of weight-handling equipment parts and components with parts or components not identical to the original (i.e., change in material, dimensions, or design configuration; the addition of parts or components not previously a part of the equipment; the removal of components previously a part of the load handling equipment; rearrangement of original parts or components).
2. Anti-two-block device is activated to prevent two-blocking, and disengages the particular function whose movement is causing the two-blocking.
3. Articulating crane is a crane whose boom consists of a series of folding, pin-connected structural members, typically manipulated to extend or retract by power from hydraulic cylinders.
4. Assembly/Disassembly means the assembly and/or disassembly of equipment covered under this procedure.
5. Assist crane is a crane used to assist in assembling or disassembling a crane.
6. Attachments are any devices that expand the range of tasks that can be done by the equipment.
7. Audible signal means a signal made by a distinct sound or series of sounds.
8. Boom angle is the angle between the horizontal and the centerline of boom base and inserts, and is an indication of operating radius.
9. Boom point elevation is the vertical distance from the ground to the centerline of the boom point shaft.
10. Blocking or cribbing is wood or other material used to support equipment or a component and distribute loads to the ground.
11. Boatswain's chair is a single-point adjustable suspension scaffold consisting of a seat or sling designed to support one employee in a sitting position.
12. Bogie means travel bogie, and is defined as two or more axles mounted in tandem in a frame so as to divide the load between the axles, and permit vertical oscillation of the wheels.
13. Boom, other than tower crane, means an inclined spar, strut, or other long structural member that supports the upper hoisting tackle on a crane or derrick.
14. Boom – tower cranes means that if the principal horizontal structure is fixed, it is a jib, or, if it is moveable, it is referred to as a boom.
15. Boom angle indicator is the angle between the horizontal and the centerline of the boom base and inserts, and is an indication of operating radius.
16. Boom-hoist-limiting device includes boom hoist disengaging device, boom hoist shut-off, boom hoist disconnect, boom hoist hydraulic relief, boom hoist kick-outs, automatic boom stop device, or derricking limiter.
17. Boom length indicator indicates the length of the permanent part of the boom (such as ruled markings on the boom) or, as in some computerized systems, the length of the boom with extensions/attachments.

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18. Boom stop includes belly straps with struts/standoff boom stops, telescoping boom stops, attachment boom stops, and backstops. These devices restrict the boom from moving above a certain maximum angle and toppling over backward.
19. Boom suspension system is a system of pendants, running ropes, sheaves, and other hardware that supports the boom tip and controls the boom angle.
20. Bridge is that part of a gantry or overhead crane that carries the trolley(s).
21. Builder means an employee builder/constructor of equipment.
22. Cathead is a spool shaped attachment on a winch around which rope is wound for hoisting and pulling.
23. Center of gravity is the point in the object around which its weight is evenly distributed.
24. Certified Welder is a welder who meets nationally recognized certification requirements applicable to the task being performed.
25. Climbing means the process in which a tower crane is raised to a new working height.
26. Top climbing is adding tower sections to the top of the crane.
27. Inside climbing is a system in which the entire crane is raised inside the structure.
28. Come-a-long means a mechanical device typically consisting of a chain or cable attached at each end that is used to facilitate movement of materials through leverage.
29. Competent person is one who is capable of identifying existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.
30. Controlled-load lowering means lowering a load by means of a mechanical hoist drum device that allows a hoisted load to be lowered with maximum control using the gear train or hydraulic components of the hoist mechanism. Controlled-load lowering requires the use of the hoist drive motor, rather than the load hoist brake, to lower the load.
31. Controlling entity means a prime contractor, general contractor, construction manager, or any other legal entity that has the overall planning, quality, and completion responsibility for the construction of the project.
32. Counterweight means a weight used to supplement the equipment weight in providing stability for lifting loads by counterbalancing those loads.
33. Crane/derrick includes all equipment covered by this SMS 038.
34. Cribbing is a system of timber, arranged in a rectangular pattern, used to support and distribute the weight of equipment.
35. Crawler crane means equipment that has a type of base mounting which incorporates a continuous belt of sprocket-driven track.
36. Critical Lift identifies loads classified as requiring a formal, written plan. A critical lift plan is defined as a non-routine crane lift requiring detailed planning and additional or unusual safety precautions. Critical lifts include lifts made when the load is greater than 75 percent of the rated capacity of the crane in the configuration that the lift will be made; lifts that require the load to be lifted, swung, or placed out of the operator's view;

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- lifts made with more than one crane or hoisting device; lifts involving non-routine or technically difficult rigging arrangements; lifts of long lead time permanent materials; lifts that involve lifting loads over structures or equipment; lifts taking place in a confined or limited access areas; hoisting personnel with a crane or derrick; or any lift which the lift supervisor, operator, or other management personnel believes should be considered critical.
37. Crossover points are locations on a wire rope that are spooled on a drum where one layer of rope climbs up on and crosses over the previous layer.
38. Dedicated channel means a line of communication assigned by the employer who controls the communication system to only one signal person and crane/derrick, or to a coordinated group of cranes/derricks/signal person(s).
39. Dedicated pile-driver is a machine that is designed to function exclusively as a pile-driver; hoisting the material and pile-driving it.
40. Dedicated spotter (power lines) must meet the requirement of this procedure (signal person qualifications), and the 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.
41. Deficiency is the state of being deficient; inadequacy; failure; imperfection; defect.
42. Derrick is a lifting device consisting of a mast secured at the top by guys or braces and, used with a hoisting mechanism and rigging, with or without a boom.
43. Dismantling includes partial dismantling (i.e., shorten a boom or substitute a different component).
44. Dragline is a bucket attachment for a crane that excavates by the crane drawing the bucket towards itself with a cable.
45. Duty cycle includes operations involving repetitive pick and swing, such as with a dragline, grapple, or clamshell; such operations are conducted primarily for production, as opposed to placement.
46. Drum rotation indicator means a device on a crane or hoist that indicates in which direction and at what relative speed a particular hoist drum is turning.
47. Electrical contact occurs when a person, object, or equipment makes contact or comes in close proximity with an energized conductor or equipment that allows the passage of current.
48. Employer-made equipment means floating cranes/derricks designed and built by an employer for the employer's own use.
49. Encroachment is where any part of the crane, load line, or load (including rigging and lifting accessories) breaches a minimum clearance distance required to be maintained from a power line.
50. Equipment criteria mean instructions, recommendation, limitations, and specifications.
51. Fall-protection equipment means guardrail systems, safety net systems, personal fall arrest systems, positioning device systems, or fall restraint systems.

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52. Fall restraint system means a fall protection system that prevents the user from falling any distance, either by a body belt or body harness, along with an anchorage, connectors, and other necessary equipment. Other components typically include a lanyard, and may also include a lifeline and other devices.
53. Fall zone means the area (including, but not limited to, the area directly beneath the load) in which it is reasonably foreseeable that partially or completely suspended material could fall in the event of an accident.
54. Fixed lead means pile-driving leads which are rigidly attached to a boom by horizontal struts extending from the leads to extended boom foot pins, thus providing a fixed triangular frame of boom, struts, and leads.
55. Flange points are points of contact between rope and rum flange where the rope changes layers.
56. Floating cranes/derricks are equipment designed by the manufacturer or employer for marine use by permanent attachment to a barge, pontoons, vessel, or other means of flotation.
57. Free fall (of the load line) means that only the brake is used to regulate the descent of the load line (drive mechanism is not used to drive the load down faster or retard its lowering).
58. Free surface effect is the uncontrolled transverse movement of liquids in compartments that reduce a vessel's transverse stability.
59. Gantry crane is a crane similar to an overhead crane except that a bridge is rigidly supported on two or more legs running on fixed rails or other runway.
60. Ground condition means the ability of the ground to support the equipment (including slope, compaction, and firmness).
61. Guy derrick is a fixed derrick consisting of a vertical mast capable of being rotated 360 degrees (but not continuous rotation) supported by guys, and a boom that is pivoted at the bottom and capable of moving in a vertical plane; a reeved rope between the head (top) of the mast and the boom harness (at the boom point) allows lifting and lowering of the boom, and a reeved rope from the boom point allows lifting and lowering of the load.
62. Hammerhead tower crane is a lifting machine arranged with a tower (mast), an upper structure that rotates, a horizontally-extended load jib (boom) with trolley, and a counterweight jib extending in the direction opposite of the load jib: neither jib is arranged for luffing. The trolley on the load jib traverses the length of the jib and contains the sheaves and accessory parts that make up the upper load block; the lower load block is suspended from the trolley.
63. Hoist means a mechanical device for lifting and lowering loads by winding rope onto or off of a drum.
64. Hoisting is the act of raising, lowering, or otherwise moving a load in the air with equipment covered by this procedure. In conformance with this procedure, "hoisting" can be done by means other than wire rope/hoist drum equipment.
65. Insulating link/device means an insulating device listed, labeled, or accepted by a nationally recognized testing laboratory. Jib stop, or jib backstop is the same type of device as a boom stop but is for a fixed or luffing jib.

DEFINITIONS

66. Jib on hammerhead cranes is the horizontal structural member attached to the rotating superstructure of a crane and upon which the load trolley travels; on mobile cranes, an extension attached to the boom to provide added boom length for lifting specified loads. An extension attached to the boom to provide added boom length for lifting specified loads. The jib may be in line with the boom, or offset to a fixed or various angles.
67. Land crane/derrick is equipment not originally designed by the manufacturer for marine use by permanent attachment to any means of floatation.
68. Lead is the device on a pile driver that maintains the hammer in position during the driving. A lead typically is made up of two vertical rails or guides, held together by a frame, in which the hammer moves vertically.
69. Lift supervisor is the person designated to be in charge of crane lifting; this may be the crane operator or an individual whose function it is to supervise lifting operations.
70. List means the angle of inclination about the longitudinal axis of a barge, pontoons, vessel, or other means of floatation.
71. Live boom is a boom that is lowered by free-fall rather than controlled boom lowering under power.
72. Load refers to the object(s) and the load-attaching equipment being hoisted, and/or the weight of the object(s).
73. Load block is an assembly of hook or shackle, swivel, pins, and frame.
74. Load moment indicator (or rated capacity) is a system that aids the equipment operator by sensing the overturning moment on the equipment; that is, load multiplied by radius. It compares this lifting condition to the equipment's rated capacity, and indicates to the operator the percentage of capacity at which the equipment is working. Lights, bells, or buzzers may be incorporated as a warning of an approaching overload condition.
75. Load moment limiter (or rated capacity) is a system that aids the equipment operator by sensing the overturning moment on the equipment (i.e., load multiplied by radius). It compares this lifting condition to the equipment's rated capacity, and when the rated capacity is reached, it shuts off power to those equipment functions that can increase the severity of loading on the equipment (e.g., hoisting, telescoping out, or luffing out). Typically, those functions that decrease the severity of loading on the equipment remain operational (e.g., lowering, telescoping in, or luffing in).
76. Load performance test is a test of a crane's performance, structural competence, and stability while lifting at a percentage of its rated load capacity.
77. Load ratings are crane ratings in pounds established by the manufacturer.
78. Locomotive crane means a crane mounted on a base or car equipped for travel on a railroad track.
79. Luffing is the act of raising or lowering the boom or jib of a crane.
80. Luffing jib limiting device is similar to a boom hoist limiting device, except that it limits the movement of the luffing jib.
81. Luffing jib crane is a type of jib on a crane that is pivoted at the jib foot and supported by luffing cables. The hoist rope usually passes over a sheave at the jib point, and the hook radius is changed by luffing, or changing the angle of inclination, of the jib. Rear

DEFINITIONS

- pivoted luffing jibs are similar, but the pivot is towards the rear of the top of the tower, rather than at the jib foot.
82. Marine-hoisted personnel transfer device means a device, such as a “transfer net” (not to include boatswain’s chairs) that is designed to protect the employees being hoisted during a marine transfer, and to facilitate rapid entry into and exit from the device.
83. Marine worksite means a construction worksite located in, on, or immediately above the water.
84. Machine list is a side-to-side out of level, which affects the crane’s capacity rating, and is measured by the angle between horizontal and a line drawn through the centerline of the boom hinge pins.
85. Mobile crane is a lifting device incorporating a cable-suspended, latticed boom or hydraulic telescopic boom designed to be moved between operating locations by transport over the road.
86. Monorail is a single run of overhead track.
87. Moving point-to-point means the times during which an employee is in the process of going to or from a work station.
88. Multi-purpose machine means a machine that is designed to be configured in various ways, at least one of which allows it to hoist (by means of a winch or hook) and horizontally move a suspended load. For example, a machine that can rotate and can be configured with removable tongs (for use as a forklift) or with a winch pack, jib (with a hook at the end), or jib used in conjunction with a winch.
89. Multiple (tandem) crane lift is the use of two or more cranes/lifting devices to lift a load.
90. Non-conductive means that, because of the nature and condition of the materials used, and the conditions of use (including environmental conditions and condition of the material), the object in question has the property of not becoming energized (that is, it has high dielectric properties offering a high resistance to the passage of current under the conditions of use).
91. Not Portable means that an operator has a qualification that is not transferable to another job site or project, the qualification only meets the requirements of the location where the operator is employed by (and operating the equipment for) the employer that issued the qualification.
92. Operating radius is the horizontal distance from the crane’s rotation to the center of the vertical hoist line or load block/ball.
93. Operational aids are devices that assist the crane operator in the safe operation of the crane, including two-block warning devices, two-block prevention devices, load and load moment indicator devices, boom angle and radius indicators, boom and jib stops, boom hoist disengaging devices, limit switches, drum rotation indicators, etc. These load indication or moment devices do not replace the manufacturer-rated load capacity charts for boom angle and radius.
94. Operational controls are levers, switches, pedals and other devices for controlling equipment operation.

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95. Operational performance test is a test, conducted without a test load, to determine the proper operation of a crane.
96. Operator is the person who is operating the equipment.
97. Outrigger is an extendable or fixed structural member(s) with one end attached to the base of a piece of equipment and the other end resting on floats on the ground: used to distribute loads in supporting equipment.
98. Outrigger float is the pedestal (or bearing pad) on which an outrigger beam is supported.
99. Overhead crane is a crane with a single- or multiple-girder moveable bridge or fixed hoisting mechanism, traveling on an overhead fixed runway structure.
100. Overhead and gantry cranes include overhead/bridge cranes, semi-gantry, cantilever gantry, wall cranes, storage bridge cranes, launching gantry cranes, and similar equipment, irrespective of whether it travels on tracks, wheels, or other means.
101. Pendants includes both wire and bar types. Pendants are typically used in latticed boom crane systems to easily change the length of the boom suspension system without completely changing the rope on the drum when the boom length is increased or decreased.
- a. *Wire type*: A fixed length of wire rope with mechanical fittings at both ends for pinning segments of wire rope together.
- b. *Bar type*: Instead of wire rope, a bar is used.
102. Performance test is a test to determine the proper operation of a crane and the ability of the crane, to safely lift loads within its performance rating.
103. Personal fall arrest system is a system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, and a body harness, and may include a lanyard, deceleration device, lifeline, or suitable combination of these.
104. Pillar crane is a fixed crane consisting of a vertical member, held in position at its base to resist overturning moment, and normally with a constant-radius revolving boom supported at the outer end by a tension member.
105. Portable means any operator with a certification that is usable for other job sites or projects, and meets the requirements of paragraph (a) of this procedure with respect to that operator.
106. Portal Crane is a type of crane consisting of a rotating upper structure, hoist machinery, and boom mounted on top of a structural gantry that may be fixed in one location, or have travel capability. The gantry legs or columns usually have portal openings in between to allow passage of traffic beneath the gantry.
107. Power-controlled lowering is a system or device in the power train, other than the load hoist brake, which can control the lowering rate of speed of the load hoist mechanism.
108. Power lines are electric transmission and distribution lines.
109. Procedures include, but are not limited to, instructions, diagrams, recommendations, warnings, specifications, protocols, and limitations.
110. Proximity alarm is a device that provides a warning of proximity to a power line that has been listed, labeled, or accepted by a Nationally Recognized Testing Laboratory.

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111. Qualified evaluator (not a third party) is a person who, due to their independence and expertise, has demonstrated that they are competent in accurately assessing whether individuals meet the Qualification Requirements for a signal person.
112. Qualified evaluator (third party) is a person who, due to their independence and expertise, has demonstrated that they are competent in accurately assessing whether individuals meet the Qualification Requirements for a signal person.
113. Qualified person is 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.
114. Range control warning device is a device that can be set by an equipment operator to warn that the boom or jib tip is at a plane or multiple planes.
115. Rated capacity means the maximum working load permitted by the manufacturer under specified working conditions, typically including a specific combination of factors such as equipment configuration, radii, boom length, and other parameters of use.
116. Reeving is a rope system in which the rope travels around drums and sheaves.
117. Reconfiguration is the addition or subtraction of boom, jib, and counterweight; or, for a fixed crane, a change in foundation.
118. Repetitive pickup points refers to, when operating on a short cycle operation, the rope being used on a single layer and being spooled repetitively over a short portion of the drum.
119. Running wire rope is a wire rope that moves over sheaves or drums.
120. Runway means a firm level surface designed, prepared, and designated as a path of travel for the weight and configuration of the crane being used to lift and travel with the crane's suspended platform. An existing surface may be used as long as it meets these criteria.
121. Saddle-jib is a type of jib on a tower crane supported by pendants. The jib is horizontal or nearly horizontal, non-luffing, and the load hook is suspended by a trolley that moves along the jib.
122. Sideboom crane is a track-type or wheel-type tractor with a boom mounted on the side of the tractor, used for lifting, lowering, or transporting a load suspended on the load hook. The boom or hook can be lifted or lowered in a vertical direction only.
123. Side loading is a load applied at an angle to the vertical plane of the boom.
124. Special hazard warnings mean warnings of site-specific hazards; for example, proximity of power lines.
125. Stability (flotation device) means the tendency of a barge, pontoons, vessel, or other means of floatation to return to an upright position after having been inclined by an external force.
126. Standby crane is a crane not in regular service, but which is used occasionally or intermittently as required.

