APPENDIX C1

EXAMPLE HEALTH AND SAFETY PLAN

HEMPSTEAD INTERSECTION STREET FORMER MANUFACTURED GAS PLANT SITE VILLAGES OF GARDEN CITY AND HEMPSTEAD, LONG ISLAND, NEW YORK

Prepared for:

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Brooklyn, New York 11201

Prepared by:

URS Corporation
257 West Genesee Street
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Buffalo, New York 14203

January 2015

TABLE OF CONTENTS

Page

TABLES

FIGURES

ATTACHMENTS

GLOSSARY OF TERMS, ACRONYMS AND ABBREVIATIONS

^{o}C	degrees Centigrade
^{o}F	degrees Fahrenheit
ACGIH	American Conference of Governmental Industrial Hygienists
analyzer	field instrument described in Section 6.1
atm	atmosphere
BZ	breathing zone
C	ceiling
Carcinogen	a substance that can cause cancer
cc	cubic centimeter
CGI	combustible gas indicator
CIH	Certified Industrial Hygienist
CNS	central nervous system
CSP	Certified Safety Professional
CRZ	contamination reduction zone
DERA	Designated Emergency Response Authority
DOT	Department of Transportation
ESLI	End-of-Service-Life Indicator
eV	electron volts
EZ	Exclusion Zone
FID	flame ionization detector
HEPA	high-efficiency particulate arresting
HSM	Health and Safety Manager
HASP	Health and Safety Plan
HSE	Health, Safety and Environment
kg	kilogram
LEL	lower explosive limit
Lpm	liters per minute
m	meter
mg	milligram
mg/M^3	milligrams per cubic meter
MGP	Manufactured Gas Plant

ml	milliliter
mm	millimeter
SDS	Safety Data Sheet
ND	not detected
NIOSH	National Institute for Occupational Safety and Health
O_2	oxygen
OEL	occupational exposure limit
OSHA	Occupational Safety and Health Administration
OVA	organic vapor analyzer
OVM	organic vapor monitor
PEL	permissible exposure limit
PID	photoionization detector
PM	project manager
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
REL	recommended exposure limit
RSO	Radiation Safety Officer
SH&E	Safety, Health and Environment
SSO	Site Safety Officer
SSR	Subcontractor's Safety Representative
STEL	short term exposure limit
TLV®	Threshold Limit Value
TWA	time-weighted average
UEL	upper explosive limit
VOC	volatile organic compound

1.0 PLAN-AT-A-GLANCE

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

Project Name:	National Grid Hempstead Former MGP Site
Project Number:	TBD
Project Location:	Villages of Garden City & Hempstead, New York
Client:	National Grid Corporation Hicksville, New York
AECOM Operating Unit:	Buffalo, New York
AECOM Project Manager:	Jon Sundquist (Buffalo)
AECOM Site Safety Officer:	Megan Dascoli
AECOM Health and Safety Manager:	Peter Gregory
Effective Dates:	June 9, 2016 to June 8, 2017

Use of the HASP after December 30, 2015 to perform activities described herein or other activities in addition to those described herein, is not permitted. The expiration date may be extended by the HSR by preparation of an addendum to the HASP approved by the AECOM Project Manager and HSR after a review of the applicability of the HASP and approved addend, if any, to the actual facility

APPROVALS

Mike Akerbergs, Deputy PM (Clifton)
For Jon Sundquist — 6/10/16
Date

Peter Gregory, CSP, Area SH&E Manager — 6/10/16
Date

Emergency Rescue Services*

To contact FIRE/RESCUE, AMBULANCE, and POLICE ……**Call 911**

*For cellular phones, be prepared to give the operator your name and location address.

Hospital	**First Aid Medical Services Facility**
Mercy Medical Center - Rockville	Hempstead Main – Medical Center (Urgent Care ONLY)
1000 North Village Avenue	2 Main Street
Rockville Centre, NY 11571 - 9024	Hempstead, NY 11550
Phone: (516) 705-2525	Phone: (516) 489-6600

Government

US EPA National Response Center (800) 424-8802

Poison Control Center **In Long Island dial 211 or (800) 222-1222**

Sharon McLelland
NY State Dept of Health, (518) 402-7880
Bureau of Environmental Exposure Investigation

Amen Omorogbe, P.E.
NY State Dept of Environmental Conservation (518) 402-9662
Division of Environmental Remediation

Nassau County Dept of Health (516) 227-9697

National Grid

Patrick Van Rossem (516) 545-2578

AECOM Corporation

Project Manager: Mike Akerbergs (973) 883-8695 (office)
(973) 634-8700 (cell)

Site Safety Officer: Megan Dascoli (212) 896-0428 (office)
(908) 623-0145 (cell)

Area Safety, Health and Environment Manager: Peter Gregory	(973) 883-8683 (office) (201) 602-3511 (cell)
AECOM Occupational Nurse Hotline: WorkCare	(877) 878- 9525
AECOM Incident Reporting Hotline	(800) 348-5046

CONSTITUENTS OF CONCERN

1. Polyaromatic Hydrocarbons (PAHs)
2. Volatile Organic Compounds (VOCS) (e.g., benzene, toluene, ethylbenzene and Xylenes [BTEX])
3. Heavy Metals (e.g., As, Pb, Hg, Se)
4. Polychlorinated Biphenyls (PCBs)

Safety data sheets (SDS) or Safety Cards are provided for the Constituents of Concern in Attachment 1.

SCOPE OF WORK, HAZARD ANALYSIS & PERSONAL PROTECTIVE EQUIPMENT

Task	Minimum Protective Clothing/Equipment Requirements	Chemical Hazards	Heat/Cold Stress	Noise	Slip/Trip/ Fall	Lifting Hazards	Mechanical Hazards	Electrical Hazards	Explosion	Water
Task 1: Mobilization of equipment, site reconnaissance, preparation of work areas, establish work zones and utility clearance; Set Up,	Steel-toed boots, safety glasses, hard hat, reflective vests, work gloves. This is to be worn for ALL tasks.	Low	Low	Low	Med	Low	Low	Low	N/A	N/A
Task 2 Monitoring wells: liquid level measurements, purging and sampling	Task 1 PPE, Tyvek (poly-coated when working with saturated materials), nitrile gloves when handling potentially contaminated materials, nitrile gloves for handling all samples.	Med	Med	Low	High	Med	Med	Low	Low	Low
Task 3 Recovery wells: NAPL pumping		High	Med	Low	High	Med	Med	Low	Low	Low
Task 4 Operations and maintenance; management of purged water, NAPL and contaminated equipment		High	Med	Low	High	Med	Med	Low	Low	N/A
Potential task: Oversight of installation of additional monitoring/recovery wells	Task 1 PPE, Tyvek (poly-coated when working with saturated materials),hearing protection nitrile gloves when handling potentially contaminated	high	Med	High	High	Med	Med	Low	Low	Low

	materials, nitrile gloves for handling all samples.									

High - Exposure likely more than 50 percent (%) of the time
Med - Exposure likely 10 to 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 is provided in Section 5.0.

The HASP Preparer has conducted a Hazard Assessment for this project based on information provided by the Project Manager in accordance with 29 CFR 1910.132(d).

For more information on Personal Protective Equipment (PPE) and respiratory protection requirements, see the Action Levels table (Page 4) and Section 7.0.

ENGINEERING CONTROLS TO BE USED (as applicable)

- Barricades for delineation of work areas (exclusion zones)
- Water spray for dust suppression
- Natural wind forces to reduce exposure to airborne contaminants (stay upwind of drilling activities)
- Light-colored PPE to reduce solar load for heat stress control

For more information, see Section 5.0.

INSTRUMENTATION TO BE USED

x Combustible Gas/O_2 Indicator
x TSI DustTrak aerosol monitor with PM-10 impactor & internal sampling pump
x MultiRAE PLUS PGM-50 Monitor (10.6 eV lamp) with PID, %LEL
x Drager Kit (benzene) or Drager CMS (or equivalent)

For more information, see Section 6.0

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 4) and in Section 6.1.1

x **Is not anticipated**

For more information on monitoring, see Section 6.0.

HAZ-COM MATERIALS INVENTORY

TSP or Alconox (decontamination)
Citrisolve (decontamination) or similar terpene-based product
Isobutylene (calibration gas) CH_4/air
(calibration gas)
Nitric/Hydrochloric Acid (sample preservative)
Fuel (equipment fuel – diesel or gasoline)

EXCLUSION ZONE AIR QUALITY MONITORING PROGRAM

Constituent Monitored	Monitoring Instrument	Instrument Reading [3]	Program Response
Total Volatile Organic Compounds [1]	Multi-RAE Plus PGM-50 with PID sensor	< 1 ppm	Continue work in Level D PPG
		≥ 1 ppm <5	Take detector tube for benzene - if reading is ≤ 0.5 ppm, continue work in Level D PPE - if reading is > 0.5 ppm, upgrade to Level C PPE (notify RMHSE)
		≥ 5 ppm <50	Upgrade to Level C PPE (notify RMHSE)
		> 50 ppm	Cease work. If feasible, take immediate actions to suppress emissions. Notify AECOM Project Manager and AECOM RMHSE ASAP.
Combustible Gases	Multi-RAE Plus PGM-50 with LEL sensor	< 10% LEL	Continue work
		≥ 10% LEL	Cease work. If feasible, take immediate actions to suppress emissions. Notify AECOM Project Manager and AECOM RMHSE ASAP.

NOTES:

[1] Measurements indicated are relative to background levels. Thus, a reading "response level" of 5 parts per million (ppm) as listed in this table is actually 7 ppm if the background level is measured as being 2 ppm immediately upwind of the work area.

[2] All instrument readings contained in this table are "one-minute averages."

[3] With the exception of combustible gas measurements, all instrument readings are to be taken in breathing zone of the potentially most exposed worker. Lower Explosive Limit (LEL) instrument readings are to be taken at the nearest possible ignition point located downwind of the source of emissions.

[4] Instrument readings are to be made initially at 10 minute intervals. After 30 minutes, (i.e., after four readings), based on the discretion of the SSO, the intervals between readings may be extended to a maximum of 30 minutes. If work tasks or conditions change, frequency should be adjusted by the Site Safety Officer (SSO) accordingly. For example, if photoionization detector (PID) measurements require upgrade to Level C PPE and the level of emissions cannot be reduced below 5 ppm by engineering controls, workers shall don Level C PPE and instrument readings made at 10-minute intervals.

[5] All monitoring equipment must be calibrated daily; these calibrations must be documented in a field notebook. Monitoring instrument readings and colorimetric tube data shall be recorded in a field log book. If these action levels are exceeded, then all site workers shall secure potential emission sources, suspend work in the immediate area of the source and evacuate the work area in an upwind direction immediately. The Site Safety Officer (SSO) and Site Manager should be notified as soon as possible. Air monitoring should be conducted periodically to determine when work can be continued. Do not resume work until air quality monitoring levels are continuously below the action level for at least 15 minutes. The SSO or Site Manager should notify the AECOM Project Manager and Project Health and Safety Manager (HSM) as soon as practical. Site workers shall take mitigative measures to suppress emissions as appropriate. If air quality monitoring levels do not recede to below the action level, a measure to eliminate or substantially reduce the emissions should be determined and discussed (prior to implementation) with the AECOM Project Manager and/or Project RHSEM.

HEALTH AND SAFETY EQUIPMENT LIST

Required	Not Required	
x		AECOM SH&E Procedures (relevant to project - see next page)
	x	Occupational Safety and Health Administration (OSHA) "Safety on the Job" Posters
x		Hardhats
x		Safety glasses
x		Ear plugs or muffs – during drilling
	x	Personal Floatation Device (PFD) – while working on boat or platform in "deep" water areas
x		Reflective safety vest (required when working around heavy equip. i.e. drill rigs)
(x)		Tyvek® coveralls
(x)		Polycoated Tyvek® Q-23 coveralls
x		Steel-toed boots
(x)		Chemical-resistant steel-toed boots or chemical-resistant boot covers
x		Work gloves (as needed)
x		Nitrile outer gloves
x		Nitrile inner gloves
x		Plastic sheeting (as needed to reduce contamination)
	x	55-gallon 17-H drums (for contaminated solids)
	x	55-gallon 17-E drums (for liquids)
	x	Drum liners
(x)		Barricade tape and barricades
x		Wash tubs and scrub brushes
x		Decontamination solution (i.e., TSP)
	x	Folding chairs
	x	portable eyewash
(x)		Respirator sanitizing equipment
x		First aid kit
x		Infection control kit
x		Drinking water
x		Gatorade or similar drink
x		Type ABC fire extinguishers (contractor supplied)
(x)		Half-face respirators approved by National Institute for Occupational Safety and Health (NIOSH)
(x)		Full-face respirators (NIOSH-approved)
(x)		Respirator cartridges (combination organic/P100)
x		PID w/10.6 eV lamp and calibration kit
x		Combustible gas indicator (CGI) and calibration kit
x		Garden sprayers (for use in decontamination)
	x	Compressed gas horn (small pocket-size)
x		Duct tape
x		Paper towels and hand soap
x		Spill sorbent
x		Plastic garbage bags

(x) use dictated by Site conditions

AECOM SH&E PROCEDURES REFERENCED BY THIS HASP

SH&E Procedures	HASP SECTION
S3NA-115-PR Hazardous Materials Communication	5.1.2
S3NA-125-PR Corrosive & Reactive Materials	1.0
S3NA-305-PR Hand & Power Tools	5.2
S3NA-117-PR Hazardous Waste Operations	5.0
S3NA-113-PR Heat Stress	5.2.1
S3NA-118-PR Hearing Conservation	5.2.3
S3NA-208-PR Personal Protective Equipment	5.0
S3NA-013-PR Housekeeping	10.1
S3NA-306-PR Highway & Road Work	5.2
S3NA-322-PR Overhead Lines	5.2.6
S3NA-123-PR Respiratory Protection	8.0
S3NA-213-PR Subcontractor Management	4.5
S3NA-313-PR Wildlife, Plants & Insects	5.3
S3NA-004-PR Incident Reporting, Notification & Investigation	5.2/12.6
S3NA-111-PR Bloodborne Pathogens	5.3
S3NA-321-PR Drilling, Boring & Direct Push Probing	5.2.8
S3NA-005-PR Driving	5.0
S3NA-317-PR Hand Safety	
S3NA-014-PR Manual Lifting	5.2.5
S3NA-007-PR Behavior-Based Safety	6.0

These SH&E Procedures are available on the AECOM Health, Safety, and Environment Ecosystem Web Site. Copies of these Procedures are also provided in Attachment 2.

Copies of the Procedures referenced by this HASP are to be maintained on Site. Project Managers (PMs) are responsible to see that other Procedures relevant to field activities, but not directly referenced by this HASP, also are available on Site.

2.0 FACILITY BACKGROUND/WORK PLAN

The Hempstead Intersection Street Former Manufactured Gas Plant (MGP) Site (the "Site") is located in the Villages of Hempstead and Garden City, Nassau County, New York. The majority of the approximately 7.5-acre Site is located within the Village of Garden City. The Site is bordered to the north by Second Street and along the east by an inactive railroad right-of-way. Property to the west of the Site is owned by the Village of Garden City and contains a public parking lot, two public water supply wells and a recharge basin for those two wells. Residences and commercial businesses surround the Site (see Figure 1, Location Map).

An active gas regulator station is located on the western portion of the Site. A 0.8-acre parcel in the southern section of the Site is located in the Village of Hempstead and is currently used to store vehicles. This parcel was previously leased and subsequently sold by the Long Island Lighting Company (LILCO), a KeySpan/National Grid predecessor company, in the early 1980s to an automobile dealer who is the current property owner. This parcel is commonly referred to as the "Sold Property." A second automobile dealership leases property in the northeastern corner of the Site. Oswego Oil Service Corporation, an active fuel oil storage and loading facility, is located off-site immediately southeast of the Site.

The area planned for eventual remediation is defined as the National Grid Former MGP Property, the Sold Property and the areas outside the property boundary that contain soil source material; the Medical Building Parking Lot to the south of the National Grid MGP Property constitutes the majority of latter area.

The Site and surrounding area are generally flat, sloping gently to the west and southwest. A perimeter fence secures the Site. Site access is primarily through the Sold Property from Intersection Street. The northern two-thirds of the Site, as well as the eastern portion, is unpaved ground covered with either vegetation or crushed stone. The southern third of the Site is paved with asphalt. Limited grass, shrubs and trees serve as a buffer extending across the northern portion of the Site along Second Street.

The National Grid Former MGP Site is zoned industrial with the exception of the Sold Property which is zoned Business "C" (which includes warehouse storage, light manufacturing, and car dealer's vehicle storage and repair). Properties immediately to the north of the Site across Second Street are zoned for multi-family residential apartment housing. Properties immediately to the east are zoned as General Commercial. The property to the west is designated parkland. Property to the south is zoned Business "C."

2.1 Site History

MGP operations began in the early 1900s and ceased in the early 1950s. The above ground MGP structures were subsequently demolished by LILCO.

In 1998, LILCO merged with Brooklyn Union Gas forming KeySpan Corporation. Following this merger, all but the previously sold automobile dealer property became KeySpan property.

The majority of MGP structures were located on the portion of the Site referred to as the Sold Property which is currently used by a private party for vehicle storage. Located in this Sold Property area were a 340,000-cubic foot (cf) capacity storage holder, a 250,000-cf capacity relief holder and a 140,000-gallon (gal) capacity gas oil tank. Located in the southeastern corner of the Site was the former gas generator house. Other structures located in this portion of the Site included an effluent water treatment facility, tar separators, skimming basins, and various tar and tar emulsion storage and settling tanks. A series of gas purifying structures including oxide purifier boxes, tar extractors and an electric precipitator house straddled the northern boundary of the Sold Property.

A coal storage area was located in the northeastern portion of the Site. Tar and oil storage tanks were located in the southern portion of the coal storage area, adjacent to the LIRR right-of-way. A large tar separator and an associated cesspool were located in the south-central portion of the Site.

A series of cooling spray ponds were located in the north-central portion of the Site. Immediately east of the former spray ponds were four 30,000-gal capacity liquid propane tanks. The concrete foundations for the propane tanks currently exist at the Site. Three drip oil tanks with capacities of 12,000, 7,300 and 9,500 gal and a paint house were located near the western property line.

Interim Remedial Measures

Previous environmental investigations identified several areas of the Site that have been impacted by past MGP operations. These areas will be addressed through a site-wide remedial program. However, some areas have warranted interim remedial measures (IRM).

A "cut and plug" IRM was undertaken at the Site during the winter of 1999. The objective of that IRM was to locate underground piping associated with historic MGP operations so that each pipe could be cut, drained of any fluids and plugged in order to limit the potential for any off-site migration of MGP-related constituents. That IRM was completed during the summer of 2000.

Several areas of the Site were identified that contain elevated levels of contamination which warrant removal prior to implementation of a site-wide remedial plan. Consequently, an IRM was performed in 2008 – 2009 that included the following activities:

- MGP delineation activities that included hollow stem auger (HSA) drilling, installation of wells and direct-push soil sampling;
- groundwater sampling from off-site monitoring wells;
- non-aqueous phase liquid (NAPL) recovery (from on-site and off-site wells) and disposal;
- and, excavation of MGP-impacted materials in the north/central portion of the Site (see Figure 2, Proposed Additional Pre-Remediation Borings).

2.2 Planned Field Activities

Field activities at the site will comprise collection of groundwater samples from existing groundwater monitoring wells and recovery of NAPL from one NAPL recovery well. This includes the following activities:

- Interface liquid level measurements in monitoring wells;
- Purging and sampling of groundwater monitoring wells;
- Pumping NAPL from recovery wells using a Water pump or equivalent; and,
- Management of purge water, NAPL and used disposable equipment.

2.3 Potential Future Field Activities

Future Field activities may include:

- New monitoring well installations (HASP includes this task);
- Oversight of landscaping activities;
- Oversight of general construction activities;

3.0 APPLICABILITY

The purpose of this HASP is to assign responsibilities, establish personal protection standards and mandatory safety procedures, and provide for contingencies that may arise while the proposed investigation activities are being conducted at the Site. This HASP complies with, but does not replace, Federal Health and Safety Regulations as set forth in OSHA Regulation 29 Code of Federal Regulations (CFR) Parts 1910 and 1926, and applicable State and local rules, regulations and guidance. This HASP is to be used by AECOM personnel and AECOM subcontractors as a supplement to these rules, regulations and guidance. This HASP is to be augmented by the AECOM SH&E Program and Management System; relevant standards from that program and system are required to be available on-site during all activities.

The provisions of this HASP are mandatory for all on-site AECOM employees and AECOM subcontractors involved in hazardous material management activities associated with this project.

Changing and/or unanticipated site conditions may require modification of this HASP to maintain a safe and healthful work environment. Any proposed changes to this HASP must be reviewed by the RMHSE prior to their implementation. Under no circumstances will modifications to this HASP conflict with Federal, State or local health and safety rules, regulations or guidance.

AECOM will provide a copy of this HASP to each of its subcontractors to fulfill its obligation under OSHA Regulation 29 CFR Part 1910.120(b) to inform subcontractors of site hazards. In turn, each subcontractor will provide documentation to AECOM that describes their plan for addressing applicable health and safety requirements for activities that are unique to their scope of services (e.g., drilling activities).

4.0 RESPONSIBILITIES

AECOM will have site safety and health oversight and coordination responsibilities for AECOM personnel; each subcontractor will be held accountable for the safe and healthful performance of work by its employees, subcontractors or support personnel who may enter the Site.

AECOM will adhere strictly to the provisions of this HASP, along with applicable regulations issued by governmental entities.

4.1 AECOM Project Manager, Mike Akerbergs

Responsibilities

- assure that projects are performed in a manner consistent with the AECOM health and safety program;
- assure that the project HASPs are prepared, approved and properly implemented;
- implement HASPs;
- assure that adequate funds are allocated to fully implement project health and safety; and,
- coordinate with the HSR on health and safety matters.
- Act as primary point of contact with National Grid for site related activities and coordination with non-project related site operations.

Authority

- assign HSR-approved SSO to project and, if necessary, assign a suitably qualified replacement;
- suspend activities if health and safety of personnel are endangered, pending an evaluation by the HSM; and,
- suspend an individual from activities for infractions of the HASP, pending an evaluation by the HSR.
- Participate in incident investigations

OPERATING UNIT HEALTH AND SAFETY REPRESENTATIVE: TBD

Responsibilities

- administer the health and safety program within the Operating Unit;
- maintain a working understanding of key government health and safety regulations and AECOM health and safety policies;
- interface with Project Managers in matters of health and safety;
- report to RHSM on health and safety matters;
- develop or review, approve or disapprove project HASPs prior to submittal to the RHSM for review;
- conduct staff training and orientation on health and safety related activities;
- appoint or approve SSOs;
- monitor compliance with HASPs and conduct facility audits;
- assist Project Managers in obtaining required health and safety equipment;

- approve personnel to work on hazardous waste management projects with regard to medical examinations, and health and safety training; and,
- answer employee questions and concerns regarding health and safety.

Authority

- suspend work or otherwise limit exposures to personnel if health and safety risks are unacceptable;
- direct personnel to change work practices if existing practices are deemed to be hazardous to health and safety of personnel; and,
- remove personnel from projects, if their actions or conditions endanger their health and safety or the health and safety of co-workers.

4.2 AECOM Site Safety Officer, Megan Dascoli

The SSO is responsible for the following activities:

- direct health and safety activities on-facility;
- report immediately all safety-related incidents or accidents to the HSR and Project Manager and National Grid;
- verify that AECOM and Contractor personnel working on-facility have met current training and medical clearance requirements;
- determine that air quality monitoring equipment is used properly by AECOM personnel in accordance with manufacturer's instructions and that the monitoring results are properly documented and filed;
- coordinate with the AECOM Project Manager and HSR to identify AECOM personnel on-facility for whom special personal protective equipment, exposure monitoring or work restrictions may be required;
- conduct safety meetings;
- conduct daily facility safety inspections;
- assist the Project Manager in all aspects of implementing the HASP and addenda, if any; and,
- maintain health and safety equipment on-facility.
- Verify that field work is scheduled with adequate personnel and equipment to complete job safely.

Authority

- implement emergency procedures as required;
- temporarily suspend activities if health and safety of personnel are endangered, pending further consideration by the HSM; and,
- temporarily suspend an individual from activities for infractions of the HASP pending further consideration by the HSM.

4.3 AECOM Area SH&E Manager

AECOM Safety, Health and Environment Area: Peter Gregory , CSP

Responsibilities

- direct the implementation of the health and safety program of the Operating Group and provide recommendations for improvement of the program;
- coordinate health and safety activities of the Operating Units in the Operating Group;
- determine need for project HASPs;
- maintain a high level of understanding regarding health and safety regulations affecting AECOM;
- review and approve HASPs;
- monitor implementation of HASPs;
- investigate reports of incidents or accidents and report to AECOM Health and Safety Director;
- provide employee health and safety training in the Operating Group;
- determine whether an accidental exposure or injury merits a change in the affected individual's work assignments and whether changes in work practices are required;
- coordinate Operating Units with regard to health and safety equipment needs; and,
- supervise HSMs through a matrix management system, in cooperation with the Operating Unit Managers.

Authority

- approve or disapprove HASPs;
- direct Operating Unit HSR to prepare project HASPs;
- access and review project files;
- direct changes in personnel work practices to improve health and safety of employees;
- remove individuals from projects, if their conduct jeopardizes their health and safety or that of co-workers; and,
- suspend work on any project that jeopardizes the health and safety of personnel involved.

4.4 AECOM Project Personnel

AECOM PROJECT PERSONNEL

Responsibilities

- attend and participate in the project safety briefings
- Bring forth any questions regarding content of the HASP to the Project Manager or Site Safety Officer
- take all reasonable precautions to prevent injury to themselves and to their fellow employees;
- perform only those tasks that they believe they can do safely and immediately reporting any accidents and/or unsafe conditions to the SSO or AECOM Project Manager;
- implement the procedures set forth in the HASP and reporting any deviations from the procedures described in that HASP to the SSO or AECOM Project Manager for action;
- notify the AECOM Project Manager and SSO of any special medical conditions (i.e., allergies) and seeing that all on-facility AECOM personnel are aware of such conditions; and,
- reviewing the project-specific HASP and addenda, if any, and signing the Safety Plan Compliance Agreement.

Authority

- all personnel following this HASP have "stop work" authority in situations where they believe that injury to themselves, their fellow employees, Contractor or Client personnel or the public, and/or property damage may occur.

4.5 Subcontractor's Safety Representative

Subcontractors are required to designate an on-site employee who will serve as the Site Safety Representative (SSR) for their company. In this capacity, the SSR is responsible for providing health and safety oversight of their personnel participating on the project team. In addition, the SSR will perform daily work area inspections, conduct safety meetings, provide safety orientations for new employees and investigate incidents involving their employees. The SSR will attend periodic safety meetings with the SSO.

5.0 JOB HAZARD ANALYSIS

A site-specific Job Hazard Analysis is provided in Table 1.

5.1 Chemical Hazards

Two categories of chemical hazards are associated with Site activities:

- site constituents; and,
- chemicals used to conduct the Site work.

Site constituents are those that exist at the Site and are the cause for conducting Site activities. The chemicals that are brought on-site to conduct the work may be hazardous and subject to regulation under OSHA's Hazard Communication Standard (i.e., 29 CFR 1910.1200).

5.1.1 Site Constituents

From an occupational health standpoint, given that any potential exposure to site personnel will be only for a short period of time (i.e., intermittent for several days), the levels of contaminants that have been, or could be, encountered during site activities should not represent a significant concern if the provisions of this HASP are appropriately implemented. However, given that the Site is still under investigation, the potential for exposure to elevated levels of these contaminants may exist. Exposure to elevated levels of these contaminants may pose hazards. Specific constituent hazards are detailed in Table 1. Overviews of these hazards are presented here in terms of the following types of occupational exposure limits:

- PEL Permissible Exposure Limit (OSHA Standard)
- TLV® Threshold Limit Value (American Conference of Governmental Industrial Hygienists [ACGIH] Guidance)
- STEL Short Term Exposure Limit
- C Ceiling

OSHA PELs and ACGIH TLV®s are time-weighted averages (TWAs), which are defined as concentrations for a normal 8-hour workday and 40-hour work week to which almost all workers can be exposed repeatedly without suffering adverse health effects.

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

A ceiling value (C) is a concentration that may not be exceeded at any time in any workday. Ceiling limits are used by OSHA and ACGIH for chemical exposure criteria.

Skin contact with potentially contaminated materials will be minimized by the use of personal protective clothing (as described in Sections 1.0 and 7.0). Certain site contaminants (e.g., benzene,

cresol, naphthalene, phenols, PCBs and PAHs) have a "skin" designation which indicates the potential for dermal absorption. Air monitoring and the use of engineering controls will minimize inhalation of vapors or particulates during site activities, and respiratory protection will be used if the action levels described in Section 1.0 are exceeded. Ingestion of contaminated materials will be minimized by the use of appropriate personal hygiene procedures during decontamination (e.g., thoroughly washing face and hands with soap and water after leaving the work area and prior to eating or drinking).

5.1.2 Hazard Communication Materials

Materials that are considered hazardous materials under the OSHA Hazard Communication Standard (i.e., 29 CFR 1910.1200) may be used during this project (possibly including acids for sample preservation and solvents for equipment decontamination). In accordance with the AECOM Hazard Communication Program, the SDSs for the hazardous materials listed in Section 1.0 are included in Attachment A. The SSO will make copies of these SDSs available to AECOM subcontractors (e.g., drillers) on this project.

AECOM's written Hazard Communication Program is located in S3NA-115-PR, a copy of which is to be maintained on Site.

5.2 Physical Hazards

Physical hazards at this work site include:

- heat stress and/or cold stress, depending on the time of year the work will be performed;
- noise from the operation of site equipment;
- slip-trip-fall hazards;
- back injuries resulting from improper lifting (manual material handling);
- being caught in or struck by moving equipment;
- drilling activities (e.g., pinch points or struck by equipment);
- electrical hazards associated with drilling or excavation activities, such as contact with overhead or underground power lines or pipelines; and,
- vehicular traffic hazards.

5.2.1 Heat Stress Recognition and Control

Heat stress monitoring will commence when personnel are wearing PPE, including Tyvek®-type coveralls, and the ambient temperature exceeds 70°F. If standard work garments (e.g., cotton coveralls) are worn, monitoring will commence at 85°F. Heat stress monitoring and control guidance can be found in S3NA-113-PR, a copy of which is to be maintained on-site.

5.2.2 Cold Stress Recognition and Control

Protection against cold stress will be initiated when temperatures drop below 45°F. Cold stress guidance is provided below (and in Attachment 2). Exposure to cold working conditions can result in cold stress (e.g., hypothermia) and/or injury (e.g., frostbite) to hands, feet and head. Hypothermia can

be brought on by exposure to cold air, immersion in cold water, or a combination of both. The wind chill factor, which is the cooling power of moving air, is a critical factor in cold stress.

Hypothermia can result when the core body temperature drops below 36°C (96.8°F). Lower body temperature will be likely to result in dizziness, drowsiness, disorientation, slurred speech or loss of consciousness, with possible fatal consequences. Pain in the extremities may be the first warning of danger from cold stress. Shivering develops when the body temperature falls to 35°C (95°F).

If fine work is to be performed with bare hands for more than 10 to 20 minutes at temperatures below 16°C (60°F), provisions will be made for keeping the workers' hands warm. If equivalent chill temperatures fall below 40°F and fine manual dexterity is not required, gloves will be worn. Metal handles of tools will be covered with insulating material at air temperatures below -1°C (30°F).

If work is to be performed continuously in the cold when the wind chill factor is at or below -7°C (19°F), heated warming shelters (e.g., tents, trailers or vehicle cabs) will be made available nearby.

5.2.3 Noise Hazards

Previous surveys indicate that heavy equipment, such as drilling equipment, may produce continuous and impact noise at or above the action level of 85 dBA. All AECOM personnel within 25 ft of operating equipment or near an operation that creates noise levels high enough to impair conversation will wear hearing protective devices (either muffs or plugs). AECOM personnel who are in the Medical Surveillance Program are automatically enrolled in the AECOM Hearing Conservation Program and have had baseline and, where appropriate, periodic audiograms. Personnel will wash their hands with soap and water prior to inserting earplugs to avoid initiating ear infections. Additional information regarding the AECOM Hearing Conservation Program is provided in S3NA-118-PR.

5.2.4 Slip/Trip/Fall Hazards

Workers should exercise caution when walking around the Site to avoid fall and trip hazards. If there are holes or uneven terrain in the work area that 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. Workers should watch where they are walking and walk only 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, and any other objects that are of odd size or shape or that weigh over 50 pounds. Safe lifting procedures are described in S3NA-014-PR. The procedures include the following:

- get help when lifting heavy loads. Lift portable generators 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 (e.g., "1,2,3, lift," etc.);
- wear sturdy work shoes that are in good condition and 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; and,
- keep the heavy part of the load close to your body to help maintain your balance.

5.2.6 Underground and Aboveground Utilities

The Site Manager or SSO is responsible for locating underground utilities before the commencement of any subsurface (> 0.3 meter [1 ft]) activities. Resources include site plans, utility companies and regional utility locating services. The proper utility company personnel will certify in writing to the Site Manager or SSO that underground utilities have been deactivated; the certification will be retained in the project files.

Procedures for activities conducted proximate to utility locations are located in S3NA-322-PR, a copy of which is to be maintained on Site. Utilities in areas designated for intrusive activities will be cleared through the Underground Facilities Protective Organization (UFPO) which can be contacted at 1-800-962-7962.

Drilling or other operations adjacent to overhead lines will not be initiated until operations are coordinated with 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 SSO will observe power shut off and place a lock and tag on the switch. In all cases, utility company personnel will certify in writing to the Site Manager or SSO that the overhead utilities have been deactivated and the certification will be 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.

Equipment, or any part of the equipment, cannot come within the following minimum clearance from energized overhead lines:

Power Lines Nominal System (kilovolts)	**Minimum Required** Clearance
0-50	10 ft
51- 100	12 ft
101-200	15 ft
201-300	20 ft
301-500	25 ft
501-750	35 ft
751-1000	45 ft

5.2.7 Work Area Protection

Project operations may be undertaken in a roadway or parking lot, e.g., off-site groundwater sampling, causing motor vehicles to pose a hazard. Guidance on properly coning and flagging the work area is provided in Attachment 2. Consideration should be given to parking work vehicles within the coned area between the work area and oncoming traffic. Procedures for work zone traffic control are provided in S3NA-306-PR, a copy of which is to be maintained on Site.

5.2.8 Drilling Hazards

The primary responsibility during drilling safety is with the drilling subcontractor(s). AECOM employees are responsible for their own safety including recognizing and avoiding drill rig hazards. AECOM employees that observe a drill rig condition believed to be unsafe shall advise the drill rig operator of the unsafe condition.

AECOM technicians, geologists, engineers or other field staff assigned to observe drilling operations or collect soil samples should observe the following guidelines:

- require a meeting at project start-up regarding the drill rig operator responsibility for rig safety and any site and equipment specific safety requirements;
- set up barricades or other means to delineate work zones;
- set up any sample tables and general work areas for the AECOM field staff to the side of the drill rig (preferably 10 meters away) and not directly behind the rig; and,
- AECOM engineers, technicians and geologists shall not assist the drillers with the drilling equipment or supplies and shall not at any time operate the drill rig controls.

Before moving a rig, the operator must do the following:

- to the extent practical, walk the planned route of travel and inspect it for overhead hazards, depressions, gullies, ruts and other obstacles;
- check the brakes of the truck/carrier (especially if the terrain along the route of travel is rough or sloped);
- lower mast;
- discharge all passengers before moving on rough or steep terrain; and,
- engage the front axle (on 4x4, 6x6, etc. vehicles) before traversing rough or steep terrain.

After the rig has been positioned to begin drilling, all brakes and/or locks must be set before drilling begins. If the rig is positioned on a steep grade and leveling of the ground is impossible or impractical, the wheel of the transport vehicle should be blocked and other means of preventing the rig from moving or topping over employed.

5.3 Biological Hazards

Potential biological hazards include illnesses and/or injuries transmitted by plants, insects, animals and pathogenic agents. There are many plants, animals and insects that are potentially harmful to humans; these include ticks, poison ivy/poison oak, certain spiders, mosquitoes and poisonous snakes. Refer to S3NA-313-PR for specific information on these hazards (Attachment 2). Inspect work areas for the presence of poisonous plants, stinging insect nests, etc. Tyvek® coveralls will be worn for Tasks 2, 3 and 4; however, if poisonous plants are present in the work area while performing Tasks 1 or 5, don Tyvek® coveralls and gloves. Remove coveralls and gloves from the inside out to prevent contact with clothing contaminated with poisonous plant oils. Consider the use of poisonous plant barrier and/or cleanser creams if needed. If working in vegetated areas of the Site, tape coveralls to boots and gloves. Use an insect repellant containing DEET. Check frequently for the presence of ticks, and perform a thorough inspection for possible ticks prior to leaving the Site. If field personnel discover an embedded tick on their skin, report it immediately to the Site Manager or SSO.

Blood-borne pathogens (BPs) include diseases that can be transmitted by contact with blood or other bodily fluids as well as contaminated items that may be encountered on this urban site (e.g., used syringes). Universal precautions should be used when administering first aid. Good hygiene practices and proper decontamination of non-disposable PPE will minimize potential for transmission of BPs. Refer to S3NA-111-PR for additional information (Attachment 2).

6.0 EXPOSURE MONITORING PLAN

Heat stress, noise and chemical exposures may be encountered at the Site. Heat stress monitoring and prevention is addressed in Section 5.2.1. Noise levels will not be monitored; AECOM personnel will wear hearing protection as described in Section 5.2.3.

6.1 Chemical Exposure Monitoring

The field instrumentation described in this HASP has been specifically selected for the contaminants that may be reasonably anticipated to be encountered during the 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 HASP PREPARER OR THE RHSEM.**

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. Specifications for this monitoring equipment are provided in Attachment 4. 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 (1-5 ppm > one minute), continuous monitoring will start immediately in the breathing zone (BZ) of the person working nearest the point of operations/contaminant source, and site personnel will don protective clothing.

A reading in the BZ above the second action level will require the use of full-face respirators with appropriate cartridges. If the monitoring instrument reads more than the fourth action level (50 ppm > one minute) work will stop, and workers will move upwind while the airborne contaminants dissipate. If elevated levels remain for more than five minutes, the source of the airborne contamination will be covered with clean soil, plastic sheeting or foam (or be controlled in an appropriate manner), and the HSE Representative or PM will be contacted for further guidance.

Air quality monitoring for must be performed in the breathing zone of the most exposed site worker (i.e., closest to the source) during all intrusive work activities. This monitoring must be performed at least each 30 minutes; results of air monitoring must be documented.

6.2 Background Readings

All direct-reading instrument readings will be evaluated relative to background readings, 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 to determine the level of "background" readings from such things as local vehicle traffic or emissions from nearby operations unrelated to the Site. Site readings will be evaluated against these background readings. The SSO will consult with the RMHSE regarding the potential health hazards associated with background readings above 5 ppm.

6.3 Data Logging

All monitoring data, including background readings, will be logged in the field logbook. The results of daily instrument calibrations will be logged either on the field form or in the field logbook. All monitoring instruments will be calibrated in accordance with the manufacturers' instructions prior to the start of each shift. Calibration also will be performed when inconsistent or erratic readings are obtained.

If an instrument cannot be calibrated to specification or becomes otherwise inoperable, all intrusive Site work (e.g., drilling,) will cease until the instrument is appropriately repaired or replaced, and the PM or RMHSE will be contacted for further guidance.

6.4 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 with combination organic vapor P100 cartridges (such as MSA GMC-H cartridges).

Sand and Portland cement that may be used in groundwater monitoring well construction may contain free silica (quartz). Airborne exposure to silica dust may occur during the handling of these materials. At a minimum, half-face respirators with P100 cartridges will be worn for operations that pose a reasonable possibility of exposure to sustained airborne dust from the pouring and mixing of dry sand or cement.

6.5 Explosive Atmospheres

A CGI/O_2 meter will be used to monitor ambient conditions during the drilling task, and decisions will be based on the levels measured using a CGI/O_2 meter (measurements are in % of the LEL), as determined by the action level table.

6.6 Oxygen-Deficient Atmospheres

No work shall be performed in oxygen-deficient atmospheres (such as confined spaces) without prior approval of the RMHSE. Confined space entry is not expected for this job. Procedures for work in areas that may have oxygen-deficient atmospheres are described in S3NA-301-PR. A confined-space entry permit is provided by, and must be approved by, the RMHSE.

Prior to entering any space where an oxygen deficiency may exist, an oxygen meter will be used to test for adequate oxygen levels. Decisions will be based on oxygen concentrations as follows:

- 20.8%: continue operations
- <20.8%: monitor continuously
- <19.5%: do not enter; ventilate and determine whether supplied air equipment is required

7.0 PERSONAL PROTECTIVE EQUIPMENT

The minimum personal protective equipment (PPE) for site personnel includes:

- hardhat (ANSI approved);
- safety glasses with side shields (or properly rated impact-resistant goggles);
- steel-toed boots or chemical-resistant steel-toed boots; (ANSI and ASTM-rated)
- hearing protection in the vicinity of noisy equipment;
- work gloves and/or chemical-resistant gloves; and,
- Tyvek® or polycoated-Tyvek® as needed.

As the various monitoring action levels are reached, additional PPE is required. Section 1.0 describes the incremental PPE requirements relative to specific action levels and the specific kinds of PPE to be used. Procedures for the use and selection of PPE are provided in S3NA-208-PR, a copy of which is to be maintained on Site.

7.1 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 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.

To obtain optimal usage from PPE, the following procedures are to be followed by all AECOM personnel:

- when using Tyvek® coveralls, don a clean, new garment after each rest break or at the beginning of each shift or when they become damaged or torn;

- inspect all clothing, gloves and boots both prior to and during use for:
  - imperfect seams;
  - non-uniform coatings;
  - tears; and,
  - poorly functioning closures; and,

- inspect reusable garments, boots, and gloves prior to and during use for:
  - visible signs of chemical permeation such as swelling, discoloration, stiffness or brittleness; and,
  - cracks or any signs of puncture or abrasion.

Reusable garments exhibiting any of these characteristics will be discarded.

7.2 Duration of Work Tasks

The SSO will establish the duration of work tasks in which personnel use PPE ensembles that include chemical protective clothing (including uncoated Tyvek®). 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. Recommended rest breaks are as follows:

- 15 minutes midway between shift startup and lunch;
- lunch break (30 to 60 minutes); and,
- 15 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 washing of hands and face with soap and water. Additional rest breaks will be scheduled according to heat stress monitoring protocols as described in S3NA-113-PR.

8.0 RESPIRATORY PROTECTION

8.1 Respirator Selection

Engineering controls and safe work practices (e.g., elimination of the source of contamination, ventilation equipment, working upwind, limiting exposure time, etc.) always must 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 29 CFR 1910.134 have been used by the Preparer of this HASP in determining respirator requirements for this project.

CAUTION: 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 a hazardous substance that can attack the body through the skin.

Airborne contaminants have been evaluated based on the suspected contaminants of concern. The concentration of the airborne chemical hazard will be evaluated using direct-reading instruments to determine what type of respirator will be used. Airborne readings will be compared to the action levels in the table in Section 1.0. See action level/respirator requirements in Section 6.1.

8.2 Medical Screening

Project employees are enrolled in the AECOM Medical Surveillance Program and are medically evaluated in compliance with the requirements of 29 CFR 1910.134(a)(10). Employees not medically cleared to wear respirators will not be assigned to this project.

The medical status of each employee is reviewed annually or more frequently if the physical status of the employee changes (determined by a physician).

8.3 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 may be worn with respiratory protection.

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 S3NA-123-PR, a copy of which is to be 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 they put on the respirator. For air-purifying respirators, the positive user seal check is performed by removing the exhalation valve cover, 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.

8.4 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 assignments require the use of respirators are trained in accordance with 29 CFR 1910.134 during initial 40-hour training for hazardous waste operations.