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127. Standing rope is a supporting rope that maintains a constant distance between two components connected by the rope.
128. Stiffleg derrick is a derrick similar to a guy derrick, except that the mast is supported or held in place by two or more stiff members (stifflegs) capable of resisting either tensile or compressive forces. Sills are generally provided to connect the lower ends of the stifflegs to the foot of the mast.
129. Supporting materials include blocking, mats, cribbing, marsh buggies (in marshes/wetland), or similar supporting materials or devices.
130. Swinger mechanism is the device that rotates a derrick mast.
131. Swinging (hanging) lead is a pile-driving lead suspended from an extended boom pint sheave pin at the top of the boom. The bottom points of the leads are positioned astride the pile location, the hammer is vertically above the top of the pile. Often the bottoms of the leads are pointed, and the weight of the pile leads and hammer force the bottom points into the ground, holding them in position.
132. Slewing is a rotation of the crane's upperworks.
133. Tagline means a rope (usually fiber) attached to a lifted load for purposes of controlling load spinning and pendular motions, or used to stabilize a bucket or magnet during material-handling operations.
134. Tailing crane lift is a procedure sometimes used in erecting large-pressure vessels or structural elements in which one crane (lead crane) lifts the top of the load, and a second crane (tail crane), rigged to the bottom of the load, either secures the bottom of the load from movement, or assists in the horizontal positioning of the load.
135. Telescoping boom consists of a boom base from which one or more boom sections are telescoped for additional length.
136. Tender means an individual responsible for monitoring and communicating with a diver.
137. Tilt-up or tilt-down operation means raising/lowering a load from the horizontal to vertical, or vertical to horizontal.
138. Top running bridge is a bridge that travels over the top of a runway track.
139. Tower crane is a type of lifting structure that uses a vertical mast or tower to support a working boom (jib) in an elevated position. Loads are suspended from the working boom.
- a. While the working boom may be of the fixed type (horizontal or angled) or have luffing capability, it can always rotate to swing loads, either by rotating on the top of the tower (top slewing) or by the rotation of the tower (bottom slewing).
 - b. The tower base may be fixed in one location or ballasted and moveable between locations.
140. Travel bogie (tower cranes) is an assembly of two or more axels arranged to permit vertical wheel displacement and equalize the loading on the wheels.
141. Trim means angle of inclination about the transverse axis of a barge, pontoons, vessel, or other means of floatation.
142. Trolley is the unit that travels on bridge rails and supports the load block.

DEFINITIONS

143. 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.
144. Underhung crane (hoist) is a crane that is suspended from the bottom flange of a runway track or a single-track monorail system.
145. Upperworks mean the revolving frame of equipment on which the engine and operating machinery are mounted, along with the operator's cab. The counterweight is typically supported on the rear of the upper structure, and the boom or other front-end attachment is mounted on the front.
146. Wire rope is rope made of wire.
- a. *Rope Lay* signifies the direction of the rotation of the wire and strands in the rope. Rotation can either be clockwise or counterclockwise; the lay of the rope affects its flexibility and resistance to wear.
 - b. *Rope Lay Length* is the distance measured along a rope in which a strand makes one complete revolution around the rope axis.
 - c. *Right Lay Rope*: the wires in the strands are laid in one direction while strands in the rope are laid in the opposite direction. The result is that wire crown runs approximately parallel to the longitudinal axis of the rope. These ropes are stable, have good resistance to kinking and twisting, and are easy to handle. They are also able to withstand considerable crushing and distortion due to the short length of the exposed wires.
 - d. *Lang Lay Rope*: the wires in the strands and the strands in the ropes are laid in the same direction. The outer wires run diagonally across the rope and are exposed for longer lengths than regular lay rope. With the outer wires presenting greater wearing surfaces, lang lay ropes have greater resistance to abrasion. They are also flexible and possess greater resistance to fatigue. They are more liable to kinking and untwisting, and are not capable of withstanding the same abuse from distortion and crushing. Lang lay ropes should have both ends permanently fastened to prevent untwisting, and should not be recommended for use on single-part hoist lines, nor should they be used with swivel-end terminals.
 - e. *Alternate Lay Ropes* have three strands made with right lay and three with left lay. The six strands are then positioned in the finished rope so that the strands alternate.
 - f. *Rotation-Resistant Rope* is a wire rope consisting of an inner-lay of strand in one direction covered by a layer of strand laid in the opposite direction. This has the effect of counteracting torque by reducing the tendency of the finished rope to rotate.



PROJECT LIFT CLASSIFICATION CHECKLIST

Date of Lift(s): Contractor/Subcontractor Name:
Project Name & Number: Location of Activity:
Crane Operator: Supervisor in Charge:

The purpose of this checklist is to determine type of lift classification. If any condition and/or situation is not clearly understood or if the lift is identified as Critical, additional documentation and assessment are required.
"ALWAYS LOOK UP AND LIVE." Be aware of overhead hazards, primarily OVERHEAD POWER LINES.

Description of load to be hoisted:

Material/Equipment to be Hoisted

Will the load be lifted, swung, or placed out of the crane operator's view?
Will lift require more than one crane or hoisting device?
Does this lift require any non-routine or technically difficult rigging arrangements?
Is the load an item of long lead time (to replace if damaged) and could impact project schedule?
Will the load be lifted over any structures or equipment?
Will lift take place in a confined or limited access area?
Does lift involve hoisting personnel?
Does lift supervisor, operator, or management believe this should be considered a critical lift?
If the answer to any of the previous questions is Yes, THIS IS NOW CLASSIFIED A CRITICAL LIFT
A. Weight of the load to be hoisted:
B. Weight of the rigging, including the block, jib, and wire rope:
C. Total weight of the lift (Sum of load weight [Row A] and rigging weight [Row B]):
D. Radius from the crane's center-pin to the center of the furthest landing or lifting point:
E. Boom Angle degrees Boom length feet
F. Maximum Load Chart Capacity weight (360-degree capacity) as crane is configured:

If the weight in Row C is greater the Row F, DO NOT MAKE THE LIFT!
G. If the weight in Row C is less than the weight in Row F, divide the weight in Row C by the weight in Row F and enter as a percentage:

If the percentage in Row G is 75% or greater, DO NOT MAKE THE LIFT YET! THIS IS NOW A CRITICAL LIFT. Contact your safety representative or supervisor for a Critical Lift Checklist and procedures.

If the percentage in Row F is less than 75%, or no unusual conditions have been identified, you may continue with the lift after this form has been signed by the following individuals:

Crane Operator Print Name Signature Date
Superintendent or CM Print Name Signature Date



CRITICAL LIFT PLAN

Location: _____ Date of lift: _____

Load description: _____

Does this lift involve lifting personnel? Yes No

Lift description: _____

A. WEIGHT

- 1. Weight Empty (load or basket) _____ lbs
- 2. Weight of Headache Ball or block _____ lbs
- 3. Weight of Lifting Bar _____ lbs
- 4. Weight of Slings and Shackles _____ lbs
- 5. Weight of Jib _____ lbs
- 6. Weight of Headache Ball on Jib _____ lbs
- 7. Weight of Cable (Load Fall) _____ lbs
- 8. Allowance for Unaccounted Material in Equipment (10% of weight) _____ lbs
- 9. No. of people lifted x 250 _____ lbs
- 10. Other _____ lbs
- Total Weight _____ lbs

Source of Load Weight:

(Name Plate, Drawings, Calculated)

Weights Verified By:

B. JIB

Erected Stored

- 1. Is Jib to be used? Yes No
- 2. Length of Jib _____
- 3. Angle of Jib _____
- 4. Rated Capacity of Jib (From Chart)

C. CRANE PLACEMENT

- 1. Any Deviation from Smooth, Solid Foundation in the Area?

- 2. Electrical Hazards in Area?

- 3. Obstacles or Obstructions to Lift or Swing?

- 4. Swing Direction and Degree (Boom Swing)?

D. CABLE

- 1. Number of Parts of Cable: _____
- 2. Size of Cable: _____

E. SIZING OF SLINGS

- 1. Sling Selection
 - a. Type of Arrangement _____
 - b. Number of Slings in Hook-up _____
 - c. Sling Length _____
 - d. Rated Capacity of Sling
- 2. Shackle Selection
 - a. Capacity (tons) _____
 - b. Shackle attached to load by: _____
 - c. Number of shackles _____



CRITICAL LIFT PLAN

F. CRANE

- 1. Type of Crane _____
- 2. Crane Capacity _____ Tons
- 3. Lift Arrangement
 - a. Max Distance-Center of Load to center pin of crane _____ ft.
 - b. Length of Boom _____ ft.
 - c. Angle of Boom at pick-up _____ degrees
 - d. Angle of Boom at set _____ degrees
 - e. Rated capacity of crane under most severe lifting conditions (From Chart)
 - 1. Over Rear _____ lbs
 - 2. Over Front _____ lbs
 - 3. Over Side _____ lbs
- 4. From chart – Rated capacity of the crane for the Lift
- 5. Max. Load on Crane _____ lbs.
- 6. Lift is within Crane's Rated Capacity _____

G. PRE-LIFT CHECKLIST

- | | YES | NO |
|--|--------------------------|--------------------------|
| 1. Matting Acceptable | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Outriggers fully extended | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Crane in good condition | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Swing Room | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. Head Room Checked | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. Max. Counterweights used | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. Tag line used | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. Experienced Operator | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. Experienced Flagman (Designated) | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. Experienced Rigger | <input type="checkbox"/> | <input type="checkbox"/> |
| 11. Load Chart in Crane | <input type="checkbox"/> | <input type="checkbox"/> |
| 12. Wind Conditions: _____ | | |
| 13. Crane Inspected By:: _____ | | |
| 14. Functional Test of Crane By: _____ | | |

SPECIAL INSTRUCTIONS OR RESTRICTIONS FOR CRANE, RIGGING, LIFT, ETC.

DIAGRAM CRANE AND LOAD PLACEMENT

DIAGRAM RIGGINGS CONFIGURE

SIGNATURE OF RIGGING SUPERVISOR	DATE	SIGNATURE-PLAN CHECKED BY	DATE
SIGNATURE OF SAFETY SUPERVISOR	DATE	SIGNATURE-SITE/FACILITY MANAGER	DATE



Safety Management Standard
REQUIRED CLEARANCE FOR
NORMAL VOLTAGE

Attachment 038-4 AMER

Issue Date: September 2001
Revision 8: September 2013

Required Clearance for Normal Voltage in Operation near High-Voltage Power Lines and Operation in Transit with No Load, and Boom or Mast Lowered

Normal Voltage, kV (Phase to Phase)	Minimum Required Clearance in Feet (meters)
Operation near High-Voltage Power Lines	
Up to 50	10 (3.05)
Over 50 to 200	15 (4.60)
Over 200 to 350	20 (6.10)
Over 350 to 500	25 (7.62)
Over 500 to 750	35 (10.67)
Over 750 to 1,000	45 (13.72)
Operation in Transit With No Load and Boom or Mast Lowered	
Up to 0.75	4 (1.22)
Over 0.75 to 50	6 (1.83)
Over 50 to 345	10 (3.05)
Over 345 to 750	16 (4.87)
Over 750 to 1,000	20 (6.10)

NOTE: Environmental conditions such as fog, smoke, or precipitation may require increased clearances.



CRANE SAFETY INSPECTION – INITIAL AND ANNUAL

Issue Date: September 2001
Revision 8: September 2013

EQ. Number: Machine Hours: Date: Manufacturer: Model: Capacity: Serial Number: Location:
Codes: X Satisfactory Not Satisfactory - Not applicable
Crane Type Gantry Crawler Truck RT Tower

GENERAL CHECKS
1. Operator's Manual/Configuration Drawings
2. Hand Signal Sign
3. Anti-Two-Block Warning Sign
...
CRANE CONFIGURATION COMPLIES WITH MANUFACTURER'S DESIGN
1. Counterweights
2. Boom Type for Application
...
LATTICE BOOM
1. Boom Stops
2. Boom Hoist Kickout Operation
...

LATTICE BOOM (Cont.)
11. Boom in Storage, Chords, Lacing, Welds Length
12. Boom Connecting Pins, Bolts, Keepers
...
JIB
1. Butt Section, Chords, Lacing, Welds, Pins, Keepers
2. Intermediate Section, Chords, Lacing, Welds
...
HYDRAULIC BOOM
1. Check Operation, Fully Retracting and Extending Boom
2. Check for Twists, Bends, Viewing Over Top of Boom
...
GANTRY AND BACK HITCH
1. Check Welds and Check for Cracks
2. Sheaves, Shafts, Pins and Keepers
...

WIRE ROPE AND PENDANTS
1. Pendant Lengths Match
2. Pendant Pins and Keepers
3. Pendant Condition at Sockets, and Broken Wire Check
...
REVOLVING FRAME, COUNTERWEIGHT
1. Check Frame for Cracks and Defects
2. House Rollers
3. Hook Rollers and Bolts
...
LOAD BLOCK, OVERHAUL BALL
1. Check Main Hook for Cracks
2. Main Hook Safety Latch
3. Check Auxiliary Hook for Cracks
...
HOIST AND SWING MACHINERY
1. Hydraulic Main Hoist
2. Hydraulic Auxiliary Hoist
3. Hydraulic Swing and Brake
...

HOIST AND SWING MACHINERY (Cont.)
16. Auxiliary Hoist Clutch
17. Third Drum Clutch and Brake
18. Boom Hoist Clutch and Brake
...
UPPER ENGINE, TRANSMISSION, T.C.
1. Mounting Bolts
2. Radiator, Fan, Hoses
3. Belts
4. Air Cleaner
5. Air Compressor Pressure: High Low
...
CARBODY AND CRAWLERS
1. Check for Structural Cracks
2. Center Pin Bushing
3. Travel Shaft Gears
4. Lower Jaw Clutches
5. Travel Brakes and Dogs
...
CARRIER
1. Outrigger Operation
2. Outrigger Structure and Pads
3. Frame, Cracks and Welds
4. Drive, Axles, Linkage

CARRIER (Cont.)
5. Steering Axles, Linkage
6. Wheel Lug Nuts
7. Tire Condition, Pressures
8. Steering Apparatus
9. Cab, Seat, Gauges, Horn
10. Radiator, Hoses, Supports
11. Engine Operation and Mounts
12. Belts
13. Air Cleaner
14. Alternator, Batteries
15. Main Transmission or Converter
16. Auxiliary Transmission or Transfer Case
17. Air Compressor
18. Record Air Pressures: High Low
19. Service Brakes
20. Brake Hoses
21. Parking Brake/Safety Brakes
22. Exhaust System
23. Hydraulic Supply
24. Lubrication
LOAD ENHANCEMENT DEVICE
1. Ringer Type
2. Skyhorse
3. Linkbelt Heavy Life Type
4. Configuration Complies with Manufacturer's Design
5. Integrity
MISCELLANEOUS
1. Log Book, In Machine and Up to Date
2. All Safety Decals & Warning on Machine
3.
4.
5.

NOTE: Make sure deficient items are noted and corrected. (File in Record Book)

Inspection Date: _____

Inspector: _____

Comments: _____



CRANE SAFETY INSPECTION – INITIAL AND ANNUAL

Issue Date: September 2001
Revision 8: September 2013

CRANE LOAD TEST			
MAXIMUM LOAD REQUIRED	AT RADIUS	WITH BOOM LENGTH	
CRAWLER POSITION		OUTRIGGER POSITION	
<input type="checkbox"/> Extended	<input type="checkbox"/> Retracted	<input type="checkbox"/> Full	<input type="checkbox"/> Intermediate <input type="checkbox"/> Retracted
SUPERSTRUCTURE POSITION	LOAD/POUNDS	RADIUS/FT	BOOM LENGTH
1.			
2.			
3.			
RESULTS OF TEST: <input type="checkbox"/> Passed <input type="checkbox"/> Failed			
REMARKS:			
Inspected By (Please Print): _____		Title: _____	
Signature: _____		Date: _____	
Operator (Please Print): _____		Date: _____	
Signature: _____		Date: _____	
Repairs Completed By: _____		Date: _____	

1. Regulations/Standards
 - A. OSHA Requires compliance with Code of Federal Regulations (CFR) 1926.550. Section A, Paragraph 6, reads as follows: A thorough annual inspection of the hoisting machinery shall be made by a competent person, or by a government or private agency recognized by the US Department of Labor. The employer shall maintain a record of the dates and results of inspections for each hoisting machine and piece of equipment.
 - B. ASME B30.5-2000, Section 5-2.1.5, reads as follows: Written, dated, and signed inspection reports and records shall be made monthly on critical items in use such as brakes, crane hooks, and ropes. Records shall be kept where readily available.
2. The mobile, hydraulic, and crawler crane inspector and operator should be familiar with the requirements of:
 - A. OSHA 29 CFR 1926.550
 - B. ASME B30.5-2000
 - C. PCSA Mobile Hydraulic Crane Standard No.2
3. In addition, regulations sometimes found in nuclear plant construction, marine construction or areas covered by more stringent local laws may require compliance with some or all of the following:
 - A. Load Moment Indicators
 - B. Manufacturers' or suppliers' certification of breaking strengths of boom hoist, main hoist, and auxiliary hoist ropes. Whenever replacement ropes are purchased, the certification should be requested from the supplier and kept with the equipment records.
 - C. Non-destructive testing of load hooks or certification by the hook and block manufacturer.
 - D. Load testing, not to exceed 110 percent of rated load at specific radii with the superstructure in various positions or swinging 360°. Limitations based on structural strength should never be exceeded.
 - E. Provisions are made for A, B, C, and D in this inspection form if required.
4. No modifications will be made to any of the load-carrying parts or structure of any crane, without written approval of the manufacturer.
5. Welding repairs to booms are to be made according to procedures established by the manufacturer. Booms thus repaired are to be load tested between 100 and 110 percent of rated load prior to being placed back in service.
6. Checks peculiar to a machine may be written under the "Miscellaneous Checks" heading.
7. All inspection reports must be dated and signed.
8. Where discrepancies exist, explain the discrepancies in the "Remarks" section.
9. A monthly inspection form with checks, meeting ASME B30.5-2000, Section 5-2.1.5, is available.
10. Wire rope must be taken out of service when any of the following conditions exist:
 - A. In running ropes, six randomly distributed wires in one lay, or three broken wires in one strand in one lay.
 - B. Wear 1/3 the original diameter of outside individual wires; kinking, crushing, bird caging, or any other damage resulting in distortion of the rope structure.
 - C. Evidence of heat damage from any cause.
 - D. Reductions from nominal diameter of more than 1/64" for diameters up to and including 5/16"; 1/32" for diameters 3/8" to and including 1/2"; 3/64" for diameters 9/16" to and including 3/4"; 1/16" for diameters 7/8".
 - E. In standing ropes, more than two broken wires in one lay in section beyond end connections or more than one broken wire at end connection.
 - F. Wire rope safety factors must be in accordance with ASME B30.5-2000.



Safety Management Standard

Attachment 038-7 AMER

MONTHLY CRANE INSPECTION CHECKLIST

Issue Date: September 2001
Revision 8: September 2013

Equipment Number: Hr. Meter Reading: Capacity:
Date: Manufacturer: Model:
S/N: Inspection Period: Location:
Block Codes: Crane Type:
GENERAL CHECKS HYDRAULIC BOOM
1. Operators Manual/Configuration Drawings
2. Hand Signals Posted
3. Anti-Two-Block Warning Signs
4. High Voltage Warning Sign
5. Capacity Chart in Cab
6. Warning Horn Operational
7. Fire Extinguisher (10BC, 5 LB)
8. Boom Angle Indicator
9. Backup Alarm
10. Anti-Two-Block Device (Main)
11. Anti-Two-Block Device (Auxiliary)
12. Load-Moment Indicator (If required)
13. Handholds and Steps
14. Non-Skid Surfaces
15. Catwalks and Handrails
16. Directional Signals
17. Head, Tail, Brake Lights
18. Housekeeping
19. Lubrication, Fluid Levels, and Fluid Condition
20. Overhead Protection
21. Window Glass
22. Log Book
23. Drum Rotation Indicators
24. Swing Radius Barricades
CRANE CONFIGURATION COMPLIES WITH MANUFACTURER'S DESIGN
1. Counterweights
2. Gantry Position
3. Mast Position
4. Boom Hoist Reeving
5. Maximum Boom Not Exceeded
6. Maximum Jib Not Exceeded
LATTICE BOOM/JIB
1. Check integrity of boom stops
2. Check boom hoist kickout
3. Check boom for alignment with revolving frame, cords, and lacing for damage or improper and undocumented repairs
4. Check for cracked welds
5. Check jib for alignment, damage, or improper and undocumented repairs
6. Check jib backstop
NOTE: Cable-type belly slings do not comply with 1926.550
7. Check all boom and jib connecting pins and locks
8. Check point sheaves and wire rope guides
9. Check jib suspension
GANTRY/BACK HITCH/COUNTERWEIGHT
1. Check welds and check for cracks
2. Check sheaves, shafts, pins, and keepers
3. Check counterweight bolts/retainers
WIRE ROPE AND PENDANTS
1. Use Monthly Wire Rope/Hook Inspection Work Sheet (SMS 038-7)
2. Check condition of main hoist rope
3. Check condition of auxiliary hoist rope
4. Check condition of boom hoist rope
5. Check condition of pendants, especially at sockets
6. Check all hoisting rope dead ends, clamps and sockets.
LOAD BLOCK AND OVERHAUL BALL
1. Check main hook for cracks, bending, and safety latch
2. Check auxiliary hook for cracks, bending, and safety latch
3. Check sheaves
4. N.D.T. main hook
5. N.D.T. auxiliary hook
The mobile, hydraulic, and crawler crane inspector and operator should be familiar with the requirements of:
ASME B30.5 - 2000
PCSA Mobile Hydraulic Crane Standard # 2

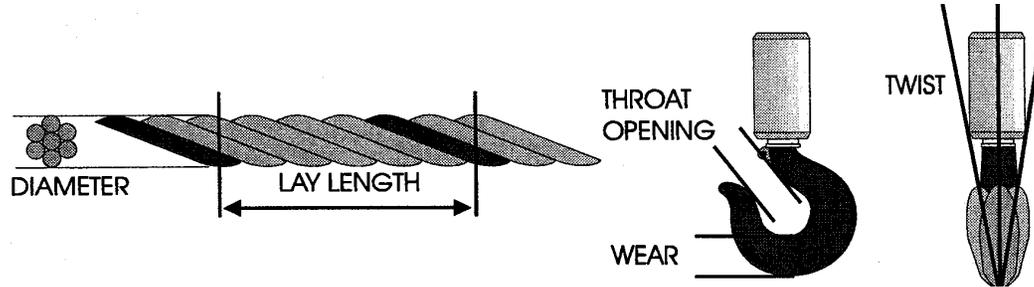


Safety Management Standard
MONTHLY WIRE ROPE AND HOOK INSPECTION

Attachment 038-8 AMER

Issue Date: September 2001
 Revision 8: September 2013

ROPE CLASSIFICATION:	MFG. BREAKING STRENGTH:	SWL (SAFE WORKING LOAD):	OWNER IF OTHER THAN URS:
HOOK MANUFACTURE:	I.D. NUMBER:	NDT RESULTS (NON-DESTRUCTIVE):	PROJECT NUMBER:



DATE	PARTS OF ROPE	ORIGINAL DIAMETER	MEASURED WEAR	BROKEN WIRES	ROPE DAMAGE	END ATTACHMENTS		HOOK INSPECTION			INSPECTOR SIGNATURE
						BROKEN WIRES	FITTING CONDITION	THROAT	WEAR OPENING	TWIST	



Safety Management Standard
PERSONNEL PLATFORM LIFTING FORM

Attachment 038-9 AMER

Issue Date: September 2001
Revision 8: September 2013

Project #: _____ **Date:** _____

1. Jobsite: _____

2. Job description (including estimated time required): _____

3. Basket needed: _____

4. Location and load

A. Height from ground in feet (approximate): _____

B. Crane needed (in tons): _____

C. Expected load in pounds:

i. People at 250 lbs (113 kg) each: _____

ii. Weight of tools and material: _____

iii. Subtotal weight: _____

iv. Weight of basket and rigging: _____

v. Total weight: _____

5. Pre-lift Meeting Signatures

A. Crane operator _____

B. Competent person _____

C. Craftsmen _____

6. Pre-Lift

A. Test load in pounds (1.5 times Item 4.C.iii [subtotal weight above]): _____

B. Crane operator to check boom angle and radius for capacity

i. Crane capacity _____

ii. Item 6.B.i divided by 2 _____

iii. Item 4.C.v (total weight) _____

iv. If Item 6.B.iii is larger than Item 6.B.ii, this crane may not be used.

C. Full-cycle test lift with test load (Item 6.A) completed

Competent Person signature: _____

7. If the crane must be relocated, then a new Personnel Platform Pre-Lift Form is required.

8. The crane operator will not leave the cab while a personnel platform is suspended, whether occupied or not occupied.

9. Approved: _____
Site Manager Safety Supervisor



BOOM TRUCK HAZARD CHECKLIST

Prior to the manipulation of any controls, operators are to ensure that all personnel are clear of all moving parts. Employees working with boom truck operators will review the boom truck hazard check list to heighten awareness while working on and around the boom truck. Access has been improved on boom trucks; these are the ONLY approved access and egress on/off the bed of the truck.

The operator is in control of ALL operations associated with this equipment. The Operator will ensure the following items have been performed and reviewed, and signed by all parties working with the boom truck PRIOR TO THE START OF OPERATIONS. The completed form will be returned to the safety department at the end of each shift.

Date:	Operator:	Location:
Activity		Check Boxes
A Job Hazard Analysis must be developed prior to any lifting activities being performed that involve the use of the boom truck.		
Operator's pre-shift inspection		<input type="checkbox"/>
Complete the Project Lift Classification Checklist (attached to this form)		<input type="checkbox"/>
Chock wheels when parking		<input type="checkbox"/>
Ensure adequate lighting is provided for night operations		<input type="checkbox"/>
The weight of the load to be lifted is within the load capacity of the boom truck		<input type="checkbox"/>
Ensure that all rigging is adequate and within the rated capacity for the load to be lifted		<input type="checkbox"/>
Verify workers, materials, and other equipment are clear of ALL boom truck devices and movement PRIOR to manipulation, operation, and/or movement of the equipment		<input type="checkbox"/>
Alert coworkers before extending outriggers at the beginning of a task		<input type="checkbox"/>
Complete survey to ensure the boom truck cannot contact overhead power lines		<input type="checkbox"/>
Use pads under outriggers when necessary.		<input type="checkbox"/>
Ensure ground is stable and free of underground utilities.		<input type="checkbox"/>
Watch for swinging of headache ball when unlatching hook from D-ring		<input type="checkbox"/>
Inspect shackles and chokers before attaching to hook		<input type="checkbox"/>
Boom truck bed access is available and in good condition (permanent or temporary ladder)		<input type="checkbox"/>
Review access/egress with personnel assigned to work on Boom Truck		<input type="checkbox"/>
Never use outriggers for access or egress		<input type="checkbox"/>
Have two people move boom cradle out of way		<input type="checkbox"/>
When loading and unloading boom trucks, check that the following are observed:		
Always use tag lines		<input type="checkbox"/>
Give clear hand signals		<input type="checkbox"/>
Do not walk under a suspended load.		<input type="checkbox"/>
Secure material transported on boom truck.		<input type="checkbox"/>
Stay clear of boom's swing radius.		<input type="checkbox"/>
After task, notify all personnel before retracting outriggers		<input type="checkbox"/>
Return rigging, outrigger pads, tools, boom cradle, and hook to proper locations		<input type="checkbox"/>

	<p style="text-align: center;">Safety Management Standard</p> <p style="text-align: center;">CRITERIA FOR DEVELOPING A WRITTEN EXAMINATION</p>	<p style="text-align: right;">SMS 038 AMER Supplemental Information A Issue Date: February 2009</p>
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This document contains information for employers, accredited testing organizations, auditors and government entities developing criteria for a written examination to test an individual's technical knowledge relating to the operation of cranes.

A. General technical information.

1. The functions and limitations of the crane and attachments.
2. Wire rope:
 - i. Background information necessary to understand the inspection and removal from service criteria in this procedure.
 - ii. Capacity and when multi-part rope is needed.
 - iii. Relationship between line pull and safe working load.
 - iv. How to determine the manufacturer's recommended rope for the crane.
3. Rigging devices and their use, such as:
 - i. Slings.
 - ii. Spreaders.
 - iii. Lifting beams.
 - iv. Wire rope fittings, such as clips, shackles and wedge sockets.
 - v. Saddles (softeners).
 - vi. Clamps (beams).
4. The technical limitations of protective measures against electrical hazards:
 - i. Grounding.
 - ii. Proximity warning devices.
 - iii. Insulated links.
 - iv. Boom cages.
 - v. Proximity to electric power lines, radii, and microwave structures.
5. The effects of load share and load transfer in multi-crane lifts.
6. Basic crane terms.

7. The basics of machine power flow systems.
 - i. Mechanical.
 - ii. Electrical.
 - iii. Pneumatic.
 - iv. Hydraulic.
 - v. Combination.
 8. The significance of the instruments and gauge readings.
 9. The effects of thermal expansion and contraction in hydraulic cylinders.
 10. Background information necessary to understand the requirements of pre-operation and inspection.
 11. How to use the safety devices and operational aids required under this procedure.
 12. The difference between duty-cycle and lifting operations.
 13. How to calculate net capacity for every possible configuration of the equipment using the manufacturer's load chart.
 14. How to use manufacturer-approved attachments and their effect on the equipment.
 15. How to obtain dimensions, weight, and center of gravity of the load.
 16. The effects of dynamic loading from:
 - i. Wind.
 - ii. Stopping and starting.
 - iii. Impact loading.
 - iv. Moving with the load.
 - v. The effect of side loading.
 - vi. The principles of backward stability.
- B. Site information.
1. How to identify the suitability of the supporting ground/surface to support the expected loads of the operation. Elements include:

- i. Weaknesses below the surface (such as voids, tanks, loose fill).
 - ii. Weaknesses on the surface (such as retaining walls, slopes, excavations, depressions).
2. Proper use of mats, blocking/cribbing and outriggers or crawlers.
3. Identification of site hazards such as power liens, piping, and traffic.
4. How to review operation plans with supervisors and other workers (such as the signal person), including how to determine working height, boom length, load radius, and travel clearance.
5. How to determine if there is adequate room for extension of crawlers or outriggers/stabilizers and counterweights.

C. Operations.

1. How to pick, carry, swing and place the load smoothly and safely on rubber tires and on outriggers/stabilizes or crawlers (where applicable).
2. How to communicate at the site with supervisors, the crew and the signal person.
3. Proper procedures and methods of reeving wire ropes and methods of reeving multiple-part liens and selecting the proper load block and/or ball.
4. How to react to changes in conditions that affect the safe operation of the equipment.
5. How to shut down and secure the equipment properly when leaving it unattended.
6. Know how to apply the manufacturer's specifications for operating in various weather conditions, and understand how environmental conditions affect the safe operation of the equipment.
7. How to properly level the equipment.
8. How to verify the weight of the load and rigging prior to initiating the lift.
9. How to determine where the load is to be picked up and place and how to verify the radii.
10. Know basic rigging procedures.
11. How to carry out the shift inspection required in this subpart.

12. Know that the following operations require specific procedures and skill levels:

- i. Multi-crane lifts.
- ii. Hoisting personnel.
- iii. Clamshell/dragline operations.
- iv. Pile driving and extracting.
- v. Concrete operations, including poured-in-place and tilt-up.
- vi. Demolition operations.
- vii. Operations on water.
- viii. Magnet operations.
- ix. Multi-drum operations.

13. Know the proper procedures for operating safely under the following conditions:

- i. Traveling with suspended loads.
- ii. Approaching a two-block condition.
- iii. Operating near power liens.
- iv. Hoisting personnel.'
- v. Using other than full outrigger/crawler extensions.
- vi. Lifting loads from beneath the surface of the water.
- vii. Using various approved counterweight configurations.
- viii. Handling loads out of the operator's vision ("operating in the blind").
- ix. Using electronic communication systems for signal communication.

14. Know the proper procedures for load control and the use of hand-held tag lines.

15. Know the emergency response procedure for:

- i. Fires.
- ii. Power line contact.
- iii. Loss of stability.

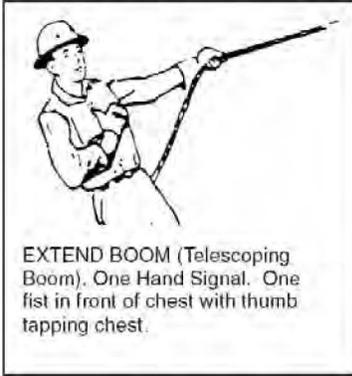
- iv. Control malfunction.
- v. Two-blocking.
- vi. Overload.
- vii. Carrier or travel malfunction.

16. Know how to properly use outriggers in accordance with manufacturer specifications.

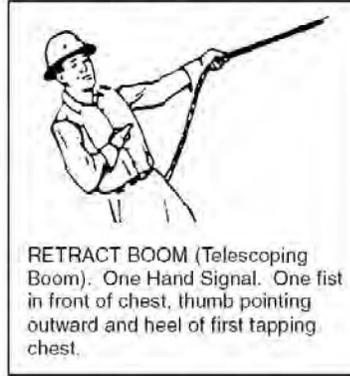
D. Use of load charts.

1. Know the terminology necessary to use load charts.
2. Know how to ensure that the load chart is the appropriate chart for the equipment in its particular configuration and application.
3. Know how to use load charts. This includes knowing:
 - i. The operational limitations of load charts and footnotes.
 - ii. How to relate the chart to the configuration of the crane, crawlers, or outriggers extended or retracted, jib erected or offset, and various counterweight configurations.
 - iii. The difference between structural capacity and capacity limited by stability.
 - iv. What is included in capacity ratings.
 - v. The range diagram and its relationship to the load chart.
 - vi. Where to find and how to use the "Parts-of-line" information.
4. Know how to use the load chart together with the load indicators and/or load moment devices.

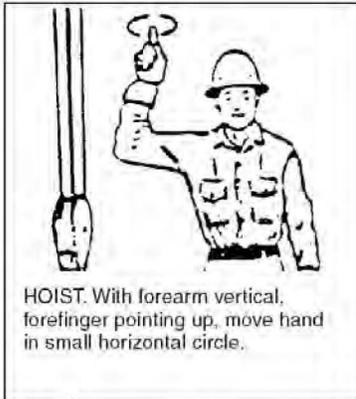
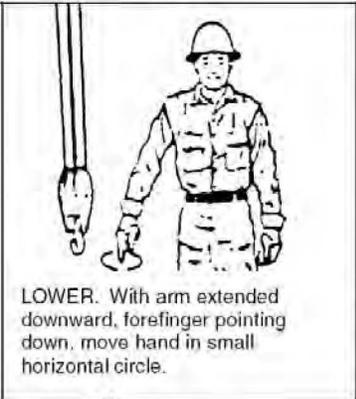
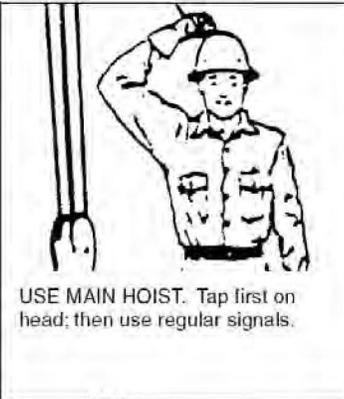
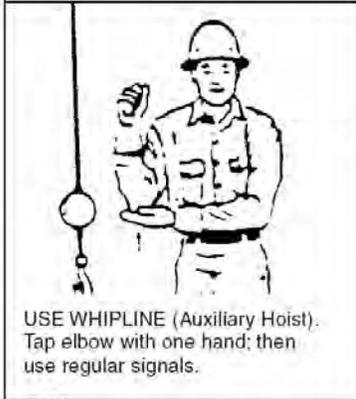
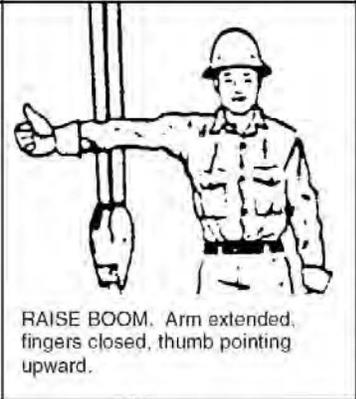
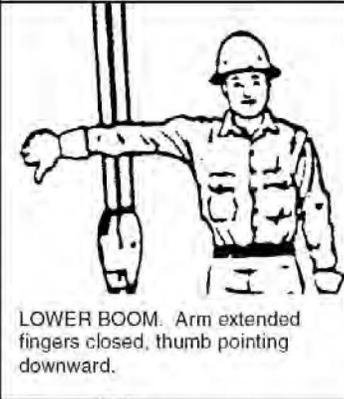
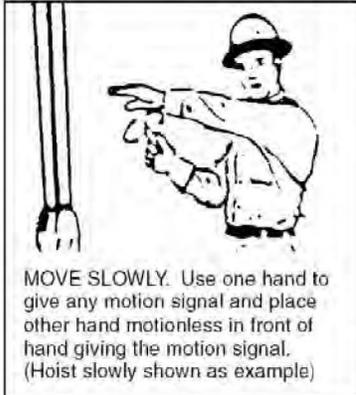
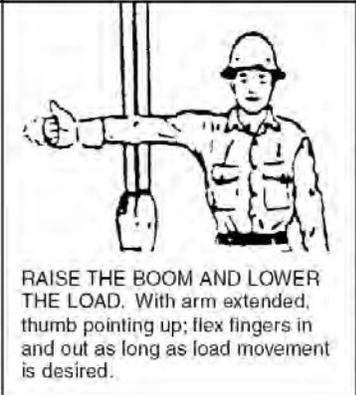
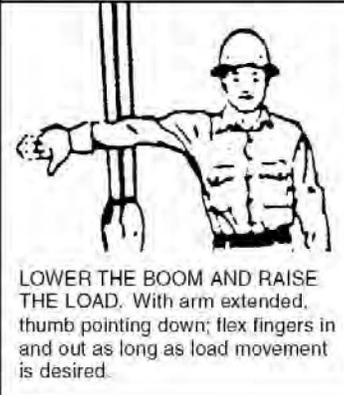
STANDARD HAND SIGNALS FOR CONTROLLING CRANE OPERATIONS



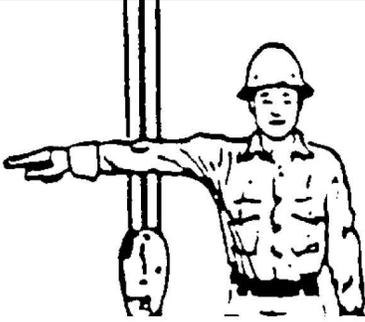
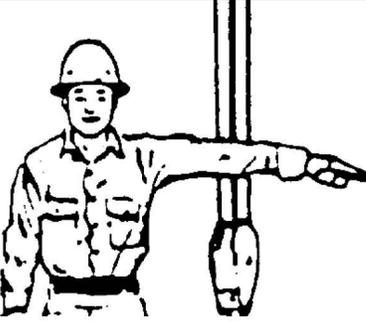
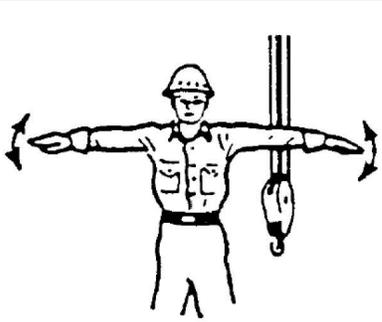
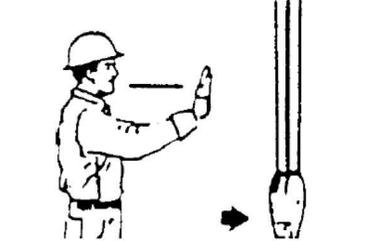
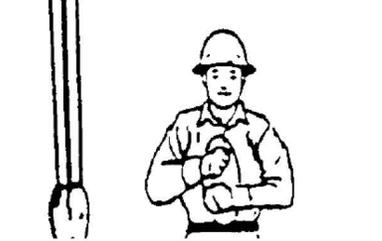
EXTEND BOOM (Telescoping Boom). One Hand Signal. One fist in front of chest with thumb tapping chest.