Hands-on training in inspecting and donning a respirator, including user seal checks, also is provided at the time of fit testing. Retraining is performed on an "as-needed" basis 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.

A particulate respirator cartridge will be changed out when the wearer has difficulty breathing through the cartridge or at least daily. Chemical gas or vapor respirator cartridges will be ***changed out at least daily.***

The fit of a chemical gas or vapor respirator will be rechecked, and the cartridges will be changed, if the wearer detects chemical odor or feels chemical irritation on the skin, both of which are indicators of leakage or cartridge breakthrough. Where available, an End-of-Service Life Indicator (ESLI) 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.

8.5 Respirator Inspection

The user will inspect respirators before and after each day's use. The inspection procedure for air-purifying respirators (i.e., full-face piece and half-face piece cartridge respirators) follows.

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); and,
- 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; and,
- excessively worn serration on the headstraps, which may permit slippage.

Examine the two inhalation valves and the 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; and,
- 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; and,
- cracks or dents in the outside case or threads of the filter or cartridge/canister.

8.6 Cleaning of Respirators

Respirators assigned and worn by one individual must be dismantled and thoroughly cleaned and disinfected after each day's use. Visitors' respirators or respirators assigned to several individuals 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. The procedures for cleaning respirators follow.

- 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 important to prevent dermatitis.
- Disinfecting: Thoroughly rinse or immerse in a sanitizer provided by the manufacturer. Alternatively, a weak chlorine bleach solution (1 milliliter of liquid bleach per liter of water) may be used.
- Final Rinsing: Rinse thoroughly in clean water (110°F maximum) to remove all traces of disinfectant. This is important to prevent dermatitis.

- Drying: Drain and dry by hanging by the straps from racks (take care to prevent damage) or by towel drying with clean, soft cloths or paper towels.

8.7 Maintenance of Respirators

Routine respirator maintenance, such as replacing missing valves, gaskets and nosecups, must only be performed by trained respirator users or a respirator manufacturer's representative. Only approved replacement parts must be used. The 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.

8.8 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., Ziplock® or twist-tie) reusable plastic bags between shifts.

The respirator storage environment must be clean, dry and away from direct sunlight. On-site cabinets or cases are suggested. Storing bagged respirators in vehicles is discouraged because of the potential for damage from other materials or equipment.

8.9 Additional Information

Additional information on the AECOM Respiratory Protection Program is located in S3NA-123-PR, a copy of which is to be available on Site.

9.0 SITE CONTROL

9.1 General

Barricade tape and/or barricades will be used to delineate a work zone for safety purposes around the work area. The barriers will be set in a 25-ft 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., a drill rig mast or a vehicle antenna) to serve as a wind direction telltale. A 5-ft 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 (see Section 10.0). All entry and exit from the work area will be made at this opening 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 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 or SSO will determine an upwind evacuation area prior to each shift and all 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.

9.2 Work Zones

If monitoring instrument readings exceed the first action level (>5 ppm for one minute), requiring the use of chemical protective equipment, work zones must be established as described below.

- Exclusion Zone (EZ) – A 25-ft circle (as practical) around the work area will be defined before work starts. The encircled area will constitute the EZ. 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 and/or tarps may be used as necessary to control contaminated materials spilled to the ground during site operations. The size of the EZ may be altered to accommodate Site conditions and to ensure contaminant containment.

- Contaminant Reduction Zone (CRZ) – A corridor leading from the EZ will be defined; it 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 that contaminated disposable equipment can be placed inside and covered. Surface/soil contamination in this area will be controlled using plastic sheeting. No one will be permitted into the CRZ or EZ unless he/she is in full compliance with the requirements of this HASP.

- 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 (e.g., roads, shelter, utilities).

10.0 DECONTAMINATION PROCEDURES

The following steps will be followed whenever personnel leave the EZ/work area:

1. Remove all equipment, sample containers, and notes to the CRZ. All waste and spent decontamination solutions will be properly contained.
2. Scrub boots with a stiff bristle brush and a solution consisting soap (e.g., Alconox®) and water. Washtubs and chairs will be provided.
3. Remove outer gloves.
4. Remove Tyvek® coveralls; discard in provided container.
5. Remove hardhat and eye protection.
6. Remove inner gloves.
7. Wash hands and face.

The decontamination area will be covered with plastic sheeting that will be replaced when torn or heavily soiled and at the end of each shift. Disposable materials shall be placed into proper containers.

Each worker will be responsible for cleaning, sanitizing and storing his/her own respirator in accordance with the manufacturer's guidance (i.e., washing in warm water and detergent or sanitizing solution, air drying, and storing in a plastic storage bag).

All spent decontamination materials (e.g., rinse waters, sludge) will be handled as directed by the PM and in accordance with relevant regulations.

10.1 Sanitation

Potable water will be made available at the Site, either from a pressurized source or as commercially available bottled water. Drinking cups will be supplied; personnel will not drink directly from the source of water or share drinking cups. Sources of non-potable water will be labeled clearly.

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

10.2 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.

10.3 Decontamination of Tools

When all work activities have been completed, contaminated tools used by AECOM personnel will be appropriately decontaminated or properly disposed of as directed by the PM.

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

11.0 SAFE WORK PRACTICES

11.1 General Site Rules

- Eating, drinking, chewing gum or tobacco, and smoking are prohibited during drilling, well installation, sampling, and NAPL recovery/disposal activities or where the possibility for the transfer of contamination exists.

- All personnel will enter designated work areas only through the CRZ. All personnel leaving an EZ/work zone must exit through the CRZ and pass through the decontamination station, as described in Section 10.0.

- Personnel will wash their hands and faces thoroughly with soap and water prior to eating, drinking or smoking.

- Personnel will 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 (e.g., the ground).

- Field survey instruments will be covered with plastic or similar coverings to minimize the potential for contamination.

- Contaminated protective equipment such as respirators, hoses, boots and disposable protective clothing will not be removed from the work area/EZ or decontamination area until it has been cleaned or properly packaged and labeled.

- Field crew members should 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.

- All wastes generated by AECOM activities at the Site will be disposed of as directed by the PM.

- All personal protective equipment will be used as specified and required.

- The buddy system will be used at all times.

- Personnel are to immediately notify the SSO or Site Manager of any illness, injuries or environmental releases.

11.2 Sampling Practices

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

- all sampling equipment will be cleaned before proceeding to the Site;
- at the sampling site, sampling equipment will be disposed of or cleaned after each use;
- work in "cleaner" areas will be conducted first, where practical; and,
- all unauthorized personnel will remain outside the EZ at all times.

11.3 Sample Shipment/Hazardous Materials Shipment

If samples to be collected during the course of this project fall under criteria that define them as hazardous materials under Department of Transportation (DOT) regulations 49 CFR Parts 171-177 (see AECOM guidelines for determination) or if hazardous waste is shipped off-site, 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.

12.0 EMERGENCY RESPONSE PLAN

Route maps to the nearest hospital (i.e., Mercy Hospital at (516) 705-2525**) and the Hempstead Main Clinic (i.e., New York Urgent Care at** (516) 489-6640**) are provided in Attachment 3.**

It is AECOM's policy to evacuate personnel from areas of hazardous material emergencies and to summon outside assistance from agencies with personnel trained to respond to the specific emergency. This section outlines the procedures to be followed by AECOM personnel in the event of a site emergency. These procedures are to be reviewed during the on-site safety briefings conducted by the SSO.

In the event of a fire or medical emergency, the emergency numbers identified in Section 1.0 must be called for assistance.

12.1 Places of Refuge

In the event of a site emergency requiring evacuation, all personnel will evacuate to a pre-designated area a safe distance from any health or safety hazard. The primary assembly area will be determined prior to the start of work each day.

During any site evacuation, all employees will be instructed to observe wind direction indicators. During evacuation, employees will be instructed to travel upwind or crosswind of the area of influence.

12.2 Communication

A communication network must be set up to alert site personnel of emergencies and to summon outside emergency assistance. All team members should maintain the list of emergency phone numbers. At least one team member shall have a cell phone which shall be "on" and in good working order.

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

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

12.3 Emergency Response Procedures

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

- emergency care provider(s);
- provide first aid/CPR as needed; and,
- communicator.

The role of the communicator is to maintain contact with appropriate emergency services and to provide 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 will be located as close to the scene as possible to transmit to the emergency care providers any additional instructions that may be given by emergency services personnel in route.

The Site Manager (usually the SSO) will 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. Responsibilities also include reviewing and revising site safety and contingency plans as necessary.

The Emergency Response Checklist can be used to help remember the things to do in an emergency.

12.4 Medical Emergency Response Plan

At least one on-site AECOM employee will hold a current certificate in American Red Cross Standard First Aid. This training provides six and one-half hours of instruction in adult CPR and basic first aid. If a medical emergency exists, personnel should:

- 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 the injured/ill person is in is dangerous or unsafe and ONLY if the rescuers are appropriately protected from potential hazards that might be encountered during the rescue.
- When emergency services personnel arrive, communicate all first aid/CPR activities that have occurred.
- Transfer responsibility for the 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 an appropriate amount of portable sterile eyewash bottles, will be available at the 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 telephone numbers list; and,
- portable radios for emergency communications in remote areas.

12.5 Incident Report

All site injuries and illnesses must be reported to the SSO and PM immediately. National Grid to get a draft incident report within 24 hours. The SSO or the PM will notify the RHSEM and National Grid immediately. Any near miss, injury or illness, regardless of severity, is to be reported (see S3NA-004-PR).

12.6 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, which are found on the MSDSs. 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 predesignated assembly area. The local Designated Emergency Response Authority (DERA) will be notified by the SSO immediately and appropriate actions will be taken to protect public health and mitigate the contaminant release. The SSO will make the following emergency contacts:

Regional Health, Safety and Environment Manager	***Ben Bertolotti:***	***973- 572-3916***
Area SH&E Manager	***Peter Gregory***	*201-602-3511*
Project Manager	***Mike Akerbergs:***	***973-883-8695***
NYSDEC Spill Report Hotline		*(800) 457-7362*
EPA National Response Center		*(800) 424-8802*

EMERGENCY RESPONSE CHECKLIST

In an Emergency	Yes?	No?
Confirm the reported incident	_____	_____
Evacuate and secure the area	_____	_____
Render first aid/CPR	_____	_____
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	_____	_____
Submit a copy of the document to the Office Safety Representative	_____	_____

13.0 TRAINING MEDICAL SURVEILLANCE AND SITE INSPECTIONS

13.1 Training and Medical Surveillance

All AECOM site personnel will have met the requirements of 29 CFR 1910.120(e) including:

- 40 hours of initial off-site training or its recognize equivalent;
- 8 hours of annual refresher training (as required);
- 8 hours of supervisor training for personnel serving as Site Managers; and,
- 3 days of work activity under the supervision of a trained and experienced supervisor.
- Current First aid/CPR training
- No applicable medical restrictions as determined through medical surveillance

All AECOM site personnel are required to be active participants in good standing in a medical surveillance program that meet the requirements of 29 CFR 1910.120(f). Current copies of training certificates and statements of medical program participation for all AECOM personnel are maintained by the local office.

In addition, all AECOM site personnel will review this HASP and sign a copy of the HASP Compliance Agreement provided in Attachment 5. The Site Manager will maintain these agreements at the Site and place them in the project file at the conclusion of the work.

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

- contents of this HASP;
- 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 PPE;
- PPE that will be used;
- site-specific respiratory protection requirements;
- decontamination protocols;
- site control measures, including safe operating practices and communication;
- location and use of emergency equipment; and,
- evacuation signals and procedures.

All site personnel, including subcontractor personnel, are require 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; these briefings (including topics discussed, attendees/affiliations; etc) will be documented. Briefings also will be conducted whenever new personnel report to the Site.

13.2 Site Inspections

The Site Manager or SSO is to conduct a daily site inspection prior to the start of each shift. It is the responsibility of the PM or Site Manager to resolve discrepancies immediately, contacting the RMHSE if necessary for assistance. Inspections are to be documented and maintained on-site until the completion of the project, at which time they are placed in the project files.

14.0 RECORDKEEPING

The PM and SSO are responsible for site recordkeeping. Prior to the start of work, they will review this HASP; if no changes are needed, they will sign the approval form (PM) or acceptance form (SSO) and forward a copy to the HSE Representative.

All AECOM personnel will review the HASP and sign the HASP Compliance Agreement; copies of these forms will be maintained in the project file as noted in Section 12.

The SSO will conduct a site safety briefing in accordance with Section 13 and have all attendees sign the form; copies of these forms will be maintained in the project file.

Any incident or exposure incident will be investigated and the Incident Report form (S3NA-004-PR) will be completed and forwarded to the HSE Representative.

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

15.0 COMMUNITY AIR MONITORING PLAN

Real-time air monitoring for total volatile organic compounds, particulates will be conducted at the perimeter of the exclusion zone during drilling, well installation, direct-push soil sampling, groundwater sampling, and NAPL recovery/disposal activities as part of the Community Air Monitoring Plan (CAMP). The CAMP also provides a contingency plan that addresses potential site control measures that may be implemented in response to elevated levels of target compounds or odor. Additional information about this air monitoring program is contained in the CAMP which is a document separate from this HASP.

ATTACHMENT 1
SAFETY DATA SHEET

ATTACHMENT 1
MATERIAL SAFETY DATA SHEETS/SAFETY CARDS

SITE CONTAMINANTS

MATERIAL SAFETY DATA SHEET

BENZENE (AMOCO/TOTAL)

MSDS No. 11697000 ANSI/ENGLISH

1.0 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: BENZENE (AMOCO/TOTAL)

MANUFACTURER/SUPPLIER:

Amoco Oil Company
200 East Randolph Drive
Chicago, Illinois 60601 U.S.A.

EMERGENCY HEALTH INFORMATION:
1 (800) 447-8735

EMERGENCY SPILL INFORMATION:
1 (800) 424-9300 CHEMTREC (USA)

OTHER PRODUCT SAFETY INFORMATION:
(312) 856-3907

2.0 COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS#	Range % by Wt.
Benzene	71-43-2	99.80
Toluene	108-88-3	0.20

(See Section 8.0, "Exposure Controls/Personal Protection", for exposure guidelines)

3.0 HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Danger! Extremely flammable. Causes eye and skin irritation. Inhalation causes headaches, dizziness, drowsiness, and nausea, and may lead to unconsciousness. Harmful or fatal if liquid is aspirated into lungs. Danger! Contains Benzene. Cancer hazard. Can cause blood disorders. Harmful when absorbed through the skin.

POTENTIAL HEALTH EFFECTS:

EYE CONTACT: Causes mild eye irritation.

SKIN CONTACT: Causes mild skin irritation. Causes skin irritation on prolonged or repeated contact. Harmful when absorbed through the skin.

INHALATION: Cancer hazard. Can cause blood disorders. Inhalation causes headaches, dizziness, drowsiness, and nausea, and may lead to unconsciousness. See "Toxicological Information" section (Section 11.0).

INGESTION: Harmful or fatal if liquid is aspirated into lungs. See "Toxicological Information" section (Section 11.0).

HMIS CODE: (Health:2) (Flammability:3) (Reactivity:0)

NFPA CODE: (Health:2) (Flammability:3) (Reactivity:0)

4.0 FIRST AID MEASURES

EYE: Flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation persists.

SKIN: Wash exposed skin with soap and water. Remove contaminated clothing, including shoes, and thoroughly clean and dry before reuse. Get medical attention if irritation develops.

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

INGESTION: If swallowed, drink plenty of water, do NOT induce vomiting. Get immediate medical attention.

5.0 FIRE FIGHTING MEASURES

FLASHPOINT: 12°F(-11°C)

UEL: 8.0%

LEL: 1.5%

AUTOIGNITION TEMPERATURE: 928°F (498°C)

FLAMMABILITY CLASSIFICATION: Extremely Flammable Liquid.

EXTINGUISHING MEDIA: Agents approved for Class B hazards (e.g., dry chemical, carbon dioxide, foam, steam) or water fog.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Extremely flammable liquid. Vapor may explode

if ignited in enclosed area.

FIRE-FIGHTING EQUIPMENT: Firefighters should wear full bunker gear, including a positive pressure self-contained breathing apparatus.

PRECAUTIONS: Keep away from sources of ignition (e.g., heat and open flames). Keep container closed. Use with adequate ventilation.

HAZARDOUS COMBUSTION PRODUCTS: Incomplete burning can produce carbon monoxide and/or carbon dioxide and other harmful products.

6.0 ACCIDENTAL RELEASE MEASURES

Remove or shut off all sources of ignition. Remove mechanically or contain on an absorbent material such as dry sand or earth. Increase ventilation if possible. Wear respirator and spray with water to disperse vapors. Keep out of sewers and waterways.

7.0 HANDLING AND STORAGE

HANDLING: Use with adequate ventilation. Do not breathe vapors. Keep away from ignition sources (e.g., heat, sparks, or open flames). Ground and bond containers when transferring materials. Wash thoroughly after handling. After this container has been emptied, it may contain flammable vapors; observe all warnings and precautions listed for this product.

STORAGE: Store in flammable liquids storage area. Store away from heat, ignition sources, and open flame in accordance with applicable regulations. Keep container closed. Outside storage is recommended.

8.0 EXPOSURE CONTROLS / PERSONAL PROTECTION

EYE: Do not get in eyes. Wear eye protection.

SKIN: Do not get on skin or clothing. Wear protective clothing and gloves.

INHALATION: Do not breathe mist or vapor. If heated and ventilation is inadequate, use supplied-air respirator approved by NIOSH/MSHA.

ENGINEERING CONTROLS: Control airborne concentrations below the exposure guidelines.

EXPOSURE GUIDELINES:

Component	CAS#	Exposure Limits

Benzene	71-43-2	OSHA PEL: 1 ppm OSHA STEL: 5 ppm ACGIH TLV-TWA: 10 ppm
Toluene	108-88-3	OSHA PEL: 100 ppm (1989); 200 ppm (1971) OSHA STEL: 150 ppm (1989); Not established. (1971) OSHA Ceiling: 300 ppm (1971) ACGIH TLV-TWA: 50 ppm (skin)

9.0 CHEMICAL AND PHYSICAL PROPERTIES

APPEARANCE AND ODOR: Liquid. Colorless. Sweet odor.

pH: Not determined.

VAPOR PRESSURE: 74.6 mm Hg at 20 °C

VAPOR DENSITY: Not determined.

BOILING POINT: 176°F(80°C)

MELTING POINT: 42°F(6°C)

SOLUBILITY IN WATER: Slight, 0.1 to 1.0%.

SPECIFIC GRAVITY (WATER=1): 0.88

10.0 STABILITY AND REACTIVITY

STABILITY: Stable.

CONDITIONS TO AVOID: Keep away from ignition sources (e.g. heat, sparks, and open flames).

MATERIALS TO AVOID: Avoid chlorine, fluorine, and other strong oxidizers.

HAZARDOUS DECOMPOSITION: None identified.

HAZARDOUS POLYMERIZATION: Will not occur.

11.0 TOXICOLOGICAL INFORMATION

ACUTE TOXICITY DATA:

EYE IRRITATION: Testing not conducted. See Other Toxicity Data.

SKIN IRRITATION: Testing not conducted. See Other Toxicity Data.

DERMAL LD50: Testing not conducted. See Other Toxicity Data.

ORAL LD50: 3.8 g/kg (rat).

INHALATION LC50: 10000 ppm (rat)

OTHER TOXICITY DATA: Acute toxicity of benzene results primarily from depression of the central nervous system (CNS). Inhalation of concentrations over 50 ppm can produce headache, lassitude, weariness, dizziness, drowsiness, or excitation. Exposure to very high levels can result in unconsciousness and death.

Long-term overexposure to benzene has been associated with certain types of leukemia in humans. In addition, the International Agency for Research on Cancer (IARC) and OSHA consider benzene to be a human carcinogen. Chronic exposures to benzene at levels of 100 ppm and below have been reported to cause adverse blood effects including anemia. Benzene exposure can occur by inhalation and absorption through the skin.

Inhalation and forced feeding studies of benzene in laboratory animals have produced a carcinogenic response in a variety of organs, including possibly leukemia, other adverse effects on the blood, chromosomal changes and some effects on the immune system. Exposure to benzene at levels up to 300 ppm did not produce birth defects in animal studies; however, exposure to the higher dosage levels (greater than 100 ppm) resulted in a reduction of body weight of the rat pups (fetotoxicity). Changes in the testes have been observed in mice exposed to benzene at 300 ppm, but reproductive performance was not altered in rats exposed to benzene at the same level.

Aspiration of this product into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this product. Do not siphon by mouth.

12.0 ECOLOGICAL INFORMATION

Ecological testing has not been conducted on this product.

13.0 DISPOSAL INFORMATION

Disposal must be in accordance with applicable federal, state, or local regulations. Enclosed-controlled incineration is recommended unless directed otherwise by applicable ordinances. Residues and spilled material are hazardous waste due to ignitability.

14.0 TRANSPORTATION INFORMATION

U.S. DEPT OF TRANSPORTATION

Shipping Name	Benzene
Hazard Class	3
Identification Number	UN1114
Packing Group	II
RQ	RQ

INTERNATIONAL INFORMATION:

Sea (IMO/IMDG)

Shipping Name Not determined.

Air (ICAO/IATA)

Shipping Name Not determined.

European Road/Rail (ADR/RID)

Shipping Name Not determined.

Canadian Transportation of Dangerous Goods

Shipping Name Not determined.

15.0 REGULATORY INFORMATION

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR Part 302.4): This product is reportable under 40 CFR Part 302.4 because it contains the following substance(s):

Component/CAS Number	Weight %	Component Reportable Quantity (RQ)
Benzene 71-43-2	99.80	10 lbs.

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR Part 355): This product is not regulated under Section 302 of SARA and 40 CFR Part 355.

SARA TITLE III SECTIONS 311/312 HAZARDOUS CATEGORIZATION (40 CFR Part 370): This product is defined as hazardous by OSHA under 29 CFR Part 1910.1200(d).

SARA TITLE III SECTION 313 (40 CFR Part 372): This product contains the following substance (s), which is on the Toxic Chemicals List in 40 CFR Part 372:

Component/CAS Number	Weight Percent
Benzene 71-43-2	99.80

U.S. INVENTORY (TSCA): Listed on inventory.

OSHA HAZARD COMMUNICATION STANDARD: Flammable liquid. Carcinogen. Irritant. CNS Effects. Target organ effects.

EC INVENTORY (EINECS/ELINCS): In compliance.

JAPAN INVENTORY (MITI): Not determined.

AUSTRALIA INVENTORY (AICS): Not determined.

KOREA INVENTORY (ECL): Not determined.

CANADA INVENTORY (DSL): Not determined.

PHILIPPINE INVENTORY (PICCS): Not determined.

16.0 OTHER INFORMATION

Prepared by:

Environment, Health and Safety Department

Issued: November 14, 1995

This material Safety Data Sheet conforms to the requirements of ANSI Z400.1.

This material safety data sheet and the information it contains is offered to you in good faith as accurate. We have reviewed any information contained in this data sheet which we received from sources outside our company. We believe that information to be correct but cannot guarantee its accuracy or completeness. Health and safety precautions in this data sheet 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. No statement made in this data sheet shall be construed as a permission or recommendation for the use of any product in a manner that might infringe existing patents. No warranty is made, either express or implied.

International Chemical Safety Cards

ETHYLBENZENE

ICSC: 0268

ETHYLBENZENE
Ethylbenzol
Phenylethane
EB
$C_8H_{10}/C_6H_5\text{-}C_2H_5$
Molecular mass: 106.2

CAS # 100-41-4
RTECS # DA0700000
ICSC # 0268
UN # 1175
EC # 601-023-00-4

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		PREVENT GENERATION OF MISTS!	
• **INHALATION**	Cough. Dizziness. Drowsiness. Headache.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
• **SKIN**	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
• **EYES**	Redness. Pain. Blurred vision.	Face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**	(further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Collect leaking liquid in covered containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer (extra personal protection: A filter respirator for	Fireproof. Separated from strong oxidants.	F symbol Xn symbol R: 11-20 S: (2-)16-24/25-29 UN Hazard Class: 3

organic vapour).		UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0268 Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993

International Chemical Safety Cards

ETHYLBENZENE

ICSC: 0268

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH AROMATIC ODOUR. **PHYSICAL DANGERS:** The vapour mixes well with air, explosive mixtures are easily formed. **CHEMICAL DANGERS:** Reacts with strong oxidants. Attacks plastic and rubber. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV (as TWA): 100 ppm; 434 mg/m^3; as STEL: 125 ppm; 543 mg/m^3 (ACGIH 1994-1995). MAK: 100 ppm; 440 mg/m^3 (1994).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion. **INHALATION RISK:** A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance irritates the eyes, the skin and the respiratory tract. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system. Exposure far above OEL could cause lowering of consciousness. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis.
PHYSICAL PROPERTIES	Boiling point: 136°C Melting point: -95°C Relative density (water = 1): 0.9 Solubility in water, g/100 ml at 20°C: 0.015 Vapour pressure, kPa at 20°C: 0.9 Relative vapour density (air = 1): 3.7	Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02 Flash point: 18°C c.c. Auto-ignition temperature: 432°C Explosive limits, vol% in air: 1.0-6.7 Octanol/water partition coefficient as log Pow: 3.2
ENVIRONMENTAL DATA	The substance is harmful to aquatic organisms.	

NOTES

The odour warning when the exposure limit value is exceeded is insufficient.

Transport Emergency Card: TEC (R)-522
NFPA Code: H2; F3; R0

ADDITIONAL INFORMATION

ICSC: 0268	ETHYLBENZENE

IMPORTANT LEGAL NOTICE:	Neither the CEC or the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

MSDS Number: **T3913** * * * * * *Effective Date:* ***12/07/07*** * * * * * *Supercedes:* ***10/05/06***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

TOLUENE

1. Product Identification

Synonyms: Methylbenzene; Toluol; Phenylmethane
CAS No.: 108-88-3
Molecular Weight: 92.14
Chemical Formula: C6H5-CH3
Product Codes:
J.T. Baker: 5375, 5812, 9336, 9351, 9364, 9456, 9457, 9459, 9460, 9462, 9466, 9472, 9476
Mallinckrodt: 4483, 8092, 8604, 8608, 8610, 8611, V560

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Toluene	108-88-3	100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. VAPOR HARMFUL. FLAMMABLE LIQUID AND VAPOR. MAY AFFECT LIVER, KIDNEYS, BLOOD SYSTEM, OR CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate (Life)
Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe (Life)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation may cause irritation of the upper respiratory tract. Symptoms of overexposure may include fatigue, confusion, headache, dizziness and drowsiness. Peculiar skin sensations (e. g. pins and needles) or numbness may be produced. Very high concentrations may cause unconsciousness and death.
Ingestion:
Swallowing may cause abdominal spasms and other symptoms that parallel over-exposure from inhalation. Aspiration of material into the lungs can cause chemical pneumonitis, which may be fatal.
Skin Contact:
Causes irritation. May be absorbed through skin.
Eye Contact:
Causes severe eye irritation with redness and pain.
Chronic Exposure:
Reports of chronic poisoning describe anemia, decreased blood cell count and bone marrow hypoplasia. Liver and kidney damage may occur. Repeated or prolonged contact has a defatting action, causing drying, redness, dermatitis. Exposure to toluene may affect the developing fetus.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or impaired liver or kidney function may be more susceptible to the effects of this substance. Alcoholic beverage consumption can enhance the toxic effects of this substance.

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4. First Aid Measures

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. CALL A PHYSICIAN IMMEDIATELY.

Ingestion:
Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately. If vomiting occurs, keep head below hips to prevent aspiration into lungs.
Skin Contact:
In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician immediately.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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5. Fire Fighting Measures

Fire:
Flash point: 7C (45F) CC
Autoignition temperature: 422C (792F)
Flammable limits in air % by volume:
lel: 1.1; uel: 7.1
Flammable liquid and vapor!
Dangerous fire hazard when exposed to heat or flame. Vapors can flow along surfaces to distant ignition source and flash back.
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire or explosion. Sensitive to static discharge.
Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Water may be used to flush spills away from exposures and to dilute spills to non-flammable mixtures.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Water spray may be used to keep fire exposed containers cool.

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6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Toluene:
- OSHA Permissible Exposure Limit (PEL):
200 ppm (TWA); 300 ppm (acceptable ceiling conc.); 500 ppm (maximum conc.).
- ACGIH Threshold Limit Value (TLV):
20 ppm (TWA), A4 - Not Classifiable as a Human Carcinogen.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half-face organic vapor respirator may be worn for up to ten times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.
Odor:
Aromatic benzene-like.
Solubility:
0.05 gm/100gm water @ 20C (68F).
Specific Gravity:
0.86 @ 20C / 4 C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
111C (232F)
Melting Point:
-95C (-139F)
Vapor Density (Air=1):
3.14
Vapor Pressure (mm Hg):
22 @ 20C (68F)
Evaporation Rate (BuAc=1):
2.24

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Heat, flame, strong oxidizers, nitric and sulfuric acids, chlorine, nitrogen tetraoxide; will attack some forms of plastics, rubber, coatings.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

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11. Toxicological Information

Toxicological Data:
Oral rat LD50: 636 mg/kg; skin rabbit LD50: 14100 uL/kg; inhalation rat LC50: 49 gm/m3/4H; Irritation data: skin rabbit, 500 mg, Moderate; eye rabbit, 2 mg/24H, Severe. Investigated as a tumorigen, mutagen, reproductive effector.

Reproductive Toxicity:
Has shown some evidence of reproductive effects in laboratory animals.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Toluene (108-88-3)	No	No	3

12. Ecological Information

Environmental Fate:
When released into the soil, this material may evaporate to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released into water, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less than 1 day. This material is not expected to significantly bioaccumulate. This material has a log octanol-water partition coefficient of less than 3.0. Bioconcentration factor = 13.2 (eels).
Environmental Toxicity:
This material is expected to be toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: TOLUENE
Hazard Class: 3
UN/NA: UN1294
Packing Group: II
Information reported for product/size: 390LB

International (Water, I.M.O.)

Proper Shipping Name: TOLUENE
Hazard Class: 3
UN/NA: UN1294
Packing Group: II
Information reported for product/size: 390LB

15. Regulatory Information

Ingredient	TSCA	EC	Japan	Australia
Toluene (108-88-3)	Yes	Yes	Yes	Yes

Ingredient	Korea	Canada DSL	Canada NDSL	Phil.
Toluene (108-88-3)	Yes	Yes	No	Yes

Ingredient	SARA 302 RQ	SARA 302 TPQ	SARA 313 List	SARA 313 Chemical Catg.
Toluene (108-88-3)	No	No	Yes	No

Ingredient	CERCLA	RCRA 261.33	TSCA 8(d)
Toluene (108-88-3)	1000	U220	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Pure / Liquid)

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: 3[Y]E
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **2** Flammability: **3** Reactivity: **0**
Label Hazard Warning:
POISON! DANGER! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. VAPOR HARMFUL. FLAMMABLE LIQUID AND VAPOR. MAY AFFECT LIVER, KIDNEYS, BLOOD SYSTEM, OR CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.
Label Precautions:
Keep away from heat, sparks and flame.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.
Label First Aid:
Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If vomiting occurs, keep head below hips to prevent aspiration into lungs. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases call a physician immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 8.
Disclaimer:
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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **X2000** * * * * * *Effective Date:* ***11/21/08*** * * * * * *Supercedes:* ***02/16/06***

MSDS Material Safety Data Sheet

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS

J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

XYLENES

1. Product Identification

Synonyms: Dimethyl benzene, xylol, methyltoluene
CAS No.: 1330-20-7
Molecular Weight: 106.17
Chemical Formula: C6H4(CH3)2
Product Codes:
J.T. Baker: 5377, 5813, 9483, 9489, 9490, 9493, 9494, 9499, 9516, X516
Mallinckrodt: 8664, 8668, 8671, 8672, 8802, V052

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
m-Xylene	108-38-3	40 - 65%	Yes
o-Xylene	95-47-6	15 - 20%	Yes
p-Xylene	106-42-3	< 20%	Yes
Ethyl Benzene	100-41-4	15 - 25%	Yes

3. Hazards Identification

Emergency Overview

DANGER! HARMFUL OR FATAL IF SWALLOWED. VAPOR HARMFUL. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. CHRONIC EXPOSURE CAN CAUSE ADVERSE LIVER, KIDNEY, AND BLOOD EFFECTS. FLAMMABLE LIQUID AND VAPOR.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate (Life)
Flammability Rating: 2 - Moderate
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation of vapors may be irritating to the nose and throat. Inhalation of high concentrations may result in nausea, vomiting, headache, ringing in the ears, and severe breathing difficulties which may be delayed in onset. Substernal pain, cough, and hoarseness are also reported. High vapor concentrations are anesthetic and central nervous system depressants.

Ingestion:
Ingestion causes burning sensation in mouth and stomach, nausea, vomiting and salivation. Minute amounts aspirated into the lungs can produce a severe hemorrhagic pneumonitis with severe pulmonary injury or death.

Skin Contact:
Skin contact results in loss of natural oils and often results in a characteristic dermatitis. May be absorbed through the skin.

Eye Contact:
Vapors cause eye irritation. Splashes cause severe irritation, possible corneal burns and eye damage.

Chronic Exposure:
Chronic inhalation can cause headache, loss of appetite, nervousness and pale skin. Repeated or prolonged skin contact may cause a skin rash. Repeated exposure of the eyes to high concentrations of vapor may cause reversible eye damage. Repeated exposure can damage bone marrow, causing low blood cell count. May damage the liver and kidneys.

Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney, blood, or respiratory function may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.
Ingestion:
Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately.
Skin Contact:
Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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5. Fire Fighting Measures

Fire:
Flash point: 29C (84F) CC
Autoignition temperature: 464C (867F)
Flammable limits in air % by volume:
lel: 1.0; uel: 7.0
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire. Sealed containers may rupture when heated. Sensitive to static discharge.
Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Vapors can flow along surfaces to distant ignition source and flash back.

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6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill

has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

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7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do Not attempt to clean empty containers since residue is difficult to remove. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
100 ppm (TWA) xylene
100 ppm (TWA) ethylbenzene
-ACGIH Threshold Limit Value (TLV):
xylene: 100 ppm (TWA) 150 ppm (STEL), A4 - Not classifiable as a human carcinogen.
ethyl benzene: 100 ppm (TWA) 125 ppm (STEL), A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans.
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details. Use explosion-proof equipment.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half-face organic vapor respirator may be worn for up to ten times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-

supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres. Where respirators are required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

The following physical data is for xylene.

Appearance:

Clear, colorless liquid.

Odor:

Characteristic odor.

Solubility:

Insoluble in water.

Specific Gravity:

0.86 @ 20C/4C

pH:

Not applicable.

% Volatiles by volume @ 21C (70F):

100

Boiling Point:

137 - 140C (279 - 284F)

Melting Point:

-25C (-13F)

Vapor Density (Air=1):

3.7

Vapor Pressure (mm Hg):

8 @ 20C (68F)

Evaporation Rate (BuAc=1):

0.7

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10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

Involvement in a fire causes formation of carbon monoxide and unidentified organic components.

Hazardous Polymerization:

Will not occur.
Incompatibilities:
Strong oxidizing agents and strong acids.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

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11. Toxicological Information

Toxicological Data:
Xylene: oral rat LD50: 4300 mg/kg; inhalation rat LC50: 5000 ppm/4H; skin rabbit LD50: > 1700 mg/kg; Irritation eye rabbit: 87 mg mild (Std. Draize); irritation skin rabbit 500 mg/24 moderate (Std. Draize); investigated as a tumorigen, mutagen, reproductive effector. Ethyl benzene: oral rat LD50: 3500 mg/kg; skin rabbit LD50: 17800 uL/kg; investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
May cause teratogenic effects.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
m-Xylene (108-38-3)	No	No	3
o-Xylene (95-47-6)	No	No	3
p-Xylene (106-42-3)	No	No	3
Ethyl Benzene (100-41-4)	No	No	2B

---

12. Ecological Information

Environmental Fate:
Following data for xylene: When released into the soil, this material may evaporate to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released into water, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less than 1 day. This material is not expected to significantly bioaccumulate. (mixed xylenes: octanol / water partition coefficient 3.1 - 3.2; bioconcentration factor = 1.3, eels)
Environmental Toxicity:
For xylene: This material is expected to be slightly toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l.

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13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: RQ, XYLENES
Hazard Class: 3
UN/NA: UN1307
Packing Group: III
Information reported for product/size: 398LB

International (Water, I.M.O.)

Proper Shipping Name: XYLENES
Hazard Class: 3
UN/NA: UN1307
Packing Group: III
Information reported for product/size: 398LB

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15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
m-Xylene (108-38-3)	Yes	Yes	Yes	Yes
o-Xylene (95-47-6)	Yes	Yes	Yes	Yes
p-Xylene (106-42-3)	Yes	Yes	Yes	Yes
Ethyl Benzene (100-41-4)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
m-Xylene (108-38-3)	Yes	Yes	No	Yes
o-Xylene (95-47-6)	Yes	Yes	No	Yes
p-Xylene (106-42-3)	Yes	Yes	No	Yes
Ethyl Benzene (100-41-4)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
m-Xylene (108-38-3)	No	No	Yes	No

o-Xylene (95-47-6)	No	No	Yes	No
p-Xylene (106-42-3)	No	No	Yes	No
Ethyl Benzene (100-41-4)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
m-Xylene (108-38-3)	1000	No	No
o-Xylene (95-47-6)	1000	No	No
p-Xylene (106-42-3)	100	No	Yes
Ethyl Benzene (100-41-4)	1000	No	No

Chemical Weapons Convention: No TSCA 12(b): Yes CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Australian Hazchem Code: 3[Y]
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **2** Flammability: **3** Reactivity: **0**
Label Hazard Warning:
DANGER! HARMFUL OR FATAL IF SWALLOWED. VAPOR HARMFUL. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. CHRONIC EXPOSURE CAN CAUSE ADVERSE LIVER, KIDNEY, AND BLOOD EFFECTS. FLAMMABLE LIQUID AND VAPOR.
Label Precautions:
Keep away from heat, sparks and flame.
Avoid contact with eyes, skin and clothing.
Keep container closed.
Use only with adequate ventilation.
Avoid breathing vapor.
Wash thoroughly after handling.
Label First Aid:
Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.

In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:

No Changes.

Disclaimer:

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Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

ALLIED CHEMICAL CORP. -- COAL TAR PITCH -- 6810-00K000604

========== Product Identification ==========

Product ID:COAL TAR PITCH
MSDS Date:01/01/1985
FSC:6810
NIIN:00K000604
MSDS Number: BCBDS
=== Responsible Party ===
Company Name:ALLIED CHEMICAL CORP.
Emergency Phone Num:201-455-5611
CAGE:1L168
=== Contractor Identification ===
Company Name:ALLIED CHEMICAL COMPANY
Box:1087R
CAGE:1L168
Company Name:ALLIED-SIGNAL INC
Address:Box:2332R
City:MORRISTOWN
State:NJ
ZIP:07962-2332
Country:US
Phone:201-455-4414
CAGE:1L164

========== Composition/Information on Ingredients ==========

Ingred Name:COAL TAR PITCH VOLATILES (BENZENE SOLUBLE FRACTION),
ANTHRACENE, BAP, PHENANTRACENE, ACRIDINE, CHRYSENE, PYRENE.
CAS:65996-93-2
RTECS #:GF8655000
Fraction by Wt: 100%
OSHA PEL:0.2 MG/M3
ACGIH TLV:0.2 MG/M3, A1; 9192

========== Hazards Identification ==========

Effects of Overexposure:INHALD,SKIN,EYE:CAN
IRRITAT.INGESTD:IRRITNT,NAUS,VOMIT.MAY CAUSE CARDIOVAS COLLAPS FROM
HIGH CONCS.

========== First Aid Measures ==========

First Aid:INHALED:REMOVE TO FRESH AIR.GIVE CPR/O*2 IF NEED.SKIN:WASH
W/WATERLESS SOAPS,NO SOLVENTS.EYES:FLUSH W/WATER OR MINERAL OIL 15
MIN.CALL PHYSICIAN.INGEST:INDUCE VOMITING,THEN 2 TBLSPN ACTIVATD
CHARCOAL(USP) IN WATER.GETI IMMEDIATE MEDICAL ATTN.

========== Fire Fighting Measures ==========

Flash Point:302-392F
Lower Limits:UNK
Upper Limits:UNK
Extinguishing Media:WATER FOG,CO*2,FOAM,DRY CHEM.,SAND OR STEAM
Fire Fighting Procedures:H*2O CAN CONTROL FIRES,WATER CAUSES
FOAMNG/ERUPTION OF TANKS
Unusual Fire/Explosion Hazard:WHEN HEATED EMITS LOW MW CPDS.AIR-BORN
DUST MAY XPLODE.CLOUD IGNITE AT 1310F.XPLOD CONC=1000 MG/03CU

========== Accidental Release Measures ==========

Spill Release Procedures:ELIMINATE IGNITION SOURCES.STOP LEAK W/O RISK.DIKE SPILL W EARTH OR SAND.COLLECT IN SUITABLE APPROVED DISPOSAL CONTAINER.

========== Handling and Storage ==========

Handling and Storage Precautions:RECOMMENDED STORAGE IS 50 DEGREES ABOVE SOFTENING POINT.WEAR CLOTHING CLOSED AT NECK,LONG SLEEVES,NON-POROUS GLOVES
Other Precautions:CHANGE CLOTHES DAILY IF CONTAMINATED.

========== Exposure Controls/Personal Protection ==========

Respiratory Protection:NIOSH APPRVD RESPIR W ORGANIC VAPOR CARTRIDGE
Ventilation:VENTILATE WORK AREA.AND/OR WEAR RESPIRATOR
Protective Gloves:NON-POROUS
Eye Protection:SAFETY GLASSES
Other Protective Equipment:FULL PROTECTV CLOTHES,FACE SHILD,GOGGLES,PROTECTV CREAM(SKIN
Supplemental Safety and Health
FP=150-200C

========== Physical/Chemical Properties ==========

HCC:N1
Boiling Pt:B.P. Text:671F/355C
Vapor Density:>1
Spec Gravity:1.27
Evaporation Rate & Reference:<1:BUTYL ACETATE=1
Solubility in Water:NEGLIGIBLE
Appearance and Odor:BLACK SOLID,LITTLE ODOR @ AMB.SMOKY ODOR ON HEATNG
Percent Volatiles by Volume:UNK

========== Stability and Reactivity Data ==========

Stability Indicator/Materials to Avoid:YES
AVOID CONTACT W/WATER WHEN CONFINED
Stability Condition to Avoid:DUSTY CONDITION BREATHING FUMES,WORK IN UNVENT AREA W/O RESP
Hazardous Decomposition Products:EMITS LOW MW CPDS WHEN BURNED
Conditions to Avoid Polymerization:OPEN FLAME/INTENSE HEAT.

========== Disposal Considerations ==========

Waste Disposal Methods:BURY OR INCINERATE AT APPROVED SITES IN ACCORDANCE WITH LOCAL,STATE AND FEDERAL REGULATIONS.

MSDS Number: **C5456** * * * * * *Effective Date:* ***05/26/09*** * * * * * *Supercedes:* ***07/06/06***

MSDS Material Safety Data Sheet

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300
National Response in Canada
CANUTEC: 613-996-6666
Outside U.S. And Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

m-CRESOL

1. Product Identification

Synonyms: m-Cresol practical; phenol, 3-methyl-; 3-hydroxytoluene; meta-Cresylic Acid; 3-Cresol; m-Cresylic Acid
CAS No.: 108-39-4
Molecular Weight: 108.14
Chemical Formula: C7H8O
Product Codes: F842

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
m-Cresol	108-39-4	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! MAY BE FATAL IF SWALLOWED, INHALED OR

ABSORBED THROUGH SKIN. CORROSIVE. CAUSES SEVERE BURNS TO EVERY AREA OF CONTACT. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER, KIDNEYS, PANCREAS AND CARDIOVASCULAR SYSTEM. VAPOR IS IRRITATING TO EYES AND RESPIRATORY TRACT. COMBUSTIBLE LIQUID AND VAPOR.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 2 - Moderate
Reactivity Rating: 1 - Slight
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: White (Corrosive)

Potential Health Effects

Cresol is toxic via ingestion and skin absorption. Cresol is similar to phenol in its action on the body, but is less severe in its effects.