RETRACT BOOM (Telescoping Boom). One Hand Signal. One fist in front of chest, thumb pointing outward and heel of first tapping chest.

 <p>HOIST. With forearm vertical, forefinger pointing up, move hand in small horizontal circle.</p>	 <p>LOWER. With arm extended downward, forefinger pointing down, move hand in small horizontal circle.</p>	 <p>USE MAIN HOIST. Tap first on head; then use regular signals.</p>
 <p>USE WHIPLINE (Auxiliary Hoist). Tap elbow with one hand; then use regular signals.</p>	 <p>RAISE BOOM. Arm extended, fingers closed, thumb pointing upward.</p>	 <p>LOWER BOOM. Arm extended, fingers closed, thumb pointing downward.</p>
 <p>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)</p>	 <p>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.</p>	 <p>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.</p>

STANDARD HAND SIGNALS FOR CONTROLLING CRANE OPERATIONS

 <p>SWING. Arm extended, point with finger in direction of swing of boom.</p>	 <p>STOP. Arm extended, palm down, move arm back and forth horizontally.</p>	 <p>EMERGENCY STOP. Both arms extended, palms down, move arms back and forth horizontally.</p>
 <p>TRAVEL. Arm extended forward, hand open and slightly raised; make pushing motion in direction of travel.</p>	 <p>DOG EVERYTHING. Clasp hands in front of body.</p>	 <p>TRAVEL (Both Tracks). Use both fists in front of body, making a circular motion about each other, indicating direction of travel, forward or backward. (For land cranes only.)</p>
 <p>TRAVEL. (One Track). Lock the track on side indicated by raised fist. Travel opposite track in direction indicated by circular motion of other fist, rotated vertically in front of body. (For land cranes only.)</p>	 <p>EXTEND BOOM (Telescoping Booms). Both fists in front of body with thumbs pointing outward.</p>	 <p>RETRACT BOOM (Telescoping Booms). Both fists in front of body with thumbs pointing toward each other.</p>



Safety Management Standard
WIND PRESSURE FORMULA

SMS 038 AMER
Supplemental Information C
Issue Date: February 2009

The wind pressure (P) in pounds per square foot on a flat surface normal to the direction of the wind for any given velocity (V) in miles per hours (mph) is given quite accurately by the formula:

$$P=0.004 V^2$$

The following table gives the pressure per square foot on a flat surface normal to the direction of the wind for different velocities, as calculated by the formula:

<u>Velocity (miles per hour)</u>	<u>Pressure (lbs per sq. ft.)</u>
10	.04
20	1.6
30	3.6

Use the formula above to calculate the pressure per square foot times the load area. Lifting is not permitted with wind velocity above 30 mph, or if the force exceeds 2% of the crane's chart capacity

Engineers and reviewers should use this checklist to confirm completeness of the lift plan. These items are included as a guide but should not be interpreted as being all-inclusive in the analysis and preparation of a Critical or Pre-Engineered Lift. Sound engineering and planning is still the responsibility of the engineer or project supervisor associated with the lift.

Never vary from the approved Lift Plan without a full review and approval by the Lift Supervisor.

Subsurface and Foundation Issues

1. What are the maximum loads imposed by the cranes on the soil/facility floor? Is the soil-bearing capacity adequate to safely support crane loads? Has a soil investigation program been performed? What is the assumed load distribution through the timber mats?
2. Has a soil investigation of the area under the path of the tailing crane (borings, etc.) been performed?
3. What pressures will be imposed on any underground structures (sewer lines, etc.)?

Transportation and Interim Storage Issues

4. Has the responsible supervisor and the site safety supervisor been notified of movement of the load to the lifting site (notification at the discretion of the responsible planner)? Are any permits required?
5. Has the load transport route to the lift site been checked for overhead obstructions? Are there any bridges, culverts, pipe ways to cross? Are they structurally capable of safely supporting the transport loads?
6. Where will the crane be assembled? What route will the crane take from the assembly site to the lift site?
7. How will the load transport get to the lift site? How will the transport be removed once the load is lifted?

Crane Issues

8. What is the minimum actual clearance between the load and the boom during the lift?
9. Has the radius been double-checked by measuring in the field?
10. Will the crane load change as the lift progresses?
11. How many parts of line are needed? How was this determined?
12. Is there adequate line length spooled on the hoist drums?
13. Will spreaders and other rigging hardware remain safely clear of the boom, the load, and other objects at all times during the lifting operation?
14. If a tailing crane has to "walk," is the path level and properly compacted?
15. What efforts have been made to identify obstructions in the lift path and swing path? How accurate are these efforts?

16. Can the outriggers be deployed as per manufacturer's load chart requirements?
17. Can rigging personnel safely control and manipulate the load throughout the lifting path?
18. Are the crane's operational safety alarms functioning properly? How, when, and were they tested?
19. Have plans been developed to monitor the crane's stability during lift?
20. Has a procedure been developed to monitor plumbness of load lines (in two directions)?
21. Has a drawing showing the elevation of the crane during the lift as well as all clearances been developed (boom to load, and load to other obstructions)?
22. Have all repairs or modifications to the crane been made in accordance with manufacturer's written instructions, and are they so certified?
23. Has the crane been load tested recently?
24. How will the crane's electronic safety alarms and interlocks be checked for operation and accuracy?
25. Has a recent wire rope and hook, load block, ball inspection been performed.
26. Has a procedure to monitor tail swing of the crane during lifting operations been developed?
27. Is the correct crane load chart for current lift conditions in the cab?
28. Is there adequate headroom to ensure that the manufacturer's minimum allowable two-block distance is maintained for the configuration of the reeve used?

Load Weight & CG Issues

29. How was the weight determined when developing the lift plan? Has any margin been added to calculated weights?
30. Has an accurate load weight determination been made before the lift to confirm calculated weight? How was this performed?
31. Has the weight of any jibs, auxiliary boom heads, etc. been considered in the calculations?
32. Has all the rigging hardware been included in the weight calculations?
33. Who has determined the center of gravity? How was it determined? Is it marked on the load? Is it shown on the lift plan drawings?
34. Is there anything inside the load that could shift during the lift?
35. Has snow or ice accumulated on the load since the weight was determined?
36. Is the surface area large enough to create unusual control problems in the wind?
37. Has all hydro test water been drained from the load (vessel) before lifting?
38. If lifting a dressed device, has the insulation absorbed any water?
39. If lift is of an existing item (being removed or demolished), have all anchor bolts and fasteners been removed?

Rigging Issues

40. Has all rigging hardware been selected to work within the manufacturer's Safe Working Load?
41. Have sling angles flatter than 45 degrees been avoided, and have the slings and shackles been chosen to allow for increased loads due to sling angles?
42. Have softeners been used to protect the rigging where sharp corners could cause damage?
43. Does the rigging provide positive control of the load to prevent slipping or shifting?
44. Are shackles and hooks always used in such a manner as to avoid side bending in the hardware?
45. Have qualified personnel designed and tested special rigging hardware in accordance with regulations?
46. Is there a plan for removing lifting tackle from the load after it is erected?
47. How will the shackle pins be removed after the lift is complete? Will a pin extractor be required, and if so, manual or hydraulic?
48. What level of inspection have the shackles, hooks, slings, etc. been subjected to?
49. Are the shackle pins and lifting eyes compatibly sized?
50. How will side loading/bending of shackles and hooks be avoided?
51. Have all rigging components such as shackles, hooks, and slings, been inspected for signs of damage or deterioration before use?
52. Is the rigging arranged to have the crane hook directly over the load's center of gravity with the load hanging level?

Roles & Responsibility Issues

53. Who is the Lifting Supervisor for the lift? What are their qualifications? Who will give the signals to the operator?
54. Has the Site Safety Supervisor been involved in the lift planning process or lift plan review?
55. Has the appropriate Project Manager/Facility Manager been involved in the lift planning process or lift plan review?
56. Has the lift plan been reviewed with the crane operator, riggers, and others involved in the lifting operation? Has the plan been reviewed with supervisors and workers in adjacent areas?
57. Has a chain of command to operate during the lift been established, and how are the involved people identified?
58. Has a final pre-lift safety meeting been scheduled?
59. Are there any language difficulties? Does everyone speak (fluently) the same language?

Operational Envelope Issues

60. What are the limits on wind speed for making the lift? How and where will wind speed be measured?
61. Is cold weather likely to affect the lift? Is it necessary to de-rate the crane or any part of the rigging equipment due to low temperatures?
62. Is adequate lighting equipment available for use, if the lifting operation should extend beyond normal daylight hours?
63. Are required personnel (operations, safety, other) available if the lift operation should extend beyond normal hours?
64. Are there overhead power lines in the operating area? If so, have minimum clearance requirements been established and has a dedicated signal person been assigned to monitor boom, load and/or load line position relative to the power line?
65. If operating near overhead power lines, are nonconductive taglines being used? Emergency Procedural Issues
66. Have emergency procedures been determined and communicated to all personnel involved in the lifting operation?
67. If required, has confirmation of notification to adjacent Departments/Divisions and local Security and Fire Rescue been received?
68. Has agreement been established on required actions if operational alarms occur during the lift?
69. Has a review of operational activities planned/occurring during time of lift been performed?
70. Has a review/agreement of safety / barricade/evacuation plans been done?
71. Has a review/agreement of contingency plans in event of a site alarm or operational upset during lift been made?
72. Have emergency plans been developed by, communicated to, and understood by operating personnel? Does the lift plan reflect the philosophy that safety is the top priority?

Load Design Follow-up Issues

73. Is the load fragile enough to require lifting from a “strong back” frame or from multiple attachment points to prevent load damage?
74. Has the “strong back” frame been designed by a competent engineer, inspected, and load-tested?
75. Has any required nondestructive testing been done to assess the quality of welds attaching lifting lugs, pad eyes, trunnions, etc.?
76. Has anyone checked that the shackle pins will fit the holes provided in the lifting lugs?
77. Are the dimensions of the lifting lugs/pad eyes consistent with the size of shackle proposed? Will the shackle be able to “turn” as the load goes from horizontal to vertical?
78. Have the appropriate impact factors been used in designing the lifting lugs, shackles, etc.?

79. Is there enough clearance between the load and the lifting lug/pad eye to get the nut on the shackle pin?
80. What are the inspection requirements for the lifting attachments (lugs/pad eyes)? Who will do it?
81. Has the load (tower) design been analyzed for localized buckling and bending shear stress during the lift operation in order to verify that allowables will not be exceeded during the lift?
82. If trays or internals are to be installed before lifting, has the possibility of load shift been considered?
83. Are all engineered lifting components (spreader bars, lift lugs, etc.) designed to ASME B30.20, Below-the-Hook Lifting Devices? (Show calculations).
84. Are the lifting lugs designed about the weak axis using a force equal to a minimum of 5% of the force of the sling? (Show calculations).
85. Who has designed the lifting lugs/trunnions? Has design been checked by a qualified engineer?

Peripheral Issues

86. Are radios required? Who will provide them? Are they safe for use in operating facilities?
87. Has a review/agreement of communications plan during lift (i.e., dedicated radio channels) been made?
88. Has the anchor bolt pattern, if required, been checked to confirm the load can be landed properly?
89. Will critical spare parts be available for the crane(s) during the lift? Are mechanics available?
90. Has a drawing showing the barricade plan to be used during the lift been developed?
91. Is a back-up operator available in case of emergency?
92. Are crane maintenance personnel available during the lift?



**DETERMINING IF HOISTING
PERSONNEL IS PERMISSIBLE**

- A. **HOISTING PERSONNEL IS PERMITTED:** When the employer can show that the erection, use, and dismantling of conventional means of reaching the worksite, 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. However, the employer may hoist personnel without showing that the erection, use, and dismantling of conventional means of reaching the worksite would be more hazardous, or is not possible because of the project's structural design or worksite conditions:
1. When engaged in work covered by this part;
 2. When using a personnel platform to hoist personnel for pile driving operations.
- B. **HOISTING PERSONNEL IS ALWAYS PROHIBITED:** Even if hoisting personnel is otherwise permitted, it is prohibited:
1. When any part of the equipment would get closer than 20 feet to a power line that is 350kV or less or 50 feet to a power line over 350 kV.
 2. When equipment is traveling unless the equipment travels on fixed rails or the employer can demonstrate that there is no less hazardous way to perform the work. However, when the equipment is a derrick, it may not be used to hoist personnel while traveling under any circumstances.
 3. When the equipment has a rated hoisting/lifting capacity of 2,000 pounds or less.
- C. **WHEN HOISTING PERSONNEL IS PERMITTED, A PERSONNEL PLATFORM MEETING THE REQUIREMENTS OF THIS PROCEDURE MUST BE USED, EXCEPT:**
1. When hoisting personnel in drill shafts eight feet or less in diameter, the employer may instead use either a personnel platform or a boatswain's chair.
 2. When hoisting personnel for pile driving operations the employer may instead use a boatswain's chair.
 3. When hoisting personnel for marine transfer, the employer may instead use a marine hoisted personnel transfer device.
 4. When hoisting personnel for storage tank, shaft, and chimney operations, the employer may instead use a boatswain's chair, but only if use of a personnel platform is infeasible.



Safety Management Standard

**ASSEMBLY / DISASSEMBLY
PROCEDURES & ASSOCIATED HAZARDS**

SMS 038 AMER
Supplemental Information F

Issue Date: February 2009
Revision 1: January 2011

Project Site	_____	Date	_____
Crane Owner	_____	Manufacturer	_____
Model	_____	Serial Number	_____
Name of Competent- Qualified Technician/Supervisor (A/D Director)	_____	Competent-Qualified Technician/Supervisor (A/D Director) Employed By:	_____
Name of Qualified Rigger	_____	Qualified Rigger Employed By:	_____
Name of Qualified Crane Signalman:	_____	Qualified Crane Signalman Employed By:	_____

Attach all competent/qualified personnel's documentation/qualifications to this form. These documents are required to be placed in the project's site equipment folder associated with the above listed crane and serial number.

Crane manufacture's procedures for assemble/disassembly (including attachments) must be followed. NOTE: If the manufacture's procedures are not used or followed, the following procedures must be met:

- Prevent unintended dangerous movement, and prevent collapse, of any part of the equipment.
- Provide adequate support and stability of all parts of the equipment.
- Position employees involved in the assembly/disassembly operation so that their exposure to unintended movement or collapse of part or all of the equipment is minimized
- A qualified person must develop the assembly/disassembly procedures.

Assembly/disassembly competent/qualified personnel must review the following with all crewmembers prior to start of any work. All crewmembers need to sign this document, which will verify their attendance during the pre-job meeting and directions are understood.

- Explain and review crewmember's task for assembly/disassembly of the crane/attachment.
- Discuss the associated hazards for the tasks crewmember will be performing.
- Review hazardous positions/locations and pinch points.
- Crewmembers must inform the PIC (person in charge) and the operator if it becomes necessary for them to enter an area out of the operators view (in, on, or under the equipment or load).
- While a crewmember is in a location and out of the operators view, the machine is not to be moved, unless directed by the PIC (competent-qualified A/D person), clearing that the crewmember is in a safe position.



- When assembling/disassembling crane boom or attachments, no one is allowed under the boom at any time. NOTE: see CFR 1926-1404 (f) (2) for an exception to this rule if necessary.
- During all phases of assembly/disassembly, rated capacity limits for loads imposed on the equipment, [equipment components (including rigging) lifting lugs and equipment accessories], must not be exceeded during the process.
- The following specific hazards must be addressed/discussed:
 1. Site and ground bearing conditions to support the equipment (slope, compaction, firmness)
 2. Blocking/cribbing (material, size, proper placement under loads, boom, etc.)
 3. Verify assist crane(s) loads and capacities for working radius used during assembly/disassembly process
 4. Center of gravity of loads must be known
 5. No pins are to be removed without rigging supporting the load, unless allowed or directed by the manufacture, as part of the assembly/disassembly procedure
 6. Use caution while installing/removing counterweights from unintended movement or inadequate support from rigging or blocking/cribbing
 7. Check potential effects of boom hoist brake failure (if applicable) prior to assembly/disassembly. The brake is to be tested to determine that it is sufficient to prevent boom movement. If it is not sufficient, then other means such as the boom hoist pawl or blocking/cribbing of the boom is required
 8. Check for loss of backwards stability, consider backwards stability prior to installing/removing components, traveling or swinging of the upper works
 9. Check wind conditions and the possible effects on loads and cranes
 10. Weather conditions that could impact the safe assembly/disassembly of the crane
 11. After the crane is assembled, an initial (incoming) and annual crane inspections are to be completed, as well as a load test.