Inhalation:
Breathing vapor, dust or mist results in digestive disturbances (vomiting, difficulty in swallowing, diarrhea, loss of appetite). Will irritate, possibly burn respiratory tract. Other symptoms listed under ingestion may also occur.
Ingestion:
Poison. Symptoms may include burning pain in mouth and throat, abdominal pain, headache, dizziness, muscular weakness, irregular breathing, weak pulse, lung damage, liver damage, pancreas damage, kidney damage, coma, and possibly death from circulatory or cardiac failure.
Skin Contact:
Corrosive. Causes severe pain followed by numbness. May be absorbed through the skin with systemic poisoning effects to follow. Discoloration and severe burns may occur.
Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Chronic Exposure:
Repeated exposure may cause symptoms described for acute poisoning as well as liver damage.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired liver or kidney function may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:
Onset of systemic effects may be delayed as long as 72 hours.

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5. Fire Fighting Measures

Fire:
Flash point: 86C (187F) CC
Autoignition temperature: 1038C (1900F)
Flammable limits in air % by volume:
lel: 1.1; uel: 1.4
Combustible Liquid and Vapor! Contact with strong oxidizers may cause fire.
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Vapors can flow along surfaces to distant ignition source and flash back. Sealed containers may rupture when heated.
Fire Extinguishing Media:
Water spray, dry chemical, alcohol foam, or carbon dioxide.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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6. Accidental Release Measures

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8.

Solid Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container.

Liquid Spills: Absorb with vermiculite, dry sand, earth or similar material and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush

to sewer.

Any Spill:
US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

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7. Handling and Storage

Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Protect from light. Outside or detached storage is preferred. Separate from other storage. Do not allow untrained workers to handle cresol. Containers of this material may be hazardous when empty since they retain product residues (dust, solids, vapors, liquid); observe all warnings and precautions listed for the product.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
5 ppm (TWA) (skin), cresol, all isomers

-ACGIH Threshold Limit Value (TLV):
5 ppm (TWA) (skin), cresol, all isomers
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a full-face piece respirator with an organic vapor cartridge and particulate filter (NIOSH type P100 or R100 filter) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. Please note that N series filters are not recommended for this material. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain

eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Colorless to yellow liquid.
Odor:
Phenolic odor.
Solubility:
Soluble in water.
Specific Gravity:
1.034 @ 20C/4C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
No information found.
Boiling Point:
202C (396F)
Melting Point:
11 - 12C (52 - 54F)
Vapor Density (Air=1):
3.72
Vapor Pressure (mm Hg):
0.1528 @ 25C (77F)
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Darkens on exposure to air or light.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Oxidizing agents and bases.
Conditions to Avoid:
Heat, flame, ignition sources, incompatibles, light, and air.

11. Toxicological Information

Toxicological Data:

Rat oral LD50: 242 mg/kg; Rabbit skin LD50: 2050 mg/kg. Irritant (std Draize) rabbit: skin = 517 mg/24H, severe; eye = 103 mg, severe. Investigated as a tumorigen, mutagen, reproductive effector.

Carcinogenicity:

EPA / IRIS classification: Group C - Possible human carcinogen.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
m-Cresol (108-39-4)	No	No	None

12. Ecological Information

Environmental Fate:

When released into water, this material is expected to readily biodegrade. This material is not expected to significantly bioaccumulate. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals.

Environmental Toxicity:

The LC50/96-hour values for fish are between 10 and 100 mg/l.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: CRESOLS
Hazard Class: 6.1, 8
UN/NA: UN2076
Packing Group: II
Information reported for product/size: 4L

International (Water, I.M.O.)

Proper Shipping Name: CRESOLS, LIQUID
Hazard Class: 6.1, 8

UN/NA: UN2076
Packing Group: II
Information reported for product/size: 4L

International (Air, I.C.A.O.)

Proper Shipping Name: CRESOLS
Hazard Class: 6.1, 8
UN/NA: UN2076
Packing Group: II
Information reported for product/size: 4L

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
m-Cresol (108-39-4)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
m-Cresol (108-39-4)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
m-Cresol (108-39-4)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
m-Cresol (108-39-4)	100	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Pure / Liquid)

Australian Hazchem Code: 2X
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **3** Flammability: **2** Reactivity: **0**
Label Hazard Warning:
POISON! DANGER! MAY BE FATAL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. CORROSIVE. CAUSES SEVERE BURNS TO EVERY AREA OF CONTACT. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER, KIDNEYS, PANCREAS AND CARDIOVASCULAR SYSTEM. VAPOR IS IRRITATING TO EYES AND RESPIRATORY TRACT. COMBUSTIBLE LIQUID AND VAPOR.
Label Precautions:
Do not breathe vapor or mist.
Do not get in eyes, on skin, or on clothing.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep away from heat and flame.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 3.
Disclaimer:
****

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

International Chemical Safety Cards

o-CRESOL

ICSC: 0030

o-CRESOL
2-Hydroxy-1-methylbenzene
2-Methylphenol
Ortho-hydroxytoluene
$C_7H_8O/CH_3C_6H_4OH$
Molecular mass: 108.2

CAS # 95-48-7
RTECS # GO6300000
ICSC # 0030
UN # 2076
EC # 604-004-00-9

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, powder, AFFF, foam, carbon dioxide.
EXPLOSION	Above 81°C explosive vapour/air mixtures may be formed.	Above 81°C use a closed system, ventilation.	
EXPOSURE		STRICT HYGIENE!	IN ALL CASES CONSULT A DOCTOR!
• **INHALATION**	Burning sensation. Cough. Headache. Laboured breathing. Nausea. Vomiting.	Local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration if indicated. Refer for medical attention.
• **SKIN**	MAY BE ABSORBED! Redness. Pain. Blisters.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
• **EYES**	Redness. Pain. Severe deep burns.	Face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**	Abdominal cramps. Burning sensation. Collapse.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place (extra personal protection: complete protective clothing including self-contained breathing apparatus).	Separated from strong oxidants, food and feedstuffs.	Do not transport with food and feedstuffs. T symbol R: 24/25-34 S: (1/2-)36/37/39-45 Note: C UN Hazard Class: 6.1

		UN Subsidiary Risks: 8 UN Packing Group: II Marine pollutant.

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0030 Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993

International Chemical Safety Cards

o-CRESOL

ICSC: 0030

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS OR YELLOW LIQUID OR CRYSTALS , WITH CHARACTERISTIC ODOUR. TURNS DARK ON EXPOSURE TO AIR AND LIGHT. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Reacts violently with strong oxidizing agents, causing fire and explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV: 5 ppm; 22 mg/m^3 (as TWA) (skin) (ACGIH 1993-1994). MAK: 5 ppm; 22 mg/m^3; skin (1992).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation, through the skin and by ingestion. **INHALATION RISK:** A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** Corrosive. The substance is corrosive to the eyes, the skin and the respiratory tract. Corrosive on ingestion. Inhalation of vapour or aerosol may cause lung oedema (see Notes). The substance may cause effects on the central nervous system and various organs. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis.
PHYSICAL PROPERTIES	Boiling point: 191°C Melting point: 31°C Relative density (water = 1): 1.05 Solubility in water, g/100 ml at 25°C: 2.5 Vapour pressure, Pa at 25°C: 33	Relative vapour density (air = 1): 3.7 Flash point: 81°C c.c. Auto-ignition temperature: 599°C Explosive limits, vol% in air: 1.4-? Octanol/water partition coefficient as log Pow: 1.95
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to water. It is strongly advised not to let the chemical enter into the environment because it persists in the environment.	

NOTES

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Immediate administration of an appropriate spray, by a doctor or a person authorized by him/her, should be considered.

Transport Emergency Card: TEC (R)-37A, 37C

NFPA Code: H 3; F 2; R 0;

ADDITIONAL INFORMATION	

ICSC: 0030 **o-CRESOL**

IMPORTANT LEGAL NOTICE:	Neither the CEC or the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

Material Safety Data Sheet
2,4-Dimethylphenol, 99%

ACC# 14357

Section 1 - Chemical Product and Company Identification

MSDS Name: 2,4-Dimethylphenol, 99%
Catalog Numbers: AC408450000, AC408450050, AC408450250, AC408451000
Synonyms: 2,4-Xylenol; 4,6-DImethylphenol Benzene; 1-Hydroxy-2,4-Dimethyl Benzene; M-Xylenol.
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
105-67-9	2,4-Dimethylphenol	99	203-321-6

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless or almost colorless crystals.
Danger! Causes eye and skin burns. Causes digestive and respiratory tract burns. Harmful if swallowed or absorbed through the skin. May cause kidney damage.
Target Organs: Kidneys, respiratory system, gastrointestinal system, eyes, skin.

Potential Health Effects
Eye: Causes eye burns.
Skin: Harmful if absorbed through the skin. Causes skin burns.
Ingestion: Harmful if swallowed. Causes gastrointestinal tract burns. A case of fatal xylenol ingestion by a long stay mental hospital patient is described. Clinical course was similar to that observed in other phenolic poisonings with active bowel sounds, nausea, vomiting, severe metabolic acidosis, hypotension, and cardiac and renal failure.
Inhalation: Causes chemical burns to the respiratory tract.
Chronic: May cause kidney damage. Chronic exposure may cause effects similar to those of acute exposure.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid immediately.

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 aid immediately. Wash clothing before reuse.
Ingestion: If swallowed, do NOT induce vomiting. Get medical aid immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Dust from this material can form explosive organic dust cloud.
Extinguishing Media: For small fires, use dry chemical, carbon dioxide, or water spray. For large fires, use dry chemical, carbon dioxide, alcohol-resistant foam, or water spray.
Flash Point: 96 deg C (204.80 deg F)
Autoignition Temperature: Not available.
Explosion Limits, Lower:1.40 vol %
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 1; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Sweep up or absorb material, then place into a suitable clean, dry, closed container for disposal. Avoid generating dusty conditions. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Minimize dust generation and accumulation. Do not breathe dust, mist, or vapor. Do not get in eyes, on skin, or on clothing. Keep container tightly closed.
Storage: Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Do not store in metal containers.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
2,4-Dimethylphenol	none listed	none listed	none listed

OSHA Vacated PELs: 2,4-Dimethylphenol: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Crystals
Appearance: colorless or almost colorless
Odor: Characteristic phenolic odor.
pH: Not available.
Vapor Pressure: 10 mm Hg @92.3
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 211 deg C
Freezing/Melting Point:21-26 deg C
Decomposition Temperature: Not available.
Solubility: 0.5% (25°C)
Specific Gravity/Density:.9700 g/cm3
Molecular Formula:C8H10O
Molecular Weight:122.17

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Dust generation, excess heat.
Incompatibilities with Other Materials: Bases - acid chlorides - acid anhydrides - oxidizing agents - corrodes steel - brass - copper - copper alloys.
Hazardous Decomposition Products: Carbon monoxide, carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported

Section 11 - Toxicological Information

RTECS#:
CAS# 105-67-9: ZE5600000
LD50/LC50:
CAS# 105-67-9:
Oral, mouse: LD50 = 809 mg/kg;
Oral, rat: LD50 = 3200 mg/kg;

Skin, rat: LD50 = 1040 mg/kg;

.

Carcinogenicity:
CAS# 105-67-9: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information available.
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: No information found
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. No information available.
Environmental: Terrestrial: Would adsorb moderately to soil. It is reported to have been biodegraded in soil in 4 days at 19 deg C. Aquatic: May adsorb moderately to sediment and will be readily biodegradable. Atmospheric: Should degrade by reaction with photochemically produced hydroxyl radicals (half-life 8 hr). Expected to slightly bioconcentrate.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 105-67-9: waste number U101.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	TOXIC SOLIDS, CORROSIVE, ORGANIC, N.O.S.	Toxic Solid, Corrosive, Organic, N.O.S.
Hazard Class:	6.1	6.1
UN Number:	UN2928	UN2928
Packing Group:	II	II

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 105-67-9 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 105-67-9: 100 lb final RQ; 45.4 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 105-67-9: immediate.

Section 313

This material contains 2,4-Dimethylphenol (CAS# 105-67-9, 99%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 105-67-9 is listed as a Priority Pollutant under the Clean Water Act. CAS# 105-67-9 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 105-67-9 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T C N

Risk Phrases:

R 34 Causes burns.
R 24/25 Toxic in contact with skin and if swallowed.
R 51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 36/37/39 Wear suitable protective clothing, gloves and eye/face pr otection.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 61 Avoid release to the environment. Refer to special instructions /safety data sheets.

WGK (Water Danger/Protection)
CAS# 105-67-9: No information available.
Canada - DSL/NDSL
CAS# 105-67-9 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of E, D1A.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.
Canadian Ingredient Disclosure List
CAS# 105-67-9 is not listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 4/16/1999
Revision #5 Date: 11/20/2008

MSDS Number: **N0090** * * * * * *Effective Date:* ***08/10/04*** * * * * * *Supercedes:* ***11/02/01***

MSDS Material Safety Data Sheet

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

NAPHTHALENE

1. Product Identification

Synonyms: Naphthene; mothballs; tar camphor; naphthaliin; white-tar
CAS No.: 91-20-3
Molecular Weight: 128.16
Chemical Formula: C10H8
Product Codes:
J.T. Baker: 2718
Mallinckrodt: 6348

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Naphthalene	91-20-3	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. MAY CAUSE ALLERGIC SKIN REACTION. MAY AFFECT LIVER, KIDNEY, BLOOD AND CENTRAL NERVOUS SYSTEM. COMBUSTIBLE.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate
Flammability Rating: 2 - Moderate
Reactivity Rating: 0 - None
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation of dust or vapors can cause headache, nausea, vomiting, extensive sweating, and disorientation. The predominant reaction is delayed intravascular hemolysis with symptoms of anemia, fever, jaundice, and kidney or liver damage.
Ingestion:
Toxic. Can cause headache, profuse perspiration, listlessness, dark urine, nausea, vomiting and disorientation. Intravascular hemolysis may also occur with symptoms similar to those noted for inhalation. Severe cases may produce coma with or without convulsions. Death may result from renal failure.
Skin Contact:
Can irritate the skin and, on prolonged contact, may cause rashes and allergy. "Sensitized" individuals may suffer a severe dermatitis.
Eye Contact:
Vapors and solid causes irritation, redness and pain. Very high exposures can damage the nerves of the eye.
Chronic Exposure:
Has led to cataract formation in eyes. May cause skin allergy.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin, blood or vascular disorders or impaired respiratory function may be more susceptible to the effects of the substance. Particularly susceptible individuals are found in the general population, most commonly in dark skinned races.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
Give large amounts of water to drink. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:
Wash skin with soap or mild detergent and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Flash point: 87C (189F) CC
Autoignition temperature: 526C (979F)
Combustible. May be ignited by heat, sparks or flame. May burn rapidly with flare-burning effect. Fire may produce irritating or poisonous gases.
Explosion:
Explosive limits, volume % in air: lel: 0.9; uel: 5.9. Above flashpoint, vapor-air mixtures are explosive within flammable limits noted above. Closed containers exposed to heat may explode. Contact with strong oxidizers may cause fire or explosion.
Fire Extinguishing Media:
Dry chemical, foam, water or carbon dioxide. Foam or direct water spray on molten naphthalene may cause extensive foaming. Molten napthalene spatters in contact with water; apply water from as far a distance as possible.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Vapors can flow along surfaces to distant ignition source and flash back.

6. Accidental Release Measures

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Keep away from moisture and oxidizers. Containers of this material may be hazardous when empty since they retain

product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
- OSHA Permissible Exposure Limit (PEL):
10 ppm, 50 mg/m3.

- ACGIH Threshold Limit Value (TLV):
TWA= 10 ppm, 52 mg/m3
STEL= 15 ppm, 79 mg/m3.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a half-face respirator with an organic vapor cartridge and particulate filter (NIOSH type P95 or R95 filter) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece respirator with an organic vapor cartridge and particulate filter (NIOSH P100 or R100 filter) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. Please note that N series filters are not recommended for this material. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
White crystals.

Odor:
Strong coal tar odor (moth balls).

Solubility:
Insoluble in water.

Specific Gravity:
1.2

pH:
No information found.
% Volatiles by volume @ 21C (70F):
No information found.
Boiling Point:
218C (424F)
Melting Point:
80C (176F)
Vapor Density (Air=1):
4.4
Vapor Pressure (mm Hg):
1 @ 53C (127F)
Evaporation Rate (BuAc=1):
< 1

---

10. Stability and Reactivity

Stability:
Stable at room temperature in sealed containers. Sublimes appreciably at temperatures above melting point.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong oxidizers, strong alkalis and strong mineral acids, mixtures of aluminum trichloride and benzoyl chloride. Reacts violently with chromic anhydride. Melted naphthalene will attack some forms of plastics, rubber, and coatings.
Conditions to Avoid:
Avoid heat, sparks, flames and other ignition sources and incompatibles.

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11. Toxicological Information

Oral rat LD50: 490 mg/kg;
Inhalation rat LC50: 340 mg/m3, 1 hour;
Skin rabbit LD50: > 20 g/kg;
Irritation data: skin (open Draize) rabbit 495 mg, mild; eye (standard Draize) rabbit 100 mg, mild;
Investigated as a tumorigen, mutagen and reproductive effector.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Naphthalene (91-20-3)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material may biodegrade to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released to water, this material is expected to quickly evaporate. When released into water, this material may biodegrade to a moderate extent. When released into the water, this material is expected to have a half-life between 1 and 10 days. This material may bioaccumulate to some extent. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less than 1 day.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: NAPHTHALENE, REFINED
Hazard Class: 4.1
UN/NA: UN1334
Packing Group: III
Information reported for product/size: 1KG

International (Water, I.M.O.)

Proper Shipping Name: NAPHTHALENE, REFINED
Hazard Class: 4.1
UN/NA: UN1334
Packing Group: III
Information reported for product/size: 1KG

International (Air, I.C.A.O.)

Proper Shipping Name: NAPHTHALENE, REFINED
Hazard Class: 4.1
UN/NA: UN1334
Packing Group: III
Information reported for product/size: 1KG

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Naphthalene (91-20-3)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Naphthalene (91-20-3)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Naphthalene (91-20-3)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Naphthalene (91-20-3)	100	U165	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Pure / Solid)

Australian Hazchem Code: 2Z
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **2** Flammability: **2** Reactivity: **0**
Label Hazard Warning:
WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. MAY CAUSE ALLERGIC SKIN

REACTION. MAY AFFECT LIVER, KIDNEY, BLOOD AND CENTRAL NERVOUS SYSTEM. COMBUSTIBLE.

Label Precautions:

Avoid contact with eyes, skin and clothing.
Avoid prolonged or repeated contact with skin.
Avoid breathing dust.
Avoid breathing vapor.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep away from heat, sparks and flame.

Label First Aid:

In all cases call a physician. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, give large amounts of water to drink. Never give anything by mouth to an unconscious person.

Product Use:

Laboratory Reagent.

Revision Information:

No Changes.

Disclaimer:

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

ULTRA SCIENTIFIC -- PHENOLS MIXTURE, US-107

MSDS Safety Information

FSC: 6850
MSDS Date: 05/13/1996
MSDS Num: CDTDX
LIIN: 00N041084
Product ID: PHENOLS MIXTURE, US-107
MFN: 02
Responsible Party
Cage: 0MU35
Name: ULTRA SCIENTIFIC
Address: 250 SMITH ST
City: NORTH KINGSTOWN RI 02852
Info Phone Number: 401-294-9400
Emergency Phone Number: 401-294-9400
Published: Y

Contractor Summary

Cage: 0MU35
Name: ULTRA SCIENTIFIC
Address: 250 SMITH STREET
City: NORTH KINGSTOWN RI 02852-5000
Phone: 401-294-9400

Ingredients

Name: SUPP DATA:PHENOL, PENTACHLORO-:IARC MONOGRAPHS ON EVAL OF CARCIN RISK OF CHEMS TO MAN, VOL 53, PG 371, 1991:

Name: ING 14:GROUP 2B. ANIMAL:LIVER.

Cas: 75-09-2
RTECS #: PA8050000
Name: METHANE, DICHLORO-; (METHYLENE CHLORIDE) (SARA 313) (CERCLA). LD50:(ORAL,RAT) 2136 MG/KG.
% Wt: 98.3408
OSHA PEL: 500 PPM
ACGIH TLV: 50 PPM
EPA Rpt Qty: 1000 LBS
DOT Rpt Qty: 1000 LBS

Cas: 59-50-7
RTECS #: GO7100000
Name: M-CRESOL, 4-CHLORO-; (4-CHLORO-3-METHYLPHENOL) (CERCLA). LD50:(ORAL,RAT) 400 MG/KG.
% Wt: 0.1508
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)
EPA Rpt Qty: 5000 LBS
DOT Rpt Qty: 5000 LBS

Cas: 95-57-8
RTECS #: SK2625000
Name: PHENOL, O-CHLORO-; (2-CHLOROPHENOL) (SARA 313) (CERCLA). LD50:(ORAL,RAT) 670 MG/KG.
% Wt: 0.1508
OSHA PEL: N/K (FP N)

ACGIH TLV: N/K (FP N)
EPA Rpt Qty: 100 LBS
DOT Rpt Qty: 100 LBS

Cas: 120-83-2
RTECS #: SK8575000
Name: PHENOL, 2,4-DICHLORO-; (2,4-DICHLOROPHENOL) (SARA 313) (CERCLA).
LD50:(ORAL,RAT) 580 MG/KG.
% Wt: 0.1508
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)
EPA Rpt Qty: 100 LBS
DOT Rpt Qty: 100 LBS

Cas: 105-67-9
RTECS #: ZE5600000
Name: 2,4-XYLENOL; (2,4-DIMETHYLPHENOL) (SARA 313) (CERCLA). LD50:(ORAL,RAT)
3200 MG/KG.
% Wt: 0.1508
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)
EPA Rpt Qty: 100 LBS
DOT Rpt Qty: 100 LBS

Cas: 534-52-1
RTECS #: GO9625000
Name: O-CRESOL, 4,6-DINITRO-; (2-METHYL-4,6-DINITROPHENOL) (SARA 302/313)
(CERCLA). LD50:(ORAL,RAT) 10 MG/KG.
% Wt: 0.1508
OSHA PEL: 0.2 MG/M3, S
ACGIH TLV: 0.2 MG/M3, S
EPA Rpt Qty: 10 LBS
DOT Rpt Qty: 10 LBS

Cas: 51-28-5
RTECS #: SL2800000
Name: PHENOL, 2,4-DINITRO-; (2,4-DINITROPHENOL) (SARA 313) (CERCLA).
LD50:(ORAL,RAT) 30 MG/KG.
% Wt: 0.1508
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)
EPA Rpt Qty: 10 LBS
DOT Rpt Qty: 10 LBS

Cas: 88-75-5
RTECS #: SM2100000
Name: PHENOL, O-NITRO-; (2-NITROPHENOL) (SARA 313) (CERCLA). LD50:(ORAL,RAT)
334 MG/KG.
% Wt: 0.1508
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)
EPA Rpt Qty: 100 LBS
DOT Rpt Qty: 100 LBS

Cas: 100-02-7
RTECS #: SM2275000
Name: PHENOL, P-NITRO-; (P-NITROPHENOL) (SARA 313). LD50:(ORAL,RAT) 250 MG/KG.
% Wt: 0.1508
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

EPA Rpt Qty: 100 LBS
DOT Rpt Qty: 100 LBS

Cas: 87-86-5
RTECS #: SM6300000
Name: PHENOL, PENTACHLORO-; (PENTACHLOROPHENOL) (PCP) (SARA 313) (CERCLA).
LD50:(ORAL,RAT) 50 MG/KG.
% Wt: 0.1508
OSHA PEL: 0.5 MG/M3, S
ACGIH TLV: 0.5 MG/M3, S
EPA Rpt Qty: 10 LBS
DOT Rpt Qty: 10 LBS

Cas: 108-95-2
RTECS #: SJ3327000
Name: PHENOL (SARA 302/313) (CERCLA). LD50:(ORAL,RAT) 414 MG/KG.
% Wt: 0.1508
OSHA PEL: 5 PPM, S
ACGIH TLV: 5 PPM, S
EPA Rpt Qty: 1000 LBS
DOT Rpt Qty: 1000 LBS

Cas: 88-06-2
RTECS #: SN1675000
Name: PHENOL, 2,4,6-TRICHLORO-; (2,4,6-TRICHLOROPHENOL) (SARA 313) (CERCLA).
LD50:(ORAL,RAT) 250 MG/KG.
% Wt: 0.1508
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)
EPA Rpt Qty: 10 LBS
DOT Rpt Qty: 10 LBS

Name: OTHER PROT EQUIP:SUCH AS A LABORATORY COAT &/OR A RUBBER APRON TO PREVENT CONTACT W/EYES, SKIN & CLOTHING.
==========
Health Hazards Data
==========
LD50 LC50 Mixture: SEE INGREDIENTS.
Route Of Entry Inds - Inhalation: YES
Skin: YES
Ingestion: YES
Carcinogenicity Inds - NTP: YES
IARC: YES
OSHA: NO
Effects of Exposure: CHLOROCARBON MATLS HAVE PRODUCED SENSITIZATION OF THE MYOCARDIUM TO EPINEPHRINE IN LAB ANIMALS & COULD HAVE A SIMILAR EFFECT IN HUMANS. ADRENOMIMETICS (E.G., EPINEPHRINE) MAY BE CONTRAINDICATED EXCEPT FOR LIFE-SUSTAINING USES IN HUMANS ACUTELY OR CHRONICALLY EXPOSED TO CHLOROCARBONS (FP N). CONTAINS (EFTS OF OVEREXP)
Explanation Of Carcinogenicity: METHYLENE CHLORIDE:IARC MONOGRAPHS, SUPP, VOL 7, PG 194, 1987:GRP 2B. NTP 7TH ANNUAL RPT ON CARCINS, 1994:ANTIC (SUPDAT)
Signs And Symptions Of Overexposure: HLTH HAZ:CARCINOGEN(S) OR CANCER SUSPECT AGENT(S). TOXIC; IRRITANT. WARNING:THIS PRODUCT CONTAINS CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER. ALL CHEMICALS SHOULD BE CONSIDERED HAZARDO US - DIRECT PHYSICAL CONATCT SHOULD BE AVOIDED.
Medical Cond Aggravated By Exposure: NONE SPECIFIED BY MANUFACTURER.
First Aid: INGEST:CALL MD IMMEDIATELY (FP N). EYES:FLUSH W/COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES. SKIN:FLUSH W/COPIOUS AMOUNTS OF WATER. INHAL:REMOVE TO FRESH AIR - GIVE OXYGEN, IF NECESSARY. CONTACT MD.
==========

Handling and Disposal
==========
Spill Release Procedures: DUE TO THE SMALL QUANTITY INVOLVED, SPILLS OR LEAKS SHOULD NOT POSE A SIGNIFICANT PROBLEM. A LEAKING AMPULE OR BOTTLE MAY BE PLACED IN A PLASTIC BAG AND NORMAL DISPOSAL PROCEDURES FOLLOWED. LIQUID SPL ASHES MAY BE ABSORBED ON VERMICULITE ORSAND.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Methods: BURN IN A CHEMICAL INCINERATOR EQUIPPED W/AFTERBURNER & SCRUBBER. OBSERVE ALL FEDERAL, STATE & LOCAL LAWS CONCERNING DISPOSAL.
Handling And Storage Precautions: KEEP TIGHTLY CLOSED & STORE IN A COOL, DRY PLACE. THIS MATL SHOULD ONLY BE USED BY THOSE PERSONS TRAINED IN THE SAFE HNDLG OF HAZARDOUS CHEMICALS.
Other Precautions: NO SMOKING IN AREA OF USE. DO NOT USE IN GENERAL VICINITY OF ARC WELDING, OPEN FLAMES OR HOT SURFACES. HEAT &/OR UV RADIATION MAY CAUSE THE FORMATION OF HCL &/OR PHOSGENE (FP N).
==========
Fire and Explosion Hazard Information
==========
Flash Point Text: NONE
Lower Limits: 15.5%
Upper Limits: 66.4%
Extinguishing Media: CARBON DIOXIDE, DRY CHEMICAL POWDER OR WATER SPRAY.
Fire Fighting Procedures: WEAR NIOSH APPROVED PRESSURE DEMAND SCBA & FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire/Explosion Hazard: THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE HCL & PHOSGENE (FP N). NON-COMBUSTIBLE.
==========
Control Measures
==========
Respiratory Protection: NIOSH APPROVED RESPIRATOR APPROPRIATE FOR EXPOSURE OF CONCERN (FP N).
Ventilation: NONE SPECIFIED BY MANUFACTURER.
Protective Gloves: IMPERVIOUS GLOVES (FP N).
Eye Protection: ANSI APPRVD CHEM WORKERS GOGGS &(SUPDAT)
Other Protective Equipment: ANSI APPRVD EYE WASH FOUNTAIN & DELUGE SHOWER (FP N). USE APPROP NIOSH APPRVD SFTY EQUIP. WEAR CHEM RESIST CLTHG
Work Hygienic Practices: NONE SPECIFIED BY MANUFACTURER.
Supplemental Safety and Health: EYE PROT:FULL LGTH FCSHLD (FP N). EXPLAN OF CARCIN:TO BE CARCIN. ANIMAL:LUNG, LIVER, SALIVARY, MAMMARY GLAND (TUMORS). 2,4,6-TRICHLOROPHENOL:IARC MONOGRAPHS, SUPP, VOL 7, PG 154, 1987:ANIMAL SUFFICIEN T EVID. NTP 7TH ANNUAL RPT ON CARCINS, 1994:ANTIC TO BE CARCIN. ANIMAL:SKIN, EYE, CNS, LIVER, KIDNEY EFTS.
==========
Physical/Chemical Properties
==========
B.P. Text: 104F,40C
M.P/F.P Text: -142F,-97C
Vapor Pres: 380 @ 22C
Vapor Density: 2.9
Spec Gravity: 1.326
Solubility in Water: INSOLUBLE
Appearance and Odor: COLORLESS LIQUID.
==========
Reactivity Data
==========
Stability Indicator: YES
Stability Condition To Avoid: NONE SPECIFIED BY MANUFACTURER.
Hazardous Decomposition Products: HCL (FP N). PHOSGENE.
Hazardous Polymerization Indicator: NO

Conditions To Avoid Polymerization: NOT RELEVANT

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Toxicological Information

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Ecological Information

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MSDS Transport Information

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Regulatory Information

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Other Information

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==========

HAZCOM Label

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Product ID: PHENOLS MIXTURE, US-107
Cage: 0MU35
Company Name: ULTRA SCIENTIFIC
Street: 250 SMITH STREET
City: NORTH KINGSTOWN RI
Zipcode: 02852-5000
Health Emergency Phone: 401-294-9400
Label Required IND: Y
Date Of Label Review: 05/20/1997
Status Code: C
Label Date: 05/20/1997
Origination Code: G
Chronic Hazard IND: Y
Eye Protection IND: YES
Skin Protection IND: YES
Signal Word: DANGER
Respiratory Protection IND: YES
Health Hazard: Severe
Contact Hazard: Moderate
Fire Hazard: None
Reactivity Hazard: Slight
Hazard And Precautions: DECOMPOSITION PRODUCTS MAY BE HAZARDOUS.
ACUTE:INHALATION OF VAPORS MAY CONTRIBUTE TO THE OCCURRENCE OF IRREGULAR HEARTBEAT (FP N). TOXIC; IRRITANT. CHRONIC:CANCER HAZARD. CONTAINS METHYLENE CHLORIDE, 2,4,6-TRICHLOROPHENOL AND PENTACHLOROPHENOL, WHICH ARE LISTED AS ANIMAL LUNG AND LIVER CARCINOGENS (FP N).

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Disclaimer (provided with this information by the compiling agencies): This information is formulated for use by elements of the Department of Defense. The United States of America in no manner whatsoever expressly or implied warrants, states, or intends said information to have any application, use or viability by or to any person or persons outside the Department of Defense nor any person or persons contracting with any instrumentality of the United States of America and disclaims all liability for such use. Any person utilizing this instruction who is not a military or civilian employee of the United States of America should seek competent professional advice to verify and assume responsibility for the suitability of this information to their particular situation regardless of similarity to a corresponding Department of Defense or other government situation.

SPEX INDUSTRIES, INC -- CYANIDE -- 6550-00N049220

========== Product Identification ==========

Product ID:CYANIDE
MSDS Date:05/07/1993
FSC:6550
NIIN:00N049220
MSDS Number: BTZDG
=== Responsible Party ===
Company Name:SPEX INDUSTRIES, INC
Address:3880 PARK AVE
City:EDISON
State:NJ
ZIP:08820
Country:US
Info Phone Num:908-549-7144
Emergency Phone Num:800-424-9300(CHEMTREC)
CAGE:07987
=== Contractor Identification ===
Company Name:SPEX CERTIPREP INC
Address:203 NORCROSS AVE
Box:City:METUCHEN
State:NJ
ZIP:08840
Country:US
Phone:732-549-7144
CAGE:07977
Company Name:SPEX INDUSTRIES, INC
Address:3880 PARK AVE
City:EDISON
State:NJ
ZIP:08820
Phone:(201) 549-7144
CAGE:07987

========== Composition/Information on Ingredients ==========

Ingred Name:POTASSIUM CYANIDE
CAS:151-50-8
RTECS #:TS8750000
Fraction by Wt: 0.0063%
OSHA PEL:5 MG/M3 (CN)
ACGIH TLV:5 MG/M3, C
EPA Rpt Qty:10 LBS
DOT Rpt Qty:10 LBS

========== Hazards Identification ==========

LD50 LC50 Mixture:LD50:(ORAL,RAT)10 MG/KG
Routes of Entry: Inhalation:YES Skin:YES Ingestion:YES
Reports of Carcinogenicity:NTP:NO IARC:NO OSHA:NO
Health Hazards Acute and Chronic:CONC KCN IS A RAPIDLY FATAL POISON
WHEN TAKEN INTO DIGESTIVE SYS. TOX SYMPS MAY ALSO OCCUR WHEN
INHALED. PRLNGD SKIN CONT WILL CAUSE IRRIT & POSS POISONING COULD
OCCUR IF SKIN IS BROKEN. BUT SOLN CNTN S A VERY SM AMT (0.0063%) OF
POTASSIUM CYANIDE. A STUDY BY AN INDEPENDENT LAB HAS SHOWN THAT
THIS SOLN (EFTS OF OVEREXP)
Explanation of Carcinogenicity:NOT RELEVANT

Effects of Overexposure:HLTH HAZ: DID NOT INDUCE ANY MORTALITY IN LAB ANIMALS FOLLOWNG ORAL ADMIN @ 0.5 G/KG & WAS CONSIDERED TO HAVE AN ACUTE ORAL LD50 VALUE OF 0.5 G/KG. ALL ANIMALS APPEARED NORM THROUGHOUT 14-DAY OBSERVAT ION PERIOD & NO ABNORM WERE NOTED @ NECROPSY ON DAY 14 OF STUDY.
Medical Cond Aggravated by Exposure:NONE SPECIFIED BY MANUFACTURER.

========== First Aid Measures ==========

First Aid:EYES: FLUSH WITH WATER FOR AT LEAST 15 MINUTES OCCAS LIFTING LIDS. SKIN: REMOVE CONTAMD CLTHG, THEN FLUSH W/WATER FOR @ LST 15 MIN. WASH CLOTHING BEFORE REUSE. INHAL: MOVE TO FRESH AIR. INGEST: GET IM MED MED HELP. IF IRRIT CONTINUES, GET MED ATTN IMMED.

========== Fire Fighting Measures ==========

Extinguishing Media:APPROPRIATE TO SURROUNDING FIRE CONDITIONS.
Fire Fighting Procedures:WEAR NIOSH/MSHA APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT .
Unusual Fire/Explosion Hazard:POTASSIUM CYANIDE IS IN VERY DILUTE CONC IN SOLN. CONC KCN MAY RELEASE HCN GAS.

========== Accidental Release Measures ==========

Spill Release Procedures:VENT AREA. WIPE UP AND PLACE IN SEALED CONTAINER FOR PROPER DISPOSAL. WASH SPILL SITE W/WATER AFTER MATERIAL HAS BEEN PICKED UP COMPLETEY. WEAR CHEM RESIST GLASSES, GLOVES & CLTHG. WEAR NIOSH/MSHA APP RVD RESPIRATOR.
Neutralizing Agent:NONE SPECIFIED BY MANUFACTURER.

========== Handling and Storage ==========

Handling and Storage Precautions:KEEP STORED IN TIGHTLY CLOSED CONTR IN A DRY AREA. KEEP @ ROOM TEMP. HARMFUL/FATAL IF SWALLOWED.
Other Precautions:AVOID INHAL, INGEST & CONTACT W/EYES & SKIN.

========== Exposure Controls/Personal Protection ==========

Respiratory Protection:NIOSH/MSHA APPROVED RESPIRATOR.
Ventilation:CHEMICAL FUME HOOD.
Protective Gloves:CHEMICAL RESISTANT GLOVES.
Eye Protection:CHEMICAL RESISTANT GLASSES.
Other Protective Equipment:CHEMICAL RESISTANT CLOTHES.
Work Hygienic Practices:WASH CAREFULLY AFTER USE.
Supplemental Safety and Health
NONE SPECIFIED BY MANUFACTURER.

========== Physical/Chemical Properties ==========

Spec Gravity:1
pH:8.4
Solubility in Water:SOLUBLE
Appearance and Odor:TRANSPARENT SOLUTION

========== Stability and Reactivity Data ==========

Stability Indicator/Materials to Avoid:YES
AVOID CONTACT W/ACID AND STRONG OXIDIZING AGENTS.
Stability Condition to Avoid:NONE SPECIFIED BY MANUFACTURER.
Hazardous Decomposition Products:CONC KCN WILL REL TOX HYDROGEN CYANIDE

& NITROGEN OXIDES IN ADDN TO CARBON MONOXIDE & CARBON DIOXIDE.

========== Disposal Considerations ==========

Waste Disposal Methods:CONTACT LOCAL HAZARDOUS OR CHEMICAL WASTE DISPOSAL AGENCY FOR REGULATIONS. DISPOSE OF I/A/W FEDERAL, STATE AND LOCAL REGULATIONS .

Disclaimer (provided with this information by the compiling agencies): This information is formulated for use by elements of the Department of Defense. The United States of America in no manner whatsoever, expressly or implied, warrants this information to be accurate and disclaims all liability for its use. Any person utilizing this document should seek competent professional advice to verify and assume responsibility for the suitability of this information to their particular situation.

AIR LIQUIDE AMERICA CORP -- LESS THAN 250PPM HYDROGEN SULFIDE; LESS (SUPDAT) -- 6830-00N066374

========== Product Identification ==========

Product ID:LESS THAN 250PPM HYDROGEN SULFIDE; LESS (SUPDAT)
MSDS Date:08/10/1994
FSC:6830
NIIN:00N066374
MSDS Number: CBDNV
=== Responsible Party ===
Company Name:AIR LIQUIDE AMERICA CORP
Address:2121 N CALIFORNIA BLVD SUITE 350
City:WALNUT CREEK
State:CA
ZIP:94596
Country:US
Info Phone Num:415-977-6500
Emergency Phone Num:800-231-1366;800-424-9300(CHEMTREC)
CAGE:AIRLI
=== Contractor Identification ===
Company Name:AIR LIQUIDE AMERICA CORPORATION
Box:3047
City:HOUSTON
State:TX
ZIP:77253
Country:US
Phone:713-896-2140
CAGE:AIRLI
Company Name:LIQUID AIR CORP ONE CALIFORNIA PLAZA
Address:2121 N. CALIFORNIA BLVD
Box:City:WALNUT CREEK
State:CA
ZIP:94596
Country:US
Phone:415-977-6500
CAGE:18260

========== Composition/Information on Ingredients ==========

Ingred Name:HYDROGEN SULFIDE (SARA 302/313) (CERCLA). BP: -76F,-60C.
VP: 267 PSIA (1840 KPA). % WT: <250 PPM.
CAS:7783-06-4
RTECS #:MX1225000
Fraction by Wt: <0.1%
OSHA PEL:20 PPM, C
ACGIH TLV:10 PPM; 15 STEL
EPA Rpt Qty:100 LBS
DOT Rpt Qty:100 LBS

Ingred Name:CARBON MONOXIDE. BP: -312.75F,-191.53C. VP: ABOVE ITS
CRITICAL TEMPERATURE. % WT: <500 PPM.
CAS:630-08-0
RTECS #:FG3500000
Fraction by Wt: <0.1%
OSHA PEL:50 PPM
ACGIH TLV:25 PPM

Ingred Name:PROPANE. BP: -43.7F,-42.1C. VP: 127 PSIA (675 KPA).

CAS:74-98-6
RTECS #:TX2275000
Fraction by Wt: 1.1%
OSHA PEL:1000 PPM
ACGIH TLV:ASPHYXIANT

Ingred Name:OXYGEN. BP: -297.3F,-182.9C. VP: ABOVE ITS CRITICAL TEMPERATURE.
CAS:7782-44-7
RTECS #:RS2060000
Fraction by Wt: 18-21%
OSHA PEL:N/K
ACGIH TLV:N/K

Ingred Name:NITROGEN. BP: -320.5F,-195.5C. VP: ABOVE ITS CRITICAL TEMPERATURE.
CAS:7727-37-9
RTECS #:QW9700000
OSHA PEL:N/K
ACGIH TLV:ASPHYXIANT

Ingred Name:HNDLG/STOR PRECS: RATE OF PROD FROM CYL. USE CHECK VALVE OR TRAP IN DISCHARGE LINE TO PVNT HAZ BACK FLOW INTO (ING 7)
RTECS #:9999999ZZ

Ingred Name:ING 6: CYL. CLOSE VALVE AFTER EACH USE & WHEN EMPTY. PROTECT CYLS FROM PHYSICAL DMG. STORE IN COOL, DRY, WELL- (ING 8)
RTECS #:9999999ZZ

Ingred Name:ING 7: VENTILATED AREA AWAY FROM HEAVILY TRAFFICKED AREAS & EMER EXITS. DO NOT ALLOW TEMP WHERE CYLS ARE (ING 9)
RTECS #:9999999ZZ

Ingred Name:ING 8: STORED TO EXCEED 125F(52C). FULL & EMPTY CYLS SHOULD BE SEGREGATED. USE "FIRST IN - FIRST OUT" INVENTORY (ING 10)
RTECS #:9999999ZZ

Ingred Name:ING 9: SYS TO PVNT FULL CYLS BEING STORED FOR EXCESSIVE PERIODS OF TIME. FOR ADDNL HNDLG RECOMS CONSULT L'AIR (ING 11)
RTECS #:9999999ZZ

Ingred Name:ING 10: LIQUIDE'S ENCYCLOPEDE DE GAZ OR COMPRESSED GAS ASSOCIATION PAMPHLET P-1.
RTECS #:9999999ZZ

Ingred Name:OTHER PRECS: ENHANCES THE RUSTING OF METALS IN AIR. DOT 39 CYLS MAY NOT BE REUSED OR REFILLED (49CFR). NEVER (ING 13)
RTECS #:9999999ZZ

Ingred Name:ING 12: TRANSPORT THESE CYLS IN TRUNKS OR VEHICLES, ENCLSD VANS, TRUCK CABS OR IN PASSENGER COMPARTMENTS. (ING 14)
RTECS #:9999999ZZ

Ingred Name:ING 13: TRANSPORT THEM "CONTAINED" IN OPEN FLATBED OR OPEN PICK-UP TYPE VEHICLES.
RTECS #:9999999ZZ

========== Hazards Identification ==========

LD50 LC50 Mixture:NONE SPECIFIED BY MANUFACTURER.

Routes of Entry: Inhalation:YES Skin:NO Ingestion:NO
Reports of Carcinogenicity:NTP:NO IARC:NO OSHA:NO
Health Hazards Acute and Chronic:THE ODOR OF HYDROGEN SULFIDE IN THESE MIXTURES SHOULD PRECLUDE THEM FROM BEING BREATHED. IF THEY ARE RELEASED AND MIXED WITH ATMOSPHERIC AIR THEY SHOULD NOT PRESENT ANY MAJOR SYMPTOMS OTHER THAN HEADA CHE, POSSIBLE NAUSEA AND DIZZINESS.
Explanation of Carcinogenicity:NOT RELEVANT
Effects of Overexposure:SEE HEALTH HAZARDS.
Medical Cond Aggravated by Exposure:PERSON IN ILL HEALTH WERE SUCH ILLNESS WOULD BE AGGRAVATED BY EXPOSURE TO THESE MIXTURES SHOULD NOT BE ALLOWED TO WORK WITH OR HANDLE THESE PRODUCTS.

========== First Aid Measures ==========

First Aid:INGEST: CALL MD IMMED . EYES: IMMED FLUSH W/POTABLE WATER FOR A MINIMUM OF 15 MIN, SEEK ASSISTANCE FROM MD . SKIN: FLUSH W/COPIOUS AMTS OF WATER. CALL MD . INHAL: IF LG QTYS OF MIX H AVE BEEN BREATHED, MOVE PERSON WHO HAS BREATHED THEM TO AREA WHERE THEY CAN INHALE "FRESH" AIR. ADMINISTRATION OF OXYGEN SHOULD ALSO BE HELPFUL. FURTHER TREATMENT SHOULD BE SYMPTOMATIC & SUPPORTIVE.

========== Fire Fighting Measures ==========

Flash Point:N/A (GAS)
Extinguishing Media:MEDIA SUITABLE FOR SURROUNDING FIRE . NONFLAMMABLE GAS MIXTURE.
Fire Fighting Procedures:USE NIOSH/MSHA APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT . IF CYLINDERS ARE INVOLVED IN A FIRE, SAFELY RELOCATE OR KEEP COOL WITH WATER SPRAY.
Unusual Fire/Explosion Hazard:THESE MIXTURES AT HIGH PRESSURE WILL ACCELERATE THE BURNING OF MATERIALS TO A GREATER RATE THAN THEY BURN AT ATMOSPHERIC PRESSURE.

========== Accidental Release Measures ==========

Spill Release Procedures:EVACUATE ALL PERSONNEL FROM AFFECTED AREA. USE APPROPRIATE PROTECTIVE EQUIPMENT. IF LEAK IS IN CONTAINER OR CONTAINER VALVE, CONTACT THE CLOSEST AIR LIQUIDE AMERICA CORPORATION LOCATION.
Neutralizing Agent:NONE SPECIFIED BY MANUFACTURER.

========== Handling and Storage ==========

Handling and Storage Precautions:USE PRESS REDUCING REGULATOR WHEN CONNECTING CYL TO LOWER PRESS (<500 PSIG) PIPING OR SYS. DO NOT HEAT CYL BY ANY MEANS TO INCR DISCHARGE (ING 6)
Other Precautions:MIXS ARE NONCORR & MAY BE USED W/ALL MATLS OF CONSTRUCTION. MOISTURE CAUSES METAL OXIDES WHICH ARE FORMED W/AIR TO BE HYDRATED SO THEY INCR IN VOL & LOSE THEIR PROT ROLE (RUST FORM). CONCS OF SO*2, CL *2, SALT, ETC IN MOISTURE (ING 12)

========== Exposure Controls/Personal Protection ==========

Respiratory Protection:NIOSH/MSHA APPROVED POSITIVE PRESSURE AIR LINE WITH MASK OR SELF-CONTAINED BREATHING APPARATUS SHOULD BE AVAILABLE FOR EMERGENCY USE.
Ventilation:HOOD WITH FORCED VENTILATION. LOCAL EXHAUST TO PREVENT ACCUMULATION ABOVE THE TWA FOR HYDROGEN SULFIDE.
Protective Gloves:IMPERVIOUS GLOVES .
Eye Protection:ANSI APPRVD CHEM WORKERS GOGGLES .

Other Protective Equipment:ANSI APPROVED EYE WASH & DELUGE SHOWER . SAFETY SHOES.
Work Hygienic Practices:NONE SPECIFIED BY MANUFACTURER.
Supplemental Safety and Health
MFR'S TRADE NAME/PART NO: THAN 500PPM CARBON MONOXIDE; LESS THAN 1.1% PROPANE & 18-21% OXYGEN IN NITROGEN. SPEC GRAV: 0.99-1.01 @ 70F (AIR =1). MP: VARIES; -317.8F,-194.35C AIR BUBBLE POINT @ 1 ATM. SOL IN H*2O: H*2S SOLUBLE; OTHER COMPONENTS NEGLIG. WASTE DISP METH: CLOSEST MFR LOCATION.

========== Physical/Chemical Properties ==========

Boiling Pt:B.P. Text:SEE INGS
Melt/Freeze Pt:M.P/F.P Text:SUPDAT
Vapor Pres:SEE INGS
Spec Gravity:SUPDAT
Solubility in Water:SUPDAT
Appearance and Odor:COLORLESS GAS WITH SLIGHT SULFUR (ROTTEN EGG) ODOR.

========== Stability and Reactivity Data ==========

Stability Indicator/Materials to Avoid:YES
NONE.
Stability Condition to Avoid:NONE.
Hazardous Decomposition Products:NONE.

========== Disposal Considerations ==========

Waste Disposal Methods:DISPOSAL MUST BE I/A/W FED, STATE & LOCAL REGS . DO NOT ATTEMPT TO DISPOSE OF WASTE/UNUSED QTYS. RETURN IN SHIPPING CNTNR PROPERLY LABELED W/ANY VALVE OUTLET PLUGS/CAPS SECURED & VALVE PROT CAP IN PLACE TO MFR. FOR EMER DISP, CNTCT (SUPDAT)

International Chemical Safety Cards

LEAD

ICSC: 0052

LEAD
Lead metal
Plumbum
(powder)
Pb
Atomic mass: 207.2

CAS # 7439-92-1
RTECS # OF7525000
ICSC # 0052

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Finely divided lead powder is flammable. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames, NO sparks, and NO smoking (if in powder form).	In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	**Prevent deposition of dust; closed system, dust explosion-**proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!	IN ALL CASES CONSULT A DOCTOR!
• **INHALATION**	Abdominal cramps. Drowsiness. Headache. Nausea. Vomiting. Weakness. Wheezing. Pallor. Hemoglobinuria. Collapse.	Ventilation (not if powder). Avoid inhalation of fine dust and mist. Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
• **SKIN**			
• **EYES**			
• **INGESTION**	Abdominal cramps (further see Inhalation).	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Carefully collect	Separated from strong oxidants, strong bases, strong acids, food and feedstuffs.	

remainder, then remove to safe place. Do NOT let this chemical enter the environment (extra personal protection: P2 filter respirator for harmful particles).		

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0052 Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993

International Chemical Safety Cards

LEAD

ICSC: 0052

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** BLUISH-WHITE OR SILVERY-GREY SOLID IN VARIOUS FORMS. TURNS TARNISHED ON EXPOSURE TO AIR. **PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air. **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. Reacts with hot concentrated nitric acid, boiling concentrated hydrochloric and sulfuric acids. Attacked by pure water and by weak organic acids in the presence of oxygen. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV: ppm; 0.15 mg/m^3 (as TWA) (ACGIH 1993-1994).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance may cause effects on the gastrointestinal tract, blood, central nervous system and kidneys , resulting in colics, shock, anemia, kidney damage and encephalopathy. Exposure may result in death. The effects may be delayed. Medical observation is indicated. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The substance may have effects on the gastrointestinal tract, nervous system, blood, kidneys and immune system , resulting in severe lead colics, paralysis of muscle groups of the upper extremities (forearm, wrist and fingers), anemia, mood and personality changes, retarded mental development, and irreversible nephropathy. May cause retarded development of the new-born. Danger of cumulative effect.
PHYSICAL PROPERTIES	Boiling point: 1740°C Melting point: 327.5°C	Relative density (water = 1): 11.34 Solubility in water: none
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to air and water. In the food chain important to humans, bioaccumulation takes place, specifically in plants and water organisms, especially shellfish.	

NOTES

Explosive limits are unknown in literature. Use of alcoholic beverages enhances the harmful effect. Depending on the degree of exposure, periodic medical examination is indicated. Do NOT take working clothes home. Refer also to cards for specific lead compounds, e.g., lead chromate (ICSC # 0003), lead(II) oxide (ICSC # 0288).

Transport Emergency Card: TEC (R)-61G12b

ADDITIONAL INFORMATION

ICSC: 0052	**LEAD**

IMPORTANT LEGAL NOTICE:	Neither the CEC or the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

MSDS Number: **M1599** * * * * * *Effective Date: **08/20/08*** * * * * *Supercedes: **12/19/05***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS

J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

MERCURY

1. Product Identification

Synonyms: Quicksilver; hydrargyrum; Liquid Silver
CAS No.: 7439-97-6
Molecular Weight: 200.59
Chemical Formula: Hg
Product Codes:
J.T. Baker: 2564, 2567, 2569
Mallinckrodt: 1278, 1280, 1288

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Mercury	7439-97-6	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

DANGER! CORROSIVE. CAUSES BURNS TO SKIN, EYES, AND RESPIRATORY TRACT. MAY BE FATAL IF SWALLOWED OR INHALED. HARMFUL IF ABSORBED THROUGH SKIN. AFFECTS THE KIDNEYS AND CENTRAL NERVOUS SYSTEM. MAY CAUSE ALLERGIC SKIN REACTION.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Life)
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation:
Mercury vapor is highly toxic via this route. Causes severe respiratory tract damage. Symptoms include sore throat, coughing, pain, tightness in chest, breathing difficulties, shortness of breath, headache, muscle weakness, anorexia, gastrointestinal disturbance, ringing in the ear, liver changes, fever, bronchitis and pneumonitis. Can be absorbed through inhalation with symptoms similar to ingestion.

Ingestion:
May cause burning of the mouth and pharynx, abdominal pain, vomiting, corrosive ulceration, bloody diarrhea. May be followed by a rapid and weak pulse, shallow breathing, paleness, exhaustion, tremors and collapse. Delayed death may occur from renal failure. Gastrointenstinal uptake of mercury is less than 5% but its ability to penetrate tissues presents some hazard. Initial symptoms may be thirst, possible abdominal discomfort.

Skin Contact:
Causes irritaton and burns to skin. Symptoms include redness and pain. May cause skin allergy and sensitization. Can be absorbed through the skin with symptoms to parallel ingestion.

Eye Contact:
Causes irritation and burns to eyes. Symptoms include redness, pain, blurred vision; may cause serious and permanent eye damage.

Chronic Exposure:
Chronic exposure through any route can produce central nervous system damage. May cause muscle tremors, personality and behavior changes, memory loss, metallic taste, loosening of the teeth, digestive disorders, skin rashes, brain damage and kidney damage. Can cause skin allergies and accumulate in the body. Repeated skin contact can cause the skin to turn gray in color. A suspected reproductive hazard; may damage the developing fetus and decrease fertility in males and females.

Aggravation of Pre-existing Conditions:
Persons with nervous disorders, or impaired kidney or respiratory function, or a history of allergies or a known sensitization to mercury may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire. Do not allow water runoff to enter sewers or waterways.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Undergoes hazardous reactions in the presence of heat and sparks or ignition. Smoke may contain toxic mercury or mercuric oxide. Smoke may contain toxic mercury or mercuric oxide.

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6. Accidental Release Measures

Ventilate area of leak or spill. Clean-up personnel require protective clothing and respiratory protection from vapor.

Spills: Pick up and place in a suitable container for reclamation or disposal in a method that does not generate misting. Sprinkle area with sulfur or calcium polysulfide to suppress mercury. Do not flush to sewer. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker CINNASORB® and RESISORB® are recommended for spills of this product.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Do not use or store on porous work surfaces (wood, unsealed concrete, etc.). Follow strict hygiene practices. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
- OSHA Acceptable Ceiling Concentration:
mercury and mercury compounds: 0.1 mg/m3 (TWA), skin
- ACGIH Threshold Limit Value (TLV):
inorganic and metallic mercury, as Hg: 0.025 mg/m3 (TWA) skin, A4 Not classifiable as a human carcinogen.
- ACGIH Biological Exposure Indices:
total inorganic mercury in urine (preshift): 35 ug/g creatinine;
total inorganic mercury in blood (end of shift): 15 ug/l.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half-face respirator with a mercury vapor or chlorine gas cartridge may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece respirator with a mercury vapor or chlorine gas cartridge may be worn up to 50 times the exposure limit, or the maximum use concentraiton specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Silver-white, heavy, mobile, liquid metal.
Odor:
Odorless.
Solubility:
Insoluble in water.
Density:
13.55
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
356.7C (675F)
Melting Point:
-38.87C (-38F)
Vapor Density (Air=1):
7.0
Vapor Pressure (mm Hg):
0.0018 @ 25C (77F)
Evaporation Rate (BuAc=1):
4

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
At high temperatures, vaporizes to form extremely toxic fumes.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Acetylenes, ammonia, ethylene oxide, chlorine dioxide, azides, metal oxides, methyl silane, lithium, rubidium, oxygen, strong oxidants, metal carbonyls.
Conditions to Avoid:
Heat, flames, ignition sources, metal surfaces and incompatibles.

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11. Toxicological Information

Toxicological Data:
Investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
All forms of mercury can cross the placenta to the fetus, but most of what is known has

been learned from experimental animals. See Chronic Health Hazards.
Carcinogenicity:
EPA / IRIS classification: Group D1 - Not classifiable as a human carcinogen.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Mercury (7439-97-6)	No	No	3

12. Ecological Information

Environmental Fate:
This material has an experimentally-determined bioconcentration factor (BCF) of greater than 100. This material is expected to significantly bioaccumulate.
Environmental Toxicity:
This material is expected to be toxic to aquatic life. The LC50/96-hour values for fish are less than 1 mg/l.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: RQ, MERCURY
Hazard Class: 8
UN/NA: UN2809
Packing Group: III
Information reported for product/size: 1LB

International (Water, I.M.O.)

Proper Shipping Name: MERCURY
Hazard Class: 8
UN/NA: UN2809
Packing Group: III
Information reported for product/size: 1LB

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Mercury (7439-97-6)	Yes	Yes	No	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	Canada-- DSL	Canada-- NDSL	Phil.
Mercury (7439-97-6)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	-SARA 302- TPQ	------SARA 313------ List	------SARA 313------ Chemical Catg.
Mercury (7439-97-6)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Mercury (7439-97-6)	1	U151	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Pure / Liquid)

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: 2Z
Poison Schedule: S7
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
DANGER! CORROSIVE. CAUSES BURNS TO SKIN, EYES, AND RESPIRATORY TRACT. MAY BE FATAL IF SWALLOWED OR INHALED. HARMFUL IF ABSORBED THROUGH SKIN. AFFECTS THE KIDNEYS AND CENTRAL NERVOUS SYSTEM. MAY CAUSE ALLERGIC SKIN REACTION.
Label Precautions:

Do not get in eyes, on skin, or on clothing.
Do not breathe vapor.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.

Label First Aid:

If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:

No Changes.

Disclaimer:

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MONSANTO CO -- POLYCHLORINATED BIPHENYLS -- 5910-01-019-8871

========== Product Identification ==========

Product ID:POLYCHLORINATED BIPHENYLS
MSDS Date:10/01/1988
FSC:5910
NIIN:01-019-8871
Status Code:A
MSDS Number: CJDKH
=== Responsible Party ===
Company Name:MONSANTO CO
Address:800 N LINDBERGH BLVD
Box:UNKNOW
City:ST LOUIS
State:MO
ZIP:63167
Country:US
Info Phone Num:314-694-1000
Emergency Phone Num:314-694-1000
Preparer's Name:PAUL R MICHAEL, SAFETY
CAGE:3Y784
=== Contractor Identification ===
Company Name:GENERAL ELECTRIC CO CAPACITOR PRODUCTS DEPARTMENT
Address:JOHN ST
Box:City:HUDSON FALLS
State:NY
ZIP:12839
Country:US
Phone:518-746-5750
CAGE:01002
Company Name:MONSANTO CO, FIBERS BUSINESS UNIT
Address:800 N LINDBERGH BLVD
Box:City:SAINT LOUIS
State:MO
ZIP:63167
Country:US
Phone:314-694-1000
CAGE:3Y784

========== Composition/Information on Ingredients ==========

Ingred Name:POLYCHLORINATED BIPHENYLS (PCBS) (SARA III)
CAS:1336-36-3
RTECS #:TQ1350000
EPA Rpt Qty:1 LB
DOT Rpt Qty:1 LB

========== Hazards Identification ==========

Reports of Carcinogenicity:NTP:YES IARC:YES OSHA:NO
Health Hazards Acute and Chronic:EYES: MODERATELY IRRITATING TO EYE TISSUES. SKIN: CAN BE ABSORBED THROUGH INTACT SKIN. MAY CAUSE DEFATTING. A POTENTIAL FOR CONTACTING CHLORACNE. INHALATION: POSSIBLE LIVER INJURY. INGESTION: SLIGH TLY TOXIC.
Explanation of Carcinogenicity:IARC: PROBABLE CARCINOGENIC. NTP: REASONABLY ANTICIPATED TO BE CARCINOGENIC.
Effects of Overexposure:CAN CAUSE DERMATOLOGICAL SYMPTOMS; HOWEVER, THESE ARE REVERSIBLE UPON REMOVAL OF EXPOSURE SOURCE.

========== First Aid Measures ==========

First Aid:EYES: IRRIGATE IMMEDIATELY WITH COPIOUS QUANTITIES OF RUNNING WATER FOR AT LEAST 15 MIN IF LIQUID OR SOLID PCBS GET INTO THEM. SKIN:CONTAMINATED CLOTHING SHOULD BE REMOVED AND THE SKIN WASHED THOROUG HLY WITH SOAP AND WATER. HOT PCBS MAY CAUSE THERMAL BURNS. INHALATION: REMOVE TO FRESH AIR. IF SKIN RASH OR RESPIRATORY IRRITATION PERSISTS, CONSULT A PHYSICIAN. (IF ELECTRICAL EQUIPMENT ARCS OVER, P CBS MAY DECOMPOSE TO PRODUCE HYDROCHLORIC ACID). INGESTION: CONSULT A PHYSICIAN. DO NOT INDUCE VOMITING OR GIVE ANY OILY LAXATIVES. (IF LARGE AMOUNTS ARE INGESTED, GASTRIC LAVAGE IS SUGGESTED).

========== Fire Fighting Measures ==========

Flash Point:>141.C, 285.8F
Extinguishing Media:PCBS ARE FIRE-RESISTANT COMPOUNDS.
Fire Fighting Procedures:STANDARD FIRE FIGHTING WEARING APPAREL AND SELF-CONTAINED BREATHING APPARATUS SHOULD BE WORN WHEN FIGHTING FIRES THAT INVOLVE POSSIBLE EXPOSURE TO CHEMICAL COMBUSTION PRODUCTS. FIRE FIGHTING EQUIPMEN T SHOULD BE THOROUGHLY CLEANED AND DECONTAMINATED AFTER USE.
Unusual Fire/Explosion Hazard:IF A PCB TRANSFORMER IS INVOLVED IN A FIRE-RELATED INCIDENT, THE OWNER OF THE TRANSFORMER MAY BE REQUIRED TO REPORT THE INCIDENT. CONSULT AND FOLLOW APPROPRIATE FEDERAL, STATE, AND LOCAL REGULATIONS.

========== Accidental Release Measures ==========

Spill Release Procedures:CLEANUP & DISPOSAL OF LIQUID PCBS ARE STRICTLY REGULATED BY THE FEDERAL GOVERNMENT. VENTILATE AREA. CONTAIN SPILL/LEAK. REMOVE SPILL BY MEANS OF ABSORPTIVE MATERIAL. SPILL CLEANUP PERSONNEL SHOULD USE PROPER PROTECTIVE CLOTHING. ALL WASTES AND RESIDUES CONTAINING PCBS SHOULD BE COLLECTED, CONTAINERIZED, MARKED AND DISPOSED OF IN THE MANNER PRESCRIBED BY EPA, & APPLICABLE STATE AND LOCAL LAWS.

========== Handling and Storage ==========

Handling and Storage Precautions:CARE SHOULD BE TAKEN TO PREVENT ENTRY INTO THE ENVIRONMENT THROUGH SPILLS, LEAKAGE, USE, VAPORIZATION, OR DISPOSAL OF LIQUID. AVOID PROLONGED BREATHING OF VAPORS OR MISTS. AVOID CONTACT WITH EYES OR P ROLONGED CONTACT WITH SKIN. COMPLY WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.
Other Precautions:FEDERAL REGULATIONS UNDER THE TOXIC SUBSTANCES CONTROL ACT REQUIRE PCBS, PCB ITEMS, STORAGE AREAS, TRANSFORMER VAULTS, AND TRANSPORT VEHICLES TO BE MARDED. SEE 40 CFR 761 FOR DETAILS.

========== Exposure Controls/Personal Protection ==========

Respiratory Protection:USE NIOSH/MSHA APPROVED EQUIPMENT WHEN AIRBORNE EXPOSURE LIMITS ARE EXCEEDED. FULL FACEPIECE EQUIPMENT IS RECOMMENDED AND, IF USED, REPLACES NEED FOR FACE SHIELD AND/OR CHEMICAL SPLASH GOGGLES. THE R ESPIRATOR USE LIMITATIONS SPECIFIED BY NIOSH/MSHA OR THE MANUFACTURER MUST BE OBSERVED.
Ventilation:PROVIDE NATURAL OR MECHANICAL VENTILATION TO CONTROL EXPOSURE LEVELS BELOW AIRBORNE EXPOSURE LEVELS.
Protective Gloves:WEAR APPROPRIATE CHEMICAL RESISTANT GLOVES TO PREVENT

SKIN CONTACT.
Eye Protection:WEAR CHEMICAL SPLASH GOGGLES AND HAVE EYE BATHS AVAILABLE.
Other Protective Equipment:WEAR APPROPRIATE PROTECTIVE CLOTHING. PROVIDE A SAFETY SHOWER AT ANY LOCATION WHERE SKIN CONTACT CAN OCCUR.
Work Hygienic Practices:WASH THOROUGHLY AFTER HANDLING.
Supplemental Safety and Health
NONE

========== Physical/Chemical Properties ==========

HCC:Z3
Vapor Pres:(MM HG @100F).005-.00006
Viscosity:(CENTISTOKES)3.6-540

========== Stability and Reactivity Data ==========

Stability Indicator/Materials to Avoid:YES
Stability Condition to Avoid:PCBS ARE VERY STABLE, FIRE-RESISTANT COMPOUNDS.
Hazardous Decomposition Products:CARBON MONOXIDE, CARBON DIOXIDE, HYDROGEN CHLORIDE, PHENOLICS, ALDEHYDES AND OTHER TOXIC COMBUSTION PRODUCTS.

========== Disposal Considerations ==========

Waste Disposal Methods:CONSULT THE APPLICABLE STATE AND LOCAL REGULATIONS PRIOR TO ANY DISPOSAL OF PCBS OR PCB-CONTAMINATED ITEMS. CONSULT WITH 40 CFR PART 761 FOR FEDERAL REQUIREMENTS.

MATERIALS BROUGHT TO SITE

MSDS Number: **A2052** * * * * * *Effective Date: **08/03/07** * * * * * Supercedes: **02/16/06***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker®

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300
National Response In Canada
CANUTEC: 613-996-6666
Outside U.S. And Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

ALCONOX®

1. Product Identification

Synonyms: Proprietary blend of sodium linear alkylaryl sulfonate, alcohol sulfate, phosphates, and carbonates.
CAS No.: Not applicable.
Molecular Weight: Not applicable to mixtures.
Chemical Formula: Not applicable to mixtures.
Product Codes: A461

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Alconox® proprietary detergent mixture	N/A	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

CAUTION! MAY BE HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO EYES AND RESPIRATORY TRACT.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 1 - Slight
Flammability Rating: 0 - None
Reactivity Rating: 0 - None
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT; PROPER GLOVES
Storage Color Code: Green (General Storage)

Potential Health Effects

Inhalation:
May cause irritation to the respiratory tract. Symptoms may include coughing and shortness of breath.
Ingestion:
May cause irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea.
Skin Contact:
No adverse effects expected.
Eye Contact:
May cause irritation, redness and pain.
Chronic Exposure:
No information found.
Aggravation of Pre-existing Conditions:
No information found.

4. First Aid Measures

Inhalation:
Remove to fresh air. Get medical attention for any breathing difficulty.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention.
Skin Contact:
Wash exposed area with soap and water. Get medical advice if irritation develops.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Not expected to be a fire hazard.
Explosion:
No information found.
Fire Extinguishing Media:
Dry chemical, foam, water or carbon dioxide.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. When mixed with water, material foams profusely. Small amounts of residue may be flushed to sewer with plenty of water.

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7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Moisture may cause material to cake. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
None established.
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
For conditions of use where exposure to dust or mist is apparent and engineering controls are not feasible, a particulate respirator (NIOSH type N95 or better filters) may be worn. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear protective gloves and clean body-covering clothing.
Eye Protection:
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
White powder interspersed with cream colored flakes.
Odor:
No information found.
Solubility:
Moderate (1-10%)
Specific Gravity:
No information found.
pH:
No information found.
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
No information found.
Melting Point:
No information found.
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
No information found.
Evaporation Rate (BuAc=1):
No information found.

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
No information found.
Conditions to Avoid:
No information found.

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11. Toxicological Information

No LD50/LC50 information found relating to normal routes of occupational exposure.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Alconox® proprietary detergent mixture	No	No	None

12. Ecological Information

Environmental Fate:
This product is biodegradable.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Alconox® proprietary detergent mixture	Yes	No	No	No

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.

Alconox® proprietary detergent mixture	No	No	Yes	No

\Federal, State & International Regulations - Part 1\

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Alconox® proprietary detergent mixture	No	No	No	No

\Federal, State & International Regulations - Part 2\

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Alconox® proprietary detergent mixture	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: No (Pure / Solid)

Australian Hazchem Code: None allocated.
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **0** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
CAUTION! MAY BE HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO EYES AND RESPIRATORY TRACT.
Label Precautions:
Avoid contact with eyes.
Keep container closed.
Use with adequate ventilation.
Avoid breathing dust.
Wash thoroughly after handling.
Label First Aid:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of eye contact, immediately flush eyes with plenty of water for at least 15 minutes. In all cases, get medical attention.
Product Use:
Laboratory Reagent.
Revision Information:

MSDS Section(s) changed since last revision of document include: 3.

Disclaimer:

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

UNOCAL CHEMICALS DIV UNION OIL CO OF CALIFORNIA -- ANTIFREEZE -- 6850-00-664-1403

========== Product Identification ==========

Product ID:ANTIFREEZE
MSDS Date:03/21/1989
FSC:6850
NIIN:00-664-1403
MSDS Number: BJPTD
=== Responsible Party ===
Company Name:UNOCAL CHEMICALS DIV UNION OIL CO OF CALIFORNIA
Address:1345 N MEACHAM RD
City:SCHAUMBURG
State:IL
ZIP:60195
Country:US
Info Phone Num:312-490-2539
Emergency Phone Num:312-490-2539
CAGE:5W323
=== Contractor Identification ===
Company Name:UNOCAL CHEMICALS DIV UNION OIL CO OF CALIFORNIA
Address:1345 N MEACHAM RD
Box:City:SCHAUMBURG
State:IL
ZIP:60195
Country:US
Phone:800-967-7601
CAGE:5W323

========== Composition/Information on Ingredients ==========

Ingred Name:ETHYLENE GLYCOL (SARA III) *
CAS:107-21-1
RTECS #:KW2975000
Fraction by Wt: 92-97%
Other REC Limits:NONE SPECIFIED
OSHA PEL:C 50 PPM
ACGIH TLV:C 50 PPM,VAPOR; 9192
EPA Rpt Qty:1 LB
DOT Rpt Qty:1 LB

Ingred Name:DIETHYLENE GLYCOL
CAS:111-46-6
RTECS #:ID5950000
Other REC Limits:NONE SPECIFIED

========== Hazards Identification ==========

LD50 LC50 Mixture:ACUTE ORAL LD50 (HUMAN) IS 1500 MG/KG
Routes of Entry: Inhalation:YES Skin:YES Ingestion:YES
Reports of Carcinogenicity:NTP:NO IARC:NO OSHA:NO
Health Hazards Acute and Chronic:ACUTE: INGESTION:ABDOMINAL DISCOMFORT OR PAIN, NAUSEA, CENTRAL NERVOUS SYSTEM DEPRESSION. SEVERE KIDNEY AND LIVER DAMAGE FROM LARGE AMOUNTS; MAY BE FATAL.
INHALATION:IRRITATION OF THE NOSE AND THROAT. EYE:DISCOMFORT WITH TRANSIENT CONJUNCTIVITIS. CHRONIC: INHALATION OF MIST MAY PRODUCE SIGNS OF CNS DISTURBANCES.
Explanation of Carcinogenicity:NONE OF THE COMPOUNDS IN THIS PRODUCT IS

LISTED BY IARC, NTP, OR OSHA AS A CARCINOGEN.
Effects of Overexposure:MAY CAUSE DIZZINESS, MALAISE, LUMBAR PAIN, UREMIA, AND CENTRAL NERVOUS SYSTEM DEPRESSION. MAY CAUSE EYE, SKIN & RESPIRATORY TRACT IRRITATION.
Medical Cond Aggravated by Exposure:PERSONS WITH A HISTORY OF KIDNEY OR LIVER DISORDERS MAYBE AT INCREASED RISK FROM EXPOSURE.

========== First Aid Measures ==========

First Aid:INHALATION: REMOVE TO FRESH AIR. CALL A PHYSICIAN IF DISCOMFORT PERSISTS. EYE: IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR 15 MINUTES. CALL A PHYSICIAN. SKIN: WASH WITH PLENTY OF SOAP & WATER. REM OVE CONTAMINATED CLOTHING/SHOES. INGESTION: IF CONSCIOUS, GIVE 2 GLASSES OF WATER TO DRINK AND INDUCE VOMITING WITH IPECAC SYRUP-NOTHING BY MOUTH IF UNCONSCIOUS. CALL A PHYSICIAN IMMEDIATELY.

========== Fire Fighting Measures ==========

Flash Point Method:COC
Flash Point:250F,121C
Lower Limits:1.6
Upper Limits:10.8
Extinguishing Media:USE CARBON DIOXIDE, FOAM, OR DRY CHEMICAL. WATER MAY BE INEEFECTIVE.
Fire Fighting Procedures:FIRE FIGHTERS SHOULD USE NIOSH APPROVED SCBA & FULL PROTECTIVE EQUIPMENT WHEN FIGHTING CHEMICAL FIRE. USE WATER SPRAY TO COOL NEARBY CONTAINERS EXPOSED TO FIRE.
Unusual Fire/Explosion Hazard:FIRE OR EXCESSIVE HEAT MAY CAUSE PRODUCTION OF HAZARDOUS DECOMPOSITION PRODUCTS. HEATED VAPORS MAY CAUSE FLASH BACK.

========== Accidental Release Measures ==========

Spill Release Procedures:SMALL SPILL: WIPE/SOAK UP WITH PAPER TOWEL OR INERT ABSORBENT. PUT IN DISPOSAL CONTAINER. FLUSH RESIDUE WITH WATER. LARGE SPILL: VENTILATE AREA. IF POSSIBLE, STOP LEAK. DIKE TO RETAIN RUN OFF. VACUUM UP FREE LIQUID. FLUSH RESIDUE WITH WATER.
Neutralizing Agent:NONE SPECIFIED BY MANUFACTURER. WATER DILUTION RECOMMENDED.

========== Handling and Storage ==========

Handling and Storage Precautions:STORE IN A COOL, DRY, WELL VENTILATED AREA. KEEP CONTAINERS TIGHTLY CLOSED WHEN NOT IN USE. PROTECT CONTAINERS FROM PHYSICAL DAMAGE.
Other Precautions:DO NOT TAKE INTERNALLY. DO NOT BREATHE MIST. AVOID PROLONGED OR REPEATED BREATHING OF VAPOR. AVOID CONTACT WITH EYES. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. FOR INDUSTRIAL USE ONLY.

========== Exposure Controls/Personal Protection ==========

Respiratory Protection:IF VENTILATION DOES NOT MAINTAIN INHALATION EXPOSURES BELOW PEL(TLV), USE NIOSH/MSHA APPROVED ORGANIC VAPOR CARTRIDGE AND DUST/MIST PRE-FILTER RESPIRATORS AS PER CURRENT 29 CFR 1910.134, INSTRUCTIONS/ WARNINGS AND NIOSH-RESPIRATOR SELECTION.
Ventilation:MECHANICAL (GENERAL) ROOM VENTILATION IS ADEQUATE IF USE IS ENCLOSED. LOCAL EXHAUST IS NEEDED IF VENTED INTO WORK AREA.

Protective Gloves:NEOPRENE, NITRILE, PVC OR NATURAL RUBBER
Eye Protection:SAFETY GOGGLES WITH OPTIONAL FACE SHIELD
Other Protective Equipment:EYE WASH STATION AND SAFETY SHOWER.
INDUSTRIAL-TYPE WORK CLOTHING AND APRON AS REQUIRED.
Work Hygienic Practices:OBSERVE GOOD PERSONAL HYGIENE PRACTICES AND RECOMMENDED PROCEDURES. DO NOT WEAR CONTAMINATED CLOTHING OR FOOTWEAR.
Supplemental Safety and Health
DO NOT TAKE INTERNALLY. DO NOT GET ON SKIN OR IN EYES. AVOID PROLONGED OR REPRATED BREATHING OF VAPOR. DO NOT BREATHE MISTS. WASH THOROUGHLY AFTER HANDLING AND BEFORE EATING OR DRINKING OR SMOKING OR USING REST ROOM.

========== Physical/Chemical Properties ==========

HCC:N1
Boiling Pt:B.P. Text:330F,166C
Vapor Pres:0.06 @20C
Vapor Density:2.1 AIR=1
Spec Gravity:1.108
Solubility in Water:COMPLETE
Appearance and Odor:CLEAR GREEN LIQUID - SLIGHT ODOR
Percent Volatiles by Volume:NEG.

========== Stability and Reactivity Data ==========

Stability Indicator/Materials to Avoid:YES
STRONG OXIDIZING AGENTS
Stability Condition to Avoid:HIGH TEMPERATURES, SPARKS, AND OPEN FLAMES
Hazardous Decomposition Products:CARBON MONOXIDE AND CARBON DIOXIDE

========== Disposal Considerations ==========

Waste Disposal Methods:DISPOSAL SHOULD BE MADE BY INCINERATION IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL LAWS AND REGULATIONS. AT VERY LOW CONCENTRATIONS IN WATER, DISPOSE OF THIS MATERIAL IN A BIOLOGICAL W ASTE WATER TREATMENT PLANT.

PORTA GAS

Material Safety Data Sheet

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

1. PRODUCT IDENTIFICATION CHEMICAL NAME: CLASS C NON-FLAMMABLE GAS MIXTURE Containing Hydrogen Cyanide (< 2.5%) and Nitrogen (Balance) SYNONYMS: Not Applicable CHEMICAL FAMILY: Not Applicable FORMULA: Not Applicable PRODUCT USE: For general analytical/synthetic chemical uses.
Document Number: MSDS1036 SUPPLIER/MANUFACTURER'S NAME: Perkgas ADDRESS: 6714-B Hall Street, Houston, TX 77081 BUSINESS PHONE: General MSDS Info: (713) 668-8477 EMERGENCY PHONE: INFOTRAC (800) 535-5053

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			OTHER
			TLV ppm	STEL ppm	PEL ppm	STEL ppm	IDLH ppm	
Hydrogen Cyanide	74-90-8	< 2.5%	NE	4.7, C, Skin	10, Skin	4.7, Skin (Vacated 1989 PEL)	50	NIOSH REL: 4.7 ppm ST; SKIN OHG MAX: 10 ppm
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%.					

This material is classified as hazardous under OSHA regulations in the United States and the WHMIS in Canada. NE = Not Established C = Ceiling Limit See Section 16 for Definitions of Terms Used. NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-2004 format.

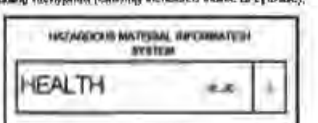
3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW! This non-flammable gas mixture is colorless with the odor of bitter almonds and can present significant health hazards, due to the presence of Hydrogen Cyanide (a chemical asphyxiant). Inhalation or skin contact overexposures can be harmful or fatal. This gas mixture can be irritating to the eyes. Hydrogen Cyanide can undergo polymerization. Emergency responders must wear adequate personal protective equipment during response situations. A cylinder rupture hazard exists when this gas mixture, which is under pressure, is subject to heat or flames.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant route of over-exposure for this gas mixture is by inhalation of elevated or reduced pressure. INHALATION: Hydrogen Cyanide, the main component of this gas mixture, is a protoplasmic poison, combining in tissue with the enzymes associated with oxidation, thereby rendering oxygen unavailable to those tissues, and causing death by chemical asphyxiation. Exposure to low concentrations of this gas mixture can cause headache, vertigo, irritation of the throat, difficulty breathing, reddening of eyes, salivation, nausea and vomiting. Exposures to higher concentrations of Hydrogen Cyanide produces symptoms including nystagmus (causing increased intake of cyanide), dyspnea, weakness of arms and legs, paralysis, unconsciousness, convulsions, and respiratory arrest. Chronic, low level exposure to Hydrogen Cyanide over long periods of time may lead to fatigue and weakness. Specific effects, based on the concentration of Hydrogen Cyanide, are presented below:

CONCENTRATION	SYMPTOMS
2-5 ppm	Detectable odor threshold.
18-36 ppm	Slight symptoms after several hours.
45-54 ppm	Tolerated for 0.5-1 hour without immediate or delayed effects.
110-135 ppm	Dangerous to life or fatal after 0.5-1 hour.
135 ppm	Fatal after 30 minutes.
180 ppm	Fatal after 10 minutes.
270 ppm	Immediately fatal.

High concentrations of this gas mixture can cause an oxygen-deficient environment. 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 overexposure, death may occur. It should be noted that before adverse health effects or suffocation could occur the effects of overexposure to Hydrogen Cyanide will be felt. OTHER HEALTH EFFECTS: Contact of this gas mixture with the skin is irritating, however, Hydrogen Cyanide (the toxic component) can be absorbed through intact skin. The symptoms of skin absorption are the same as by inhalation. Contact of this gas mixture with the eyes is slightly smarting. Hydrogen Cyanide will also diffuse on contact with the eyes. There is some evidence that very high Hydrogen Cyanide exposure to the eyes may result in damage to the retina and nerves of the eye. HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms: Overexposure to this gas mixture may cause the following health effects: ACUTE: Depending on the duration and concentration of Hydrogen Cyanide in this gas mixture, inhalation overexposures can cause symptoms, headache, dizziness, unconsciousness of gait, a feeling of suffocation, nausea, paralysis, unconsciousness, convulsions, and respiratory arrest. Inhalation overexposures can be fatal due to Hydrogen Cyanide toxicity and asphyxiation. Skin contact overexposures may be harmful or fatal. This gas mixture may be irritating to the eyes. CHRONIC: Chronic, low level exposure to this gas mixture over long periods of time may lead to fatigue and weakness. Some evidence exists that low-level, long-term exposure to Hydrogen Cyanide (a component of this gas mixture) on the eyes will result in damage to the nerves of the eyes. Refer to Section 11 (Toxicological Information) for additional information. TARGET ORGANS: Respiratory system, skin, eyes, enzymes embedded with oxidation.



4. FIRST AID MEASURES RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS PRODUCT WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT, OR BY THEMSELVES, alternately, Self-Contained Breathing Apparatus and chemically impervious clothing should be worn. Remove victim(s) to fresh air, as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary. A complete Cyanide Antidote Kit should be available near all areas of use. Personnel should be trained in the use of the kit to administer first-aid in advance of medical assistance. The kit should contain at least the following: Two inhalers (or dozen) of amyl nitrite pearls. Two ampoules of sterile sodium nitrite solution (10 mL of a 3% solution in each). Two ampoules of sterile sodium thiosulfate solution (50 mL of a 25% solution of each). Two 20 mL sterile syringes. Two 50 mL sterile syringes. One stainless steel needle. One tourniquet. Twelve gauze pads. One bottle of 70% alcohol. One ampoule file. SKIN EXPOSURE: If this gas concentrate the skin, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Victim must seek medical attention. EYE EXPOSURE: If this gas contaminates the eyes, 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. Because of the special hazard of Cyanide compounds, special particular precautions are administered to victims of exposure to Hydrogen Cyanide. Personnel should be trained to administer initial first-aid treatment to victims of Hydrogen Cyanide poisoning prior to respirator burn medical professionals. If victim has difficulty breathing, is becoming confused and/or is losing consciousness, administer amyl nitrite. Crush one pearl of amyl nitrite onto cloth and hold to the victim's nose 15 to 30 seconds of each minute. Use a new pearl every 4 minutes (0.3 mg total), or every 3 minutes (0.15 mg total). While amyl nitrite is being administered, if possible, monitor blood pressure. If blood pressure of the victim drops below 60/30, stop amyl nitrite treatments and obtain advice of professional medical personnel immediately. Administration of oxygen should only be done by trained personnel. If cardiac arrest occurs, begin CPR, again by trained personnel. While waiting for response by professional medical personnel, provide general supportive measures to victim such as keeping them warm and quiet. Take copy of label and MSDS to physician or other health professional with victim(s). Physicians should refer to Section 11 (Toxicological Information) for specific recommendations to physicians.

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. Use extinguishing media appropriate for surrounding fire. UNUSUAL FIRE AND EXPLOSION HAZARDS: This gas mixture contains a chemical asphyxiant; subsequently, it presents a significant health hazard to firefighters. This gas mixture does not burn; however, cylinders, when involved in a fire, may explode or blast in the heat of the fire. 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 fire-fighters must wear Self-Contained Breathing Apparatus and full protective equipment. If possible, shut off the flow of this gas mixture. If this product is involved in a fire, fire run-off water should be contained to prevent possible environmental damage.

6. ACCIDENTAL RELEASE MEASURES LEAK RESPONSE: Evacuate immediate area. Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. Minimum Personal Protective Equipment should be Level A: triple-gloves (rubber gloves and nitrile gloves, over latex gloves), fully-encapsulating chemically resistant suit and boots, hard-hat, and Self Contained Breathing Apparatus. A colorimetric tube is available for Hydrogen Cyanide. Monitor the surrounding area for Hydrogen Cyanide and oxygen. The atmosphere must have less than 50% of the TLV of Hydrogen Cyanide (TLV = 4.7 ppm C) and at least 19.5% Oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus. Attempt to close the main source valve prior to entering the area. If this does not stop the release (or it is not possible to reach the valve), allow the gas to release in place or remove it to a safe area and allow the gas to be released there. Due to the extreme toxicity of Hydrogen Cyanide, all contaminated clothing should be removed and placed in a sealed container for proper disposal. If gas is leaking incidentally from the cylinder or its valve, contact your supplier.