ALL personnel involved in the assembly/disassembly process (the crew) must sign the attendance portion of this procedures/hazards document; therefore, acknowledging their attendance and understanding of the procedures.

Any additional personnel/employees that are required or added to the crew during this task must be given a pre-job briefing (as described above) before being allowed access to the work area.



Safety Management Standard
CRANE OPERATOR SKILL EVALUATION

SMS 038 AMER
Supplemental Information G
Issue Date: September 2013

Date _____ Employee Name _____ Evaluator _____

Description:

Operates hydraulic, friction, carry deck cranes, track-type crawlers, rubber tire truck and rough terrain, barge mounted and tower cranes.

STEPS	KEYPOINTS	SATISFACTORY
1)	Demonstrated abilities a) Pre-shift inspection check list (SMS Attachment 019-1, EQ 505 or equivalent) i) Check equipment for loose bolts and leaks; check oil, air, hydraulic fluid and water ii) Make sure area around the equipment is clear of people and other equipment iii) Check for fire extinguisher iv) Make sure that the following equipment is operational a) Brakes b) Lights c) Back-up alarms d) Hand rails & ladders e) Seat belts f) Tires g) Glass, wipers h) Gauges, including temperature, oil, air and fuel i) Wheel chocks (for rubber tire type cranes) v) Notify supervision of any equipment that is not operational vi) The operator can park a piece of equipment that is unsafe to operate if it poses a danger or hazard to employees or property b) Maintain three points of contact while entering and exiting the equipment	<input type="checkbox"/> Yes <input type="checkbox"/> No
2)	Identification of equipment controls	<input type="checkbox"/> Yes <input type="checkbox"/> No
3)	Load handling techniques a) Use of controls b) Use of boom functions c) Hoisting and holding load d) Lowering and placing load down e) Control of load while swinging/slewing	<input type="checkbox"/> Yes <input type="checkbox"/> No
4)	Moving and setting crane up	<input type="checkbox"/> Yes <input type="checkbox"/> No
5)	Understanding and proper use of operational aids	<input type="checkbox"/> Yes <input type="checkbox"/> No
6)	Following crane hand signals given	<input type="checkbox"/> Yes <input type="checkbox"/> No
7)	Operating around overhead power line or obstructions	<input type="checkbox"/> Yes <input type="checkbox"/> No
8)	Parking and shut down procedures a) Equipment line-up i) Straight line ii) Allow easy access for maintenance and servicing b) Turn off all accessories c) Lower bucket to the ground d) Place and position wheel chocks (rubber tire type cranes) e) Perform a general walk around looking for maintenance items	<input type="checkbox"/> Yes <input type="checkbox"/> No

URS SAFETY MANAGEMENT STANDARD

Fall Protection

1. Applicability

This standard applies to operations of URS Corporation and its subsidiary companies where personnel could be exposed to fall hazards of 6 feet (2 meters) or greater in the construction, mining, and demolition industry, and 4 feet (1.2 meters) or greater in other industries (General Industry). The standard also addresses steep slope work where the work surface angle is greater than 30 degrees from horizontal.

2. Purpose and Scope

The purpose of this standard is to provide criteria for the recognition and control of fall hazards.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility, site, or project location.

4. Requirements

A. Fall Protection – General

1. A Qualified Person has a recognized degree or professional certificate and with extensive knowledge, training and experience in the fall protection and rescue field that is capable of designing, analyzing, evaluating and specifying fall protection systems. A Qualified Person will:
 - a. Be properly trained by a competent authority and hold necessary credentials.
 - b. Approve fall arrest attachment points.
 - c. Approve fall arrest systems.
 - d. Fulfill rescue plan requirements if external entities (e.g., fire department) are not used.
2. A person who is capable of identifying hazardous or dangerous conditions in the personal fall arrest system or any component thereof, as well as in their application and use with related equipment. A Competent Person will:
 - a. Be properly trained by a competent authority.

URS SAFETY MANAGEMENT STANDARD

Fall Protection

- b. Ensure that one or more fall protection or prevention systems outlined in this standard is provided at all locations where fall hazards exist.
 - c. Ensure that all personnel working with and around fall hazards and fall protection systems are properly trained.
 - d. Ensure that access controls to areas with fall hazards are effective.
 - e. Inspect fall protection equipment.
 - f. Approve fall protection plans.
 - g. Ensure that safety monitoring systems or warning line systems are properly implemented, with trained staff as monitors.
2. An Authorized User who will:
- a. Be properly trained by a competent authority.
 - b. Conduct pre-use inspections of equipment.
 - c. Understand and demonstrate proper use of the fall protection equipment.
 - d. Acknowledge identified fall hazards in the workplace.
3. Fall hazards generally fall into three categories for URS employees;
- a. General Industry – application where fall hazards greater than 4 feet (1.2 meters) exist, including:
 - i. Workers are conducting inspection of existing facilities not under construction
 - ii. Working in environmental remediation activities where no construction activities are occurring
 - iii. Working in manufacturing operations
 - iv. Working in vehicle and aircraft maintenance, and repair operations
 - v. Working in warehouses

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- vi. Working on towers, poles, or other elevated structures.
 - b. Construction/mining – These activities require fall protection when fall hazards exceed 6 feet (2 meters). Activities include maintenance, mining, demolition, renovation, and construction support inspections and surveying.
 - c. Steep Slope – Fall protection measures must be used whenever the slope angle exceeds 30 degrees from horizontal (note that this excludes roofing applications, which are covered under Construction activities). Activities include the inspection of dams, environmental surveys of timbered slopes, or other applications where traditional fall protection systems are impractical.
4. Fall hazards include, but are not limited to, excavations, highwalls, unprotected elevations, ladders, scaffolds, floor holes, wall openings, formwork, rebar tying, inspection of dams, working on top of vehicles, equipment, or airframes, working over operating machinery, working above hazardous substances, and all other locations and operations where potential fall hazards exist.
5. Fall hazards must be addressed by one of five means (for additional information, see Attachment 040-1 AMER – Fall Protection Checklist):
- a. Elimination or substitution controls such as moving planned work to ground level or substitution of a process, sequence, or procedure so that employees are no longer exposed to a fall hazard;
 - b. Passive fall protection such as isolating or separating employees from the fall hazard through the use of guardrails or covered floor openings;
 - c. Fall restraint, which includes securing an employee to an anchor using a lanyard that is short enough to prevent the employee's center of mass from reaching the actual fall hazard;
 - d. Fall arrest, which includes systems to stop an employee's fall after it has begun (e.g., personal fall arrest systems, safety nets, etc.);

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- e. Administrative controls, including safety observers, boundary markings (i.e., tape, cable, or barricades) located 6 feet (2 meters) or more from an exposed edge, and maintaining three-points of contact.
5. Note that in some places, the standards for fall protection are required at different elevations than specified in this standard. Where this is the case, the more conservative elevation will be used in defining when fall protection systems are required.
6. In each instance where employees are exposed to fall hazards and passive fall protection controls are impractical, a Fall Protection Plan must be developed to define a strategy to protect the employees. Attachment 040-3 – Fall Protection Plan Template may be used to develop a Fall Protection Plan. Fall Protection Plans must be approved by the Site/Location/Project Manager and Safety Manager prior to work commencing.
7. Where administrative controls are the only feasible method of fall protection, Attachment 040-3 AMER - Fall Protection Plan Template and Attachment 040-4 AMER – Alternative Fall Protection Permit should be used. Refer to Section I for additional information.

B. Training

1. Qualified Person training should include:
 - a. Selection of fall protection systems and compatibility of systems.
 - b. Designing anchorages or complex active fall protection systems.
 - c. Determining fall clearances and swing fall or other impact forces.
2. Competent Person training should include:
 - a. Background knowledge, including regulations and standards.
 - b. Recognition and identification of fall hazards.
 - c. Selection of abatement solutions, systems and compatibility of systems.

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- d. Inspection and approval of personal protective equipment.
 - e. Development and application of system use and rescue procedures.
3. Authorized User training should be conducted by a Competent Person for each employee who may be exposed to falls. Training should include:
 - a. The nature and location of fall hazards in the work area.
 - b. The correct procedures for erecting, maintaining, disassembling, and inspecting the fall protection systems to be used.
 - c. The correct procedure for conducting a pre-use inspection of fall protection equipment in accordance with manufacturer's recommendations.
 - d. The use and operation of guardrail, personal fall arrest, safety net, warning line, and safety monitoring systems, controlled access zones, and other protection to be used.
 - e. The role of each employee in the safety monitoring system, when used.
 - f. The limitations on the use of mechanical equipment during the performance of roofing work on low-sloped roofs.
 - g. The correct procedures for the handling and storage of equipment and materials and the erection of overhead protection.
 - h. The role of employees in fall protection plans.
 - i. The standards contained in 29 Code of Federal Regulations (CFR) 1926 Subpart M or other applicable regulations/standards.
4. Prepare a written certification record that includes the name of the employee trained, the date(s) of training, and the signature of the person who conducted the training.
5. Provide re-training when one of the following situations occur:
 - a. Changes in the workplace render previous training obsolete.

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- b. Changes in the types of fall protection systems or equipment to be used render previous training obsolete.
- c. Inadequacies in affected employee's knowledge or use of fall protection systems or equipment indicate that the employee has not retained the requisite understanding or skill.

C. Guardrail Systems

- 1. Guardrail systems are used in Construction, Mining, and General Industry activities. The guardrail requirements apply in these settings at different heights: 6 feet (2 meters) in construction; and 4 feet (1.2 meters) in general industry:
 - a. Provide guardrail systems, when feasible, at all locations where a fall hazard exists. Where guardrail systems are impractical, an alternative form of fall protection must be provided, as outlined elsewhere in this Standard.
 - b. Require that guardrail systems meet the following criteria:
 - i. Install top rails 42 inches (1.1 meters) above the walking/working surface capable of withstanding, without failure, a minimum force of 200 pounds (91 kilograms) in any outward or downward direction with no more than 3 inches (7.6 centimeters) of deflection.
 - ii. Install midrails 21 inches (53 centimeters) above the walking/working surface capable of withstanding, without failure, a minimum force of 150 pounds (68 kilograms) in any outward or downward direction.
 - iii. Space posts not more than 8 feet (2.5 meters) apart on centers.
 - c. Require that there are no openings more than 19 inches (48 centimeters) wide in any guardrail system.
 - d. Do not use plastic or steel banding as top rail or midrail.
 - e. Provide top rails and midrails of at least one-quarter inch (6 millimeters) nominal thickness or diameter, and smoothly surfaced to prevent cuts and punctures.

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- f. Erect guardrails on all sides when using guardrail systems around holes.
- g. When guardrails are used around holes that are used for access, such as ladderways, provide a gate or offset the guardrail so that a person cannot walk directly into the hole.
- h. When guardrails are used at hoisting areas, place a chain, gate, or removable guardrail section across the access point when hoisting operations are not taking place.
- i. Provide guardrail systems at *all* locations above dangerous equipment, regardless of height above the danger.
- j. Provide guardrails at all wall openings where the outside bottom edge of the opening is 6 feet (2 meters) or more above lower levels, and the inside bottom edge of the wall opening is less than 39 inches (1 meter) above the walking/working surface.
- k. Erect guardrail systems on all unprotected sides or edges of ramps and runways when such systems are used.
- l. Where wire rope is used for construction of guardrail systems:
 - i. Ensure the wire rope used for construction of the guardrail system is a minimum of $\frac{1}{4}$ inch (0.6 centimeters) in diameter.
 - ii. Flag the toprail with high-visibility material every 6 feet (2 meters).
 - iii. Attach wire rope to existing structures, equipment, or other wire ropes using Crosby clips of the U-Bolt and saddle type. Examples of this can be found in SMS 041 – Rigging, and Supplemental Information C to SMS 041.
 - iv. Never clip two straight lengths of wire rope together. Instead, form an eye in each length and connect the eyes together.
 - v. Never use fewer than the number of clips recommended.

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- vi. Always use new clips; re-used clips will not develop the proper efficiency.
- vii. Use a thimble when creating an eye to prevent the rope from wearing the eye, and to provide a safer connection.
- viii. Check the tension of the rope an hour after installation. Retighten as necessary, and check for tightness at frequent intervals thereafter.

D. Personal Fall Arrest Systems (General Industry and Construction)

1. Provide and require the proper use of personal fall arrest systems on all unprotected elevations 6 feet (2 meters) or higher for Construction activities, and 4 feet (1.2 meters) or higher for General Industry applications. Where these systems are impractical, an alternative form of fall protection must be provided. Refer to Section I for additional information.
2. All aspects of personal fall protection systems must be designed, installed, and used under the supervision of a Competent Person.
3. Maintain a safety factor of at least 2 in all components of a personal fall protection system (i.e., the static strength of the system should be at least two times the maximum required arresting force).
4. *Safety belts (body belts) are prohibited as a means of fall protection, although they may have application as a positioning device.*
5. Use only full-body harnesses, shock-absorbing lanyards, lifelines, and anchorage points that meet the following criteria:
 - a. Body harness design and construction must meet the specifications set forth in 29 CFR 1926.500-.503 (or equivalent) and ANSI Z359.1.
 - b. All snaphooks must be of the locking type and must be able to withstand a force of 3,600 pounds (1,633 kilograms) in all directions of potential loading to the gate.
 - c. All hardware must be dropforged or pressed steel with a corrosion-resistant finish. Surfaces must be smooth and free of sharp edges. D-rings and snaphooks must have a minimum tensile strength of 5,000 pounds (2,270 kilograms).

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- d. Ropes and webbing used in lanyards, lifelines, and body harnesses must be made of synthetic fibers.
- e. The attachment point (D-ring) of a body harness should be located in the center of the wearer's back near shoulder level, or above the wearer's head. *Note that front-mounted D-rings are allowed if the personal fall arrest system is designed to restrict free fall distances to 2 feet (60 centimeters) or less and limit the maximum fall arrest loads to 900 pounds (410 kilograms) of force or less.*
- f. Horizontal lifelines must be designed, installed, and used under the supervision of a Competent Person, and be capable of supporting at least 5,000 pounds (2,270 kilograms) of force per employee attached.
- g. Lanyards and vertical lifelines must have a minimum breaking strength of 5,000 pounds (2,270 kilograms).
- h. Self-retracting lifelines and lanyards that limit free-fall to 2 feet (60 centimeters) or less must be capable of sustaining a minimum tensile load of 3,000 pounds (1,360 kilograms) in the fully extended position.
- i. Self-retracting lifelines and lanyards that do not limit free fall to 2 feet (60 centimeters) or less, ripstitch, and other shock-absorbing lanyards must be capable of sustaining a minimum tensile load of 5,000 pounds (2,270 kilograms) in the fully extended position.
- j. Protect lifelines against being cut or abraded.
- k. Anchorage points for personal fall protection systems must be independent of any anchorage point being used to support or suspend platforms and must have a static strength of at least 5,000 pounds (2,270 kilograms) per employee attached.
- l. Anchorage points for work positioning systems (systems designed to support a worker on a vertical system while working with hands free) and rescue systems must have a static strength of at least 3,000 pounds (1,365 kilograms).
- m. Anchorage points for worker restraint systems (systems designed to limit a worker's travel in such a manner that he/she cannot reach a fall hazard zone) must have a static

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strength of at least 1,000 pounds (455 kilograms). Worker restraint systems are only to be used on walking or working surfaces with a slope of less than 18.4°.

- n. Personal fall arrest systems, when stopping a fall, must:
 - i. Limit arresting force on an employee to 1,800 pounds (820 kilograms) when used with a body harness;
 - ii. Be rigged such that an employee can neither free fall more than 6 feet (1.8 meters) nor contact any lower level;
 - iii. Bring an employee to a complete stop and limit maximum acceleration distance an employee travels to 3.5 feet (1.1 meters); and
 - iv. Have sufficient strength to withstand twice the potential impact energy of an employee free-falling a distance of 6 feet (1.8 meters), or the free-fall distance permitted by the system, whichever is less.
- 6. Fall protection equipment and anchorages must be inspected at the beginning of each shift by an authorized person and at least once per year (or more frequently if required by manufacturer) by a competent person. The annual inspections must be documented and remain on file for the life of the equipment. Inspections may be documented using SMS 040-2 AMER or the manufacturer's inspection checklist.
- 7. Require employees to be familiar with the fitting and donning of body harnesses; proper tie-off techniques; and suitable anchorage points.
- 8. Where feasible, tie-off points should be above the employee's shoulders to limit potential fall length.
- 9. Never tie off to guardrail systems or hoists.
- 10. Require employees to remain tied off 100 percent of the time at or above 6 feet (2 meters) for Construction applications, or above 4 feet (1.2 meters) for General Industry applications, by means of horizontal lifelines, vertical lifelines, a double-lanyard system, or other suitable means.

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11. Remove from service any component of a personal fall protection system that has been subjected to impact loading, and do not use it again until it is inspected by a competent person, and determined to be undamaged and suitable for reuse.
12. Make provisions for the prompt rescue of personnel in the event of a fall, or require that employees are capable of self-rescuing team members. Prompt rescue means getting to the rescue subject within 6 minutes of the accidental fall. Methods of rescue will be addressed in the fall protection plan.
13. If an in-house rescue team is to be used, ensure team members are qualified, trained and equipped for the task. Develop action plans and instructions for the team, and provide them with the opportunity to simulate a rescue.
14. If an outside rescue team is to be used, ensure that a documented plan of approach is completed, and that written confirmation of the plan is provided by the rescue agency.
15. Provide separate vertical lifelines for each employee using a vertical lifeline. For lifeline use, 5/8-inch (16-millimeter) nylon rope is recommended.
16. Ensure each employee working from a swing scaffold, bosun's chair, or other suspended work platform is provided with a lifeline separate from the suspended work platform.
17. Protect lanyards and lifelines against cuts and abrasions. Where tools are used that have the potential to sever, abrade, or burn lanyards, lifelines, or safety straps, replace synthetic materials with wire rope or wire-cored manila rope of equal strength.
18. Use rope grabs to attach to vertical lifelines—never use knots.

E. Safety Net Systems (Construction Applications)

1. Provide safety net systems at locations where a fall hazard of 6 feet (2 meters) or greater exists, and other forms of fall protection are not feasible. Where safety net systems are impractical, an alternative form of fall protection as outlined elsewhere in this standard must be provided.
2. Require that safety net systems meet the criteria set forth in 29 CFR 1926.500 – 503.