7. HANDLING and USE: WORK PRACTICES AND HYGIENE PRACTICES: Avoid all contact with this gas mixture. All employees who handle this material should be trained to handle it safely. Wash thoroughly after handling chemicals. Do not eat or drink while handling chemicals. All work practices should minimize the releases of this gas mixture. Work with this gas mixture should never be done alone. Someone who is trained in the hazards and how to rescue victims must be in view of personnel using materials containing Hydrogen Cyanide at all times. This person must be equipped and ready to respond to an emergency. If a release occurs, personnel must don a respirator immediately and leave the area until the extent of the release is determined. Workers who handle mixtures containing Hydrogen Cyanide should wear protective clothing, as listed in Section 8 (Exposure Controls and Personal Protection). Instant-acting showers should be available in the event of an emergency. Special eye-wash fountains or similar equipment should be available for eye irrigation. A cyanide poisoning antidote kit should be available in Hydrogen Cyanide use areas. Proper respiratory protection equipment must be provided and workers using such equipment must be mentally trained in its operation and limitations. Precautions must always be taken to prevent suck-back of foreign materials into the cylinder by using a check-valve, or vacuum break, since backflow may cause dangerous pressure changes within the cylinder. STORAGE AND HANDLING PRACTICES: Compressed gases can present significant safety hazards. Some cylinders away from heavily trafficked areas and emergency exits. Cylinders should be stored upright (with valve protection cap in place) and firmly secured to prevent falling or being knocked over. Cylinders can be stored in the open, but in such cases, should be protected against extremes of weather and from the dangers of the ground to prevent rusting. Cylinders should be stored in dry, well-ventilated areas away from sources of heat, ignition and direct sunlight. Keep storage area clear of materials that can burn. Do not allow area where cylinders are stored to exceed 52°C (125°F). Store containers away from heavily trafficked areas and emergency exits. Store away from process and gas production areas, elevators, building and room exits, or main aisles leading to exits. Protect cylinders against physical damage. Keep the smallest amount on-site as is necessary. Use and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent the containers from being stored for long periods of time. Use a check valve in the discharge line to prevent hazardous backflow. Never tamper with pressure relief devices in valves and cylinders. SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: Compressed gases can present significant safety hazards. The following rules are applicable to work situations in which cylinders are being used. Before Use: Move cylinders with a suitable hand truck. Do not drag, slide or roll cylinders. Do not drop cylinders or permit them to strike each other. Secure cylinders firmly. Leave the valve protection cap (where provided) in place until cylinders is ready for use. During Use: Use designated CGA fittings and other support equipment. Do not use adapters. Use piping and equipment adequately designed to withstand pressures to be encountered. Do not heat cylinder by any means to increase the discharge rate of the gas mixture from the cylinder. Do not use oils or grease on gas-handling fittings or equipment. Leak check system with leak detection solution; never with flame. Immediately contact the supplier if there are any difficulties associated with operating cylinder valve. Never insert an object (e.g., wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing a leak to occur. Use an adjustable strap wrench to remove overly tight or rusted caps. Never strike an arc on a compressed gas cylinder or make a cylinder part of an electric circuit. After Use: Close main cylinder valve. Valves should be closed tightly. Replace valve protection cap. Mark empty cylinders "EMPTY". NOTE: Use only DOT or ASME code cylinders designed for compressed gas storage. Close valve after each use and when empty. Cylinders must not be recharged except by or with the consent of owner. PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Purge gas handling equipment and inert gas before attempting repairs. Always use this gas mixture in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION VENTILATION AND ENGINEERING CONTROLS: All areas where gas mixtures containing Hydrogen Cyanide is used should be monitored with very sensitive gas detection instruments. Detection of concentrations below 50% of the TLV level of 4.7 ppmC should trigger immediate response and corrective action. Detection at higher levels should initiate an alarm calling for evacuation of all personnel with the potential to be exposed. Use with adequate ventilation. A hood with forced ventilation is preferable. Because of the high hazard associated with Hydrogen Cyanide, stringent control measures such as a gas cabinet enclosure or isolation may be necessary, if appropriate, install automatic monitoring equipment to detect the level of Hydrogen Cyanide. RESPIRATORY PROTECTION: Maintain exposure levels of Hydrogen Cyanide below the levels listed in Section 2 (Composition and Information on Ingredients) and oxygen levels above 19.5% in the workplace. Use supplied-air respiratory protection if Hydrogen Cyanide levels exceed exposure limits during emergency response to a release of the product. If respiratory protection is required, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), or equivalent State standards. The following NIOSH respiratory protection recommendations are for Hydrogen Cyanide:

CONCENTRATION	RESPIRATORY EQUIPMENT
Up to 47 ppm	Supplied Air Respirator (SAR)
Up to 80 ppm	Supplied Air Respirator (SAR) operated in continuous-flow mode 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 Hydrogen Cyanide or escape-type SCBA should be used. The IDLH concentration for Hydrogen Cyanide is 50 ppm. EYE PROTECTION: Splash goggles or safety glasses and face shield. HAND PROTECTION: Wear gloves when

handling cylinders of this gas mixture. Wear Teflon, Viton, or neoprene/cloth gloves for industrial use. Use nitrile gloves for spill response (see Section 6, Accidental Release Measures). BODY PROTECTION: Use appropriate body protection. Safety shoes are recommended when handling cylinders.

9. PHYSICAL and CHEMICAL PROPERTIES: The following information is for Nitrogen, the main component of this gas mixture. GAS DENSITY @ 0°C (32°F) and 1 atm: 0.07 pounds/ft³ (1.163 kg/m³) BOILING POINT: -195.8°C (-320.4°F) FREEZING/MELTING POINT: @ 34 psig: -210°C (-346.8°F) SPECIFIC GRAVITY (air = 1) @ 21.1°C (70°F): 0.906 pH: Not applicable. SOLUBILITY IN WATER: mL/mL at @ 0°C (32°F) and 1 atm: 0.023 MOLECULAR WEIGHT: 28.06 EVAPORATION RATE (n-BuAc = 1): Not applicable. EXPANSION RATIO: Not applicable. ODOR THRESHOLD: Not applicable. Odorless. SPECIFIC VOLUME (ft³/lb): 13.8. VAPOR PRESSURE @ 21.1°C (70°F): psig: Not applicable. COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable. The following information is for the gas mixture. ODOR THRESHOLD: 0.5 5.8 ppm (threshold only) 7.8-6.0 ppm (recognition) (for Hydrogen Cyanide). APPEARANCE AND COLOR: The gas mixture is colorless with the odor of bitter almonds. HOW TO DETECT THIS SUBSTANCE (warning properties): The odor is not a reliable warning property as the gas causes rapid olfactory fatigue. Colorimetric tubes are available for Hydrogen Cyanide. Various oil leak detecting fluids 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: Hydrogen Cyanide, a component of this gas mixture, is very unstable as it is sensitive to heat, light and moisture. DECOMPOSITION PRODUCTS: When heated in combustion, Hydrogen Cyanide emits toxic fumes of carbon monoxide, carbon dioxide and nitrogen oxides. Nitrogen, the main component of this gas mixture does not decompose, per se, but may react with other components in the heat of a fire. MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Due to the presence of Hydrogen Cyanide, this gas mixture will be incompatible with bases and strong acids. Hydrogen Cyanide will attack some forms of plastics and rubber. HAZARDOUS POLYMERIZATION: Hydrogen Cyanide, a component of this product, can undergo polymerization. CONDITIONS TO AVOID: Contact with incompatible materials and exposure to heat, light and moisture. Avoid exposing cylinders to extremely high temperatures, which could cause the cylinders to rupture.

11. TOXICOLOGICAL INFORMATION TOXICITY DATA: The following toxicology data are available for the components of the gas mixture present in concentrations greater than or equal to 1 mole %. HYDROGEN CYANIDE: Oral Human LDLo: 570 µg/kg Inhalation-Man TCLo: 500 mg/m³/5M intermit. C Human Toxicology. Inhalation-Human LCLo: 300 ppm/5 minutes. Inhalation-Human LCLo: 120 mg/m³/1 hour. Inhalation-Human LCLo: 200 mg/m³/10 minutes. Inhalation-Man LCLo: 455 mg/m³/ 5 minutes. Subcutaneous-Human LDLo: 1 mg/kg Intravenous-Human LDLo: 1 mg/kg Intravenous-Man TDLo: 55 µg/kg. Pulmonary system effects Unreported-Man LDLo: 1471 µg/kg Intramuscular-Human, adult LD50: 488 mg/kg Ocular Rabbit, adult LD50: 1340 µg/kg Inhalation-Rat LC50: 548 ppm/30 minutes Intravenous-Rat LD50: 610 µg/kg Oral-Mouse LD50: 3760 µg/kg Inhalation-Mouse LC50: 323 ppm/5 minutes Intraperitoneal-Mouse LD50: 3950 µg/kg Subcutaneous-Mouse LD50: 1 mg/kg Intravenous-Mouse LD50: 387 µg/kg Intravascular-Mouse LD50: 2700 µg/kg Oral-Dog, adult LD50: 4 mg/kg Inhalation-Dog, adult LC50: 618 mg/m³/1 minute Subcutaneous-Dog, adult LDLo: 1700 µg/kg Intravenous-Dog, adult LDLo: 1340 µg/kg Inhalation-Monkey LC50: 1548 mg/m³/5 minutes. NITROGEN: There are no specific toxicology data for Nitrogen gas. Nitrogen is a simple asphyxiant (SA), 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, CALOSHA, and IARC, and therefore are neither considered to be or suspected to be a cancer-causing agent by these agencies. IRRITANCY OF PRODUCT: This gas mixture may be irritating to eyes/mucous membranes. SENSITIZATION OF PRODUCT: This gas mixture contains no known sensitizer. REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this gas mixture and its components on the human reproductive system. Mutagenicity: This gas mixture is not expected to cause mutagenic effects in humans. Embryotoxicity: This gas mixture is not expected to cause embryotoxic effects in humans. Teratogenicity: This gas mixture is not expected to cause teratogenic effects in humans. Reproductive Toxicity: This gas mixture is not expected to cause adverse reproductive effects in humans. A mutagen is a chemical that causes permanent changes to genetic material (DNA) such that the changes will propagate through generations. An embryotoxin is a chemical that 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 that causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance that interferes in any way with the reproductive process. MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing eye disorders, dermatitis and respiratory conditions may be aggravated by over-exposure to this gas mixture. RECOMMENDATIONS TO PHYSICIANS: Administer amyl nitrate inhalations, if victim does not respond, inject, intravenously, 0.3 grams sodium nitrite (10 mL of a 3% solution at a rate of 2.5-5.0 mL/minute), followed in place by 12.5 grams of sodium thiosulfate intravenously (50 mL of a 25% solution injection at about the same rate as the sodium nitrite solution). The same needle and vein can be used for both injections. Watch victim continuously for 24-48 hours. If symptoms recur or persist, repeat the sodium nitrite and sodium thiosulfate therapy at one-half the original dose. BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) are not applicable for the components of this gas mixture.

12. ECOLOGICAL INFORMATION ENVIRONMENTAL STABILITY: This gas mixture will be dissipated rapidly in well-ventilated areas. Hydrogen Cyanide, a component of this gas mixture, is very unstable as it is sensitive to heat, light and moisture. The following environmental data are applicable to the components of this product. 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: Due to the presence of Hydrogen Cyanide, animals exposed to this gas may be killed. Hydrogen Cyanide is not known to bioaccumulate in any of the mammalian species that have been studied. This gas mixture may be harmful or fatal to contaminated plant life. EFFECT OF CHEMICAL ON AQUATIC LIFE: Hydrogen Cyanide, a component of this gas mixture, is very soluble in water, and even low concentrations in water are detrimental to aquatic life. If a release this product occurs near a river or other body of water, the release has the potential to kill fish and other aquatic life. The following ecotoxicity data are available for Hydrogen Cyanide (as Hydrocyanic Acid). Daphnia: 90% immobilization after 48 hours at 1.8 mg/litre (conditions of bioassay not specified). LC_{50}: Aquatic crustacea 2.29 mg/L/96 hours (conditions of bioassay not specified) LC_{50}: Gammarus pseudolimnaeus 0.17 mg/L/96 hours (conditions of bioassay not specified) TLm: Pimephales 0.099 mg/L/24 hour (conditions of bioassay not specified) TLm: Lepomis bluegill (mortality) 0.18 mg/L/24 hour (conditions of bioassay not specified) TLm: Pimephales 0.06 mg/L/24 hour (in sea water) (conditions of bioassay not specified) LTC: Lepomis macrochirus (bluegill eggs) 325-693 µg/L/96 hours (flow-through bioassay) LC_{50}: Lepomis macrochirus (bluegill, swim-up fry) 232-366 µg/L/96 hours (flow-through bioassay) LC_{50}: Lepomis macrochirus (bluegill, juveniles) 76-125 µg/L/96 hours (flow-through bioassay) LC_{50}: Perca flavescens (yellow perch eggs) 276-386 µg/L/96 hours (flow-through bioassay) LC_{50}: Perca flavescens (yellow perch, juvenile) 76-108 µg/L/96 hours (flow-through bioassay) LC_{50}: Salvelinus fontinalis (brook trout eggs) 212-302 µg/L/96 hours (flow-through bioassay) LC_{50}: Salvelinus fontinalis (brook trout, swim-up fry) 56-106 µg/L/96 hours (flow-through bioassay) LC_{50}: Salvelinus fontinalis (brook trout, juvenile) 53-143 µg/L/96 hours (flow-through bioassay) LC_{50}: Salmo gairdneri (rainbow trout) 53 µg/L/96 hours (flow-through bioassay) LC_{50}: Pimephales promelas (fathead minnow eggs) 121-262 µg/L/96 hours (flow-through bioassay) LC_{50}: Pimephales promelas (fathead minnow, swim-up fry) 82-125 µg/L/96 hours (flow-through bioassay) LC_{50}: Pimephales promelas (fathead minnow, juvenile) 65-127 µg/L/96 hours (flow-through bioassay) LC_{50}: Gambusia affinis (small) 160-180 µg/L/48 hours (conditions of bioassay not specified) LC_{50}: Lymnaea emarginata (snail) 3,300 µg/L/48 hours (conditions of bioassay not specified) LC: Lymnaea sp. (small variety) 31,900 µg/L/96 hours LC_{50}: Pinus nitigra (larva) 1,350 µg/L/48 hours (conditions of bioassay not specified) LC_{50}: Stenotomus versum (mayfly) 500 µg/L/48 hours (conditions of bioassay not specified) LC_{50}: Hyalella azteca sp. (caddis) 2,000 µg/L/48 hours (conditions of bioassay not specified) LC_{50}: Salmo gairdneri (rainbow trout) 50 µg/L/48 hours (conditions of bioassay not specified) LC_{50}: Pimephales promelas (fathead minnow) 240 µg/L/48 hours (conditions of bioassay not specified) LC_{50} Pimephales promelas (fathead minnow, juvenile) 120 µg/L/8 days (conditions of bioassay not specified) LC_{50}: Pimephales promelas (fathead minnow, juvenile) 123 µg/L/96 hours(conditions of bioassay not specified) LC_{50}: Lepomis macrochirus (bluegill, juvenile) 104 µg/L/48 hours (conditions of bioassay not specified) LC_{50}: Lepomis macrochirus (bluegill, juvenile) 154 µg/L/72 hours (conditions of bioassay not specified) LC_{50}: Perca flavescens (yellow perch embryo) 281 µg/L/96 hours (conditions of bioassay not specified).

13. DISPOSAL CONSIDERATIONS PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Return cylinders with any residual product to Portogas. Do not dispose of locally. For emergency disposal, secure the cylinder and slowly discharge the gas to the atmosphere in a well-ventilated area or outdoors, away from all sources of ignition.

14. TRANSPORTATION INFORMATION THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION. PROPER SHIPPING NAME: Compressed gases, n.o.s. (Nitrogen, Hydrogen Cyanide) HAZARD CLASS NUMBER and DESCRIPTION: 2.3 (Non-Flammable Gas) UN IDENTIFICATION NUMBER: UN 1956 PACKING GROUP: Not applicable. LABEL(S) REQUIRED: Non-Flammable Gas NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 126 MARINE POLLUTANT: Hydrogen Cyanide is designated by the Department of Transportation to be a Marine Pollutant (49 CFR 172.101, Appendix B). However, the concentration of this component is below 10% and this material is not required to be marked per the requirements of 49 CFR 172.322. TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use above information for the preparation of Canadian shipments.

15. REGULATORY INFORMATION 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	SARA 304	SARA 313
HYDROGEN CYANIDE	YES	YES	YES

U.S. SARA THRESHOLD PLANNING QUANTITY: Hydrogen Cyanide = 500 pounds. U.S. CERCLA REPORTABLE QUANTITIES (RQ): Hydrogen Cyanide = 10 pounds (Extremely Hazardous Substance). CANADIAN DSL INVENTORY STATUS: The components of this gas mixture are listed on the DSL Inventory. U.S. TSCA INVENTORY STATUS: The components of this gas mixture are listed on the TSCA Inventory. OTHER U.S. REGULATIONS: Hydrogen Cyanide (as Cyanide) is subject to the reporting requirements of CFR 29 1910.1000. Hydrogen Cyanide is listed on Table 4-1. Hydrogen Cyanide is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The threshold quantity for this gas is 2,500 pounds. Depending on specific operations involving the use of Hydrogen Cyanide, the regulations of the Process Safety Management of Highly Hazardous Chemicals may be applicable (29 CFR 1910.119). Hydrogen Cyanide is listed in Appendix A of this regulation. The threshold quantity for Hydrogen Cyanide under this legislation is 1,000 pounds. This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82). Hydrogen Cyanide is listed under Table 1 as a Regulated Toxic Substance, per 40 CFR Part 68, of the Risk Management for Chemical Release Prevention. The threshold quantity for Hydrogen Cyanide under this regulation is 2,500 pounds. CALIFORNIA PROPOSITION 65: The components of this gas mixture are not on the California Proposition 65 list. 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: Hydrogen Cyanide. California - Permissible Exposure Limits for Chemical Contaminants: Hydrogen Cyanide. Nitrogen. Florida - Substance List: Hydrogen Cyanide. Illinois - Toxic Substance List: Hydrogen Cyanide. Kansas - Section 302/313 List: Hydrogen Cyanide. Massachusetts - Substance List: Hydrogen Cyanide. Michigan - Critical Materials Register: No. Minnesota - List of Hazardous Substances: Hydrogen Cyanide. Missouri - Employer Information/Toxic Substance List: Hydrogen Cyanide. New Jersey - Right to Know Hazardous Substance List: Hydrogen Cyanide; Nitrogen. North Dakota - List of Hazardous Chemicals, Reportable Quantities: Hydrogen Cyanide. Pennsylvania - Hazardous Substance List: Hydrogen Cyanic Nitrogen. Rhode Island - Hazardous Substance List: Hydrogen Cyanide. Nitrogen. Texas - Hazardous Substance List: Hydrogen Cyanide. West Virginia - Hazardous Substance List: Hydrogen Cyanide. Wisconsin - Toxic and Hazardous Substances: Hydrogen Cyanide. OTHER CANADIAN REGULATIONS: This gas mixture is categorized as a Controlled Product, Hazard Classes A and D1A, 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 not allowed if un-full or 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. 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. Flammable gases and liquids have properties which can cause serious injury or death. Disclaimer: To the best of Portogas's knowledge, the information contained herein is reliable and accurate as of the 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. Data may be changed from time to time. Be sure to consult the latest edition.

PORTAGAS

April 2005

Material Safety Data Sheet

Rev. 1

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 Note: The Material Safety Data Sheet is for this gas mixture supplied in cylinders with 39 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

Document Number: MSDS1013 SUPPLIER/MANUFACTURER'S NAME: Portagas ADDRESS: 6717-B Fork Street, Houston, TX 77011 BUSINESS PHONE: General MSDS Info: (713) 928-5477 EMERGENCY PHONE: INFOTRAC: (800) 535-5053

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA		NIOSH	OTHER
			TLV ppm	STEL ppm	PEL ppm	STEL ppm	IDLH ppm	
Oxygen	7782-44-7	0.0015 - 23.5%	There are no specific exposure limits for Oxygen. Oxygen levels should be maintained above 19.5%.					
Methane	74-82-8	0.0005 - 2.5%	There are no specific exposure limits for Methane. Methane is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					
Hydrogen Sulfide	7783-06-4	0.001- 0.025 %	10 (NIC = 5)	15	10 (Vacated 1989 PEL)	20 (ceiling); 50 (ceiling, 10 min. peak once per 8-hour shift 15 (vacated 1989 PEL)	100	NIOSH REL: STEL = 10 (ceiling) 10 minutes DFG-MAKs: TWA = 10 PEAK = 2xMAK, 10 min., momentary value
Carbon Monoxide	630-08-0	0.0005 - 1.0%	25	NE	50 35 (Vacated 1989 PEL)	200 (ceiling) (Vacated 1989 PEL)	1200	NIOSH RELS: TWA = 35 STEL = 200 (ceiling) DFG MAKs: TWA = 30 PEAK = 2xMAK, 15 min., average value DFG MAK Pregnancy Risk Classification: B
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. NIC = Notice of Intended Change See Section 15 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 atmosphere (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:

HYDROGEN SULFIDE CONCENTRATION	OBSERVED EFFECT
0.3-30 ppm	Odor is unpleasant.
50 ppm	Eye irritation, Dryness and irritation of nose, throat.
Slightly higher than 50 ppm	Irritation of the respiratory system.
100-150 ppm	Temporary loss of smell.
200-250 ppm	Headache, vomiting nausea. Prolonged exposure may lead to lung damage. Exposures of 4-8 hours can be fatal.
300-500	Swifter onset of symptoms. Death occurs in 1-4 hours.
500 ppm	Headache, excitement, staggering, and stomach ache after brief exposure. Death occurs within 0.5 - 1 hour of exposure.
> 600 ppm	Rapid onset of unconsciousness, coma, death.
> 1000 ppm	Immediate respiratory arrest.

NOTE: This gas mixture contains a maximum of 250 ppm Hydrogen Sulfide. The higher concentration values here are presented to delineate the complete health effects which have been observed for humans after exposure to Hydrogen Sulfide. 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 the 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:

CARBON MONOXIDE CONCENTRATION	OBSERVED EFFECT
All exposure levels:	Over-exposure to Carbon Monoxide can be indicated by the lips and fingernails turning bright red.
200 ppm:	Slight symptoms (i.e. headache) after several hours of exposure.
400 ppm:	Headache and discomfort experienced within 2-3 hours of exposure.
1,000 -2000 ppm:	Within 30 minutes, slight palpitations of the heart occurs. Within 1.5 hours, there is a tendency to stagger.
2000-2500 ppm:	Within 2 hours, there is mental confusion, headaches, and nausea. Unconsciousness within 30 minutes
>2500 ppm:	Potential for collapse and death before warning symptoms.

Additionally, if mixtures of this gas mixture contain less than 19.5% Oxygen and are released in a small, poorly ventilated area (i.e. an enclosed or confined space), 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 following effects associated with various levels of oxygen are as follows:

OXYGEN CONCENTRATION	OBSERVED EFFECT
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.

SKIN and EYE CONTACT: Hydrogen Sulfide, a component of this gas mixture, may be irritating to the skin. Inflammation and irritation of the eyes can occur at very low airborne concentration of Hydrogen Sulfide (less than 10 ppm). Exposure over several hours may result in "gas eyes" or "sore eyes" with symptoms of scratchiness, irritation, tearing and burning. Above 50 ppm of Hydrogen Sulfide, there is an intense tearing, blurring of vision, and pain when looking at light. Over-exposed individuals may see rings around bright lights. Most symptoms disappear when exposure ceases. However, in serious cases, the eye can be permanently damaged. **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 symptoms develop 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 upstream range being 2-2.8 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. **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. 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.

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, 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.

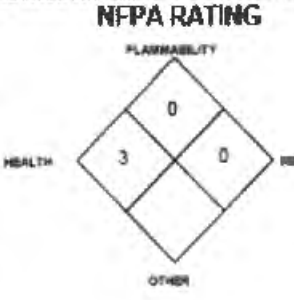
7. HANDLING and USE WORK PRACTICES AND HYGIENE PRACTICES: Be aware of any signs of dizziness or fatigue, especially if work is done in a poorly ventilated area; exposures to fatal concentrations of this gas mixture could occur without any significant warning symptoms, due to olfactory fatigue or oxygen deficiency. Do not attempt to repair, adjust, or in any

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD (BLUE)	3
FLAMMABILITY HAZARD (RED)	0
PHYSICAL HAZARD (YELLOW)	0
PROTECTIVE EQUIPMENT	
Eyes / Skin / Hands / Body	
See Section 8	

For Routine Industrial Use and Handling Applications

NFPA RATING



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 operated 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 8 (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 responses 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 19.18.35% 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 250 ppm — Supplied Air Respirator (SAR)

Up to 675 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 inside. **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: -345.0°F (-210°C) **BOILING POINT:** -320.4°F (-195.8°C) **SPECIFIC GRAVITY** (air = 1) @ 70°F (21.1°C): 0.966 **pH:** Not applicable. **SOLUBILITY IN WATER** vol/vol @ 32°F (0°C) and 1 atm: 0.023 **MOLECULAR WEIGHT:** 28.01 **EVAPORATION RATE** (nBuAc = 1): Not applicable. **EXPANSION RATIO:** Not applicable. **VAPOR PRESSURE** @ 70°F (21.1°C) (psig): Not applicable. **SPECIFIC VOLUME (ft³/lb):** 13.8 **COEFFICIENT WATER/OIL DISTRIBUTION:** Not applicable. 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 or 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.

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:** LC_{50} (Inhalation-Rat) 1807 ppm/4 hours LC_{50} (Inhalation-Mouse) 2444 ppm/4 hours LC_{50} (Inhalation-Guinea Pig) 5718 ppm/4 hours LC_{50} (Inhalation-wild bird species) 1334 ppm LCLo (Inhalation-Human) 4 mg/m³/12 hours. Behavioral: coma; Vascular: BP lowering not cited/unclassified in autonomic section; Blood: methemoglobinemia-carboxyhemoglobin LCLo (Inhalation-Man) 5000 ppm/5 minutes LCLo (Inhalation-Human) 6000 ppm/5 minutes LCLo (Inhalation-Dog) 4000 ppm/45 minutes LCLo (Inhalation-Rabbit) 4000 ppm LCLo (Inhalation-Mammal-species unspecified) 5000 ppm/5 minutes TCLo (Inhalation-Human) 600 mg/m³/10 minutes: Behavioral: headache TCLo (Inhalation-Man) 650 ppm/45 minutes: Blood: methemoglobinemia-carboxyhemoglobin; Behavioral: changes in psychophysiological tests TCLo (Inhalation-Rat) 1800 ppm/1 hour/16 days-intermittent Cardiac: other changes TCLo (Inhalation-Rat) 30 mg/m³/8 hours/10 weeks-intermittent: Brain and Coverings: other degenerative changes; Behavioral: muscle contraction or spasticity TCLo (Inhalation-Rat) 66 ppm/24 hours/90 days-continuous: Blood: pigmented or nucleated red blood cells, other changes TCLo (Inhalation-Rat) 250 ppm/5 hours/20 days-intermittent: Blood: pigmented or nucleated red blood cells; changes in other cell count (unspecified), changes in erythrocyte (RBC) count TDLo (Subcutaneous-Rat) 9383 mg/kg/18 weeks-intermittent: Blood changes in serum composition (e.g. TP, bilirubin, cholesterol) TCLo (Inhalation-Monkey) 200 ppm/24 hours/90 days-continuous: Blood: pigmented or nucleated red blood cells, other changes; TCLo (Inhalation-Rabbit) 200 mg/m³/3 hours/13 weeks-intermittent: Brain and Coverings: other degenerative changes; Cardiac: other changes; Blood: hemorrhage TCLo (Inhalation-Guinea Pig) 200 mg/m³/8 hours/30 weeks-continuous: Cardiac: arrhythmias (including changes in conduction); EKG changes not diagnostic of specified effects, pulse rate increase, without fall in BP TCLo (Inhalation-Mouse) 50 ppm/30 days-intermittent; Lungs, Thorax, or Respiration: structural or functional change in trachea or bronchi TCLo (Inhalation-Guinea Pig) 200 mg/m³/5 hours/4 weeks-intermittent: Endocrine: hyperglycemia TCLo (Inhalation-Guinea Pig) 200 ppm/24 hours/50 days-continuous: Blood: pigmented or nucleated red blood cells, other changes TCLo (Inhalation-Rat) 75 ppm/21 hours: female 0-20 day(s) after conception: Reproductive: Maternal Effects: other effects; Effects on Newborn: behavioral TCLo (Inhalation-Rat) 150 ppm/24 hours: female 1-22 day(s) after conception: Reproductive: Effects on Newborn: growth stistics (c,g,/s, reduced weight gain), behavioral TCLo (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) TCLo (Inhalation-Rat) 150 ppm/24 hours: female 0-20 day(s) after conception: Reproductive: Effects on Newborn: behavioral TCLo (Inhalation-Rat) 75 ppm/24 hours: female 0-20 day(s) after conception: Reproductive: Specific Developmental Abnormalities: immune and reticuloendothelial system TCLo (Inhalation-Mouse) 65 ppm/24 hours: female 7-18 day(s) after conception: Reproductive: Effects on Newborn: behavioral TCLo (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 TCLo (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) TCLo (Inhalation-Mouse) 8 ppb/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 TCLo (Inhalation-Rabbit) 50 ppm/24 hours/8 weeks-continuous: Blood: changes in platelet count TCLo (Inhalation-Mouse) 6 ppb/1 hour: female 6 day(s) after conception; Reproductive: Specific Developmental Abnormalities: Central Nervous System TCLo (Inhalation-Rabbit) 180 ppm/24 hours: female 1-30 day(s) after conception; Reproductive: Effects on Newborn: stillbirth, viability index (e.g. # alive at day 4 per # born alive) Micronucleus Test (Inhalation-Mouse)1500 ppm/20 minutes Sister Chromatid Exchange (Inhalation-Mouse) 2500 ppm/10 minutes **HYDROGEN SULFIDE:** LC_{50} (Inhalation-Rat) 444 ppm: Lungs, Thorax, or Respiration: other changes; Gastrointestinal: hypermotility, diarrhea; Kidney, Ureter, Bladder: urine volume increased LC_{50} (Inhalation-Mouse) 634 ppm/1 hour LCLo (Inhalation-Human) 600 ppm/30 minutes LCLo (Inhalation-Man) 5700 µg/kg. Behavioral: coma. Lungs, Thorax, or Respiration: chronic pulmonary edema LCLo (Inhalation-Human) 800 ppm/5 minutes LCLo (Inhalation-Mammal-species unspecified) 800 ppm/5 minutes TCLo (Inhalation-Rat) 30 ppm/6 hours/30 weeks-intermittent: Sense Organs and Special Senses (Olfaction): olfactory nerve change, effect not otherwise specified TCLo (Inhalation-Rat) 1200 mg/m³/2 hours/5 days-intermittent: Brain and Coverings: other degenerative changes; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: cue cholinesterase TCLo (Inhalation-Rat) 100 ppm/8 hours/5 weeks-intermittent: Brain and Coverings: other degenerative changes; Lungs, Thorax, or Respiration: other changes; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: cytochrome oxidase (including oxidative phosphorylation) TCLo (Inhalation-Rat) 80 ppm/6 hours/90 days-intermittent: Brain and Coverings: changes in brain weight; Nutritional and Gross Metabolic: weight loss or decreased weight gain TCLo (Inhalation-Rat) 20 ppm: female 6-22 day[s] after conception lactating female 21 day[s] post-birth; Reproductive: Effects on Newborn: physical TCLo (Inhalation-Mouse) 80 ppm/6 hours/90 days-intermittent: Nutritional and Gross Metabolic: weight loss or decreased weight gain; Related to Chronic Data: death TCLo (Inhalation-Rabbit) 40 mg/m³/5 hours/30 weeks-intermittent: Sense Organs and Special Senses (Eye): conjunctive irritation **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. **IRRITANCY 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 (O_3) and OH to changes in methane (CH_4). Carbon Monoxide (CO), and NO emissions and to perturbations in climate and stratospheric chemistry. In most cases, increased CH_4 and CO emissions will suppress OH (negative coefficients) or increased O_3 (positive coefficients) except in areas where NO and O_3 influenced by pollution are sufficient to increased OH. In most regions, NO, CO, and CH_4 emission increased will suppress OH and increased O_3, but these trends may be opposed by stratospheric O_3 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 highs (3.25 and 5.03 ppm) Hydrogen Sulfide, significant reductions in leaf CO_2 and water vapor exchanges occurred, and stomatal openings were depressed. When Hydrogen Sulfide gas was applied in 29 species at green plants for 5 hours, young, rapidly elongating tissues were more sensitive to injury than other tissues. Symptoms included scorching of young shoots and 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, Thiopleca, and Thiothrix 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 anerobes and are photolropic, and are found in waters with high H_2S concentrations. The interactions of these organisms form part of the global sulfur cycle. Bioaccumulation: 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:** LC_{50} (Aedes arthropods) 96 hours = 0.111 mg/l. LC_{50} (Crangon arthropods) 96 hours = 1.07 mg/l. LC_{50} (Gammarus arthropods) 96 hours = 0.84 mg/l. LC_{50} (Ephemera) 96 hours = 0.316 mg/l. LC_{50} (Inhalation-Flies) > 960 minutes = 360 mg/m³. C_{wo} (Inhalation-Flies) 7 minutes = 1,500 mg/m³. $LC_{50}F$ (bluegill, eggs) 72 hours = 0.0190 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. $LC_{50}F$ (bluegill, adults) 96 hours = 0.0448 mg/l. $LC_{50}F$ (fathead minnows) 96 hours = 0.0071-0.55 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. Toxic (goldfish) = 100 mg/l, Lethal (goldfish) 96 hours = 10 mg/l. Toxic (carp) 24 hours = 3.3 mg/l. Toxic (goldfish) 24 hours = 4.3 mg/l. Toxic (sunfish) 1 hour = 4.9 to 5.3 mg/l. Toxic (goldfish) 200 hours = 5 mg/l. Toxic (minnows) 24 hours = 5-6 mg/l. Toxic (carp) 24 hours = 5-25 mg/l. Toxic (trout) 15 minutes = 10 mg/l. Toxic (goldfish) 24 hours = 25 mg/l. Toxic (tench) 3 hours = 100 mg/l. MATC.F (fathead minnows) 0.0037 mg/l. MATC.F (bluegill) 0.0064 mg/l. MATC.F (brook trout) 0.055 mg/l.

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

15. 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. **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. **Disclaimer:** To the best of Portagas's knowledge, the information contained herein is reliable and accurate as of the 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. Data may be changed from time to time. Be sure to consult the latest edition.

PORTAGAS

Material Safety Data Sheet

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

1. PRODUCT IDENTIFICATION CHEMICAL NAME; CLASS: ISOBUTANE SYNONYMS: 2-Methylpropane; **CHEMICAL FAMILY:** Alkane (hydrocarbon) **FORMULA:** C_4H_{10}
Document Number: MSDS1047 **PRODUCT USE:** For fuel and synthetic chemical use; food additive, agricultural uses, aerosol propellant, refrigerant. **SUPPLIER/MANUFACTURER'S NAME:** Portagas
ADDRESS: 6717-B Polk Street, Houston, TX 77011 **BUSINESS PHONE:** General MSDS Info: (713) 928-6477 **EMERGENCY PHONE:** INFOTRAC: (800) 535-5053

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			
			TLV ppm	STEL ppm	PEL ppm	STEL ppm	IDLH Ppm	OTHER ppm
Isobutane	75-28-5	> 95%	Simple Asphyxiant	NE	800 (Vacated 1989 PEL)	NE	NE	NIOSH REL: 800 ppm
Maximum Impurities		<5%	None of the trace impurities in this product significantly to the hazards associated with the product. All hazard information pertinent to this product has been provided in this Material Safety Data Sheet, per the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200) and State equivalents standards.					

This material is classified as hazardous under OSHA regulations in the United States and the WHMIS in Canada. NE – Not Established C = Ceiling Limit NOTE: all WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-2004 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is a colorless, liquefied, flammable gas. Both the liquid and gas pose a serious fire hazard when accidentally released. Rapid evaporation of liquid from cylinder may cause frostbite. Flame or high temperature impinging on a localized area of the cylinder of this product can cause the cylinder to burst or rupture without activating the cylinder's relief devices. Isobutane is an asphyxiant and presents a significant health hazard by displacing the oxygen in the atmosphere. Provide adequate fire protection during emergency response situations.

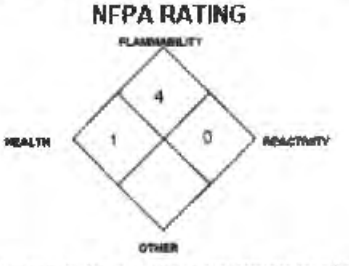
SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of over-exposure for this product is by inhalation. **INHALATION:** Isobutane also has some degree of anesthetic action and can be mildly irritating to the mucous membranes. Isobutane can also be a narcotic at high concentrations. High concentrations of this gas can cause an oxygen-deficient environment. It should be noted that before suffocation could occur, the lower flammability limit of isobutane in air would be exceeded; possibly causing an oxygen-deficient and explosive atmosphere. Individuals breathing an oxygen deficient 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 following effects associated with various levels of oxygen are as follows:

CONCENTRATION	SYMPTOM OF EXPOSURE
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 and vomiting, collapse or loss of consciousness.
Below 6%:	Convulsive movements, possible respiratory collapse, and death.

OTHER POTENTIAL HEALTH EFFECTS: Contact with liquid or rapidly expanding gases (which are released under high pressure) may cause frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after such contact can quickly subside. **HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms.** Over-exposure to this gas mixture may cause the following health effects: **ACUTE:** The most significant hazard associated with this product is inhalation of oxygen-deficient atmospheres. Symptoms of oxygen deficiency include respiratory difficulty, ringing in ears, headaches, shortness of breath, wheezing, headache, dizziness, indigestion, nausea, and, at high concentrations, unconsciousness or death may occur. The skin of a victim of over-exposure may have a blue color. **CHRONIC:** There are currently no known adverse health effects associated with chronic exposure to the components of this compressed gas. **TARGET ORGANS:** Respiratory system.

4. FIRST-AID MEASURES RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS PRODUCT WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus and Fire-Retardant Personal Protective equipment should be worn. Adequate fire protection must be provided during rescue situations. 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:** Exposure to the liquefied gas can cause frostbite. Remove any clothing that may restrict circulation to any frozen area. Do not rub frozen parts as tissue damage may occur. As soon as practicable, place any affected area in warm water bath which has a temperature that does not exceed 105°F (40°C). NEVER USE HOT WATER. NEVER USE DRY HEAT. If area of frostbite is extensive, and if possible, remove clothing while showering with warm water. If warm water is not available, or is impractical to use, wrap the affected parts gently in blankets. Alternatively, if the fingers or hands are frostbitten, place the affected area of the body in the armpit. Encourage victim to gently exercise the affected part while being warmed. Seek immediate medical attention. Frozen tissue is painless and appears waxy, with a possible yellow color. Frozen tissue will become swollen, painful and prone to infection when thawed. If the frozen part of the body has been thawed by the time medical attention has been obtained, cover the area with a dry sterile dressing and a large bulky protective covering. **EYE EXPOSURE:** If liquid is splashed into eyes, or if irritation of the eye develops after exposure to liquid or gas, 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. Victim(s) must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to physician or other health professional with victim(s).

5. FIRE-FIGHTING MEASURES FLASH POINT: -159°C (-254°F) **AUTOIGNITION TEMPERATURE:** 462°C (864°F) **FLAMMABLE LIMITS (in air by volume, %):** Lower (LEL): 1.8% Upper (UEL): 8.4% **FIRE EXTINGUISHING MATERIALS:** Extinguish Isobutane fires by shutting-off the source of the gas. Use water spray to cool fire-exposed containers, structures, and equipment. **UNUSUAL FIRE AND EXPLOSION HAZARDS:** When involved in a fire, this material may decompose and produce toxic gases including carbon monoxide and carbon dioxide. **DANGER!** Fires impinging (direct flame) on the outside surface of unprotected cylinders of this product can be very dangerous. Exposure to fire could cause a catastrophic failure of the cylinder releasing the contents into a fireball and explosion of released gas. The resulting fire and explosion can result in severe equipment damage and personnel injury or death over a large area around the cylinder. For massive fires in large areas, use unmanned hose holder or monitor nozzles; if this is not possible, withdraw from area and allow fire to burn. Explosion Sensitivity to Mechanical Impact: Not sensitive. Explosion Sensitivity to Static Discharge: Static discharge may cause this product to ignite explosively, if released. **SPECIAL FIRE-FIGHTING PROCEDURES:** Structural fire-fighters must wear Self-Contained Breathing Apparatus and full protective equipment. Because of the potential for a BLEVE, evacuation of non-emergency personnel is essential. If water is not available for cooling or protection of cylinder exposures, evacuate the area. The North American Emergency Response Guidebook (Guide #115) recommends 0.5 miles. Other information for pre-planning can be found in the American Petroleum Institute Publications 2510 and 2510A.



6. ACCIDENTAL RELEASE MEASURES LEAK RESPONSE: Evacuate immediate area. Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a gas release, clear the affected area, protect people, and respond with trained personnel. Eliminate any possible sources of ignition, and provide maximum explosion-proof ventilation. If the gas is leaking from cylinder or valve, contact the supplier. Adequate fire protection must be provided. Use only non-sparking tools and equipment during the response. Minimum Personal Protective Equipment should be **Level B: fire-retardant protective clothing, gloves and Self-Contained Breathing Apparatus.** Use only non-sparking tools and equipment. Locate and seal the source of the leaking gas. Protect personnel attempting the shut-off with water-spray. Allow the gas to dissipate. Combustible gas concentration must be below 10% of the LEL (1.8%) prior to entry. Monitor the surrounding area for combustible gas levels and oxygen level. The atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus. Attempt to close the main source valve prior to entering the area. If this does not stop the release (or if it is not possible to reach the valve), allow the gas to release in-place or remove it to a safe area and allow the gas to be released there. **THIS IS AN EXTREMELY FLAMMABLE GAS.** Protection of all personnel and the area must be maintained.

7. HANDLING and USE WORK PRACTICES AND HYGIENE PRACTICES: Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this product could occur without any significant warning symptoms. Non-sparking tools should be used. **STORAGE AND HANDLING PRACTICES:** Specific requirements are listed in NFPA 58. Cylinders should be stored upright (with valve-protection cap in place) and firmly secured to prevent falling or being knocked over. Cylinders can be stored in the open, but in such cases, should be protected against extremes of weather and from the dampness of the ground to prevent rusting. Cylinders should be stored in dry, well-ventilated areas away from sources of heat, ignition and direct sunlight. Keep storage area clear of materials which can burn. Do not allow area where cylinders are stored to exceed 52 °C (125 °F). Store containers away from heavily trafficked areas and emergency exits. Store away from process and production areas, away from elevators, building and room exits or main aisles leading to exits. Protect cylinders against physical damage. Cylinders should be separated from oxygen cylinders, or other oxidizers, by a minimum distance of 20 ft., or by a barrier of non-combustible material at least 5 ft. high, having a fire-resistance rating of at least 0.5 hours. Isolate from other incompatible chemicals (refer to Section 10, Stability and Reactivity). Storage areas must meet national electrical codes for Class 1 Hazardous Areas. Post "No Smoking or Open Flames" signs in storage or use areas. Consider installation of leak detection and alarm for storage and use areas. Have appropriate extinguishing equipment in the storage area (i.e. sprinkler system, portable fire extinguishers). Keep the smallest amount on-site as is necessary. 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. Use non-sparking ventilation systems, approved explosion-proof equipment, and appropriate electrical systems. Electrical equipment used

in gas-handling operations, or located in storage areas, should be non-sparking or explosion proof. Use a check valve in the discharge line to prevent hazardous backflow. Never tamper with pressure relief devices in valves and cylinders. **SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS:** Compressed gases can present significant safety hazards. The following rules are applicable in work situations in which cylinders are being used: **Before Use:** Move cylinders with a suitable hand-truck. Do not drag, slide or roll cylinders. Do not drop cylinders or permit them to strike each other. Secure cylinders firmly. Leave the valve protection cap (where provided) in-place until cylinder is ready for use. **During Use:** Use designated CGA fittings and other support equipment. Do not use adapters. Use piping and equipment adequately designed to withstand pressures to be encountered. Do not heat cylinder by any means to increase the discharge rate of the product from the cylinder. Do not use oils or grease on gas-handling fittings or equipment. Do not "crack" valve open before connecting it, since self-ignition may occur. Leak check system with leak detection solution, never with flame. Immediately contact the supplier if there are any difficulties with operating cylinder valve. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing a leak to occur. Use an adjustable strap wrench to remove over-tight or rusted caps. Never strike an arc on a compressed gas cylinder or make a cylinder part of an electric circuit. **After Use:** Close main cylinder valve. Valves should be closed tightly. Replace valve protection cap. Mark empty cylinders "EMPTY". **NOTE:** Use only DOT or ASME code containers designed for flammable gas storage. Earth-ground and bond all lines and equipment associated with this product. **STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:** Use the proper connections, DO NOT USE ADAPTERS: THREADED: 0-500 PSIG - CGA 510 PIN-INDEXED YOKE: **Not Applicable.** ULTRA HIGH INTEGRITY: **Not Applicable. PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT:** Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Purge gas handling equipment with inert gas (i.e. nitrogen) before attempting repairs. Always use product in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation. Provide natural or explosion-proof ventilation adequate to ensure Isobutane does not reach its lower flammability limit of 1.8%. Local exhaust ventilation is preferred, because it prevents gas dispersion into the work place by eliminating it at its source. If appropriate, install automatic monitoring equipment to detect the level of flammable gas. **RESPIRATORY PROTECTION:** Maintain oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection if oxygen levels are below 19.5% (air-purifying respirators will not function) or during emergency response to a release of this product. During an emergency situation, before entering the area, check for flammable gas level as well as oxygen-deficient atmospheres. If respiratory protection is required, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), or equivalent State standards. **EYE PROTECTION:** Safety glasses. **HAND PROTECTION:** Wear leather gloves when handling cylinders of this product. Otherwise, wear glove protection appropriate to the specific operation for which this product is used. Use low-temperature protective gloves when working with containers of Liquid Isobutane. **BODY PROTECTION:** Use body protection appropriate for task. Cotton clothing is recommended for use to prevent static electric build-up. Safety shoes are recommended when handling cylinders. Transfer of large quantities under pressure may require use of fire retardant clothing.

9. PHYSICAL and CHEMICAL PROPERTIES GAS DENSITY @ 21.1°C (70°F) and 1 atm: 0.114 74 lb/ft³ (2.4787 kg/m³) **BOILING POINT:** -11.72°C (10.9°F) **FREEZING/MELTING POINT @ 10 psig:** -159°C (-255.3°F) **SPECIFIC GRAVITY (air = 1) @ 21.1°C (70°F):** 2.006 36 **pH:** Not applicable. **SOLUBILITY IN WATER vol/vol @ 37.8°C (100°F):** 0.052 **MOLECULAR WEIGHT:** 58.12 **EVAPORATION RATE (nBuAc = 1):** Not applicable. **EXPANSION RATIO:** Not applicable. **ODOR THRESHOLD:** 1800 mg/m³ **SPECIFIC VOLUME (ft³/lb):** 8.33 **VAPOR PRESSURE @ 21.1°C (70°F) psig:** 30.58 **COEFFICIENT WATER/OIL DISTRIBUTION:** Not applicable. **APPEARANCE AND COLOR:** Colorless, odorless gas which is shipped as a liquefied gas under its own vapor pressure. **HOW TO DETECT THIS SUBSTANCE (warning properties):** There are no distinct warning properties. 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: Stable. **DECOMPOSITION PRODUCTS:** When ignited in the presence of oxygen, this gas will burn to produce carbon monoxide, carbon dioxide. **MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE:** Strong oxidizers (i.e. chlorine, bromine pentafluoride, oxygen, oxygen difluoride, and nitrogen trifluoride). **HAZARDOUS POLYMERIZATION:** Will not occur. **CONDITIONS TO AVOID:** Contact with incompatible materials and exposure to heat, sparks and other sources of ignition. Cylinders exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION TOXICITY DATA: The following toxicology data are available for Isobutane: **ISOBUTANE:** Inhalation-Rat LC_{50}: 57 ppm/ 15 minute Inhalation-Mouse LCLo: 1041 g/m³/ 2 hour **SUSPECTED CANCER AGENT:** Isobutane is not found on the following lists: **FEDERAL OSHA Z LIST,** NTP, IARC, CAL/OSHA; therefore is not considered to be, nor suspected to be a cancer-causing agent by these agencies. **IRRITANCY OF PRODUCT:** Isobutane can cause some irritation to mucus membranes. In addition, contact with rapidly expanding gases can cause frostbite to exposed tissue. **SENSITIZATION TO THE PRODUCT:** Isobutane is not known to cause sensitization in humans; however, Isobutane is considered a weak heart sensitizing agent, based on animal tests. **REPRODUCTIVE TOXICITY INFORMATION:** Listed below is information concerning the effects of Isobutane on the human reproductive system. Mutagenicity: No mutagenicity effects have been described for Isobutane. Embryotoxicity: No embryotoxic effects have been described for Isobutane. Teratogenicity: No teratogenicity effects have been described for Isobutane. Reproductive Toxicity: No reproductive toxicity effects have been described for Isobutane. *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.* **MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:** Acute or chronic respiratory conditions may be aggravated by over-exposure to Isobutane. **BIOLOGICAL EXPOSURE INDICES (BEIs):** Currently, Biological Exposure Indices (BEIs) are not applicable for Isobutane. **RECOMMENDATIONS TO PHYSICIANS:** Administer oxygen, if necessary; treat symptoms; reduce or eliminate exposure.

12. ECOLOGICAL INFORMATION ENVIRONMENTAL STABILITY: This gas will be dissipated rapidly in well-ventilated areas. **EFFECT OF MATERIAL ON PLANTS or ANIMALS:** Any adverse effect on animals would be related to oxygen deficient environments. No adverse effect is anticipated to occur to plant-life. **EFFECT OF CHEMICAL ON AQUATIC LIFE** No evidence is currently available on this product's effects on aquatic life.

13. DISPOSAL CONSIDERATIONS PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Return cylinders with any residual product to Portagas. Do not dispose of locally.

14. TRANSPORTATION INFORMATION THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION. ALTERNATE DESCRIPTION: PROPER SHIPPING NAME: Isobutane Petroleum gases, liquefied **HAZARD CLASS NUMBER and DESCRIPTION:** 2.1 (Flammable Gas) 2.1 (Flammable Gas) **UN IDENTIFICATION NUMBER:** UN 1969 UN 1075 **PACKING GROUP:** Not applicable, Not applicable. **DOT LABEL(S) REQUIRED:** Flammable Gas Flammable Gas **NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 115 MARINE POLLUTANT:** Isobutane is 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 present serious safety hazards and should be discouraged. **NOTE:** Shipment of compressed gas cylinders which have not been filled with the owners consent is a violation of Federal law (49 CFR, Part 173.301 (b). **TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:** THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian Shipments.

15. REGULATORY INFORMATION SARA REPORTING REQUIREMENTS: Isobutane is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act. This product is subject to the reporting requirements of Sections 311 and 312 of Title III of the Superfund Amendments and Reauthorization Act (40 CFR 370.21). **SARA THRESHOLD PLANNING QUANTITY:** Not applicable. **TSCA INVENTORY STATUS:** Isobutane is listed on the TSCA Inventory. **CERCLA REPORTABLE QUANTITY (RQ):** Not applicable. **OTHER U.S. FEDERAL REGULATIONS:** Generally recognized as safe, (GRAS) as a direct human food ingredient when used as a propellant, aerating agent and gas. Isobutane does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82). Isobutane is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for of this gas is 10,000 pounds. Depending on specific operations involving the use of this product, the regulations of the Process Safety Management of Highly Hazardous Chemicals may be applicable (29 CFR 1910.119). Under this regulation Isobutane is not listed in Appendix A, however, any process that involves a flammable gas on-site, in one location, in quantities of 10,000 lbs (4,563 kg) or greater is covered under this regulation unless it is used as a fuel. Isobutane is listed as a Regulated Substance, per 40 CFR, Part 68, of the Risk Management for Chemical Releases as a flammable substance. The threshold quantity for Isobutane under this regulation is 10,000 lbs. **OTHER CANADIAN REGULATIONS:** Isobutane is categorized as a Controlled Product, Hazard Classes A, and B1 as per the Controlled Product Regulations. **STATE REGULATORY INFORMATION:** Isobutane is covered under specific State regulations, as denoted below: **Alaska - Designated Toxic and Hazardous Substances:** Isobutane. **California - Permissible Exposure Limits for Chemical Contaminants:** Isobutane. **Florida - Substance List:** No. **Illinois - Toxic Substance List:** Isobutane. **Kansas - Section 302/313 List:** No. **Massachusetts - Substance List:** Isobutane. **Minnesota - List of Hazardous Substances:** Isobutane. **Missouri - Employer Information/Toxic Substance List:** Isobutane. **New Jersey - Right to Know Hazardous Substance List:** Isobutane. **North Dakota - List of Hazardous Chemicals, Reportable Quantities:** No. **Pennsylvania - Hazardous Substance List:** Isobutane. **Rhode Island - Hazardous Substance List:** Isobutane. **Texas - Hazardous Substance List:** No. **West Virginia - Hazardous Substance List:** No. **Wisconsin - Toxic and Hazardous Substances:** No. **CALIFORNIA PROPOSITION 65:** Isobutane is not on the California Proposition 65 lists.

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. **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 can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 4221 Walney Road 5th floor, Chantilly, VA 20151-2923, Telephone: (703) 788-2700. *P-1 "Safe Handling of Compressed Gases in Containers" P-14 "Accident Prevention in Oxygen-Rich and Oxygen Deficient Atmospheres" SB-8 "Use of Oxy-fuel Gas Welding and Cutting Apparatus" SB-2 "Oxygen Deficient Atmospheres" "Handbook of Compressed Gases"*

Disclaimer: To the best of Portagas's 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. Data may be changed from time to time. Be sure to consult the latest edition.

OMEGA LABORATORIES, INC. -- CITRI-SOLVE -- 6850-00F027939

========== Product Identification ==========

Product ID:CITRI-SOLVE
MSDS Date:09/01/1989
FSC:6850
NIIN:00F027939
MSDS Number: BRBGT
=== Responsible Party ===
Company Name:OMEGA LABORATORIES, INC.
Address:8732 CLAY RD SUITE 103
City:HOUSTON
State:TX
ZIP:77080
Country:US
Info Phone Num:713-462-3606
Emergency Phone Num:713-462-3606
CAGE:15205
=== Contractor Identification ===
Company Name:OMEGA LABORATORIES INC
Address:8732 CLAY RD
Box:City:HOUSTON
State:TX
ZIP:77080
Phone:(713) 462-3606
CAGE:15205

========== Composition/Information on Ingredients ==========

Ingred Name:CARVENE; CYCLOHEXENE, 1-METHYL-4-(1-METHYLETHENYL), CITRUS TERPENE, D-LIMONENE
CAS:5989-27-5
RTECS #:GW6360000
Fraction by Wt: >20%

Ingred Name:ESTER
Fraction by Wt: >50%

Ingred Name:WEIGHT PER GALLON IN POUNDS: 7.7 LBS
RTECS #:9999999WG

========== Hazards Identification ==========

Routes of Entry: Inhalation:NO Skin:NO Ingestion:NO
Reports of Carcinogenicity:NTP:NO IARC:NO OSHA:NO
Health Hazards Acute and Chronic:SKIN/EYES: IRRITATION.
Explanation of Carcinogenicity:NONE

========== First Aid Measures ==========

First Aid:INHALATION: REMOVE TO FRESH AIR. INGESTION: DRINK LARGE AMOUNTS OF WATER OR CARBON BLACK SLURRY. EYES: FLUSH W/CLEAN WATER FOR AT LEAST 15 MINS. SKIN: WASH W/SOAP & WATER. OBTAIN MEDICAL ATTENTION IN ALL CASES.

========== Fire Fighting Measures ==========

Flash Point Method:CC

Flash Point:140F
Extinguishing Media:FOAM, DRY CHEMICAL & CO2.
Fire Fighting Procedures:CLASS B FIRE PROCEDURES. BECAUSE IT IS A LIGHT OIL, WATER IS NOT VERY EFFECTIVE. MAY PRODUCE SLIPPERY FLOORS.
Unusual Fire/Explosion Hazard:CONTAINERS EXPOSED TO UNUSALLY HIGH TEMPERATURES MAY BURST.

========== Accidental Release Measures ==========

Spill Release Procedures:USE ABSORBENT MATERIAL TO PICK UP EXCESS LIQUID; SWEEP OR SCOOP UP & DISPOSE OF PROPERLY, ACCORDING TO LOCAL ORDINANCES. WASH ANY RESIDUE W/DETERGENT & WATER. DON'T DISPOSE OF IN SEWAGE SYSTEM.

========== Handling and Storage ==========

Handling and Storage Precautions:KEEP AWAY FROM HEAT, SPARKS OR OPEN FLAMES.

========== Exposure Controls/Personal Protection ==========

Respiratory Protection:NONE REQUIRED
Ventilation:NORMAL IS ADEQUATE
Protective Gloves:NONE REQUIRED
Eye Protection:RECOMMENDED
Supplemental Safety and Health

========== Physical/Chemical Properties ==========

Spec Gravity:0.857-0.883
Solubility in Water:COMPLETE
Appearance and Odor:LIGHT RED, W/CITRUS/ORANGE ODOR.

========== Stability and Reactivity Data ==========

Stability Indicator/Materials to Avoid:YES
AVOID MIXING W/ANY OTHER CHEMICALS.
Stability Condition to Avoid:HEAT, SPARKS & OPEN FLAMES
Hazardous Decomposition Products:CO2, CO

========== Disposal Considerations ==========

Waste Disposal Methods:SMALL SPILLS CAN BE SAFELY DISPOSED OF BY STANDARD WASTE METHODS. DISPOSE LARGE SPILLS IN ACCORDANCE W/FEDERAL, STATE & LOCAL REGULATIONS REGARDING WASTE DISPOSAL.

COASTAL CORP -- DIESEL FUEL NO 2 -- 9140-00N017679

========== Product Identification ==========

Product ID:DIESEL FUEL NO 2
MSDS Date:02/07/1990
FSC:9140
NIIN:00N017679
MSDS Number: BLCNC
=== Responsible Party ===
Company Name:COASTAL CORP
Address:9 GREENWAY PLAZA
City:HOUSTON
State:TX
ZIP:77046
Country:US
Info Phone Num:713-877-1400
Emergency Phone Num:713-877-1400
CAGE:46684
=== Contractor Identification ===
Company Name:COASTAL CORP
Address:9 GREENWAY PLAZA
Box:City:HOUSTON
State:TX
ZIP:77046
Country:US
Phone:713-877-6732
CAGE:46684

========== Composition/Information on Ingredients ==========

Ingred Name:PETROLEUM MID-DISTILLATE; (DIESEL FUEL NO. 2). TLV: 5
MG/M3;10MG/M3 STEL, OIL MIST.
CAS:68476-34-6
Fraction by Wt: 100%
OSHA PEL:5 MG/M3, OIL MIST
ACGIH TLV:SEE INGRED NAME

Ingred Name:SUPP DATA: CLOSING VALVES, PRESS VACUUM BUNGS & FLAME
ARRESTORS.
RTECS #:9999999ZZ

Ingred Name:VENT: 3) TO PREVENT OXYGEN DEFICIENT ATMOSPHERES,
ESPECIALLY IN CONFINED SPACES.
RTECS #:9999999ZZ

Ingred Name:EYE PROT: CHEMICAL WORKERS GOGGLES , WHERE CONTACT WITH
LIQUID OR MIST MAY OCCUR.
RTECS #:9999999ZZ

========== Hazards Identification ==========

LD50 LC50 Mixture:NONE SPECIFIED BY MANUFACTURER.
Routes of Entry: Inhalation:YES Skin:UNKNOWN Ingestion:YES
Reports of Carcinogenicity:NTP:NO IARC:NO OSHA:NO
Health Hazards Acute and Chronic:ACUTE: EYES: SLIGHT-MODERATE IRRIT.
SKIN: MODERATELY-EXTREMELY IRRITATING; CAUSING REDNESS, DRYING TO
BURNS OR BLISTERING. INHAL: IRRIT TO MUC MEMB & RESP TRACT. WILL
PRDCE SYMP OF INTOXICATION SUCH A S HDACH, DIZZ, NAUS, VOMIT & LOSS

OF COORDINATION. INGEST: STOMACH IRRIT, GASTRITIS, MILD EXCITATION, (EFTS OF OVEREXP)
Explanation of Carcinogenicity:NOT RELEVANT
Effects of Overexposure:HLTH HAZ: LOSS OF CONS, CONVULSIONS, CYANOSIS, CONGESTION & CAPILLARY HEMORRHAGING OF THE LUNG & INTERNAL ORGANS. ASPIRATION HAZARD IF VOMITING OCCURS. CHRONIC: PRLNG/RPTD SKIN CONT MAY CAUSE DERMATIT IS.
Medical Cond Aggravated by Exposure:MAY AGGRAVATE PRE-EXISTING DERMATITIS. MIDDLE DISTILLATES HAVE CAUSED SKIN CANCER & KIDNEY DMG IN LAB ANIMALS. THE NIOSH, BASE ON FINDINGS OF CARCINOGENIC & TUMORIGENIC RESPONSES OF MICE & (SUPP DATA)

========== First Aid Measures ==========

First Aid:EYE CONT: FLUSH THORO W/POTABLE WATER FOR AT LEAST 15 MINUTES. GET MED ATTN. SKIN CONT: COOL THE EXPOSED AREA IMMED. REMOVE CONTAM CLTHG. IMMED WASH AFFECTED AREAS W/SOAP & WATER. INHAL: REMOVE TO FRE SH AIR. APPLY ARTF RESP IF NOT BRTHG. GET MED ATTN. INGEST: DO NOT INDUCE VOMITING. IF SPONTANEOUS VOMITING OCCURS, HOLD THE VICTIM'S HEAD LOWER THAN HIPS TO PREVENT ASPIRATION.

========== Fire Fighting Measures ==========

Flash Point Method:PMCC
Flash Point:125F,52C
Lower Limits:0.6%
Upper Limits:7.5%
Extinguishing Media:DRY CHEMICAL, CARBON DIOXIDE, FOAM, AND WATER SPRAY.
Fire Fighting Procedures:USE A WATER SPRAY TO COOL FIRE-EXPOSED CONTRS. USE A SMOTHERING TECHNIQUE FOR EXTING FIRE OF THIS COMBUST LIQUID. DO NOT USE A FORCED WATER STREAM (SUPP DATA)
Unusual Fire/Explosion Hazard:FLOWING OIL CAN BE IGNITED BY SELF-GENERATED STATIC ELECTRICITY.

========== Accidental Release Measures ==========

Spill Release Procedures:REMOVE SOURCES OF HEAT OR IGNITION INCLUDING INTERNAL COMBUSTION ENGINES & POWER TOOLS. CLEAN-UP SPILL, BUT DO NOT FLUSH TO SEWER OR SURFACE WATER. VENTILATE AREA & AVOID BREATHING VAPORS OR MISTS.
Neutralizing Agent:NONE SPECIFIED BY MANUFACTURER.

========== Handling and Storage ==========

Handling and Storage Precautions:STORE IN TIGHTLY CLOSED CONTRS IN A DRY COOL PLACE, AWAY FROM SOURCES OF HEAT/IGNIT. GROUND/BOND ALL TRANSFER/STORAGE EQUIP TO PVNT STATIC (SUPP DATA)
Other Precautions:EMPTY CONTRS MAY CONTAIN RESIDUE (LIQ &/OR VAP) & CAN BE DANGEROUS. DO NOT PRESSURIZE/CUT/WELD/BRAZE/SOLDER/DRILL/GRIND OR EXPOSED SUCH CONTRS TO HEAT/FLAME/SPARKS OR OTHER SOURCES OF IGNIT; THEY MAY EXPLODE & CAUSE INJURY OR DEATH.

========== Exposure Controls/Personal Protection ==========

Respiratory Protection:USE NIOSH/MSHA APPROVED RESPIRATORY PROTECTIVE EQUIPMENT FOR CLEANING LARGE SPILLS OR ENTRY INTO LARGE TANKS, VESSELS OR OTHER CONFINED SPACES.
Ventilation:PROVIDE ADEQUATE VENT: 1) TO MEET OCCUP EXPOS LIMITS, 2) TO

PREVENT THE FORMATION OF EXPLOSIVE ATMOSPHERES, AND (ING 3)
Protective Gloves:IMPERVIOUS GLOVES .
Eye Protection:REMOVE CONTACT LENSES & WEAR (ING 4)
Other Protective Equipment:EMERGENCY EYEWASH & DELUGE SHOWER
Work Hygienic Practices:NONE SPECIFIED BY MANUFACTURER.
Supplemental Safety and Health
FIRE FIGHT PROC: DIRECTLY ON OIL FIRES AS THIS WILL SCATTER THE FIRE. FIREFIGHTERS SHLD WEAR NIOSH/MSHA APPRVD SCBA & FULL PROT EQUIP . MED CNDTNS: RATS EXPOSED TO WHOLE DIESEL EXHAUST, RECOMMEN DS THAT WHOLE DIESEL EXHAUST BE REGARDED AS A "POTNTL OCCUP CARCINOGEN". HNDLG/STOR PREC: SPARKS & EQUIP W/SELF (ING 2)

========== Physical/Chemical Properties ==========

HCC:V4
Boiling Pt:B.P. Text:300F,149C
Vapor Pres:1.6
Vapor Density:8
Spec Gravity:0.87
Evaporation Rate & Reference:0.01
Solubility in Water:INSOLUBLE
Appearance and Odor:CLEAR TO LIGHT AMBER LIQUID, MILD PETROLEUM ODOR.

========== Stability and Reactivity Data ==========

Stability Indicator/Materials to Avoid:YES
STRONG OXIDIZING AGENTS.
Stability Condition to Avoid:HEAT, SPARK, FLAME, & BUILD-UP OF STATIC ELECTRICITY.
Hazardous Decomposition Products:CARBON MONOXIDE, CARBON DIOXIDE, SULFUR DIOXIDE, AND HYDROCARBONS.

========== Disposal Considerations ==========

Waste Disposal Methods:DISPOSE THROUGH A LICENSED WASTE DISPOSAL COMPANY. FOLLOW FEDERAL, STATE AND LOCAL REGULATIONS.

US OIL CO INC -- LEADED REGULAR GASOLINE N/O -- 9130-00-264-6216

========== Product Identification ==========

Product ID:LEADED REGULAR GASOLINE N/O
MSDS Date:03/01/1989
FSC:9130
NIIN:00-264-6216
MSDS Number: BPHZM
=== Responsible Party ===
Company Name:US OIL CO INC
Address:425 S WASHINGTON AVE
City:COMBINED LOCKS
State:WI
ZIP:54113-1049
Country:US
Info Phone Num:414-739-6100
Emergency Phone Num:414-739-6100, CHEMTREC 800-424-9300
CAGE:KO841
=== Contractor Identification ===
Company Name:U S OIL CO INC
Address:558 CARTER CT
Box:City:KIMBERLY
State:WI
ZIP:54136
Country:US
Phone:920-735-8287
CAGE:9V710
Company Name:US OIL CO INC
Address:425 S WASHINGTON AVE
Box:City:COMBINED LOCKS
State:WI
ZIP:54113-1049
Country:US
Phone:414-739-6100
CAGE:KO841

========== Composition/Information on Ingredients ==========

Ingred Name:HYDROCARBONS (AROMATIC AND ALIPHATIC)
Fraction by Wt: >50%
Other REC Limits:NONE SPECIFIED
OSHA PEL:1PPM/5STEL;1910.1028
ACGIH TLV:10 PPM; A2; 9192

Ingred Name:ETHYL BENZENE (SARA III)
CAS:100-41-4
RTECS #:DA0700000
Fraction by Wt: 2.0%
Other REC Limits:NONE SPECIFIED
OSHA PEL:100 PPM/125 STEL
ACGIH TLV:100 PPM/125STEL 9192
EPA Rpt Qty:1000 LBS
DOT Rpt Qty:1000 LBS

Ingred Name:BENZENE (SARA III)
CAS:71-43-2
RTECS #:CY1400000
Fraction by Wt: 0.1-4.9%

Other REC Limits:NONE SPECIFIED
OSHA PEL:1PPM/5STEL;1910.1028
ACGIH TLV:10 PPM; A2; 9293
EPA Rpt Qty:10 LBS
DOT Rpt Qty:10 LBS

Ingred Name:TOLUENE (SARA III)
CAS:108-88-3
RTECS #:XS5250000
Fraction by Wt: 15%
Other REC Limits:NONE SPECIFIED
OSHA PEL:200 PPM/150 STEL
ACGIH TLV:50 PPM; 9293
EPA Rpt Qty:1000 LBS
DOT Rpt Qty:1000 LBS

Ingred Name:CYCLOHEXANE (SARA III)
CAS:110-82-7
RTECS #:GU6300000
Fraction by Wt: 1.0%
Other REC Limits:NONE SPECIFIED
OSHA PEL:300 PPM
ACGIH TLV:300 PPM, 9293
EPA Rpt Qty:1000 LBS
DOT Rpt Qty:1000 LBS

Ingred Name:CUMENE (SARA III)
CAS:98-82-8
RTECS #:GR8575000
Fraction by Wt: 1%
Other REC Limits:NONE SPECIFIED
OSHA PEL:S, 50 PPM
ACGIH TLV:S, 50 PPM; 9293
EPA Rpt Qty:5000 LBS
DOT Rpt Qty:5000 LBS

Ingred Name:1,2,4-TRIMETHYLBENZENE (SARA III)(PSEUDOCUMENE)
CAS:95-63-6
RTECS #:DC3325000
Fraction by Wt: 2.0%
Other REC Limits:NONE SPECIFIED
OSHA PEL:25 PPM
ACGIH TLV:25 PPM; 9293

Ingred Name:XYLENES (O-,M-,P- ISOMERS) (SARA III)
CAS:1330-20-7
RTECS #:ZE2100000
Fraction by Wt: 12%
Other REC Limits:NONE SPECIFIED
OSHA PEL:100 PPM/150 STEL
ACGIH TLV:100 PPM/150STEL;9192
EPA Rpt Qty:1000 LBS
DOT Rpt Qty:1000 LBS

========== Hazards Identification ==========

Routes of Entry: Inhalation:YES Skin:YES Ingestion:NO
Reports of Carcinogenicity:NTP:YES IARC:YES OSHA:YES
Health Hazards Acute and Chronic:ACUTE-INHALATION:CENTRAL NERVOUS
SYSTEM DEPRESSION, HEADACHE, NAUSEA, DIZZINESS, FATIGUE, NARCOSIS,

UNCONSCIOUSNESS, ASPHYXIATION. EYE:IRRITATION. SKIN:DEFATING, IRRITATION/ DERMATITIS. INGESTION: GI DISTURBANCES, NAUSEA, VOMITING. CHRONIC:DERMATITIS, ANEMIA, PULMONARY EDEMA, LIVER AND KIDNEY DAMAGE.
Explanation of Carcinogenicity:BENZENE IS LISTED AS A CARCINOGEN BY NTP, IARC, OSHA AND EPA.
Effects of Overexposure:OVEREXPOSURE MAY LEAD TO RESPIRATORY IRRITATION, NAUSEA, FATIGUE, BLURRED VISION, DIZZINESS, HEADACHES, UNCONSCIOUSNESS, AND EYE IRRITATION, REDNESS.
Medical Cond Aggravated by Exposure:SKIN AND RESPIRATORY DISORDERS.

========== First Aid Measures ==========

First Aid:SKIN: REMOVE CONTAMINATED CLOTHING. WASH WITH SOAP AND WATER. GET MEDICAL ATTENTION IF IRRITATION PERSISTS. INHALATION: REMOVE TO FRESH AIR & RESTORE BREATHING IF NECESSARY. GET MEDICAL ATTENTION. EYE : IMMEDIATELY FLUSH WITH WATER FOR 15 MINUTES WHILE HOLDING EYELIDS OPEN. GET MEDICAL ATTENTION. INGESTION: GET IMMEDIATE MEDICAL ATTENTION. DO NOT INDUCE VOMITING. NOTHING BY MOUTH IF UNCONSCIOUS.

========== Fire Fighting Measures ==========

Flash Point Method:TCC
Flash Point:-50F,-46C
Autoignition Temp:Autoignition Temp Text:495F
Lower Limits:<1.0%
Upper Limits:8.0%
Extinguishing Media:USE CARBON DIOXIDE, FOAM, OR DRY CHEMICAL. USE WATER FOG TO COOL SRROUNDING CONTAINERS.
Fire Fighting Procedures:WEAR FIRE FIGHTING PROTECTIVE EQUIPMENT AND A FULL FACED SELF CONTAINED BREATHING APPARATUS. EVACUATE AREA. COOL FIRE EXPOSED CONTAINERS WITH WATER SPRAY.
Unusual Fire/Explosion Hazard:VAPORS HEAVIER THAN AIR AND MAY TRAVEL A CONSIDERABLE DISTANCE TO SOURCE OF IGNITION AND FLASH BACK.

========== Accidental Release Measures ==========

Spill Release Procedures:MINOR: ABSORB MATERIAL WITH CLAY, VERMICULITE, OR SIMILAR ABSORBENT MATERIAL. PLACE IN DISPOSAL CONTAINERS. MAJOR: DIKE & CONTAIN SPILL. ELIMINATE SOURCES OF IGNITION. SHUT OFF LEAKS. REMOVE LIQUID BY VACUUM OR ABSORBENT.

========== Handling and Storage ==========

Handling and Storage Precautions:STORE IN A COOL, VENTILATED WORK AREA. KEEP CONTAINERS CLOSED WHEN NOT IN USE. FLAMMABLE LIQUID; EMPTY CONTAINERS CAN BE HAZARDOUS.
Other Precautions:THE SELECTION OF PERSONAL PROTECTIVE EQUIPMENT SHOULD BE MADE BY THE MATERIAL USER BASED ON THE PARTICULAR CONDITIONS WHERE THE MATERIAL IS TO BE USED TOGETHER WITH INFORMATION CONTAINED IN THIS MSDS.

========== Exposure Controls/Personal Protection ==========

Respiratory Protection:USE NIOSH APPROVED RESPIRATOR. AIR-SUPPLIED OR FILTERING TYPE WITH ORGANIC VAPOR CARTRIDGES ARE RECOMMENDED.
Ventilation:LOCAL AND MECHANICAL EXHAUST RECOMMENDED. AVOID OPEN ELECTRICAL SOURCES NEAR PRODUCT VAPOR AREAS.
Protective Gloves:NEOPRENE, NITRILE, OR POLYVINYL ALCOHOL

Eye Protection:USE CHEMICAL SAFETY GOGGLES & FACESHIELD
Other Protective Equipment:EYE WASH STATION & SAFETY SHOWER.
Work Hygienic Practices:DO NOT TAKE INTERNALLY. AVOID SKIN CONTACT. WASH SKIN AFTER USING PRODUCT. DO NOT EAT, DRINK OR SMOKE IN WORK AREA.
Supplemental Safety and Health
NONE

========== Physical/Chemical Properties ==========

HCC:F1
Boiling Pt:=29.4C, 85.F
Vapor Pres:>275 MMHG
Vapor Density:>1
Spec Gravity:0.70-0.77
Evaporation Rate & Reference:<1 (ETHER=1)
Solubility in Water:NEGLIGIBLE
Appearance and Odor:BRONZE OR RED CLEAR LIQUID WITH GASOLINE ODOR.
Percent Volatiles by Volume:100

========== Stability and Reactivity Data ==========

Stability Indicator/Materials to Avoid:YES
STRONG OXIDIZING AGENTS
Stability Condition to Avoid:HIGH HEAT, OPEN FLAMES AND OTHER SOURCES OF IGNITION
Hazardous Decomposition Products:CARBON MONOXIDE, CARBON DIOXIDE AND OTHER HYDROCARBON COMPOUNDS DURING COMBUSTION.

========== Disposal Considerations ==========

Waste Disposal Methods:WASTE MAY BE BURNED IN AN APPROVED INCINERATOR OR DISPOSED OF IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL LAWS AND REGULATIONS.

CONOCO -- UNLEADED GASOLINE -- 9130-00B030050

========== Product Identification ==========

Product ID:UNLEADED GASOLINE
MSDS Date:12/01/1988
FSC:9130
NIIN:00B030050
MSDS Number: BHHFM
=== Responsible Party ===
Company Name:CONOCO
Box:2197
City:HOUSTON
State:TX
ZIP:77252
Country:US
Info Phone Num:713-293-5550
Preparer's Name:MSDS ANALYST
CAGE:DO148
=== Contractor Identification ===
Company Name:CONOCO
Address:SOUTH DELMAR
Box:2197
City:HARTFORD
State:IL
ZIP:62048-0177
Phone:800-959-3673
CAGE:DO148
Company Name:CONOCO INC
Address:1000 S PINE
Box:1267
City:PONCA CITY
State:OK
ZIP:74603
Country:US
Phone:800-441-3637,CHEMTREC 800-424-9300
CAGE:58326

========== Composition/Information on Ingredients ==========

Ingred Name:BENZENE (SARA III)
CAS:71-43-2
RTECS #:CY1400000
Fraction by Wt: 0.1-4.9%
OSHA PEL:1PPM/5STEL;1910.1028
ACGIH TLV:10 PPM; A2; 9192
EPA Rpt Qty:10 LBS
DOT Rpt Qty:10 LBS

Ingred Name:ETHYL BENZENE (SARA III)
CAS:100-41-4
RTECS #:DA0700000
Fraction by Wt: 02%
OSHA PEL:100 PPM/125 STEL
ACGIH TLV:100 PPM/125STEL 9192
EPA Rpt Qty:1000 LBS
DOT Rpt Qty:1000 LBS

Ingred Name:CUMENE (SARA III)

CAS:98-82-8
RTECS #:GR8575000
Fraction by Wt: 01%
OSHA PEL:S, 50 PPM
ACGIH TLV:S, 50 PPM; 9192
EPA Rpt Qty:5000 LBS
DOT Rpt Qty:5000 LBS

Ingred Name:PSEUDOCUMENE
CAS:95-63-6
Fraction by Wt: 02%
OSHA PEL:NONE ESTABLISHED
ACGIH TLV:25 PPM 125MG/M3

Ingred Name:METHYL TERT-BUTYL ETHER (SARA III)
CAS:1634-04-4
RTECS #:KN5250000
Fraction by Wt: <15%
EPA Rpt Qty:1 LB
DOT Rpt Qty:1 LB

Ingred Name:XYLENES (O-,M-,P- ISOMERS) (SARA III)
CAS:1330-20-7
RTECS #:ZE2100000
Fraction by Wt: 12%
OSHA PEL:100 PPM/150 STEL
ACGIH TLV:100 PPM/150STEL;9192
EPA Rpt Qty:1000 LBS
DOT Rpt Qty:1000 LBS

Ingred Name:TOLUENE (SARA III)
CAS:108-88-3
RTECS #:XS5250000
Fraction by Wt: 15%
OSHA PEL:200 PPM/150 STEL
ACGIH TLV:50 PPM; 9293
EPA Rpt Qty:1000 LBS
DOT Rpt Qty:1000 LBS

Ingred Name:HYDROCARBONS (AROMATIC & PARAFFINIC)
Fraction by Wt: 50%>

========== Hazards Identification ==========

Routes of Entry: Inhalation:YES Skin:YES Ingestion:YES
Reports of Carcinogenicity:NTP:YES IARC:YES OSHA:YES
Health Hazards Acute and Chronic:A FEW STUDIES HAVE INDICATED THAT WORKERS EXPOSED TO HIGH CONCENTRATIONS OF BENZENE OVER MANY YEARS HAVE A SLIGHTLY HIGHER INCIDENCE OF LEUKEMIA. BENZENE CAN ALSO BE TOXIC TO THE BLOOD AND BLOOD-FORMI NG TISSUES. SOME STUDIES HAVE SHOWN THAT PETROLEUM DISTILLATES HAVE CAUSED DAMAGE OR TUMORS IN KIDNEYS AND LIVER.
Explanation of Carcinogenicity:BENZENE IS LISTED AS A POTENTIAL CARCINOGEN.
Effects of Overexposure:THIS PRODUCT MAY CAUSE IRRITATION TO EYES,LUNGS OR SKIN AFTER PROLONGED OR REPEATED EXPOSURE. OVEREXPOSURE MAY CAUSE CENTRAL NERVOUS SYSTEM DEPRESSION. EXTREME EXPOSURE OR ASPIRATION INTO THE LUNGS MA Y CAUSE PNEUMONIA. OVEREXPOSURE MAY CAUSE
WEAKNESS,HEADACHE,NAUSEA,DIZZINESS,UNCONSCIOUSNESS,CONVULSION,ETC.

Medical Cond Aggravated by Exposure:EXPOSURE TO PETROLEUM DISTILLATES MAY RESULT IN SKIN CANCER (AS SEEN IN SOME LAB ANIMAL STUDIES). WASHING WITH SOAP AND WATER AFTER SKIN EXPOSURE GREATLY REDUCES THIS POSSIBILITY.

========== First Aid Measures ==========

First Aid:EYES-FLUSH IMMEDIATELY WITH PLENTY OF WATER FOR 15 MINS AND SEEK MEDICAL ATTENTION. IF SWALLOWED,DO NOT INDUCE VOMITING.IF BREATHING STOPS,GIVE ARTIFICIAL RESPIRATION.SEEK MEDICAL ATTENTION. SKIN-REMO VE CONTAMINATED CLOTHING AS SOON AS POSSIBLE. WASH EXPOSED SKIN WITH SOAP AND WATER. IF IRRITATION PERSISTS CONSULT A PHYSICIAN. NOTE TO PHYSICIAN-GASTRIC LAVAGE MAY BE CONSIDERED BASES ON QUAN. INGS

========== Fire Fighting Measures ==========

Flash Point Method:TCC
Flash Point:AS LOW AS -50F
Lower Limits:<1
Upper Limits:8
Extinguishing Media:DRY CHEMICAL,CO2,FOAM.
Fire Fighting Procedures:USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL.IF LEAK OR SPILL HAS NOT IGNITED,USE WATER SPRAY TO DISPERSE VAPORS & PROTECT PERSONNEL ATTEMPTING TO STOP LEAK.
Unusual Fire/Explosion Hazard:PRODUCTS OF COMBUSTION MAY CONTAIN CARBON MONOXIDE,CARBON DIOXIDE AND OTHER TOXIC MATERIAL.DON'T ENTER ENCLOSED SPACE WITHOUT PROTECTIVE EQUIP/RESPIRATORY EQPT.

========== Accidental Release Measures ==========

Spill Release Procedures:CONTAIN SPILL IMMEDIATELY IN SMALLEST POSSIBLE AREA. RECOVER AS MUCH OF THE PRODUCT ITSELF AS POSSIBLE BY VACUUMING,THEN RECOVER RESIDUAL FLUIDS BY USING ABSORBENT MATERIAL. REMOVE CONTAMINATED ITEMS AND PLACE IN PROPER DISPOSAL CONTAINERS.

========== Exposure Controls/Personal Protection ==========

Respiratory Protection:SELECT APPROPRIATE NIOSH-APPROVED RESPIRATORY PROTECTION WHERE NECESSARY TO MAINTAIN EXPOSURES BELOW THE ACCEPTABLE LIMITS.PROPER RESPIRATOR SHOULD BE DETERMINED BY ADEQUATELY TRAINED PERSONNEL.
Ventilation:USE SUFFICIENT VENTILATION TO MAINTAIN ATMOSPHERIC CONCENTRATIONS BELOW PERMISSIBLE EXPOSURE LIMITS.AVOID SPARKING MIX.
Protective Gloves:NBR OR NEOPRENE FOR PROLONGED SKIN EXPOS
Eye Protection:SPLASH GOGGLES OR FACE SHIELD FOR SPRAY.
Other Protective Equipment:SUFFICIENT PROTECTIVE CLOTHING TO MINIMIZE SKIN EXPOSURE. LAUNDER CONTAMINATED CLOTHING BEFORE REUSE.
Work Hygienic Practices:AVOID CONTACT WITH EYES,SKIN OR CLOTHING. WASH WITH SOAP AND WATER IF SKIN CONTACT OCCURS.
Supplemental Safety and Health
WATER SPRAY MAY BE USED TO FLUSH SPILLS AWAY FROM EXPOSURES. HANDLE AND STORE IN ACCORDANCE WITH NFPA PROCEDURES FOR CLASS IA FLAMMABLE LIQUID.

========== Physical/Chemical Properties ==========

Boiling Pt:B.P. Text:85-437F
Vapor Pres:275-475

Vapor Density:>1 AIR=1.0
Spec Gravity:0.70-0.77 H2O=1
Solubility in Water:SLIGHT
Appearance and Odor:GASOLINE ODOR,WATER WHITE TO STRAW YELLOW LIQUID.
Percent Volatiles by Volume:100

========== Stability and Reactivity Data ==========

Stability Indicator/Materials to Avoid:YES
OXIDIZING MATERIALS.
Stability Condition to Avoid:HEAT,FLAME
Hazardous Decomposition Products:CARBON MONOXIDE MAY BE FORMED FROM INCOMPLETE COMBUSTION.

========== Disposal Considerations ==========

Waste Disposal Methods:RECYCLE AS MUCH OF THE RECOVERABLE PRODUCT AS POSSIBLE. DISPOSE OF NONRECYCLABLE MATERIAL IN ACCORDANCE WITH STATE,LOCAL AND FEDERAL REGULATIONS. AVOID WASHING,DRAINING OR DIRECTING MATERIAL TO STORM OR SANITARY SEWERS.

MATERIAL SAFETY DATA SHEET
EQUILON MSDS: 01814ET 01/04/99

HAVOLINE MOTOR OIL 10W-40
TELEPHONE NUMBER:
24 HOUR EMERGENCY ASSISTANCE
EQUIVA SERVICES: 877-276-7283
CHEMTREC: 800-424-9300
GENERAL MSDS ASSISTANCE
877-276-7285
NAME AND ADDRESS:
EQUILON ENTERPRISES LLC
PRODUCT STEWARDSHIP
P.O. BOX 674414
HOUSTON, TX 77267-4414
LEGEND:
N.D. - NOT DETERMINED N.A. - NOT APPLICABLE N.T- NOT TESTED
< - LESS THAN > - GREATER THAN

1.NAME

MATERIAL IDENTITY
Product Code and Name:
01814 HAVOLINE MOTOR OIL 10W-40
Chemical Name and/or Family or Description:
Havoline Motor Oils

2. COMPOSITION/INFORMATION ON INGREDIENTS

THE CRITERIA FOR LISTING COMPONENTS IN THE COMPOSITION SECTION IS AS FOLLOWS: CARCINOGENS ARE LISTED WHEN PRESENT AT 0.1 % OR GREATER; COMPONENTS WHICH ARE OTHERWISE HAZARDOUS ACCORDING TO OSHA ARE LISTED WHEN PRESENT AT 1.0 % OR GREATER; NON-HAZARDOUS COMPONENTS ARE LISTED AT 3.0 % OR GREATER. THIS IS NOT INTENDED TO BE A COMPLETE COMPOSITIONAL DISCLOSURE. REFER TO SECTION 14 FOR APPLICABLE STATES' RIGHT TO KNOW AND OTHER REGULATORY INFORMATION.
Product and/or Component(s) Carcinogenic According to:

OSHA	IARC	NTP	OTHER	NONE
				X

Composition: (Sequence Number and Chemical Name)

Seq.	Chemical Name	CAS Number	Range in %
01 #	Solvent-dewaxed heavy paraffinic petroleum distillates	64742-65-0	80.00-94.99
02	Alkenylsuccinimide dispersant	ACC#110544	3.00-9.99

PRODUCT IS NON-HAZARDOUS ACCORDING TO OSHA (1910.1200).
COMPONENT, BY DEFINITION, IS CONSIDERED HAZARDOUS ACCORDING TO OSHA BECAUSE IT CARRIES THE PERMISSIBLE EXPOSURE LIMIT (PEL) FOR MINERAL OIL MIST.
Exposure Limits referenced by Sequence Number in the Composition Section

Seq.	Limit	
01	5	mg/m3 TWA-OSHA (MINERAL OIL MIST)
01	5	mg/m3 TWA-ACGIH (MINERAL OIL MIST)
01	10	mg/m3 STEL ACGIH (MINERAL OIL MIST)

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW
Appearance:
Bright and clear liquid
Odor:
Additive odor

WARNING STATEMENT

WARNING ! USED GASOLINE MOTOR OIL IS A POSSIBLE SKIN CANCER HAZARD BASED ON ANIMAL DATA

HMIS			NFPA		
Health:	1	Reactivity: 0	Health:	1	Reactivity: 0
Flammability:	1	Special : -	Flammability:	1	Special : -

POTENTIAL HEALTH EFFECTS

	EYE	SKIN	INHALATION	INGESTION
Primary Route of Exposure:	X	X	X	

EFFECTS OF OVEREXPOSURE

Acute:

Eyes:

May cause minimal irritation, experienced as temporary discomfort.