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3. Install safety nets as close as possible under the walking/working surface on which employees are working, but never more than 30 feet (9 meters) below this level.
4. Require that the potential fall area from the walking/working surface to the net is unobstructed.
5. Install safety nets with enough clearance under them to prevent contact with the surface or structures below when subjected to an impact force equal to the drop test specified below.
6. Extend the outer edge of the net 8 feet (2.5 meters) from the edge of the working surface when the vertical distance from the working level to the net is 5 feet (1.5 meters) or less.
7. Extend the outer edge of the net 10 feet (3 meters) from the edge of the working surface when the vertical distance from the working level to the net is 5 to 10 feet (1.5 to 3 meters).
8. Extend the outer edge of the net 13 feet (4 meters) from the edge of the working surface when the vertical distance from the working level to the net is greater than 10 feet (3 meters).
9. Conduct a drop test of the safety net after installation and before being used as a fall protection system; whenever relocated; after major repair; and at 6-month intervals if left in one place.
10. Conduct the drop test by dropping a 400 pound (180 kilograms) sandbag, 30 inches (76 centimeters) in diameter, into the net from at least 42 inches (107 centimeters) above the highest walking/working level at which employees are exposed to a fall.
11. Inspect safety nets at least once a week (and after any occurrence that could affect the integrity of the system) for wear, damage, and deterioration. Remove defective nets and components from service.
12. Remove all materials, scrap, equipment, and tools that have fallen into the net as soon as possible, but at least before the next work shift.

F. Hole Covers

1. Provide covers in roadways and vehicle aisles that are capable of supporting at least twice the maximum axle load of the largest vehicle expected to cross over the cover.

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2. Provide walking/working surface hole covers that are capable of supporting at least twice the weight of employees, equipment, and materials that may be imposed on the cover at any one time.
 3. Secure covers at the time of installation to prevent displacement by the wind, equipment, or employees.
 4. Color code or mark all hole covers with the word "HOLE" or "COVER" to provide warning of the hazard.
- G. Safety Monitoring Systems, Warning Line Systems, and Controlled Access Zones
1. These control measures must be approved by the Competent Person prior to performing any roofing, overhand bricklaying, leading edge, or other elevated work that may require the use of one or more of these systems.
- H. Protection from Falling Objects (Construction Applications)
1. Install toe-boards along the edge of the overhead walking/working surface.
 2. Require that toe-boards are a minimum of 3½ inches (9 centimeters) in height; that they are capable of withstanding at least 50 pounds (22 kilograms) of force applied in any downward or outward direction; and that there is no more than a ¼-inch (6-millimeter) clearance between the toe-board and the walking/working surface.
 3. Install paneling or screening from the top of the toe-board to the top rail or mid-rail when tools, equipment, or materials are piled higher than the top of the toe-board.
 4. Provide sidewalk sheds or canopies as appropriate. For additional information, see SMS 011 – Demolition.
- I. Alternative Fall Protection Plans
1. When traditional fall protection systems (e.g., guardrails, harnesses) are impractical, a Safety Manager may authorize an Alternative method of Fall Protection. Typically, this is intended to include steep slope (>30 degrees from horizontal) work along graded roads, on the face of dams, on top of an aircraft on the flight line, and in other remote or inaccessible steep work areas. This may include rope access systems on vertical or nearly vertical

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surfaces. This does not include roofing applications, because appropriate equipment and regulatory guidance exists in those cases.

2. A Fall Protection Plan must be developed using Attachment 040-3 AMER – Fall Protection Plan Template. Fall Protection Plans must be approved by the appropriate the Site/Location/Project Manager and Safety Manager before work commences.
3. Fall Protection Plans involving administrative controls shall include an Alternative Fall Protection Permit (Attachment 040-4 AMER), ensuring that the Authorized Users have identified all hazards (including environmental conditions), are accompanied by a safety observer, and are properly trained. Alternative Fall Protection Permits must be approved by a Competent Person. Alternative Fall Protection Permits shall not be authorized if environmental factors pose an increased risk (e.g., inclement weather/rain).
4. The Fall Protection Plan, must address the following areas thoroughly:
 - a. Fall protection strategy and application.
 - b. Protective system and equipment, in detail.
 - c. Methods and procedures, including limitations of the system, and the required numbers of trained workers.
 - d. Alternative Fall Protection Permit (Attachment 040-5 AMER).
 - e. Explanation of why more effective fall protection controls are impractical. Cost and convenience are inadequate justifications.
 - f. Rescue capability and procedures.
 - g. Training required, in detail, for all workers.
 - h. Responsibilities of key personnel, including the supervisor.
 - i. Controlled access zones.
 - j. The use of motor vehicles as an anchoring point is prohibited.

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- k. The use of three-points of contact. Authorized users must be accompanied by a safety observer.

5. Documentation Summary

Place in the Project Safety Files:

- A. Qualified Person Qualifications (if used)
- B. Competent Person Qualifications
- C. Authorized User/Employee Training Records
- D. Fall Protection Plan
- E. Alternative Fall Protection Permits

6. Resources

- A. U.S. Occupational Safety and Health Administration (OSHA) Standard 29 CFR 1926, Subpart M – [Fall Protection](#)
- B. U.S. OSHA Technical Links – [Fall Protection](#)
- C. U.S. Mine Safety and Health Administration, 30 CFR 56.15000
- D. U.K. – [Construction \(Health, Safety and Welfare\) Regulations 1996](#)
- E. ANSI Z359 2012– Fall Protection Code
- F. [ANSI A10.11-1989](#) – Safety Nets Used During Construction, Repair, and Demolition Operations
- G. [ANSI 1264.1-1995](#) – Safety Requirements for Workplace Floor and Wall Openings, Stairs and Railing Systems
- H. [SMS 011](#) – Demolition
- I. [SMS 041](#) - Rigging
- J. [Attachment 040-1 AMER](#) – Fall Protection Checklist
- K. [Attachment 040-2 AMER](#) – Fall Protection PPE Checklist
- L. [Attachment 040-3 AMER](#) – Fall Protection Plan Template
- M. [Attachment 040-4 AMER](#) – Alternative Fall Protection Work Permit

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Rigging

1. Applicability

This standard applies to URS Corporation and its subsidiary companies involved in the use of rigging and lifting. For purposes of this standard, the term "rigging" applies to all devices that are used in the lifting of objects. This includes, but is not limited to, wire rope and synthetic slings, rigging hardware, chain hoists, come-a-longs (manually lever operated hoists), below-the-hook lifting devices, lever chain, electric hoist, hooks, spreader and lifting beams, and blocks.

2. Purpose and Scope

The purpose of this standard is to ensure the safe use and proper maintenance of rigging.

3. Implementation

Implementation of this standard is the responsibility of the URS Manager directing activities of the facility, site, or project location.

4. Requirements

A. General

1. Allow only qualified employees to perform rigging tasks.
2. Know the safe working capacity of all rigging and equipment. Do not exceed the safe working capacity.
3. Know the load weight, including the weight of the rigging.
4. Inspect all rigging before each use and as necessary during use; immediately remove any defective rigging from service.
5. When not in use, remove all rigging from the immediate work area so it does not present a hazard to employees.
6. Rigging must be compatible with the environments where it is to be used (e.g., nylon slings are not to be used around torch cutting).
7. Use extreme caution to avoid shock loading, especially when temperatures are below freezing. Rigging that has been subjected to shock loading must be removed from service until it has been properly inspected by a qualified person.

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8. Always maintain safe working distances from energized power lines and equipment, as defined in SMS 034 – Utility Clearances and Isolation.
9. Keep the load line plumb to maintain a stable load.
10. Use tag lines on all loads whenever feasible.
11. Use chocks, blocks, or other means to prevent movement of materials when unhooking a load.
12. Do not give signals to the crane operator, unless it is an emergency stop, or you are the designated signalman.
13. Keep your hands off suspended loads whenever possible.
14. Do not stand or pass under a suspended load.
15. Never ride the load, sling, or headache ball.
16. Verify that the straps, shackles, and the beam or overhead structure to which a come-a-long is secured is of adequate strength to support the weight of the load, plus gear. The upper hook must be secured to prevent it from coming free of its support.
17. The supporting structure and the connection point must have a load rating at least equal to that of the hoist.
18. Do not use scaffolding as a point of attachment for come-a-longs unless the scaffolding is specifically designate for that purpose.
19. Keep all portions of the human body from the area between the rigging and the load, and from between the rigging and the crane hook or hoist hook.
20. Never stand in line with or next to the leg(s) of a sling that is under tension.
21. Do not use synthetic rope or metal mesh slings as bridles on suspended personnel platforms.

B. Rigging Practices

1. Do not use slings that appear to be damaged unless they are inspected and accepted as usable by a qualified person.

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2. Do not exceed the rated load of the sling.
3. Shorten or adjust slings only by methods approved by the sling manufacturer.
4. Do not shorten or lengthen slings by knotting or twisting.
5. Hitch slings in a manner providing control of the load.
6. Protect slings in contact with edges, corners, or protrusions with a material of sufficient strength, thickness, and construction to prevent damage to the sling.
7. Do not rest loads on the sling.
8. Do not pull slings from under a load when the load is resting on the sling.
9. Avoid twisting and kinking.
10. Be alert for possible snagging during lifting—with or without load.
11. Balance the load to prevent slippage in a basket hitch.
12. Rig the load to prevent the sling from slipping or sliding along the load, when using multiple basket or choker hitches.
13. Keep loads under control when using a basket hitch by ensuring the legs of the sling contain or support the load from the sides, above the center of gravity.
14. Do not drag slings on the floor or over an abrasive surface.
15. Make sure that the choke point in a choker hitch is only on the sling body, not on a splice or fitting.
16. Do not use an angle of choke less than 120 degrees in a choker hitch without reducing the rated load, as specified in American Society of Mechanical Engineers (ASME) B30.9-1.5.5.
17. Balance the load in a choker hitch to prevent edge overload.
18. Do not constrict, bunch, or pinch slings by the load, hook, or any fitting.

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19. Center the load applied to the hook in the base (bowl) of the hook to prevent tip loading on the hook, unless the hook is designed for tip loading.
20. Do not use any object in the eye of a sling wider than one-third the length of the eye.
21. Do not allow sling and load to rotate when hand-tucked slings are used in a single-leg vertical-lift application. Take care to minimize sling rotation.

C. Chain Hoist and Come-a-Longs (manually lever operated hoists)

1. Confirm the capacity of the chain hoist or come-a-long is clearly marked on the housing or handle of the equipment. Also ensure that this capacity is not exceeded.
2. Mark the control actuator on come-a-longs to indicate the direction of the resultant motion.
3. Inspect chain hoists before each use to ensure that they are safe. Inspect the lift chain, pinion, sheaves, and hooks for distortion and wear.
4. Inspect come-a-longs before each use to ensure that they are safe. Inspect the ratchet, pawl, chain, and hooks for distortion and wear.
5. Confirm that the straps, shackles, and the beam or overhead structure to which a hoist is secured are of adequate strength to support the weight of the load plus gear. The upper hook must be secured to prevent it from coming free of its support.
6. Confirm that the supporting structure and the connection point has a load rating at least equal to that of the hoist.
7. Confirm that the synthetic straps and slings have proper softening devices in place when used against sharp edges.
8. Do not use any hoist that has defects or is in need of adjustment or repair, until repaired.
9. Do not use scaffolding as a point of attachment for lifting devices such as tackle, chain falls, and come-a-longs, unless the scaffolding is specifically designed for that purpose.

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10. Testing guidelines are as follows:

- a. Operational Tests – Test all altered or repaired hoists, or hoists that have not been in use within the preceding 12 months, before being placed in service by, or under the direction of, a competent person to ensure compliance with this standard, including the following:
 - i. Check all functions of the hoist with the hoist suspended in the unloaded state, or nominally loaded, as necessary.
 - ii. After the above test, apply a load of at least 50 pounds—times the number of load-supporting parts of chain—to the hoist in order to check proper load control.
- b. Load Test – Statically or dynamically load-test a hoist in which load-suspension parts have been altered, replaced, or repaired as follows:
 - i. A qualified person shall determine the need to load-test the hoist.
 - ii. Prepare a written report of the test and place it on file.
 - iii. The test load shall not be less than 100% of the rated load of the hoist, or more than 125% of the same, unless otherwise recommended by the manufacturer or a qualified person.
 - iv. The replacement of load chain is excluded from this load test; however, make an operational test of the hoist in accordance with this standard prior to placing the hoist back in service.
 - v. A qualified person will approve test anchorages or suspensions for testing.

11. Inspection of Hoists

- a. A competent person will inspect all new, altered, or modified hoists prior to initial use.
- b. Do not use a hoist with a defect or in need of adjustment or repair until the hoist has been repaired.
- c. Daily, or before use if the hoist is not used daily, inspect the hoist to ensure there is no obvious damage to the hoist, load

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line, or hooks. Inspections must include operating mechanism, upper-limit device (if powered hoists), hoist braking system, hooks and latches, load line or chain, and load line reeving.

- d. Visual inspections (determined by service application) must be performed and documented by a competent person. All operating parts of the hoist must be inspected for wear, loose fasteners, corrosion, cracks, or distortion. ASME B30.16 must be reviewed to ensure compliance.
- e. The inspector must use a checklist to ensure all components are inspected. A checklist similar to ASME B30.16, Table 1 for chain hoist, and ASME B30.21, Table 1 for come-a-longs, will be used.
- f. Maintain records of annual inspections. Maintain a record log or similar, such as external color coding/markings.
- g. Repairs or alterations to hoists will be made by the manufacturer's representative or manufacturer's trained personnel only. After all repairs or alterations are completed, test the hoist per ASME B30.16-2.2 Testing.

In situations where URS is required to use client-provided rigging, repairs or alterations will be made in accordance with manufacturer's recommendations.

12. Maintenance

- a. Conduct preventive maintenance per the manufacturer's recommendations.
- b. Use replacement parts at least equal to the original manufacturer's specifications.
- c. Use a competent person to perform adjustments, repairs, and replacement of parts as per ASME B30.16.
- d. Do not make repairs by welding or reshaping the hoists or components.
- e. Keep chains and wire rope load lines lubricated, per the owner's manual.

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13. Operations

- a. The operation of a hoist is to be performed by a trained individual only. For powered hoists, the operators must be trained in all operating controls, warnings, limitations, capacity, and operation instructions found in the owner's manual.
- b. Do not allow the operator to adjust or repair a hoist unless qualified to perform the maintenance on the hoist.
- c. Allow only one qualified signal person to give signals to the operator. Only an emergency stop signal will be accepted from anyone.
- d. Operate hand hoists with hand power only, and only by one person.
- e. Do not operate hoists with an extension (cheater bar) on the lever.
- f. Do not load the hoist beyond its capacity.
- g. Do not wrap the hoist chain or wire rope around the load. Attach the load using a sling or suitable attachment point.
- h. Use proper rigging and rigging techniques to attach the load.
- i. The operator must ensure that the load line is not kinked or twisted before applying the load.
- j. Do not allow the hoist or body frame to bear against any object or the supporting structure.
- k. Do not lift or move the load over personnel.
- l. The operator must not release the hoist lever until the ratchet and pawl are engaged and the lever is at rest.
- m. The operator must not engage in any activity that will divert the operator's attention while operating a hoist.
- n. The load shall be balanced under the hoist.

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- o. The operator must not leave a suspended load unattended unless specific precautions have been instituted and are in place.

D. Below-the-Hook Lifting Devices

1. This Section only pertains to lifting beams (spreader beams), balance pallet lifters, balancing “C” hook, and plate clamps. Refer to ASME B30.20-2006 for all other below-the-hook lifting devices.
2. The rated load and all required information for lifting devices must be legible, and on the lifting devices.
3. Provide all devices with individual, legible-rated loads and required information, if multiple lifting devices are assembled for use.
4. All below-the-hook lifting devices must be in accordance with ASME BTH-1 design criteria.
5. Identification
 - a. Mark all structural and mechanical lifting devices with, but not limited to, the following:
 - i. The manufacturer’s name and address
 - ii. Serial number
 - iii. Weight of device (if over 100 pounds)
 - iv. Rated load.
 - b. Mark repaired or Modified Lifting Devices with, but not limited to, the following:
 - i. Name and address of the person/company that repaired or modified the device
 - ii. Person/company unit identification marking
 - iii. Lift weight (if altered).
6. Inspections
 - a. Designate a qualified person to conduct an initial inspection prior to initial use to verify compliance with ASME B30.20.

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- b. Every lift – Confirm that the operator performs a visual inspection prior to and during each lift.
- c. Document frequent visual inspection.
 - i. Normal service: Monthly
 - ii. Heavy service: Weekly to monthly
 - iii. Severe service: Daily to weekly
 - iv. Special or infrequent service: As recommended by a qualified person before use, and after each use as directed by a qualified person.
- d. Periodic visual inspection
 - i. Inspection conducted by a qualified person making records of external condition for continued evaluation.
 - ii. An external code mark on the device is an acceptable identification in lieu of records.

E. Wire Rope Slings

- 1. All wire rope slings must meet the requirements specified in ASME B30.9-2010 or most current, as well as any other project-specific regulations.
- 2. The sling manufacturer is required to provide initial identification tag. Request that identification tags be installed on both ends of the sling when an order is placed with the sling manufacturer.
- 3. Wire rope sling identification tags must include:
 - a. Name or trademark of the manufacturer.
 - b. Rated load for type(s) of hitch(es), and the angle upon which it is based.
 - c. Diameter or size.
 - d. Number of legs, if more than one.
 - e. Serial number (may request from sling manufacturer, but not required).

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4. Wire rope slings must have a design factor of no less than 5:1.
5. Wire rope slings must be manufactured from new/unused regular lay cable. Do not use rotation resistant wire rope.
6. Wire rope slings may have either a fiber core, strand core, or independent wire rope core.
7. Do not use wire rope slings for overhead hoisting that have hand-tucked eyes, eyes that are created with cable clamps, or eyes that are created with molly hogans.
8. Wire rope slings do not have to be proof-loaded unless required by the project specifications. If proof-loading is required, it must be done in compliance with ASME B30.9-2.6.2 - Proof Loading Requirements.
9. When required by project site specifications, proof-loading certificates must be provided with the delivery of all new wire rope slings. The certificate must include some form of identification of the wire rope sling and the load in pounds that was used in the proof load.
10. Do not use wire rope slings that do not comply with the requirements of ASME B30.9-2010 unless approved for use by a qualified person.
11. Store wire rope slings in a dry environment where they will not be exposed to mechanical damage, corrosive action, extreme temperatures, or extreme heat. Extreme heat would include—but not be limited to—welding and burning operations, electrical currents, or other heat sources.
12. Keep wire rope slings lubricated, in accordance with the sling manufacturer's recommendations.
13. Minimize the exposure to dust that may cause internal wear when storing wire rope slings.
14. Inspections
 - a. Provide all wire rope slings with legible identification tags that meet the requirements in Item 3, above.

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- b. If one of the two identification tags is not present, a decision must be made by a competent person to install the replacement tag, or continue to use the sling with the remaining tag in place. [Note: This only applies to sites using dual tag sling marking procedures.]
- c. Perform inspections of wire rope slings before each use. The inspection must be performed by a competent person designated by the employer. Written records are not required for frequent inspections.
- d. Periodic inspection intervals shall not exceed one year. If a wire rope sling is used in an environment that may cause damage or excessive wear, the periodic inspection interval must be no more than weekly, or as working conditions prevail, as deemed appropriate by a competent person. Written records are required for periodic inspections. The written records must include sling identification number. Documentation will be recorded on Attachment 041-2 NA (Wire Rope and Hook Inspection). Refer to ASME B30.9-2.9.3(b), 2010.

15. Removal Criteria

- a. Remove wire rope slings from service if any of the Inspection Requirements are not met.
- b. Remove wire rope slings from service if any of the individual strand wires have corrosion pits, or if there are any signs the core, end fittings, or mechanical sling eye fittings have indications of hidden corrosion.
- c. Remove wire rope slings from service if the core is exposed.
- d. If any broken wires are found on a wire rope sling, reference ASME B30.9-2010; paragraph 9-2.9.4 for removal guidelines.
- e. Repair a sling under certain conditions, as stated in ASME B30.9-2010.
- f. Treat individual wires that are broken, crushed, bent, and kinked as broken wires, as far as removal is concerned. Reference ASME B30.9-2010 9-2.9.4 for removal criteria. Use a magnifying glass for the inspection.

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- g. Remove any wire rope slings that have crushed areas in the body. Flattened areas at the ends of the eyes are acceptable, as long as none of the individual wires have the types of damage that are stated in Item 6 in this Section.
- h. Request the on-site rigging inspector to qualify wire rope slings with areas that may be questionably classified as “bends and kinks.”
- i. Remove wire rope slings from service if the end fittings or mechanical eye fittings show signs of internal corrosion, or are bent, gouged, crushed, or show any other signs of wear or damage.
- j. Remove wire rope slings from service if there is any cause to question the sling’s integrity or ability to work at its rated capacity.

F. Rigging Hardware

- 1. Hardware includes shackles, links, rings, swivels, turnbuckles, eyebolts, hoist rings, wire rope clips, wedge sockets, rigging blocks, and load-indicating devices.
- 2. Stand clear of all rigging when it is under tension.
- 3. Store rigging in areas safe from damage, corrosive environment, or extreme heat.
- 4. The terms “rate load” and “working load limit” are commonly used to describe hardware loads.
- 5. Do not exceed the manufacturer’s recommended safe working loads.
- 6. Do not use rigging or rigging hardware that has been or appears to have been modified in any manner.
- 7. All rigging hardware must have the following markings by the manufacturer cast or stamped onto them, or otherwise attached to them.
 - a. Name or trademark of the manufacturer
 - b. Rated load

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- c. Size.
- 8. Rigging hardware design factors may differ on some items from a 5:1 factor. Refer to ASME B30.20-2010 for individual hardware safety design factors.
- 9. Inspection
 - a. Initial inspection must be completed by a competent person prior to use. Documentation of the inspection is not required.
 - b. Frequent Inspection: Performed by the user or a competent person, this is a visual inspection to be completed daily prior to use, and more frequently if required by use. Documentation of the inspection is not required.
 - c. Periodic inspections must be completed by a competent person; the time for these inspections must not exceed 1 year. The inspection must include the items listed below for removal from service.
 - d. Rigging hardware must be taken out of service when damage such as the following is visible:
 - i. Missing or illegible manufacturer's name or trademark and/or rated load identification.
 - ii. Indications of heat damage, including weld spat or arc strikes.
 - iii. Excessive pitting or corrosion.
 - iv. Bent, twisted, distorted, stretched, elongated, cracked, or broken load-bearing components.
 - v. Excessive nicks or gouges.
 - vi. A 10% reduction in the catalog dimension at any point around the body or pins.
 - vii. Incomplete pin engagement.
 - viii. Excessive thread damage.

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- ix. Evidence of any unauthorized welding.
- x. Unauthorized replacement components.
- xi. Insufficient number of wire rope clips (if applicable).
- xii. Improperly tightened wire rope clips.
- xiii. Indications of damaged wire rope.
- xiv. Indications of wire rope slippage.
- xv. Other conditions, including visible damage, that cause doubt as to their continued use.

10. Shackles

- a. Do not use round-pin shackles with cotter-pin retention for hoisting unless they have an inline load.
- b. The screw pin must fully engaged and tight, and the shoulder is in contact with the shackle body.
- c. Loads applied to shackles must be centered in the bow.
- d. When shackles are used in a choker hitch, the pin must be in the choking eye of the sling.

11. Adjustable Hardware (turnbuckles, eyebolts, eye nuts, and swivel hoist rings)

- a. Turnbuckles, eyebolts, and eye nuts must have the manufacturer's name/trademark, size, or rated load, and grade for alloy eyebolts clearly labeled.
- b. Swivel rings must have the manufacturer's name/trademark, rated load, and torque value clearly labeled.
- c. Adjustable hardware identification must be provided by the manufacturer.
- d. Eyebolts & Eye Nuts
 - i. Use non-shouldered eyebolts for in-line loads only.

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- ii. Confirm that shouldered eyebolts are flush and securely tightened, and rated loads reduced for angle of load induced.
- iii. Confirm that eyebolts are aligned with the direction of pull. Steel washers may be used to position the alignment to angle of load induced.
- iv. Confirm that eye nuts have full tread engagement and are secured against rotation under loading.
- v. Use eye nuts for in-line loads only.

12. Compression Hardware (wire rope clips and wedge sockets)

a. Wire Rope Clips

- i. Consult the rope clip manufacturers, or qualified person, before installing clips on plastic or impregnated wire rope.
- ii. Place the saddle on the live end and the U-bolt on the dead end when ending terminations.
- iii. Use the minimum number and spacing of clips as per the manufacturer or qualified person recommendations.
- iv. Tighten clips to the proper torque as recommended by the manufacturer or qualified person.
- v. Load the assembly to at least the expected working load both before and after putting it into service. Once the load is removed from the assembly, retighten clips to the proper torque, as recommended by the manufacturer or qualified person.
- vi. Do not use wire rope clips to form eyes in slings for hoisting.

b. Wedged Sockets

- i. Assemble sockets as recommended by the manufacturer. Live end of the connection must be in line with sockets pin.

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- ii. Match the socket and wedge assembly for the rope size being installed.
 - iii. Do not interchange wedges between the manufacturers, sockets, or models.
 - iv. Secure the dead end tail extending beyond the wedge, as recommended by the manufacturer.
 - v. Do not secure dead end of the rope to the live end of the wire rope (unless a double saddle clip of the proper size is used).
 - vi. Apply a load to fully seat the wedge before use after assembly of the wedge socket is complete.
- c. Links, Rings, and Swivels (including oblong, round, and pear-shaped links and rings, eye-and-eye, and eye-and-jaw types used for positioning)
- i. Confirm the link or ring is the correct size and shape for proper seating in a hook, lifting device, or rigging hardware.
 - ii. Confirm that multiple slings or rigging gathered in a link or ring do not exceed a 120-degree included angle.
 - iii. Confirm the horizontal angles are not used less than 30 degrees for links and rings.
 - iv. Forged swivels are positioning hardware, and should not rotate under loading. Confirm that swivels only have "in-line" loads applied to them.
- d. Rigging Blocks (including tackle, utility, rolling, and snatch blocks)
- i. Load fittings on blocks may include hooks, eyes, swivels, yokes, bails, shackles, and pins.
 - ii. These blocks must have markings displaying manufacturer, rated load, and rope size(s).

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- iii. The minimum allowable D/d between the sheave pitch diameter and wire rope diameter is 6.
 - iv. For hooks attached to blocks, removal criteria are specified in ASME B30.10-1.2.3(a).
 - v. Applied to a rigging block need to be in line with the sheave(s) and load fittings to prevent side loading.
- e. Detachable Load-Indicating Devices (including crane scales, dynamometers, and shackles with load-indicating pins)
- i. Mark load-indicating devices (LIDs) by the manufacturer to show the manufacturer's name, rated load, serial number, and model number.
 - ii. Prior to use, confirm all new, altered, modified, or repaired LIDs are calibrated to within +/-2% of the LID's maximum rated load; this should be done by the manufacturer or a qualified person.
 - iii. Maintain a written record of the most recent calibration.
 - iv. Perform a periodic calibration at an interval specified by the manufacturer or a qualified person.
 - v. Confirm the load applied to the LID is on its centerline and in tension.
 - vi. Multiple slings should not be applied to the pin of a shackle with a load-indicating pin.
 - vii. Do not side load the LID.

G. Metal Slings

1. Alloy Steel-Chain Slings

a. Slings Identification

- i. Mark each sling to show:
 - a) Grade

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- b) Nominal chain size
 - c) Number of legs
 - d) Rated loads for the vertical hitch and bridle hitch and the angle
 - e) Length (reach)
 - f) Individual sling identification.
 - g) Manufacturer name or trademark
- b. Inspections
- i. Initial Inspection – Prior to use, all new, altered, modified, or repaired slings must be inspected by a competent person to verify compliance with the applicable provisions of this Section.
 - ii. Frequent Inspection – A visual inspection for damage must be performed by the user or the competent person each day or shift, before use.
 - iii. Periodic Inspection – A complete inspection for damage of the sling must be periodically performed by a competent person. Examine each link and component individually, taking care to expose and examine all surfaces, including the inner-link surfaces.
 - iv. Maintain a written record of the most recent periodic inspection, including the condition of the sling. Documentation will be recorded on Attachment 041-1 NA (Sling and Choker Inspection).
 - v. Periodic inspection intervals must not exceed 1 year. Base the frequency of periodic inspections on:
 - a) Frequency of sling use
 - b) Severity of service conditions
 - c) Nature of lifts being made

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- d) Experience gained on the service life of slings used in similar circumstances.

Guidelines for the time intervals for the periodic inspections are:

- a) Normal service – Yearly
- b) Severe service – Monthly or quarterly
- c) Special service – As recommended by the competent person.

c. Removal Criteria

- i. Remove an alloy steel chain sling from service if conditions such as the following are present:
 - a) Missing or illegible sling identification.
 - b) Cracks or breaks.
 - c) Excessive wear, nicks, or gouges. Reduction in the thickness of the chain links, as listed in Table 6 of ASME B30.9.
 - d) Stretched chain links or components.
 - e) Bent, twisted, or deformed chain links or components.
 - f) Evidence of heat damage.
 - g) Excessive pitting or corrosion.
 - h) Lack of ability of chain or components to hinge (articulate) freely.
 - i) Weld splatter.
 - j) Other conditions, including visible damage, that cause doubt as to the continued use of the sling.

d. Repair

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- i. Slings shall be repaired only by the sling manufacturer.

In situations where URS is required to use client-provided rigging, repairs will be made in accordance with manufacturer's recommendations.

2. Metal Mesh Slings

a. Slings Identification

- i. Each sling must be marked to show:
 - a) Name or trademark of the manufacturer.
 - b) Rated loads for the type(s) of hitch(es) used and the angle upon which the rating is based.
 - c) Width and gauge.
 - d) Serial number

b. Inspections

- i. Initial Inspection – Prior to use, all new, altered, modified, or repaired slings must be inspected by a competent person to verify compliance with the applicable provisions of this Section. Documentation of the inspection is not required.
- ii. Frequent Inspection – A visual inspection for damage must be performed by the user or the competent person each day or shift, before use. Conditions such as those listed in this Section or any other condition that may result in a hazard will cause the sling to be removed from service. Slings will not be returned to service until approved by a qualified person. Documentation of the inspection is not required.
- iii. Periodic Inspection – A complete inspection for damage to the sling must be periodically performed by a designated person. Inspection must be conducted on the entire length, including splices, end attachments, and fittings. The sling must be examined for conditions such as those listed ASME

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B.30.9-3.9.4, and a determination made as to whether they constitute a hazard.

- iv. Maintain a written record of the most recent periodic inspection, including the condition of the sling. Documentation will be recorded on Attachment 041-1 NA (Sling and Choker Inspection).
- v. Periodic inspection intervals must not exceed 1 year. Base the frequency of periodic inspections on:
 - a) Frequency of sling use
 - b) Severity of service conditions
 - c) Nature of lifts being made
 - d) Experience gained on the service life of slings used in similar circumstances.

Guidelines for the time intervals for the periodic inspections are:

- a) Normal service – Yearly
 - b) Severe service – Monthly or quarterly
 - c) Special service – As recommended by the competent person.
- c. Removal Criteria
- i. Remove a wire mesh sling from service if conditions such as the following are present:
 - a) Missing or illegible sling identification.
 - b) Broken weld or a broken brazed joint along the sling edge.
 - c) Broken wire in any part of the mesh.
 - d) Reduction in wire diameter of 25% due to abrasion, or 15% due to corrosion.
 - e) Lack of flexibility due to distortion of the mesh.

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- f) Distortion of the choker fitting so the depth of the slot is increased by more than 10%.
- g) Distortion of either end fitting so the width of the eye opening is decreased by more than 10%.
- h) A 15% reduction of the original cross-section area of any point around the hook opening of the end fitting.
- i) Visible distortion of either end fitting out of its plane.
- j) Cracked end fitting.
- k) Slings in which the spirals are locked or without free articulation must not be used.
- l) Fittings that are pitted, corroded, cracked, bent, twisted, gouged, or broken.
- m) Other conditions, including visible damage, that cause doubt as to the continued use of the sling.

d. Repair

- i. Slings shall be repaired only by the sling manufacturer.

In situations where URS is required to use client-provided rigging, repairs will be made in accordance with manufacturer's recommendations.

- ii. Metal mesh and fittings used for sling repair shall comply with the provisions of this Section.
- iii. Do not repair cracked, broken, bent, or damaged metal mesh or components; they must be replaced.
- iv. All repairs shall comply with the proof requirements of this Section.

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- v. Modifications or alterations to the sling or components must be considered as repairs, and must conform to all other provisions of this Section.
- e. Other
 - i. When components of a sling have lower rated load capacities than the metal mesh the slings are attached to, the sling shall be identified with a rated load capacity consistent with the lowest load capacity of its components.
 - ii. Do not subject metal mesh slings to a reduction in rated load if used in temperatures below -20 degrees Fahrenheit [°F] (-20° Celsius [C]), and above 550°F (288°C).
 - iii. Use all slings covered by this Section that are elastomer-coated only in a temperature range from 0°F (-18°C) to 200°F (93°C). For operation at temperatures outside these ranges or for other coatings, consult the sling manufacturer for specific data.

H. Synthetic Rope, Round, & Webbing Slings

1. Sling Identification

- a. All slings shall show the following:
 - i. Name or trademark of the manufacturer.
 - ii. The manufacturer's code or stock number.
 - iii. Rated loads for the type(s) of hitch(es) used and the angle upon which the rate is based.
 - iv. Type of fiber or synthetic material.
- b. Sling identification must be done by the sling manufacturer.
- c. Sling identification must be maintained by the user so as to be legible during the life of the sling.

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- d. Replacement of the sling identification must be considered a repair. Additional proof of testing is not required.

2. Inspections

- a. Initial Inspection – Prior to use, a competent person must inspect all new, altered, modified, or repairs slings.
- b. Frequent Inspection – Each day or shift, before use, a visual inspection for damage must be performed by the user or the competent person. Conditions such as those listed in the removal criteria below, or any other condition that may result in a hazard, will cause the sling to be removed from service. Do not return slings to service until approved by the manufacturer. Documentation of the inspection is not required.
- c. Periodic Inspection – A complete inspection for damage to the sling must be periodically performed by a designated person. Inspection must be conducted on the entire length, including splices, end attachments, and fittings. Examine the sling for conditions such as those listed in this Section, and make a determination as to whether they constitute a hazard.
- d. Maintain a written record of the most recent periodic inspection, including the condition of the sling. Record documentation on Attachment 041-1 NA (Monthly Sling and Choker Inspection).
- e. Periodic inspection intervals must not exceed 1 year. The frequency of periodic inspections should be based on:
 - i. Frequency of sling use.
 - ii. Severity of service conditions.
 - iii. Nature of lifts being made.
 - iv. Experience gained on the service life of slings used in similar circumstances.
- f. Guidelines for the time intervals of periodic inspections are:
 - i. Normal service – Yearly.

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- ii. Severe service – Monthly or quarterly.
- iii. Special service – As recommended by the qualified person.

3. Removal Criteria

- a. Remove synthetic rope slings from service if conditions such as the following are present:
 - i. Missing or illegible sling identification.
 - ii. Cuts, gouges, or areas of extensive fiber breakage along the length, and abraded areas on the rope.
 - iii. Damage that is estimated to have reduced the effective diameter of the rope by more than 10%.
 - iv. Uniform fiber breakage along the major part of the length of the rope in the sling, such that the entire rope appears covered with fuzz or whiskers.
 - v. Inside the rope, fiber breakage, fused or melted fiber (observed by prying or twisting to open the strands) involving damage estimated at 10% of the fiber in any strand, or the rope as a whole.
 - vi. Discoloration, brittle fibers, and hard or stiff areas that may indicate chemical damage, ultraviolet damage, or heat damage.
 - vii. Dirt and grit in the interior of the rope structure that is deemed excessive.
 - viii. Foreign matter that has permeated the rope and makes it difficult to handle, and may attract and hold grit.
 - ix. Kinks or distortion in the rope structure, particularly if caused by forcibly pulling on loops (known as hackles).
 - x. Melted, hard, or charred areas that affect more than 10% of the diameter of the rope, or affect several

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adjacent strands along the length that affect more than 10% of strand diameters.

- xi. Poor condition of thimbles or other components manifested by corrosion, cracks, distortion, sharp edges, or localized wear.
- xii. Acid or caustic burns.
- xiii. Evidence of heat damage.
- xiv. Broken or damaged core yarns.
- xv. Weld splatter that exposes core yarns.
- xvi. Other visible damage that causes doubt as to the strength of the sling.

4. Repair

- a. Slings shall be repaired only by the sling manufacturer.

In situations where URS is required to use client-provided rigging, repairs will be made in accordance with manufacturer's recommendations.