Skin:

Brief contact may cause slight irritation. Prolonged contact, as with clothing wetted with material, may cause more severe irritation and discomfort, seen as local redness and swelling.

Other than the potential skin irritation effects noted above, acute (short term) adverse effects are not expected from brief skin contact; see other effects, below, and Section 11 for information regarding potential long term effects.

Inhalation:

Vapors or mist, in excess of permissible concentrations, or in unusually high concentrations generated from spraying, heating the material or as from exposure in poorly ventilated areas or confined spaces, may cause irritation of the nose and throat, headache, nausea, and drowsiness.

Ingestion:

If more than several mouthfuls are swallowed, abdominal discomfort, nausea, and diarrhea may occur.

Sensitization Properties:

Unknown.

Chronic:

No adverse effects have been documented in humans as a result of chronic exposure. Section 11 may contain applicable animal data.

Medical Conditions Aggravated by Exposure:

Because of its irritating properties, repeated skin contact may aggravate an existing dermatitis (skin condition).

Other Remarks:

None

4. FIRST AID MEASURES

Eyes:

Flush eyes with plenty of water for several minutes. Get medical attention if eye irritation persists.

Skin:

Wash skin with plenty of soap and water for several minutes. Get medical attention if skin irritation develops or persists.

Ingestion:

If more than several mouthfuls of this material are swallowed, give two glasses of water (16 oz.). Get medical attention.

Inhalation:

If irritation, headache, nausea, or drowsiness occurs, remove to fresh air. Get medical attention if breathing becomes difficult or respiratory irritation persists.

Other Instructions:

Remove and dry-clean or launder clothing soaked or soiled with this material before reuse. Dry cleaning of contaminated clothing may be

more effective than normal laundering. Inform individuals responsible for cleaning of potential hazards associated with handling contaminated clothing.

5. FIRE-FIGHTING MEASURES

Ignition Temperature - AIT (degrees F):
Not determined.
Flash Point (degrees F):
400 (COC)
Flammable Limits (%):
Lower: Not determined.
Upper: Not determined.
Recommended Fire Extinguishing Agents And Special Procedures:
Use water spray, dry chemical, foam, or carbon dioxide to extinguish flames. Use water spray to cool fire-exposed containers. Water or foam may cause frothing.
Unusual or Explosive Hazards:
None
Special Protective Equipment for Firefighters:
Wear full protective clothing and positive pressure breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES (Transportation Spills: CHEMTREC (800)424-9300)

Procedures in Case of Accidental Release, Breakage or Leakage:
Ventilate area. Avoid breathing vapor. Wear appropriate personal protective equipment, including appropriate respiratory protection. Contain spill if possible. Wipe up or absorb on suitable material and shovel up. Prevent entry into sewers and waterways. Avoid contact with skin, eyes or clothing.

7. HANDLING AND STORAGE

Precautions to be Taken in
Handling:
Minimum feasible handling temperatures should be maintained.
Storage:
Periods of exposure to high temperatures should be minimized. Water contamination should be avoided.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Protective Equipment (Type)
Eye/Face Protection:
Safety glasses, chemical type goggles, or face shield recommended to prevent eye contact.
Skin Protection:
Workers should wash exposed skin several times daily with soap and water. Soiled work clothing should be laundered or dry-cleaned.
Respiratory Protection:
Airborne concentrations should be kept to lowest levels possible. If vapor, mist or dust is generated and the occupational exposure limit of the product, or any component of the product, is exceeded, use appropriate NIOSH or MSHA approved air purifying or air supplied respirator after determining the airborne concentration of the contaminant. Air supplied respirators should always be worn when airborne concentration of the contaminant or oxygen content is unknown.
Ventilation:
Adequate to meet component occupational exposure limits (see Section 2).
Exposure Limit for Total Product:

None established for product; refer to Section 2 for component exposure limits.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:
Bright and clear liquid
Odor:
Additive odor
Boiling Point (degrees F):
Not determined.
Melting/Freezing point (degrees F):
Not applicable.
Specific Gravity (water=1):
.8805
pH of undiluted product:
Not applicable.
Vapor Pressure:
Not determined.
Viscosity:
13.8 cSt at 100.0 C
VOC Content:
Not determined.
Vapor Density (air=1):
Not determined.
Solubility in Water (%):
Not determined.
Other: None

10. STABILITY AND REACTIVITY

This Material Reacts Violently With:
(If Others is checked below, see comments for details)

Air	Water	Heat	Strong Oxidizers	Others	None of These
			X		
-	-	-	-	-	-

Comments:
None
Products Evolved When Subjected to Heat or Combustion:
Toxic levels of carbon monoxide, carbon dioxide, irritating aldehydes and ketones; combustion products of nitrogen, sulfur, calcium, zinc, or phosphorous may also be released.
Hazardous Polymerizations: DO NOT OCCUR

11. TOXICOLOGICAL INFORMATION

TOXICOLOGICAL INFORMATION(ANIMAL TOXICITY DATA)
Median Lethal Dose
Oral:
LD50 Believed to be > 5.00 g/kg (rat) practically non-toxic
Inhalation:
Not determined.
Dermal:
LD50 Believed to be > 2.00 g/kg (rabbit) practically non-toxic
Irritation Index, Estimation of Irritation (Species)
Skin:
(Draize) Believed to be > .50 - 3.00 /8.0 (rabbit) slightly irritating
Eyes:
(Draize) Believed to be < 15.00 /110 (rabbit) no appreciable effect
Sensitization:

Not determined.

Other:

Used gasoline motor oils have been shown to cause skin cancer when repeatedly applied to mouse skin without any effort to remove the material between applications. There is no evidence of a causal relationship between skin cancer in humans and exposure to used motor oil.

12. DISPOSAL CONSIDERATIONS

Waste Disposal Methods

This product has been evaluated for RCRA characteristics and does not meet the criteria of a hazardous waste if discarded in its purchased form. Under RCRA, it is the responsibility of the user of the product to determine at the time of disposal, whether the product meets RCRA criteria for hazardous waste. This is because product uses, transformations, mixtures, processes, etc. may render the resulting materials hazardous.

Remarks

None

13. TRANSPORT INFORMATION

Transportation

DOT:

Proper Shipping Name:

Not regulated

IMDG:

Proper Shipping Name:

Not evaluated

ICAO:

Proper Shipping Name:

Not evaluated

TDG:

Proper Shipping Name:

Not evaluated

14. REGULATORY INFORMATION

Federal Regulations:

SARA Title III:

Section 302/304 Extremely Hazardous Substances

Seq.	Chemical Name	CAS Number	Range in %
None			

Section 302/304 Extremely Hazardous Substances (CONT)

Seq.	TPQ	RQ
None		

Section 311 Hazardous Categorization:

Acute	Chronic	Fire	Pressure	Reactive	N/A
					X

Section 313 Toxic Chemical

Chemical Name	CAS Number	Concentration
Dialkydithiophosphoric acid, zinc salt	84605-29-8	0.10-0.99
Zinc dithiophosphate	25103-54-2	0.10-0.99

CERCLA 102(a)/DOT Hazardous Substances: (+ indicates DOT Hazardous Substance)

Seq.	Chemical Name	CAS Number	Range in %
None			

CERCLA/DOT Hazardous Substances (Sequence Numbers and RQ's):

Seq.	RQ

None

TSCA Inventory Status:

This product, or its components, are listed on or are exempt from the Toxic Substance Control Act (TSCA) Chemical Substance Inventory.

Other:

None.

State Regulations:

California Proposition 65:

The following detectable components of this product are substances, or belong to classes of substances, known to the State of California to cause cancer and/or reproductive toxicity.

Chemical Name	CAS Number

None

International Regulations:

WHMIS Classification:

Not controlled

Canada Inventory Status:

Not determined.

EINECS Inventory Status:

Not determined.

Australia Inventory Status:

Not determined.

Japan Inventory Status:

Not determined.

15. ENVIRONMENTAL INFORMATION

Aquatic Toxicity:

Not determined.

Mobility:

Not determined.

Persistence and Biodegradability:

Not determined.

Potential to Bioaccumulate:

Not determined.

Remarks:

None

16. OTHER INFORMATION

None

THE INFORMATION CONTAINED IN THIS DATA SHEET IS BASED ON THE DATA AVAILABLE TO US AT THIS TIME, AND IS BELIEVED TO BE ACCURATE BASED UPON THAT DATA. IT IS PROVIDED INDEPENDENTLY OF ANY SALE OF THE PRODUCT, FOR PURPOSE OF HAZARD COMMUNICATION. IT IS NOT INTENDED TO CONSTITUTE PRODUCT PERFORMANCE INFORMATION, AND NO EXPRESS OR IMPLIED WARRANTY OF ANY KIND IS MADE WITH RESPECT TO THE PRODUCT, UNDERLYING DATA OR THE INFORMATION CONTAINED HEREIN. YOU ARE URGED TO OBTAIN DATA SHEETS FOR ALL PRODUCTS YOU BUY, PROCESS, USE OR DISTRIBUTE, AND ARE ENCOURAGED TO ADVISE THOSE WHO MAY COME IN CONTACT WITH SUCH PRODUCTS OF THE INFORMATION CONTAINED HEREIN.

TO DETERMINE THE APPLICABILITY OR EFFECT OF ANY LAW OR REGULATION WITH RESPECT TO THE PRODUCT, YOU SHOULD CONSULT WITH YOUR LEGAL ADVISOR OR THE APPROPRIATE GOVERNMENT AGENCY. WE WILL NOT PROVIDE ADVICE ON SUCH MATTERS, OR BE RESPONSIBLE FOR ANY INJURY FROM THE USE OF THE PRODUCT DESCRIBED HEREIN. THE UNDERLYING DATA, AND THE INFORMATION PROVIDED HEREIN

AS A RESULT OF THAT DATA, IS THE PROPERTY OF EQUIVA SERVICES, LLC AND IS NOT TO BE THE SUBJECT OF SALE OR EXCHANGE WITHOUT THE EXPRESS WRITTEN CONSENT OF EQUIVA SERVICES, LLC.

Date: 1999-01-04 New X Revised, Supersedes: 1998-12-11

Inquiries regarding MSDS should be directed to:
Equiva Services LLC
Manager Product Stewardship
P.O. Box 674414
Houston, TX 77267-4414

17. PRODUCT LABEL

Label Date: 1999-01-04

READ AND UNDERSTAND MATERIAL SAFETY DATA SHEET BEFORE HANDLING OR DISPOSING OF PRODUCT. THIS LABEL COMPLIES WITH THE REQUIREMENTS OF THE OSHA HAZARD COMMUNICATION STANDARD (29 CFR 1910.1200) FOR USE IN THE WORKPLACE. THIS LABEL IS NOT INTENDED TO BE USED WITH PACKAGING INTENDED FOR SALE TO CONSUMERS AND MAY NOT CONFORM WITH THE REQUIREMENTS OF THE CONSUMER PRODUCT SAFETY ACT OR OTHER RELATED REGULATORY REQUIREMENTS.

01814 HAVOLINE MOTOR OIL 10W-40

WARNING STATEMENT

WARNING ! USED GASOLINE MOTOR OIL IS A POSSIBLE SKIN CANCER HAZARD BASED ON ANIMAL DATA

PRECAUTIONARY MEASURES

-Continuous contact with used gasoline motor oils has caused skin cancer in laboratory animals.
-Avoid contact with used motor oil.
-Avoid prolonged breathing of vapor, mist, or gas.
-Clean oil-soaked clothing before reuse.
-Wash thoroughly after handling.

FIRST AID

Eye Contact:
Flush eyes with plenty of water for several minutes. Get medical attention if eye irritation persists.

Skin Contact:
Wash skin with plenty of soap and water for several minutes. Get medical attention if skin irritation develops or persists.

Ingestion:
If more than several mouthfuls of this material are swallowed, give two glasses of water (16 oz.). Get medical attention.

Inhalation:
If irritation, headache, nausea, or drowsiness occurs, remove to fresh air. Get medical attention if breathing becomes difficult or respiratory irritation persists.

Note to Physician:
None

FIRE

In case of fire, use water spray, dry chemical, foam or carbon dioxide. Water may cause frothing. Use water spray to cool fire-exposed containers.

	Chemical Name	CAS Number	Range in %
#	Solvent-dewaxed heavy paraffinic petroleum distillates	64742-65-0	80.00-94.99
	Alkenylsuccinimide dispersant	ACC#110544	3.00-9.99

PRODUCT IS NON-HAZARDOUS ACCORDING TO OSHA (1910.1200).
COMPONENT, BY DEFINITION, IS CONSIDERED HAZARDOUS ACCORDING TO OSHA

BECAUSE IT CARRIES THE PERMISSIBLE EXPOSURE LIMIT (PEL) FOR MINERAL OIL MIST.

Pennsylvania Special Hazardous Substance(s)	CAS Number	Range in %
None		

HMIS			NFPA		
Health: 1	Reactivity: 0		Health: 1	Reactivity: 0	
Flammability: 1	Special : -		Flammability: 1	Special : -	

Transportation

DOT:

Proper Shipping Name:

Not regulated

CAUTION: Misuse of empty containers can be hazardous. Empty containers can be hazardous if used to store toxic, flammable, or reactive materials. Cutting or welding of empty containers might cause fire, explosion or toxic fumes from residues. Do not pressurize or expose to open flame or heat. Keep container closed and drum bungs in place.

Name and Address:

Equilon Enterprises LLC
P.O. Box 674414
Houston ,TX 77267-4414

TRANSPORTATION EMERGENCY: (877)276-7283
CHEMTREC: (800)424-9300
HEALTH EMERGENCY: (877)276-7283

}

MSDS Number: **N3660** * * * * * *Effective Date: **11/07/08** * * * * * *Supercedes: **02/15/08***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response to Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

NITRIC ACID, 50-70%

1. Product Identification

Synonyms: Aqua Fortis; Azotic Acid; Nitric Acid 50%; Nitric Acid 65%; nitric acid 69-70%
CAS No.: 7697-37-2
Molecular Weight: 63.01
Chemical Formula: HNO3
Product Codes:
J.T. Baker: 5371, 5796, 5801, 5826, 5856, 5876, 5896, 9597, 9598, 9600, 9601, 9602, 9603, 9604, 9606, 9607, 9608, 9610, 9616, 9617, 9670, 9761
Mallinckrodt: 1409, 2704, 2705, 2706, 2707, 2716, 6623, H862, H988, H993, H998, V077, V650

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Nitric Acid	7697-37-2	50 - 70%	Yes
Water	7732-18-5	30 - 50%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 3 - Severe (Oxidizer)
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison.

Inhalation:
Corrosive! Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract.
Ingestion:
Corrosive! Swallowing nitric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract.
Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.
Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

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4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. 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. Thoroughly clean shoes before reuse. Get medical attention immediately.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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5. Fire Fighting Measures

Fire:
Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Can react with metals to release flammable hydrogen gas.
Explosion:
Reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc. Reacts with most metals to release hydrogen gas which can form explosive mixtures with air.
Fire Extinguishing Media:
Water spray may be used to keep fire exposed containers cool. Do not get water inside container.
Special Information:
Increases the flammability of combustible, organic and readily oxidizable materials. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
2 ppm (TWA), 4 ppm (STEL)
-ACGIH Threshold Limit Value (TLV):
2 ppm (TWA); 4 ppm (STEL)

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Nitric acid is an oxidizer and should not come in contact with cartridges and canisters that contain oxidizable materials, such as activated charcoal. Canister-type respirators using sorbents are ineffective.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Colorless to yellowish liquid.
Odor:
Suffocating, acrid.

Solubility:
Infinitely soluble.
Specific Gravity:
1.41
pH:
1.0 (0.1M solution)
% Volatiles by volume @ 21C (70F):
100 (as water and acid)
Boiling Point:
122C (252F)
Melting Point:
-42C (-44F)
Vapor Density (Air=1):
2-3
Vapor Pressure (mm Hg):
48 @ 20C (68F)
Evaporation Rate (BuAc=1):
No information found.

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate. Will react with water or steam to produce heat and toxic and corrosive fumes.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.
Conditions to Avoid:
Light and heat.

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11. Toxicological Information

Nitric acid: Inhalation rat LC50: 244 ppm (NO2)/30M; Investigated as a mutagen, reproductive effector. Oral (human) LDLo: 430 mg/kg.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Nitric Acid (7697-37-2)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: NITRIC ACID
Hazard Class: 8
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 6.5GL

International (Water, I.M.O.)

Proper Shipping Name: NITRIC ACID
Hazard Class: 8
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 6.5GL

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Nitric Acid (7697-37-2)	Yes	Yes	Yes	Yes

Water (7732-18-5)	Yes	Yes	Yes	Yes

\Chemical Inventory Status - Part 2\

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Nitric Acid (7697-37-2)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

\Federal, State & International Regulations - Part 1\

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Nitric Acid (7697-37-2)	1000	1000	Yes	No
Water (7732-18-5)	No	No	No	No

\Federal, State & International Regulations - Part 2\

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Nitric Acid (7697-37-2)	1000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 2PE
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0** Other: **Oxidizer**
Label Hazard Warning:
POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep from contact with clothing and other combustible materials.
Do not store near combustible materials.
Store in a tightly closed container.

Remove and wash contaminated clothing promptly.

Label First Aid:

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 14.

Disclaimer:

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

E K INDUSTRIES INC -- TRISODIUM PHOSPHATE -- 6810-00-141-6078

========== Product Identification ==========

Product ID:TRISODIUM PHOSPHATE
MSDS Date:05/26/1988
FSC:6810
NIIN:00-141-6078
MSDS Number: BLJRR
=== Responsible Party ===
Company Name:E K INDUSTRIES INC
Address:411 KAY AVE
City:ADDISON
State:IL
ZIP:60101
Country:US
Info Phone Num:815-723-4000
Emergency Phone Num:815-723-4000
Chemtrec Ind/Phone:(800)424-9300
CAGE:0BYE6
=== Contractor Identification ===
Company Name:E K INDUSTRIES INC
Address:411 KAY AVE
Box:City:ADDISON
State:IL
ZIP:60101
Country:US
Phone:815-723-4000/CHEMTREC 800-424-9300
CAGE:0BYE6

========== Composition/Information on Ingredients ==========

Ingred Name:SODIUM PHOSPHATE, TRIBASIC (SARA III)
CAS:7601-54-9
RTECS #:TC9490000
Other REC Limits:NONE SPECIFIED
EPA Rpt Qty:5000 LBS
DOT Rpt Qty:5000 LBS

========== Hazards Identification ==========

LD50 LC50 Mixture:LD50 (ORAL RAT) IS 6500 MG/KG
Routes of Entry: Inhalation:YES Skin:YES Ingestion:NO
Reports of Carcinogenicity:NTP:NO IARC:NO OSHA:NO
Health Hazards Acute and Chronic:ACUTE-EYE, SKIN, MUCOUS MEMBRANE AND RESPIRATORY TRACT IRRITATION, NAUSEA. CHRONIC-NONE KNOWN OR REPORTED.
Effects of Overexposure:EYE, SKIN, MUCOUS MEMBRANE AND RESPIRATORY TRACT IRRITATION, NAUSEA.
Medical Cond Aggravated by Exposure:NONE KNOWN.

========== First Aid Measures ==========

First Aid:INHALATION:REMOVE TO FRESH AIR. CALL A PHYSICIAN. EYES:FLUSH WITH WATER FOR 15 MINUTES, INCLUDING UNDER THE EYELIDS. SKIN:WASH THOROUGHLY WITH WATER.INGESTION:IF CONSCIOUS, IMMEDIATELY DRINK LARGE AMO UNT OF WATER. SEE A DOCTOR.

========== Fire Fighting Measures ==========

Flash Point:NON-FLAMMABLE
Extinguishing Media:MEDIA APPROPRIATE FOR SURROUNDING FIRE.
Fire Fighting Procedures:WEAR A NIOSH/MSHA-APPROVED SELF-CONTAINED BREATHING APPARATUS OPERATED IN POSITIVE PRESSURE MODE & FULL PROTECTIVE EQUIPMENTS. COOL FIRE EXPOSED CONTAINERS.

========== Accidental Release Measures ==========

Spill Release Procedures:WEAR NIOSH/MSHA APPROVED DUST RESPIRATOR. WEAR GOGGLES, IMPERVIOUS COVERALLS, GLOVES AND BOOTS. SHOVEL OR SWEEP UP AND PLACE IN AN APPROVED DOT CONTAINER AND SEAL.
Neutralizing Agent:NOT APPLICABLE.

========== Handling and Storage ==========

Handling and Storage Precautions:STORAGE-STORE IN A COOL, DRY, WELL-VENTILATED AREA AWAY FROM EXCESS HEAT AND FLAMES.
Other Precautions:WARNING STATEMENT: EMPLOY NORMAL INDUSTRIAL SAFEGUARD WHEN HANDLING THIS PRODUCT. MATERIAL SHOULD BE INSPECTED PERIODICALLY. IN LIQUID FORM, TRISODIUM PHOSPHATE IS CORROSIVE TO STEEL. THE PH OF A ONE PER CENT AQUEOUS SOLUTION IS 12.

========== Exposure Controls/Personal Protection ==========

Respiratory Protection:USE NIOSH/MSHA APPROVED RESPIRATORY PROTECTION WHEN AIRBORNE DUST IS EXPECTED.
Ventilation:LOCAL EXHAUST
Protective Gloves:IMPERVIOUS
Eye Protection:CHEMICAL SAFETY GOGGLES
Other Protective Equipment:EYE WASH STATION AND EMERGENCY SHOWER
Work Hygienic Practices:DO NOT EAT, DRINK OR SMOKE IN WORK AREAS. WASH THOROUGHLY AFTER HANDLING. DO NOT RAISE DUST. DO NOT BREATHE DUST.
Supplemental Safety and Health

========== Physical/Chemical Properties ==========

HCC:B3
Melt/Freeze Pt:=75.C, 167.F
Vapor Pres:NIL
Spec Gravity:1.6
Evaporation Rate & Reference:NIL
Solubility in Water:21% @ 60F
Appearance and Odor:WHITE CRYSTAL OR POWDER - ODORLESS

========== Stability and Reactivity Data ==========

Stability Indicator/Materials to Avoid:YES
NONE KNOWN.
Stability Condition to Avoid:MOISTURE, EXCESS HEAT
Hazardous Decomposition Products:PHOSPHOROUS OXIDES

========== Disposal Considerations ==========

Waste Disposal Methods:CONSULT APPROPRIATE FEDERAL, STATE AND LOCAL REGULATORY AGENCIES TO ASCERTAIN PROPER DISPOSAL PROCEDURES.

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GEORGIA GULF CORP -- HYDROCHLORIC ACID -- 6810-00F030501

========== Product Identification ==========

Product ID:HYDROCHLORIC ACID
MSDS Date:02/01/1992
FSC:6810
NIIN:00F030501
MSDS Number: BSLCY
=== Responsible Party ===
Company Name:GEORGIA GULF CORP
Address:400 PERIMETER CENTER TER SUITE 595
Box:105197
City:ATLANTA
State:GA
ZIP:30348
Country:US
Info Phone Num:504-685-1200/404-395-4500
Emergency Phone Num:504-685-2638/404-395-4500
CAGE:49960
=== Contractor Identification ===
Company Name:GEORGIA GULF CORPORATION
Address:400 PERIMETER CENTER TER SUITE 595
Box:105197
City:ATLANTA
State:GA
ZIP:30348
Country:US
Phone:504-685-2500/770-395-4500 GOOD#
CAGE:49960

========== Composition/Information on Ingredients ==========

Ingred Name:HYDROCHLORIC ACID, HYDROGEN CHLORIDE, MURIATIC ACID
HYDROCHLORIDE
CAS:7647-01-0
RTECS #:MW4025000
Fraction by Wt: 30.5%
Other REC Limits:7 PPM
OSHA PEL:5 PPM
ACGIH TLV:C 11 MG/CUM
EPA Rpt Qty:5000 LBS
DOT Rpt Qty:5000 LBS

========== Hazards Identification ==========

LD50 LC50 Mixture:ORAL LDLO (HUMAN): 81 MG/KG
Routes of Entry: Inhalation:YES Skin:YES Ingestion:YES
Reports of Carcinogenicity:NTP:NO IARC:NO OSHA:NO
Health Hazards Acute and Chronic:CORROSIVE TO SKIN, EYES, NOSE MUCOUS
MEMBRANES, RESPIRATORY & GASTROINTESTINAL TRACT. INHALATION:
RESPIRATORY TRACT IRRITATION/INFECTION. SEVERE & FATAL
GASTROINTESTINAL BURNS W/NECROSIS. SEVERE BURNS TO EYES &
BLINDNESS. CHANGES IN PULMONARY FUNCTION, CHRONIC BRONCHITIS,
DERMATITIS, TOOTH EROSION, & CONJUNCTIVITIS.
Explanation of Carcinogenicity:NONE
Effects of Overexposure:INHALATION: BURNING, CHOKING, COUGHING & SEVERE
BREATHING DIFFICULTIES. INGESTION: PAIN IN MOUTH, THROAT & STOMACH.
SKIN: INFLAMMATION & SCARRING, RASH. EYES: BURNS.

Medical Cond Aggravated by Exposure:SKIN, RESPIRATORY OR DIGESTIVE DISEASE

========== First Aid Measures ==========

First Aid:INHALATION: REMOVE TO FRESH AIR. IF BREATHING STOPS, GIVE ARTIFICIAL RESPIRATION. PROVIDE EMERGENCY AIRWAY SUPPORT, IF INDICATED, GIVING 100% HUMIDIFIED SUPPLEMENTAL OXYGEN. SKIN: WASH W/SOAP & PLENTY OF WATER PROMPTLY. REMOVE CLOTHING. EYES: IMMEDIATELY FLUSH W/PLENTY OF ROOM TEMPERATURE WATER FOR AT LEAST 15 MINS, OCCASIONALLY LIFTING LOWER/UPPER LIDS. INGESTION: DON'T INDUCE VOMITING. SEE SUPP.

========== Fire Fighting Measures ==========

Extinguishing Media:FLOODING AMOUNTS OF WATER, DRY CHEMICAL, ALCOHOL FOAM
Fire Fighting Procedures:KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA & DENY ENTRY. STAY UPWIND. USE ACID PROOF FULL PROTECTIVE CLOTHING & NIOSH APPROVED SELF-CONTAINED RESPIRATOR.
Unusual Fire/Explosion Hazard:HYDROCHLORIC ACID DOES NOT IGNITE READILY. ADDING WATER TO HYDROCHLORIC ACID PRODUCES VIOLENT EXOTHERMIC REACTION.

========== Accidental Release Measures ==========

Spill Release Procedures:RESTICT ACCESS TO AREA. MOVE UNPROTECTED PERSONNEL UPWIND. WEAR APPROPRIATE CLOTHING & RESPIRATORY EQUIPMENT. DON'T TOUCH SPILL. PREVENT SPILLS FROM ENTERING WATER WAYS & SEWERS. NEUTRALIZE & PLACE IN TO CONTAINERS FOR PROPER DISPOSAL.
Neutralizing Agent:BASE SUCH AS LIME, SODIUM HYDROXIDE

========== Handling and Storage ==========

Handling and Storage Precautions:STORE IN COOL, DRY, WELL VENTILATED PLACE. STORE AWAY FROM OXIDIZING AGENTS & ALKALINE MATERIALS.

========== Exposure Controls/Personal Protection ==========

Respiratory Protection:USE NIOSH APPROVED RESPIRATOR. RESPIRATORS MUST BE SELECTED BASED ON AIRBORNE LEVELS FOUND IN THE WORKPLACE & MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR.
Ventilation:LOCAL TO MAINTAIN EXPOSURE LEVELS BELOW RECOMMENDED EXPOSURE LIMITS
Protective Gloves:NEOPRENE/POLYVINYL CHLORIDE/BUTYL RUBBER
Eye Protection:SPLASH PROOF CHEMICAL SAFETY GOGGLES
Other Protective Equipment:QUICK DRENCH, IMPERVIOUS CLOTHING, EYE WASH FOUNTAIN
Work Hygienic Practices:REMOVE/LAUNDER CONTAMINATED CLOTHING BEFORE REUSE.
Supplemental Safety and Health
FIRST AID: DON'T GIVE SODIUM BICARBONATE IN AN ATTEMPT TO NEUTRALIZE THE ACID. THIS CAN RESULT IN AN EXOTHERMIC REACTION & WORSEN THE BURN. IMMEDIATE DILUTION W/WATER OR MILK MAY BE BENEFICIAL. OBTAIN MEDICAL ATTENTION IN ALL CASES.

========== Physical/Chemical Properties ==========

Boiling Pt:B.P. Text:81.5C

Melt/Freeze Pt:M.P/F.P Text:-114.8C
Vapor Pres:25
Vapor Density:1.27
Spec Gravity:1.16
pH:<1
Solubility in Water:COMPLETE
Appearance and Odor:WHITE TO YELLOW, CLEAR LIQUID W/STRONG IRRITATING ODOR

========== Stability and Reactivity Data ==========

Stability Indicator/Materials to Avoid:YES
ALKALINE MATERIALS & OXIDIZING AGENTS. HIGHLY CORROSIVE TO MOST METALS.
Hazardous Decomposition Products:REACTS W/METALS TO FORM FLAMMABLE HYDROGEN GAS

========== Disposal Considerations ==========

Waste Disposal Methods:DISPOSE OF IN ACCORDANCE W/LOCAL, STATE, & FEDERAL REGULATIONS. CORROSIVE, UN1789.

Disclaimer (provided with this information by the compiling agencies): This information is formulated for use by elements of the Department of Defense. The United States of America in no manner whatsoever, expressly or implied, warrants this information to be accurate and disclaims all liability for its use. Any person utilizing this document should seek competent professional advice to verify and assume responsibility for the suitability of this information to their particular situation.

ATTACHMENT 2
AECOM SH&E Procedures

ATTACHMENT 2
URS SAFETY MANAGEMENT STANDARDS

URS SAFETY MANAGEMENT STANDARD 002
HAZARD COMMUNICATION (WORKER RIGHT-TO-KNOW)

URS SAFETY MANAGEMENT STANDARD
Hazard Communication (Worker Right-to-Know)

1. Applicability

This procedure applies to the operations of URS Corporation and its subsidiary companies.

2. Purpose and Scope

The purpose of this Hazard Communication standard (also know 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. Procedures

The associated implementing regional procedures for this standard are included as attachments:

SMS 002 NA – North America

SMS 002 EU – UK and Ireland, Europe, and Middle East

SMS 002 AP2 – Asia Pacific

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 know 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.

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 names consistent with the applicable material safety data sheet (MSDS).

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. Material Safety Data Sheets (MSDSs)

1. The safety representative will obtain an MSDS for each chemical before it is used. MSDSs will generally be received by the person ordering the product. MSDSs 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 MSDS 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 MSDSs in an area that is accessible by all employees at all times. An electronic database is an acceptable method of maintaining the MSDSs.

4. The assigned person or department will replace MSDSs when updated sheets are received and will communicate any significant changes to those who work with the chemical.

5. MSDSs are required for all hazardous materials brought on site by project personnel.

6. General household products to be used for their specific purpose, as well as food, drugs, and cosmetics 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 on to a site or project must submit MSDSs 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 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 name and identity of the hazardous chemical(s).

2. Appropriate hazard warnings.

3. Name and address of the chemical manufacturer, importer, or other responsible party.

Labels on incoming containers of hazardous materials will not be removed or defaced.

Labels are also required when a hazardous substance is transferred from a primary container to a secondary container. Labels on secondary containers must indicate the product name or the names of the hazardous substances contained therein, as well as related physical and health hazards and their associated target organs.

E. Hazardous Nonroutine Tasks

Periodically, employees are required to perform hazardous nonroutine 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 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. Names of hazardous chemicals to which they may be exposed while on the jobsite.

2. Precautions the employees may take to lessen the possibility of exposure by usage of appropriate protective measures, such as ventilation or isolation of the work. In some cases, as an administrative control measure, a task may be delayed to a time when a minimal number of employees are present in the area.

3. Location of MSDSs.

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, or

    b. Whenever new chemicals are introduced into the workplace.

2. This training will include the following:

    a. Applicable regulatory requirements.

    b. Location of the program, inventory, and MSDS.

    c. Chemicals used and their hazards (chemical, physical, and health).

    d. How to detect the presence or release of chemicals.

    e. Safe work practices and methods employees can take to protect themselves from chemical hazards.

    f. How to read an MSDS.

    g. Site- or project-specific information on hazard warnings and labels in use at the location, if applicable.

3. Document the training.

4. Where non–English-speaking workers are employed, arrange provisions for training in the appropriate language. International Chemical Safety Cards (see Section 6, ILO) may be used in conjunction with MSDS information to provide non–English-language information. MSDSs are required to be on site, but there is no requirement for the MSDSs to be in a language other than English.

5. Documentation Summary

The following documentation will be maintained in the project file:

A. Chemical Inventory.

B. MSDSs.

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 General Industry Standards – Occupational Exposure to Hazardous Chemicals in Laboratories – 29 CFR 1910.1450

C. U.S. OSHA Construction Standards – Hazard Communication – 29 CFR 1926.59

D. Mine Safety and Health Administration – Hazard Communication – 30 CFR 47

E. OSHA Administration Technical Links – Hazard Communication

F. National Paint and Coatings Association (NPCA) – Hazardous Materials Identification System (HMIS) Version III

G. National Fire Protection Association (NFPA) Standard 704 – Standard System for the Identification of Hazardous Materials for Emergency Response

H. 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

I. Agency for Toxic Substances and Disease Registry (ATSDR) – Tox FAQs and Tox FAQs en Espanol, 2003. http://www.atsdr.cdc.gov/toxfaq.html

7. Supplemental Information

A. Hazard Communication Program – Template

B. Hazard Communication Employee Training Program

HAZARD COMMUNICATION PROGRAM

Table of Contents

Appendices

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, Material Safety Data Sheets (MSDS), and training.

2. This written Hazard Communication Program applies to all operations that MAY expose employees to hazardous substances because of normal work conditions 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 A master list and the MSDSs of all of the hazardous substances to which employees may be exposed on this jobsite 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. The identity of the hazardous substances they contain;
2. Appropriate warnings of the physical and health hazards associated with those substances;
3. The name and address of the chemical manufacturer or distributor.

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 in one (1) and two (2) above.

EXCEPTION: When an employee transfers a hazardous substance into a portable container for his/her own immediate use, within the work shift 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. MATERIAL SAFETY DATA SHEETS (MSDS)

D-1 Material Safety Data Sheets (MSDSs) are documents that supply information about a particular hazardous substance or mixture. Manufacturers are required to provide MSDSs when the hazardous substances are sold to distributors or purchasers. In most cases, MSDSs 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 MSDSs and other information on all hazardous substances used (see sample letter in Appendix IV).

D-3 The Project Safety Representative will review MSDSs for completeness. If an MSDS is missing or obviously incomplete, a new MSDS will be requested from the manufacturer. In some cases, MSDSs 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 MSDSs are available to all employees in their work area for review during each work shift. If MSDSs are not available or new hazardous substance(s) in use do not have MSDSs, 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, MSDSs for the substances must be obtained.

D-6 When doing renovation or remodeling work, the Project Supervisor shall coordinate MSDSs of hazardous materials used by contractors. Contractors bringing hazardous materials on to a site or project must submit MSDSs to the Project Supervisor. The Project Supervisor should consult wit 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. Also, 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 MSDS 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 MSDSs 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, 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 MSDSs 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.
- Reactor vessels.
- 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 chemicals 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 chemicals in our workplace?

_____2. Are we prepared to update our hazardous chemical list?

_____3. Have we obtained or developed a material safety data sheet for each hazardous chemical we use?

_____4. Have we developed a system to ensure that all incoming hazardous chemicals 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 chemicals?

_____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 chemicals in the workplace?

_____10. Are employees trained about proper work practices and personal protective equipment in relation to the hazardous chemicals 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 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 chemicals 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 chemicals they have brought to the site?

APPENDIX II

EXAMPLES OF POTENTIALLY HAZARDOUS MATERIALS THAT MAY BE FOUND ON URS CORPORATION CONSTRUCTION AND GENERAL INDUSTRY PROJECTS

Acetone
Acetylene gas
Adhesives
Aluminum etching agent
Ammonia
Anti-freeze
Arsenic compounds
Asbestos
Asphalt (Petroleum) fumes
Battery Fluids
Benzene (and derivatives)
Bleaching agents
Carbon black
Carbon monoxide (in cylinders)
Caulking, sealant agents
Caustic soda (sodium hydroxide)
Chromate salts
Chromium
Cleaners
Cleaning agents
Coal tar pitch
Coal tar epoxy
Coatings
Cobalt
Concrete curing compounds
Creosol
Cutting oil (oil mist)
De-emulsifier for oil
Diesel gas, diesel oil
Drywall
Dusts (brick, cement block)
Enamel
Etching agents
Ethyl alcohol
Fiberglass, mineral wool
Foam insulation
Freon 20, R20 (and others)
Gasoline (petrol, ethyl)
Glues
Graphite
Greases
Helium (in cylinders)
Hydraulic brake fluid
Hydrochloric acid
Hydrogen (in cylinders)
Inks
Insulations
Iron
Kerosene
Lead
Lime (calcium oxide)
Limestone
Lubricating oils
Lye (sodium hydroxide, potassium hydroxide)
Magnesium
Metals (aluminum, nickel, copper, zinc, cadmium, iron, etc.)
Methanol (methyl alcohol)
Methyl ethyl ketone (2-butanone)
Motor oil additives
Muriatic acid (hydrochloric acid)
Naptha (coal tar)
Nitroglycerin
Oxalic acid
Ozone
Paint remover
Paint stripper
Paints/lacquers
Particle board
Pentachlorophenol
Pesticides
Photographic developers and fixers
Photogravure ink (copy machine)
Plastics
Polishes for metal floors
Propanol
Putty Resins, epoxy/synthetics
Sealers
Shellac
Solder, flux (zinc chloride, fluorides, etc.)
Solder, soft (lead, tin)
Solvents
Sulfuric acid
Thinner, paint/lacquer
Tin
Transite
Turpentine, gum spirit, oil of turpentine
Varnishes
Waterproofing agents
Waxes
Welding Rods
Wood alcohol (methanol)
Wood preservative
Xylene
Zinc

APPENDIX III

LIST OF PROJECT SPECIFIC HAZARDOUS SUBSTANCES

On the following page(s) is a current list of the specific hazardous substances and the manufacturer's name of the product known to be present at this jobsite.

This list uses the chemical name referenced on the MSDS. Specific information on each substance may be found on the MSDSs located in the project office.

APPENDIX IV

(PROJECT LETTERHEAD)

Date

Product Manufacturer's Name
Product Manufacturer's Address

Subject: Material Safety Data Sheet Requisition

Dear Manufacturer:

Please provide the following material 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 MATERIAL SAFETY DATA SHEETS (MSDS) 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, MSDS 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 LIST in your work area.

READING LABELS AND MSDS

LABELS: A product label on both the original and secondary containers should be reviewed prior to working with the material. Each label will have three important pieces of information you should be familiar with:

1. The identity of the Hazardous Substance.
2. Hazard Warnings.
3. Target Organs.

The label on the original container will also state the name and address of the manufacturer.

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 MSDS. It is essential for your safety that you read the Hazard Warning and only use the Hazardous Substance(s) within the guidelines prescribed on the label. Questions concerning the label should be directed to your supervisor/foreman.

MATERIAL SAFETY DATA SHEETS (MSDS): The MSDS 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 MSDS. 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 Substance(s) 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 MSDSs.

Employees may be trained using the common type or generic chemical group or by reviewing the specific MSDS 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 Substance(s).
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 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 MSDS section on Fire and Explosion Hazard information. 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 are 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.

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.

HAZARD COMMUNICATION TRAINING

Date: _____

I have received hazard communication training as described in the URS Corporation Hazard Communication Program.

Employee Name (Print)	Employee Signature	Employee Number

I hereby certify that the above named employees have been provided with hazard communication training.

_____ _____

Supervisor/Instructor's Name Supervisor/Instructor's Signature

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. But 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	**Flammable solids**
Aldehydes	Phosphorus
Ketones	Magnesium Dust
Amines	Zirconium Dust
Ethers	Titanium Dust
Aliphatic Hydrocarbons	Aluminum Dust
Aromatic Hydrocarbons	Zinc Dust
Alcohols	
Nitroaliphatics	

Water Reactive Flammable Solids	**Pyrophoric Liquids**
Potassium	Organometallic compounds
Sodium	Dimethyl Zinc
Lithium	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 charge in the material it is acting on. Common corrosives are:

Halogens	**Acids**	**Bases (Caustics)**
Bromine	Acetic acid	Potassium Hydroxide
Chlorine	Hydrochloric acid	Sodium Hydroxide
Fluorine	Hydrofluoric acid	
Iodine	Nitric acid	
	Sulfuric acid	

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 material safety data sheet (MSDS). The MSDS is a short technical report that provides you with the known hazards of a specific material. The MSDS explains how to properly use the material, handle any problems related to the material and how to store the material. Know what the MSDS 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 that 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 on biohazardous materials.

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 include 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, gases, and contamination of 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 material 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 the name of the chemical in the container, the name/address of the manufacturer and a hazard warning statement and/or graphic hazard statement that warns you of possible dangers. Read the label on all materials with which you work.

Examples of hazard warning statements:

- Danger, will cause death if swallowed
- Warning, causes eye irritation, harmful if swallowed
- Caution, avoid contact with skin and avoid breathing of vapors

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.

MSDS

Material safety data sheets, if read and followed, are a powerful means of controlling chemical exposures. Chemical manufacturers are required to provide MSDSs for the chemicals they produce or import. The purpose of the MSDS is to communicate information on the recommended safe use and handling procedures for that chemical.

MSDS may look different, yet the Occupational Safety and Health Administration (OSHA) requires that all MSDS must provide certain categories of information about the chemical substance or mixture:

- Material identification (physical and chemical)
- Hazardous ingredients
- Emergency and first aid procedures
- Recommended control measures
- Physical and health hazards
- Safe handling procedures
- Date of preparation/revision
- Manufacturer's name, address, and phone number
- Primary routes of entry
- National Toxicological Program (NTP) or Annual Report on Carcinogens from the International Agency for Research on Cancer

MATERIAL SAFETY DATA SHEETS
THEY ANSWER YOUR QUESTIONS ABOUT THE CHEMICALS YOU WORK WITH

What product/ chemical is this MSDS for?