5. Other

- a. Refer to ASME B30.9-2010 for vertical, choker, and basket hitches. For angles other than those shown in these tables, use the rated load for the next-lower angle, or qualified personal will calculate the rated load.
- b. When components of the sling have a lower-rated load than the synthetic rope with which it is being used, the sling will be identified with a rated load consistent with the lowest load rating of any of the components.
- c. Polyester and nylon rope slings will not be used in contact with objects or at temperatures in excess of 194°F (90°C), or at temperatures below -40°F (-40°C).
- d. Do not use polypropylene slings in contact with objects or at temperatures in excess of 140°F (60°C), or below -40°F (-40°C).

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- e. Some synthetic yarns do not retain their published breaking strength during long-term exposure above 140°F (60°C). The rope sling manufacturer should be consulted for the effects of long-term heat exposure.
- f. Certain chemically *active* environments may weaken or destroy synthetic rope slings. In general, acids may affect nylon, and strong alkalis may affect polyester, both are aggravated by elevated temperatures. In general, polypropylene may be affected by volatile petroleum and other solvents, and most hydrocarbons at elevated temperatures.
- g. The presence of rust in wet nylon ropes has been found to be potentially harmful. Consult the sling manufacturer before using slings in a chemically active environment.
- h. Ropes made of polypropylene will be made of fibers that have been produced with an appropriate ultraviolet inhibitor. Slings made of nylon rope should be made of fibers that have been produced with an appropriate ultraviolet inhibitor. Nylon, and particularly polypropylene ropes subjected to long-term exposure to sunlight, should be subjected to an appropriate retirement criteria; consult the sling manufacturer or a qualified person.
- i. Slings should be stored in an area where they will not be subjected to mechanical, chemical, or ultraviolet damage, or extreme temperatures.
- j. When used at or in contact with extreme temperatures, the guidance provided in this Section must be followed.
- k. Do not store nylon ropes in areas where they may become impregnated with rust.
- l. Thoroughly rinse slings exposed to salt water with fresh water to prevent mechanical damage from salt crystals when the rope dries.

I. Training

- 1. Personnel shall be trained in the selection of rigging, inspection, cautions to personnel, effects of the environment, and rigging practices.

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5. Documentation Summary

The following documents will be maintained in the project profile:

- A. Manufacturer's Sling Certifications
- B. Rigger's Training Certificates
- C. Inspection Records
- D. Training Documentation

6. Resources

- A. U.S. Occupational Safety and Health Administration (OSHA) Standard – [Rigging Equipment for Material Handling](#) – 29 Code of Federal Regulations (CFR) 1926.251
- B. American Society of Mechanical Engineers (ASME) B30.9 – Slings
- C. ASME B30.10 – Hooks
- D. ASME B30.16 – Overhead Hoists (Underhung)
- E. ASME B30-20 – Below-the-Hook Lifting Devices
- F. ASME B30-21 – Manually Lever Operated Hoists
- G. [Bob's Rigging & Crane Handbook](#)
- H. [SMS 034](#) – Utility Clearances and Isolation
- I. [Attachment 041-1 NA](#) – Sling and Choker Inspection
- J. [Attachment 041-2 NA](#) – Wire Rope and Hook Inspection

7. Supplemental Information

- A. [Safety Factors](#)
- B. [Good and Bad Rigging Practices](#)
- C. [Good and Bad Rigging Practices – Applications and Efficiencies of Rope Connections](#)
- D. [Common Defect Characteristics and Inspection Items](#)



Cable Size	Approx. Breaking Strength	Factor of Safety & Allowable Load							Weight Lbs/Ft
		7	6	5	4.5	4	3.5	3	
1/2"	-21,200	3,300	3,600	4,300	4,700	5,350	6,050	7,150	.46
	+26,700	3,700	4,450	5,530	5,900	6,700	7,600	8,900	
5/8"	-3,320	4,800	5,550	6,700	7,300	8,350	9,400	11,150	.72
	+41,200	5,900	6,900	8,300	9,100	10,400	11,700	13,900	
3/4"	-47,300	6,700	7,750	9,400	10,500	11,750	13,500	15,700	1.04
	+58,900	8,450	9,850	11,800	13,000	14,800	16,800	19,700	
7/8"	-64,300	9,150	10,650	12,800	14,200	16,000	18,300	21,200	1.42
	+79,600	11,300	13,150	15,800	17,600	19,700	22,700	25,650	
1"	-83,300	11,900	13,950	16,700	18,500	20,900	23,800	27,900	1.85
	+103,300	14,700	17,150	20,300	22,900	25,400	29,500	34,200	
1-1/8"	-105,100	15,000	17,500	21,000	23,300	28,100	30,000	35,000	2.34
	+130,000	18,600	21,300	26,000	28,800	32,300	37,100	43,200	
1-1/4"	-129,100	18,400	21,250	25,900	28,600	32,200	36,800	43,000	2.80
	+168,900	24,100	28,100	33,900	37,500	42,200	48,200	56,200	
1-3/8"	-155,200	22,100	25,900	31,000	34,400	38,900	44,300	51,600	3.50
	+192,000	27,200	32,000	38,200	42,600	48,000	54,800	64,000	
1-1/2"	-184,000	26,200	30,700	36,900	40,800	46,100	52,500	61,200	4.16
	+228,000	32,500	3,800	45,500	50,600	57,000	65,100	76,000	

-6 x 19 I.W.R.C improve plow steel hoisting cable (upper line) 1/2" through 1" diameter.

+6 x 19 I.W.R.C. extra improved plow steel hoisting cable (lower line) 1/2" through 1" diameter.

-6 x 37 I.W.R.C improve plow steel hoisting cable (upper line) 1-1/8" through 1-1/2" diameter.

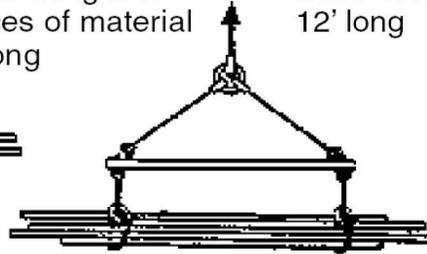
+6 x 37 I.W.R.C. extra improved plow steel hoisting cable (lower line) 1-1/8" through 1-1/2" diameter.

The above chart is primarily intended to determine safe loads for hoist load lines and guy lines. If used for slings, the values must be reduced by the loss for the type of end fitting.

Wrong —
Load over
12' long

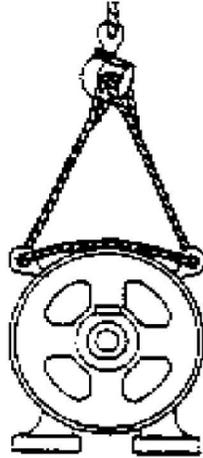


Double slings shall be
used when lifting 2 or
more pieces of material
over 12' long

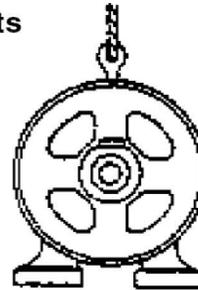


Right —
Load over
12' long

Bad Practice —
Lifting on eye
bolts from an
angle reduces
side loads as
much as 90%



Eye Bolts



Good Practice —
Vertical lift on
eye bolt

**Suspending Needle Beams
or Scaffolds**

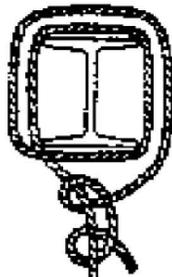
Bad Practice —
Beam can
cut rope



Good Practice —
Sharp corners
padded

**Hoisting
Structural Steel**

Bad Practice —
Sharp bend
flanges can
cut rope



Good Practice —
Use spacer blocks
and pad corners

Bad —
 Because of
 cutting action
 of eye splice
 on a running
 line.



Good —
 No cutting
 action on
 running line.

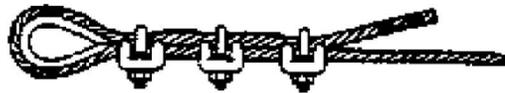
Eye Splices

Bad Practice —
 Wire rope done with
 clip. Efficiency 50%
 or less.



Bad Practice —
 Thimble should be
 used to increase
 strength of the eye
 and reduce wear on
 rope.

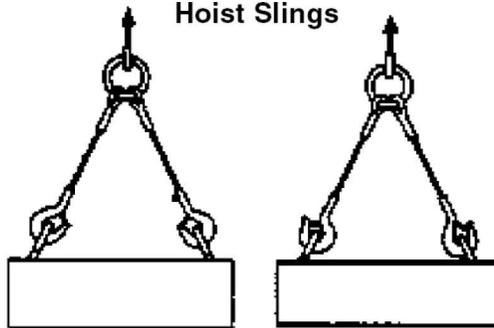
Good Practice —
 Note use of thimble in
 eye splice.



Good Practice —
 Use of thimble in
 eye splice.

Hoist Slings

Bad Practice —
 Hook openings
 are turned in.



Good Practice —
 Hooks are
 turned out.

See "Handbook for Riggers, 1989 pp 115 - 121 for other examples.

Application of Wire Rope Clips Crosby Type



1. CORRECT METHOD — U-Bolts of clips on short end of rope
(No distortion on live end of rope.)

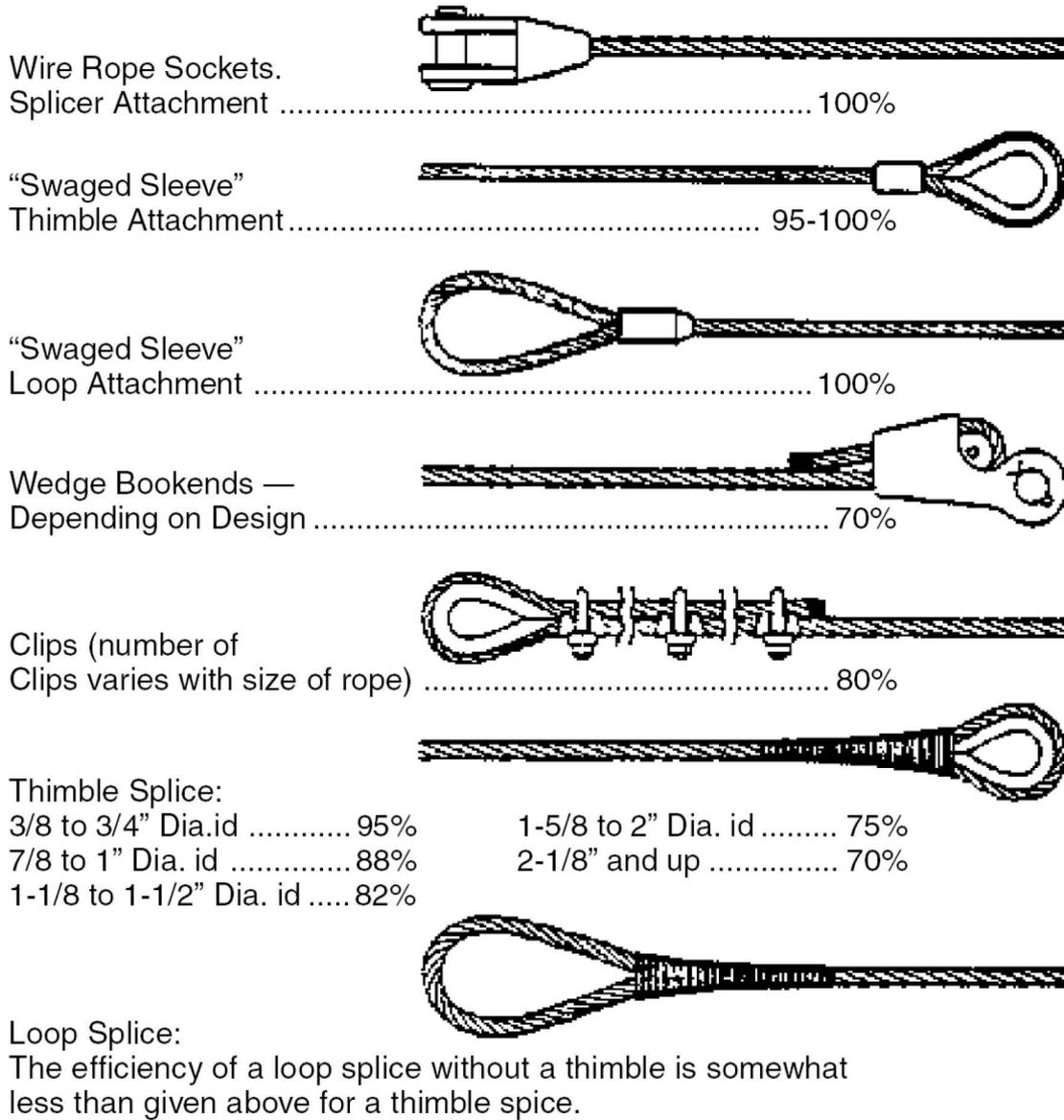


2. WRONG METHOD — U-Bolts on live end of rope.
(This will cause mashed spots on live end of rope.)



3. WRONG METHOD — Staggered clips: two correct, one wrong. (This will cause a mashed spot in live end of rope due to wrong position of center clip.)

**Efficiency of Wire Rope Connections
 As Compared to Safe Loads on Wire Rope**



Reference: page 61, “Handbook for Riggers, 1989.

Approximate Efficiency of Polypropylene Rope Knots and Connections as Compared to Safe Load on Rope

Clove Hitch	Bowline (inside)	Bowline (outside)
Strength — 75%	Strength — 50%	Strength — 53%
Square or Scarf Knot	Timber Hitch or Half Hitch	Sheepshank
Strength — 43%	Strength — 72%	Strength — 50%
Short Splice	Long Splice	Eye Splice
Strength — 80%	Strength — 70%	Strength — 85%

A. Frequent Inspection Defect Characteristics

1. Alloy Steel Chain Slings
 - a. Wear, nicks, cracks, breaks, gouges, stretch bands, weld splatter, discoloration from excessive temperature and evidence of opening of the hook throat.
 - b. Free movement between chain links and attachments.
 - c. Free movement and proper seating of hook latches.
2. Wire Rope Slings
 - a. Distortion of rope such as kinking, crushing, unstranding, bird caging, main strand displacement or core protrusion.
 - b. Loss of rope diameter in short rope lengths or unevenness of outer strands.
 - c. General corrosion.
 - d. Broken or cut strands.
 - e. Number, distribution and type of broken wires.
3. Natural and Synthetic Fiber Rope Slings
 - a. Cuts, gouges and abrasions.
 - b. Worn fibers or yarns.
 - c. Filament or fiber breakage.
 - d. Particles of debris or broken fibers between strands.
 - e. Evidence of chemical agents and/or sunlight damage (discoloration, harshness, brittleness, etc.)
 - f. Kinks or knots.
 - g. Evidence of heat damage (melting or charring).
 - h. Damaged fittings and/or attachments.
4. Synthetic Webbing Slings
 - a. Acid or caustic burns.
 - b. Evidence of heat damage (melting or charring).
 - c. Holes, tears, cuts or snags.
 - d. Abrasive wear.
 - e. Knots.
 - f. Damaged fittings and/or attachments.

B. Periodic Inspection Defect Characteristics

1. Alloy Chain Slings
 - a. Worn links will not exceed the following values as stated below (in inches) or the manufacturer specifications.

<u>Nominal Chain or Coupling Link Size</u>	<u>Maximum Wear (Diameter)</u>
9/32	3/32
3/8	5/64
1/2	7/64
5/8	9/64
3/4	5/32
7/8	11/64
1	3/16
1 1/4	1/4

- b. Sharp transverse nicks and grinding and the sling used at its rated capacity, providing the depth of the grind does not exceed the above values, can round out gouges.

2. Wire Rope Slings

- a. The following conditions should be sufficient to remove the sling from service:
- For strand laid and single part slings, ten randomly distributed broken wires in one rope lay, or five broken wires in one strand in one rope lay.
 - Severe localized abrasion or scraping.
 - Kinking, crushing, bird caging or any other damage.
 - Evidence of heat damage.
 - Cracked, deformed or worn end attachments.
 - Corrosion of the rope or end attachments.
- b. Criteria for cable laid and braided slings:

Sling Body	Allowable Broken Wires Per Lay or One Braid	Allowable Broken Strands Per Sling Length
Less than 8 part braid	20	1
Cable laid	20	1
8 part or more	40	1

3. Natural and Synthetic Fiber Rope Slings

Conditions such as the following should be sufficient reason to remove the sling from service:

- Cuts, gouges and badly abraded spots.
- Serious worn surface fibers or yarns.
- Considerable filament or fiber breakage along the line where adjacent strands meet.
- Particles of broken filament or fibers inside the rope between the strands (inspect inside the rope).
- Discoloration or harshness that may mean chemical damage or excessive exposure to sunlight. Inspect filaments or fibers for weakness or brittleness.

- Kinks or brittleness.
- Melting or charring on any part of the sling.
- Excessive pitting or corrosion or cracked, distorted or broken fittings.
- Other visible damage that causes doubt as to the strength of the sling.

4. Synthetic Webbing Slings

Conditions such as the following should be sufficient reason to remove the sling from service:

- Acid or caustic burns.
- Melting or charring of any part of the sling.
- Holes, tears, cuts or snags.
- Broken or worn stitching in load bearing splices.
- Excessive abrasive wear.
- Knots in any part of the sling.
- Excessive pitting or corrosion; or cracked, distorted or broken fittings.
- Other visible damage that causes doubt as to the strength of the sling. For example, **colored threads exposed**.

C. Hook Inspections

Hooks having any of the following deficiencies are to be removed from service unless a qualified person approves their continued use and initiates corrective action:

- Wear exceeding 10%, or as recommended by the manufacturer of the original sectional dimension.
- A bend or twist exceeding 10 degrees from the plane of the unbent hook.
- An increase in throat opening exceeding 15% or as recommended by the manufacturer.
- If a latch that is provided becomes inoperative because of wear or deformation, and is required for the service involved, it will be replaced or repaired before the hook is put back into service. If the latch fails to fully close the throat opening, the hook will be removed from service or moused until repairs are made.

If hooks are coated, visual inspection should take this coating into consideration. Surface variations can disclose evidence of heavy or severe service to require more detailed analysis. In such instances, the surface condition may then call for stripping the coating or nondestructive testing.



SLING AND CHOKER INSPECTION

Sling Choker Chain- Lifting Beam Number	WIRE ROPE	No. of Damaged Wires	Burn Marks	Corrosion	Fittings Damaged	Bird Caging	SYNTHETIC	No. of "Red" Threads Showing	Burn or Chemical Mark	Label Readable	Fittings Damaged	Heat Damage	CHAIN	Corrosion	Links Worn or Cracked	Label Readable	Heat Damage	LIFTING BEAM	Certified	Modifications w/o Mfg. Approval	Load Capacity Visible	INSPECTION RESULTS	PASS	FAIL-destroy sling/choker
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Block Codes
X=Yes; ✓=No; NA = Not Applicable