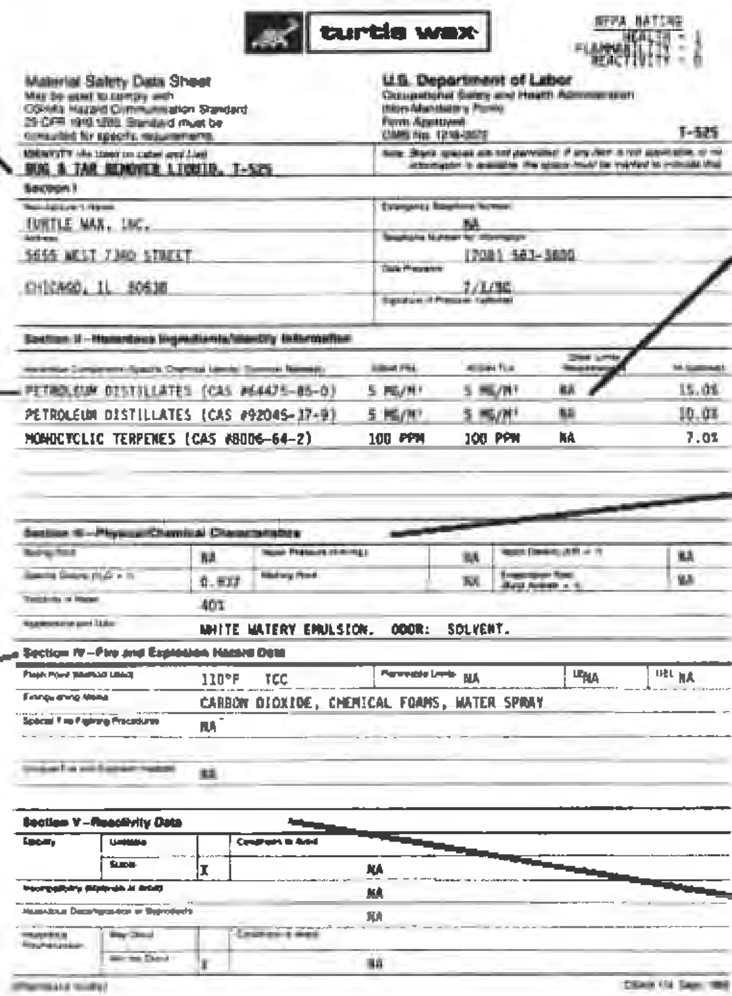
How much of this material can I be safely exposed to?

What Chemicals are contained in this material?

How do I recognize this material? Things to know for storage and

What should I do to prevent this material from catching fire? How do I put it out?

Are there conditions or materials that should not come in contact with the product?



turtle wax

NFPA RATING
HEALTH - 1
FLAMMABILITY - 2
REACTIVITY - 0

Material Safety Data Sheet
May be used to comply with
OSHA's Hazard Communication Standard
29 CFR 1910.1200. Standard must be
consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

T-525

IDENTITY (As Used on Label and List)
BUG & TAR REMOVER LIQUID, T-525

Section I

TURTLE WAX, INC.
5655 WEST 73RD STREET
CHICAGO, IL 60638

Emergency Telephone Number: NA
Telephone Number for Information: (708) 563-3600
Date Prepared: 7/1/90

Section II – Hazardous Ingredients/Identity Information

Hazardous Components	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
PETROLEUM DISTILLATES (CAS #64475-85-0)	5 MG/M³	5 MG/M³	NA	15.0%
PETROLEUM DISTILLATES (CAS #92045-37-9)	5 MG/M³	5 MG/M³	NA	10.0%
MONOCYCLIC TERPENES (CAS #8006-64-2)	100 PPM	100 PPM	NA	7.0%

Section III – Physical/Chemical Characteristics

Boiling Point	NA	Vapor Pressure (mm Hg.)	NA	Vapor Density (AIR = 1)	NA
Specific Gravity (H_2O = 1)	0.937	Melting Point	NA	Evaporation Rate (Butyl Acetate = 1)	NA
Solubility in Water	40%				
Appearance and Odor	WHITE WATERY EMULSION. ODOR: SOLVENT.				

Section IV – Fire and Explosion Hazard Data

Flash Point (Method Used): 110°F TCC — Flammable Limits: NA — LEL: NA — UEL: NA
Extinguishing Media: CARBON DIOXIDE, CHEMICAL FOAMS, WATER SPRAY
Special Fire Fighting Procedures: NA
Unusual Fire and Explosion Hazards: NA

Section V – Reactivity Data

Stability: Stable X — Conditions to Avoid: NA
Incompatibility (Materials to Avoid): NA
Hazardous Decomposition or Byproducts: NA
Hazardous Polymerization: Will Not Occur X — NA

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 a MSDS?
   A. Main Statistical Data Service.
   B. Material 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. MSDSs.
   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 MSDS 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. A MSDS 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. MSDS Book.

10. A new chemical used in your area is always considered a new hazard.
    A. True
    B. False

11. If a MSDS 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 chemical is a liquid with a flashpoint:
    A. Of 2,000 degrees Fahrenheit
    B. Below 100 degrees Fahrenheit
    C. At freezing
    D. All of the above

14. Using the ANSI labeling system, which 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 Material Safety Data Sheets.
    A. True
    B. False

17. A primary/original container label for a chemical must include:
    A. The chemical name
    B. The chemical manufacturers or importer's name and address
    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 material 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

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    A. The chemical name
    B. The chemical manufacturers or importer's name and address
    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 material 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

URS SAFETY MANAGEMENT STANDARD 009
CORROSIVE AND REACTIVE MATERIALS

URS SAFETY MANAGEMENT STANDARD
Corrosive and Reactive Materials

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 protect employees from the hazards of corrosive and reactive materials. Information is provided regarding the proper methods to store, handle and work with 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. Procedures

The associated implementing regional procedures for this standard are included as attachments:

SMS 009 NA – North America

SMS 009 EU – UK and Ireland, Europe, and Middle East

SMS 009 AP7 – Asia Pacific

URS SAFETY MANAGEMENT STANDARD
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.

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 indicted 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

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

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.

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

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

URS	Health, Safety and Environment **CORROSIVE AND REACTVE 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: • Name of chemical • Signal word (e.g., DANGER; WARNING; CAUTION, etc.) • Manufacturer	☐ Yes ☐ No ☐ NA

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: • Chemical splash goggles • Chemical resistant gloves • Chemical resistant apron	☐ Yes ☐ No ☐ NA
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 • Marked with a highly visible sign • Well lit and visible • Working and delivering a minimum of 1.5 liters of water per minute for 15 minutes	☐ Yes ☐ No ☐ NA ☐ Yes ☐ No ☐ NA ☐ Yes ☐ No ☐ NA ☐ 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:

_____

_____

URS SAFETY MANAGEMENT STANDARD 016
HAND TOOLS AND PORTABLE EQUIPMENT

URS SAFETY MANAGEMENT STANDARD
Hand Tools and Portable Equipment

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 procedures for the safe use and handling of hand tools and power equipment. Additional information on hand safety is provided in SMS 064 – Hand Safety.

3. Procedures

The associated implementing regional procedures for this standard are included as attachments:

SMS 016 NA – North America

SMS 016 EU – UK and Ireland, Europe, and Middle East

SMS 016 AP6 – Asia Pacific

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.

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.

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 ⅛ inch (3 mm).

   b. Tongue guard gaps should not exceed ¼ 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.

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

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:

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.

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.

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 al 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.

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.

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

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).

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 1873.1:2003Australian/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

URS SAFETY MANAGEMENT STANDARD
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 subject to this standard. Reference related URS Safety Management Standards for such operations.

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 included under this standard include, but are not limited to, hand auger, soil gas evaluation, groundwater monitoring, test pits, and all types of power drilling, including direct push. Remediation techniques included under this standard include, but are not limited to, excavation, groundwater treatment, soil gas treatment, containment, and land farming.

The applicability of the HAZWOPER standard to URS activities is primarily in the areas of site investigation and remediation.

3. Procedures

The associated implementing regional procedures for this standard are included as attachments:

SMS 017 NA – North America

SMS 017 EU – UK and Ireland, Europe, and Middle East

SMS 017 AP7 – Asia Pacific

URS SAFETY MANAGEMENT STANDARD
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 Safety Management System 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 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 Health, Safety, and Environment (HSE) Manager, or a safety professional specifically approved by the HSE Manager, and by the project manager.
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 are documented in site-/project-specific HASPs that are provided to clients by the project manager for their review and approval prior to the initiation of field activities.

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 are incorporated into project-/site-specific HASPs, which are reviewed and approved by clients prior to the initiation of field activities. 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. Remove any non-impermeable PPE clothing that becomes contaminated with hazardous substances in accordance with the decontamination procedures noted above.

8. Provide regular showers, change rooms, and sanitation facilities for employees, as necessary.

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 the United States).

3. 8-hour refresher training completed within 12 months of the initial or subsequent refresher training.

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 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.

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.

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 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

D. Completed Health and Safety (H&S) 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

B. European Agency for Safety and Health at Work, Dangerous Substances http://europe.osha.eu.int/good_practice/risks/dangerous_substances/

C. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities – National Institute for Occupational Safety and Health (NIOSH) 85-115

D. SMS 010 – Confined Space Entry

E. SMS 024 – Medical Screening & Surveillance

F. SMS 043 – Personal Monitoring

G. SMS 029 – Personal Protective Equipment

H. SMS 068 – Compliance Assurance

URS SAFETY MANAGEMENT STANDARD 018
HEAT STRESS

URS SAFETY MANAGEMENT STANDARD
Heat Stress

1. Applicability

This standard applies to URS field projects where ambient (not adjusted) temperatures exceed 70 °F (21 °C) for personnel wearing chemical protective clothing, including Tyvek™ coveralls, and 90 °F (32 °C) for personnel wearing normal work clothes.

2. Purpose and Scope

The purpose of this standard is to protect project personnel from the effects of heat related illnesses.

3. Procedures

The associated implementing regional procedures for this standard are included as attachments:

SMS 018 NA – North America

SMS 018 EU – UK and Ireland, Europe, and Middle East

SMS 018 AP7 – Asia Pacific

URS SAFETY MANAGEMENT STANDARD
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 semi-permeable or impermeable protective clothing such as Tyvek or Saranex coveralls, and 90°F (32°C) for personnel wearing normal permeable work clothes. Permeable clothing refers to clothes of standard cotton or synthetic materials.

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. For employees wearing chemical-protective clothing, physiological monitoring (Section J) is the most effective approach, because evaporative cooling capability is limited.

B. Heat stress is influenced by air temperature, radiant heat, and humidity. The Wet Bulb Globe Temperature (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 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.).

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 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 values in the following table, using the determinations made in 4.B.3 through 4.B.5.

Table 2
SCREENING CRITERIA FOR HEAT STRESS EXPOSURE
(WBGT Values in °F /°C)

Work Cycle	Acclimatized				Unacclimatized			
	Light Work	Mod. Work	Heavy Work	Very Heavy Work	Light Work	Mod. Work	Heavy Work	Very Heavy Work
100% Work (60 min/ hour)	85.1/ 29.5	81.5/ 27.5	78.8/ 26.0	N/A	81.5/ 27.5	77.0/ 25.0	72.5/ 22.5	N/A

a. If the measured WBGT is *less than* the table 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 table value, institute heat stress controls, including a work-rest cycle, and perform physiological monitoring as described elsewhere in this standard.

c. Because of the physiological strain associated with very heavy work among less fit workers regardless of WBGT, values are not provided in Table 1 for continuous work. Physiological monitoring should always be implemented under these conditions.

d. For workers wearing semi-permeable or impermeable clothing, such as Tyvek or Saranex, the WBGT procedures cannot be used. For these situations, workers should begin physiological monitoring as soon as the temperature in the work area exceeds 70°F (21°C).

C. 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 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 018-1 NA – 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 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.

D. Record monitoring results and worker's self-assessments on Attachment 018-1 NA – Heat Stress Monitoring Record.

E. Investigate the use of auxiliary cooling devices in extreme heat conditions.

F. Conduct briefings for employees regarding health hazards and control measures associated with heat stress whenever conditions require the implementation of heat stress monitoring. Review the information provided in Supplemental Information A.

G. Provide cool water and electrolyte replacement drinks as described in Supplemental Information A.

H. Allow employees who are not accustomed to working in hot environments appropriate time for acclimatization, as described in Supplemental Information A.

I. 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, 2003

D. AFL-CIO Building Trades Division – Heat Stress in Construction

E. Attachment 018-1 NA – Heat Stress Monitoring Record

7. Supplemental Information

A. Heat Stress Informational Supplement

URS	Health, Safety and Environment **HEAT STRESS MONITORING RECORD**	Attachment 018-1 NA Issue Date: May 2001 Revision 5: February 2009

Date: _____ Safety Representative: _____

Worker's Name: _____ Subcontractor: _____

Work Activity/Equipment: _____

Time	Work-Rest Cycle	Aural Temp (°F/°C)	Pulse (BPM)			Comments
			P_1	P_2	P_1-P_2	

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. 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.

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. 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.

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.

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. 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 026
NOISE AND HEARING CONSERVATION

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. Procedures

The associated implementing regional procedures for this standard are included as attachments:

SMS 026 NA – North America

SMS 026 EU – UK and Ireland, Europe, and Middle East

SMS 026 AP4 – Asia Pacific

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.

b. Require that hearing protectors are used in accordance with manufacturer's specifications to effectively protect hearing.

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 Health, Safety, and Environment (HSE) 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).

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.

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 within 21 days of the determination.

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. 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 in the project file:

A. Noise surveys, when applicable.

B. Training records.

6. Resources

A. U.S. Occupational Safety and Health Administration (OSHA) Standard – Occupational Noise Exposure – 29 CFR 1910.95

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

URS Safety Management Standard
Personal Protective Equipment

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 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. Procedures

The associated implementing regional procedures for this standard are included as attachments:

SMS 029 NA – North America

SMS 029 EU – UK and Ireland, Europe, and Middle East

SMS 029 AP6 – Asia Pacific

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 NA to perform the assessment.

   2. Reevaluate completed hazard assessments when job conditions or duties change.

B. Eliminate the hazards identified in Attachment 029-1 NA, 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 NA for recommended PPE.

   2. Review Material 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 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.
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 hart 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 1 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.

   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, and flaking.

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.

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 Division 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 requiring grinding, cutting, power washing, or handling corrosive chemicals will require face shields 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.

   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.

   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, 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.

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 NA. 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 NA).

B. Completed Personal Protective Equipment Inspection Sheet (Attachment 029-2 NA).

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 - 1989 – Eye and Face Protection

F. American National Standards Institute /International Safety Equipment Association, ANSI/ISEA 107 - 2004 – Standard for High-Visibility Safety Apparel

G. American Society for Testing and Materials, ASTM F13-WK4519, Specification for Personal Protective Footwear

H. *Quick Selection Guide to Chemical Protective Clothing,* K Forsberg and S.Z. Mansdorf, Wiley Interscience, 2002

I. Best Manufacturing Co. http://www.bestglove.com/. Information on chemical resistant gloves.

J. SMS 040 – Fall Protection

K. SMS 026 – Noise and Hearing Conservation

L. SMS 064 – Hand Safety

M. Attachment 029-1 NA – Hazard Assessment Form

N. Attachment 029-2 NA – Personal Protective Equipment Inspection Form

7. Supplemental Information

A. Eye and Face Protector Selection Guide

B. Welding Lens Selector

C. Traffic Control Class Guidelines and Scenarios

URS	Health, Safety and Environment **HAZARD ASSESSMENT CERTIFICATION FORM**	Attachment 029-1 NA Issue Date: July 2000 Revision 5: February 2009

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	☐ Yes	☐ No	Hard hat, ANSI Z89, Class G, E or C
2.	Flying objects that could strike head	☐ Yes	☐ No	Hard hat, ANSI Z89, Class G, E or C
3.	Energized wires or equipment that could strike head	☐ Yes	☐ No	Hard hat, ANZI Z89, Class G or E (dependent on potential voltage)
4.	Sharp objects or corners at head level	☐ Yes	☐ No	Hard hat, ANSI Z89, Class G, E or C

Eye Hazards

5.	Chemical splashes or irritating mists	☐ Yes	☐ No	See Supplemental Information A for additional information
6.	Excessive dust	☐ Yes	☐ No	Safety glasses or goggles
7.	Smoke and/or fumes	☐ Yes	☐ No	Safety goggles
8.	Welding operations	☐ Yes	☐ No	Welding goggles; See Supplemental Information A and B for additional information
9.	Lasers/optical radiation	☐ Yes	☐ No	Have URS HSE Representative assist you in proper selection
10.	Projectiles	☐ Yes	☐ No	Safety glasses or goggles plus face shield
11.	Sawing, cutting, chipping, and/or grinding	☐ Yes	☐ No	Safety glasses or goggles plus face shield; See Supplemental Information A for additional information

Face Hazards

12.	Chemical splashes or irritating mists	☐ Yes	☐ No	Safety goggles; See Supplemental Information A for more information; add face shield if irritating or corrosive
13.	Welding operations	☐ Yes	☐ No	Welding goggles or welding helmet; see Supplemental Information A and B for additional information
14.	Projectiles	☐ Yes	☐ No	Safety glasses or goggles plus face shield

Hand Hazards

15.	Chemical exposure	☐ Yes	☐ No	Use chemical-resistant gloves specific to hazard; consult MSDS, chemical hazard guide, or HSE Representative
16.	Sharp edges, splinters, etc.	☐ Yes	☐ No	Leather or Kevlar gloves
17.	Temperature extremes – heat	☐ Yes	☐ No	Leather gloves, welder's gloves, hot mill gloves

If any of the indicated hazards are present, eliminate the hazard or use the indicated PPE.

18.	Temperature extremes – cold	☐ Yes	☐ No	Insulated gloves
19.	Blood, fungus, biological agents	☐ Yes	☐ No	Nitrile gloves
20.	Exposure to live electrical currents	☐ Yes	☐ No	Electrical gloves; consult HSE representative
21.	Sharp tools, machine parts, etc.	☐ Yes	☐ No	Leather or Kevlar gloves
22.	Material handling	☐ Yes	☐ No	Leather gloves

Foot Hazards

23.	Heavy materials (greater than 50 pounds) handled by employees	☐ Yes	☐ No	Safety shoes or boots
24.	Potential to crush whole foot	☐ Yes	☐ No	Safety shoes or boots with metatarsal guard
25.	Sharp edges or points (puncture risk)	☐ Yes	☐ No	Safety shoes or boots
26.	Exposure to electrical wires	☐ Yes	☐ No	Safety shoes or boots with electrically non-conductive soles
27.	Slippery conditions	☐ Yes	☐ No	Rubber-soled boots or grips
28.	Chemical contamination	☐ Yes	☐ No	Rubber, PVC, or polyurethane boots or boot covers with puncture and protective toe if task required
29.	Wet conditions	☐ Yes	☐ No	Rubber boots or boot covers
30.	Construction/demolition	☐ Yes	☐ 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	☐ Yes	☐ No	ANSI A-10.14 Type 1 full-body harness
32.	Suspended scaffolds, boatswain's chairs, float scaffolds, or suspended staging	☐ Yes	☐ No	ANSI A-10.14 Type 1 full-body harness
33.	Working in trees	☐ Yes	☐ No	ANSI A-10.14 Type 1 full-body harness
34.	Working in vehicle-mounted elevating work platforms (e.g., bucket trucks, aerial lifts)	☐ Yes	☐ No	ANSI A-10.14 Type 1 full-body harness

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 HSE Representative for respirator selection guidance

If any of the indicated hazards are present, eliminate the hazard or use the indicated PPE.

Excessive Noise

40.	Exposure to noise	☐ Yes	☐ No	Ear plugs, muffs or both

Body and Leg Protection

41.	Chemical exposure	☐ Yes	☐ No	Contact URS HSE 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 NA – 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 _____

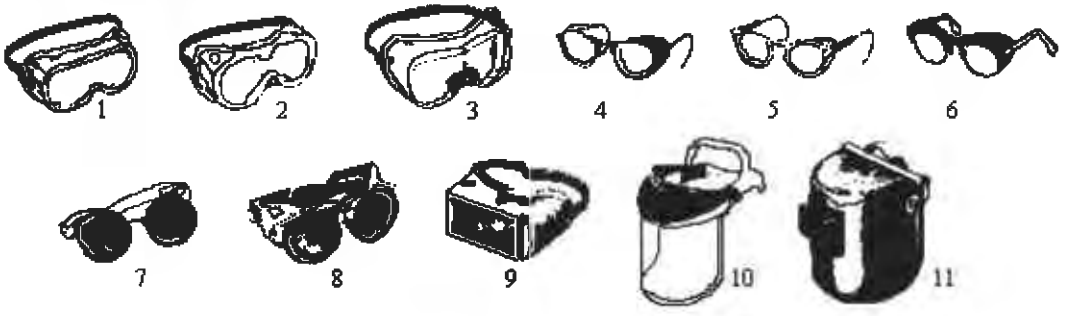
URS	Health, Safety and Environment **PERSONAL PROTECTIVE EQUIPMENT INSPECTION SHEET**	Attachment 029-2 NA Issue Date: July 2000 Revision 5: February 2009

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.	☐ Yes ☐ No
2.	Suspension system in hard hat does not show signs of deterioration, including cracking, tearing, or fraying.	☐ Yes ☐ No
3.	The brim or shell is not cracked, perforated, or deformed.	☐ Yes ☐ No
4.	Employees use hard hats in marked areas.	☐ Yes ☐ No
5.	Areas requiring hard hat usage are marked.	☐ Yes ☐ No
	Safety Shoes	
6.	Safety shoes used by employees do not show signs of excessive wear.	☐ Yes ☐ No
7.	Areas requiring safety shoes are marked.	☐ Yes ☐ No
	Work Gloves	
8.	Gloves are available and worn when needed.	☐ Yes ☐ No
9.	Gloves are appropriate for the task.	☐ Yes ☐ 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.	☐ Yes ☐ No
	Protective Clothing	
11.	Protective clothing (including traffic control apparel) is worn by employees when required.	☐ Yes ☐ No
	Hearing Protection	
12.	Noise hazard areas are posted.	☐ Yes ☐ No
13.	Employees are using earplugs or muffs when using noise producing equipment or working in posted noise hazard areas.	☐ Yes ☐ No
	Safety Glasses	
14.	Eye hazard areas are marked or posted.	☐ Yes ☐ No
15.	Employees use safety glasses when working in eye hazard areas or working with equipment that produces an eye hazard.	☐ Yes ☐ No
16.	Face shields are used when required and worn over safety glasses.	☐ Yes ☐ No

REMARKS ***(All "No" answers indicate a hazard which needs to be fixed.)***

URS	Health, Safety and Environment **EYE AND FACE PROTECTOR SELECTION GUIDE**	SMS 029 NA Supplemental Information A Issue Date: February 2009



1. GOGGLES, Flexible Fitting, Regular Ventilation
2. GOGGLES, Flexible Fitting, Hooded Ventilation
3. GOGGLES, Cushioned Fitting, Rigid Body
4. SPECTACLES, Metal Frame, with Sideshields
5. SPECTACLES, Plastic Frame, with Sideshields
6. SPECTACLES, Metal-Plastic Frame, with Sideshields
7. GOGGLES, Eyecup Type (Tinted Lenses – Welding; Clear Lenses – Chipping)
8. GOGGLES, Coverspec Type (Tinted Lenses – Welding; Clear Lenses – Chipping)
9. WELDING GOGGLES, Coverspec Type, Tinted Plate Lens
10. FACE SHIELD (Plastic or Mesh Window)
11. WELDING HELMETS

APPLICATIONS		
OPERATION	**HAZARDS**	**RECOMMENDED PROTECTORS** **Bold Type Numbers = Slightly Preferred Protection**
ACETYLENE – BURNING ACTEYLENE – CUTTING ACETYLENE – WELDING	SPARKS, HARMFUL RAYS, MOLTEN METAL, FLYING PARTICLES	**7,8,9**
CHEMICAL HANDLING	SPLASH, ACID BRUNS, FUMES	**2,10** (For severe exposure, add 10 over 2)
CHIPPING	FLYING PARTICLES	**1,2,4,5,6,7,8**
ELECTRIC (ARC) WELDING	SPARKS, INTENSE RAYS, MOLTEN METAL	**9,11** (11 in combination with 4,5,6 in tinted lenses, advisable)
FURNACE OPERATIONS	GLARE, HEAT, MOLTEN METAL	**7,8,9** (For severe exposure, add 10)
GRINDING – LIGHT	FLYING PARTICLES	**1,3,4,5,6,10**
GRINDING – HEAVY	FLYING PARTICLES	**1,3,7,8** (For severe exposure, add 10)
LABORATORY	CHEMICAL SPLASH, GLASS BREAKAGE	**2** (10 when in combination with 4,5,6)
MACHINING	FLYING PARTICLES	**1,3,4,5,6,10**
MOLTEN METALS	HEAT, GLARE, SPARKS, SPLASH	**7,8** (10 in combination with 4,5,6 in tinted lenses)
SPOT WELDING	FLYING PARTICLES, SPARKS	**1,3,4,5,6,10**

Non-side shield spectacles available for limited hazard use requiring only frontal protection.

URS	Health, Safety and Environment **WELDING LENS SELECTION**	SMS 029 NA Supplemental Information B Issue Date: February 2009

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

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 (in^2), or 0.14 square meters (m^2), of fluorescent yellow-green, orange-red, or red background materials combined with 155 in^2 (0.10 m^2) retro-reflective material. As an alternative, the apparel can have 310 in^2 (0.20 m^2) 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 in^2 (0.50 m^2) of fluorescent yellow-green, orange-red, or red background materials combined with 201 in^2 (0.13 m^2) 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;

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 in^2 (0.80 m^2) of fluorescent yellow-green, orange-red, or red background materials combined with 310 in^2 (0.20 m^2) 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;

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 in^2 (0.30 m^2) of fluorescent yellow-green, orange-red, or red background materials combined with 108 in^2 (0.07 m^2) 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 in^2 (0.30 m^2) of fluorescent yellow-green, orange-red, or red background materials combined with 108 in^2 (0.07 m^2) 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 in^2 (0.05 m^2) of fluorescent yellow-green, orange-red, or red background materials combined with 10 in^2 (0.0065 m^2) retro-reflective material. As an alternative, the headwear can have 78 in^2 (0.05 m^2) 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. Procedures

The associated implementing regional procedures for this standard are included as attachments:

SMS 030 NA – North America

SMS 030 EU – UK and Ireland, Europe, and Middle East

SMS 030 AP7 – Asia Pacific

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.

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.

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 or storing foods 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.

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.

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

URS	Health, Safety and Environment **SANITATION INSPECTION SHEET**	Attachment 030-1 NA Issue Date: June 1999 Revision 3: February 2009

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 032
WORK ZONE TRAFFIC CONTROL

URS SAFETY MANAGEMENT STANDARD
Work Zone Traffic Control

1. Applicability

This standard applies to the activities of URS Corporation and its subsidiary companies.

2. Purpose and Scope

This purpose of this standard is to protect personnel from the hazards associated with work performed on or next to highways and roads.

3. Procedures

The associated implementing regional procedures for this standard are included as attachments:

SMS 032 NA – North America

SMS 032 EU – UK and Ireland, Europe, and Middle East

SMS 032 AP7 – Asia Pacific

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

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.

H. Wear high-visibility clothing as follows:

1. Class 1 safety apparel (as defined by American National Standards Institute/International Safety Equipment Association [ANSI/ISEA]) for activities that permit the worker:

    a. Full and undivided attention to approaching traffic;

    b. Ample separation between the worker and vehicle traffic; and

    c. Optimum visibility in uncomplicated backgrounds where vehicle and equipment speeds do not exceed 25 miles per hour (mph) (40 kilometers per hours [kph]).

2. Wear Class 2 safety apparel for activities where:

    a. Greater visibility is required due to bad weather;

    b. There are complicated backgrounds;

    c. Employees are performing tasks that draw their attention away from approaching traffic;

    d. Vehicle speeds exceed 25 mph (40 kph); and

    e. Work activities take place closer to the vehicle traffic.

3. Wear class 3 safety apparel for activities where:

    a. Workers are exposed to higher vehicle speeds (generally 50 mph [80 kph] or more) or reduced sight distances;

    b. The worker and vehicle operators have a high task load; and

    c. The worker must be visible through the full range of body motions as a person at a minimum of 1,280 feet (390 meters).

4. Refer to SMS 029 – Personal Protective Equipment, for additional information on high-visibility clothing requirements, including 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) – 2003 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. SMS 029 – Personal Protective Equipment

I. Attachment 032-1 – Traffic Control Device Inspection Checklist

URS	Health, Safety, and Environment **TRAFFIC CONTROL DEVICE INSPECTION CHECKLIST**	Attachment 032-1 NA Issue Date: June 1999 Revision 2: February 2009

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 034
UTILITY CLEARANCES AND ISOLATION

URS SAFETY MANAGEMENT STANDARD
Utility Clearances and Isolation

1. Applicability

This standard applies to the operations of URS Corporation and its subsidiary companies.

2. Purpose and Scope

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.

3. Procedures

The associated implementing regional procedures for this standard are included as attachments:

SMS 034 NA – North America, UK and Ireland, Europe, and Middle East

SMS 034 AP7 – Asia Pacific

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).

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.

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. 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.

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)

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.

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.

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. 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.

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. United Kingdom – Health and Safety Executive GS6

F. SMS 013 – Excavation Safety

URS SAFETY MANAGEMENT STANDARD
Respiratory Protection

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 protect employees (1) performing operations for which exposures cannot be controlled by use of conventional engineering or administrative controls and (2) prior to establishing a negative air exposure assessment. This standard is also used to select use, maintain, and store respiratory protection equipment in accordance with acceptable practices.

3. Implementation

The associated implementing regional procedures for this standard are included as attachments:

SMS 042 NA – North America

SMS 042 EU – UK and Ireland, Europe, and Middle East

SMS 042 AP6 – Asia Pacific

URS SAFETY MANAGEMENT STANDARD
Respiratory Protection

1. Applicability

This standard applies to URS Corporation and its subsidiary companies that may require the use of respiratory protection, including Immediately Dangerous to Life and Health (IDLH) and emergency conditions. This program also addresses the voluntary use of respirators.

2. Purpose and Scope

The purpose of this standard is to protect those employees performing operations for which exposures cannot be controlled by use of conventional engineering or administrative controls, and prior to establishing a negative air exposure assessment, and to require that respiratory protective equipment is selected, used, maintained, and stored in accordance with acceptable practices. This procedure establishes the minimum standard for respirator training, selection, and use during the performance of all work requiring such protection.

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. Before assigning hazardous jobs to employees, determine if respirators are required.

1. If the potential for respiratory hazards exists for any portion of a job, complete Attachment 042-1 NA – Identifying When A Respirator Is Needed.

2. Contact a Division Health, Safety, and Environment (HSE) Manager, Regional or Strategic Business Unit (RBU/SBU) Manager, or URS Certified Industrial Hygienist (CIH) if any of the questions in Attachment 042-1 are checked "yes."

3. Follow instructions in Attachment 042-2 NA – Voluntary Use or Respirators – for employees who wish to voluntarily use dust masks.

4. Follow all the requirements of this standard for employees who wish to voluntarily use tight-fitting (e.g., air purifying) respirators.

5. Required respirators will be paid for by URS and will be provided without cost to the employee.

6. Control worker's exposure to air contaminants, where practicable, by engineering or administrative controls, or by substitution of process materials with less-toxic substances. Use respirators only when engineering or administrative controls are not feasible or completely effective.

B. Select the proper respirator for the job.

1. Contact the appropriate HSE Manager or CIH for assistance in respirator selection for those jobs identified in Attachment 042-1 NA.

2. Contact the appropriate HSE Manager for follow up if there are any problems implementing the recommendations made.

C. Require employees who will use respirators to be medically qualified by a project medical consultant (PMC) before fit-testing and assigning them a respirator. The PMC should preferably be an occupational physician; however, the Occupational Safety and Health Administration (OSHA) allows any physician or licensed health care professional (PLHCP) to conduct evaluations of respiratory protection medical forms. The PMC, where required, will determine the physiological and psychological status that is relevant to wearing different types of respirators. The PMC will review all questionnaires and test results and verify in writing that workers are physically and psychologically able to perform work while using respiratory protective devices. These determinations will be made using guidelines established by the PMC.

1. For program details, refer to SMS 024 – Medical Screening and Surveillance.

2. Require that employees have a current and accurate Medical Surveillance form (Attachment 024-2).

3. Obtain a copy of the employee's Health Status Medical Report from the Office Health and Safety Representative. The consulting occupational physician of the medical service provider following each work-related examination issues the Health Status Medical Report. Employees cannot be assigned respirators unless they are medically cleared for respirator use.

D. Require respirator users to receive appropriate training.

1. All respirator users must be trained:

a. Before they are assigned a respirator.

b. Annually thereafter.

c. Whenever a new hazard or job is introduced.

d. Whenever employees fail to demonstrate proper use or knowledge.

2. Document training in accordance with the requirements of SMS 055 – Training.

3. Training must address, at a minimum, the following:

a. Why the respirator is necessary, and what conditions can make the respirator ineffective.

b. What the limitations and capabilities of the respirators are.

c. How to inspect, put on and remove, and check the seals of the respirator.

d. What the respirator maintenance and storage procedures are.

e. How to recognize medical signs and symptoms that may limit or prevent effective use of the respirator.

f. The engineering and administrative controls being used and the need for respirators.

g. The hazards and consequences of improper respirator use.

h. How to recognize and handle emergency situations.

E. Require respirator users to be fit tested.

1. Any employee who has been assigned a reusable respirator must be fit tested on an annual basis (no more than 1 year may elapse between fit tests), or when the employee is assigned a respirator of a different make, type, or size from that previously tested.

2. Qualitative or quantitative fit testing can be performed by contract or in-house personnel.

3. Obtain a signed, written copy of the fit-test results. The fit-test results should include:

a. Employee's name and employee identification number.

b. Respirator brand, model, and size fitted for.

c. Date fit tested.

d. Method of fit testing used.

e. Name and signature of fit tester.

f. Manufacturer and serial number of fit-testing apparatus (if used).

A fit test results form is available as Attachment 042-3 NA.

F. A person assigned the task of issuing respirators to persons who must wear respirators for protection against harmful atmospheres should be given adequate training to ensure that the correct respirator is issued for each application. This training should include, but not necessarily be limited to, the following:

1. Establishment of a working knowledge of the specific types of respirators to be issued, their limitations, and the importance of issuing only the respirators for which each user is specifically approved.

2. Familiarization with the respirator maintenance and repair program in order to be able to identify any respirator that is improperly cleaned or needs repair.

3. Familiarization with the procedures for respirator issue. Only persons trained to ensure that proper respirators are issued will be permitted to issue respirators to persons needing them.

G. Provide qualified employees with respirator(s) and adequate amounts of parts and cartridges.

1. Assign employees whose duties require respirators their own respirator for which they have been fit tested.

2. Provide special eyeglass inserts designed for the respirator if an employee must wear eyeglasses with a full-facepiece respirator. Contact lenses may be worn when wearing a full-facepiece respirator.

3. Respirators and cartridges must be approved by the National Institute for Occupational Safety and Health (NIOSH). Military-issue respirators are approved under Military Standard AR 11-34.

H. Require respirators to be used properly.

1. Prohibit facial hair where the respirator-sealing surface meets the wearer's face.

2. Require employees to perform a positive and negative fit check every time the respirator is put on.

3. Employees will leave the area where respirators are being used:

    a. Before removing the facepiece for any reason.

    b. To correct any respirator malfunction.

    c. To change the respirator and/or respirator cartridges.

    d. The employee becomes ill (dizziness, nausea, etc.).

    e. If any of the following is detected:

        1. Vapor or gas breakthrough

        2. Leakage around the facepiece

        3. Increased breathing resistance.

4. Use cartridges with End-of-Service-Life indicators, or determine the respirator cartridge change-out schedule. See Supplemental Information A for guidance.

I. Require respirators to be cleaned and stored properly.

1. Clean and disinfect respirators after each use.

2. Store respirators in a plastic bag or case and in a clean location.

3. Inspect respirators before use and after each cleaning.

J. Address issues associated with special-use respirators (self-contained breathing apparatus; air-supply respirators; emergency-use respirators).

1. Self-Contained Breathing Apparatus

    Inspect self-contained breathing apparatus and other emergency-use respirators monthly and after each use in accordance with manufacturer's instructions.

2. Air-Supplied Respirators

a. Air used for atmosphere-supplying respirators must meet or exceed the requirements for Type 1 – Grade D breathing air. Never use oxygen.

1. A certificate of analysis must accompany bottled air.

2. Compressors used to supply breathing air must:

i. Prevent entry of contaminated air into the air supply.

ii. Minimize moisture content.

iii. Have suitable in-line sorbent beds and filter to provide appropriate air quality.

iv. Have a high–carbon-monoxide alarm that sounds at 10 part per million (ppm).

b. Couplings on air-hose lines must be incompatible with other gas systems.

K. Require follow-up training and medical surveillance to be provided as directed.

1. Provide follow-up physical examinations as directed by the SMS 024-3 NA – Medical Screening and Surveillance Exam Protocol table.

2. Provide follow-up physicals as directed by the Occupational Health Manager.

3. Provide annual refresher training.

4. Provide annual fit testing.

5. Documentation Summary

All Respiratory Protection Program documentation must be protected by the Privacy Act of 1974 (PL-93-579), and confidential medical information not required by OSHA may be protected under the Health Insurance Portability Accountability Act of 2003 (HIPAA).

The following information will be maintained in the office/project file:

1. Identifying When A Respirator Is Needed – Attachment 042-1 NA.

2. Voluntary Use of Respirators – Attachment 042-2 NA.

3. Fit Test Record – Attachment 042-3 NA.

4. Employee Health Status Medical Report, including clearance for respirator use.

5. Employee Respirator Training Records.

6. Resources

A. U.S. OSHA Standard - Respiratory Protection – 29 Code of Federal Regulations (CFR) 1910.134

B. U.S OSHA Technical Links – Respiratory Protection

C. ANSI Z88.6-2006 – Respirator Use – Physical Qualifications for Personnel

D. AIHA, The Occupational Environment – Its Evaluation and Control

E. NIOSH Respirator Decision Logic

F. NIOSH Guide to Industrial Respiratory Protection

G. SMS 024 – Medical Screening and Surveillance Program

H. SMS 055 – Health and Safety Training

I. Attachment 042-1 NA – Identifying When a Respirator is Needed

J. Attachment 042-2 NA – Voluntary Use of Respirators

K. Attachment 042-3 NA – Fit Test Record

L. Attachment 042-4 NA – Respirator Standard Operating Procedure

7. Supplemental Information

A. Respirator Cartridge Change Schedule

B. Hazard Analysis for Respirator Use

C. Fit Testing Guidance

D. Respirator Selection Guidance

E. Inspection, Cleaning, and Storage Guidance

URS	Health, Safety and Environment **IDENTIFYING WHEN A RESPIRATOR IS NEEDED**	Attachment 042-1 NA Issue Date: July 2000 Revision 3: February 2009

Site Location: _____ Date: _____

Name of Person Performing Evaluation: _____

Project: _____

Answer the questions below for the jobs you are to perform on site. If a 'Yes' response is checked, consult with an HSE Manager or a URS Certified Industrial Hygienist (CIH) to determine if a respirator is truly needed for the job; and if so, the type of respirator needed.

It is important to be aware of the respiratory protection requirements for any chemicals you are exposed to; these can be found on the Material Safety Data Sheets or chemical labels.

Material Used or Process to be Performed			Notes
Abrasive Blasting			
• Abrasive blasting (with any type of grit or material) will be performed	☐ Yes	☐ No	_____
• Employee will fill abrasive blasting pots or perform clean-up activities	☐ Yes	☐ No	_____
• Employee will be in a contained area where abrasive blasting is taking place	☐ Yes	☐ No	_____
Acids			
• Liquid or powder acids will be used in a situation where acid vapors, mists, or dust may be breathed	☐ Yes	☐ No	_____
Adhesives			
• Aerosols-propelled adhesives are to be used in areas where there is insufficient or no local exhaust ventilation	☐ Yes	☐ No	_____
• Two-part adhesives (mix part one with two, let set, then use) are to be used in areas where there is limited ventilation	☐ Yes	☐ No	_____
Alkalis/Bases/Caustics			
• Powdered alkalis will be used in a situation where an airborne dust may be breathed	☐ Yes	☐ No	_____
Asbestos Abatement			
• Asbestos will be removed, repaired, or sampled	☐ Yes	☐ No	_____
• Employees will be inspecting or overseeing areas where asbestos will be removed or disturbed	☐ Yes	☐ No	_____
Cleaning Compounds			
• Degreasers or carbon removers will be used in areas where local exhaust ventilation is not provided	☐ Yes	☐ No	_____
• Aerosol-propelled cleaning compounds will be used in areas where there is no local exhaust ventilation	☐ Yes	☐ No	_____
• Entry into a vault, tank, silo, sewer, or other confined space that has been used for chemical storage, recently painted, or where inert gases may have been used without ventilation	☐ Yes	☐ No	_____
• Degreasers or carbon removers will be used in voids, tanks, or other confined spaces	☐ Yes	☐ No	_____
Corrosion-Preventive Compounds			
• Corrosion-prevention compounds, including chemical conversion compounds and corrosion inhibitors, will be used in areas where there is no local exhaust ventilation	☐ Yes	☐ No	_____
Detergents/Soaps			
• Ammonia-based detergents will be used in large quantities (more than 5 gallons) in areas where local exhaust ventilation cannot be	☐ Yes	☐ No	_____

Material Used or Process to be Performed		Notes
provided		
• Large quantities (5- or 55-gallon containers) of high pH powder detergent/soap will be used in a situation where dust may be breathed	☐ Yes ☐ No	
Fuels (including regular or unleaded gasoline, kerosene, diesel fuel, JP-5)		
• Employees will be inside unventilated fuel cells or other confined spaces containing fuels	☐ Yes ☐ No	
Grinding, Cutting, Sanding		
• Cutting, grinding, or sanding surfaces that have coatings containing beryllium, cadmium, chromium, lead, or zinc	☐ Yes ☐ No	
• Cutting, grinding, or sanding surfaces that are concrete or glass without use of ventilation or water	☐ Yes ☐ No	
Hazardous Waste Sites		
• Employees will be performing tasks on a hazardous waste site that requires the use of respirator (as indicated in the site health and safety plan)	☐ Yes ☐ No	
• Employees will be performing site assessments on potential hazardous waste sites	☐ Yes ☐ No	
Hydraulic Fluids (including petroleum-based fluids, synthetic fire-resistant fluids, and water-based fire-resistant fluids)		
• Hydraulic fluids and the vapors generated will not be exhausted using local exhaust ventilation	☐ Yes ☐ No	
• Synthetic fire-resistant fluids or water-based fire-resistant fluids will be used in an area where the air is contaminated with visible mist or spray from hydraulic fluids	☐ Yes ☐ No	
Inspection Penetrants (including Flouro-finder, water-indicating pastes, and penetrant removers)		
• An aerosol-propelled inspection penetrant will be used in an area where local exhaust ventilation cannot be provided, or in a situation where the solvent vapors can be breathed	☐ Yes ☐ No	
Lead Abatement Activities		
• Lead-containing materials will be disturbed, removed, or sampled	☐ Yes ☐ No	
• Employees will be inspecting or overseeing areas where lead will be removed or disturbed	☐ Yes ☐ No	
Lubricants/Oils		
• Aerosol lubricants or oils will be sprayed with no immediate exhaust ventilation	☐ Yes ☐ No	
Oxidizers (materials that give off oxygen, including chlorine laundry bleach, calcium hypochlorite, calcium oxide, oxygen candles, lithium hydroxide, hydrogen peroxide, and sodium dichromate)		
• Oxidizers containing organic chlorine will be used in a situation where the dusts or vapors may be breathed	☐ Yes ☐ No	
• Powdered oxidizers will be used in a situation where airborne dust may be breathed	☐ Yes ☐ No	
Paint Materials (including paints, primers, thinners, enamels, lacquers, strippers, coatings, and varnishes)		
• Paint materials will be spray-applied in areas where there is no local exhaust ventilation	☐ Yes ☐ No	
• Two-part (mix part a with part b, let set, then apply) polyurethane or epoxy polyamide paints will be brush- or spray-applied	☐ Yes ☐ No	

Material Used or Process to be Performed			Notes
• Paints containing beryllium, cadmium, chromium, lead, or zinc (refer to the MSDS)	☐ Yes	☐ No	
• Paint materials will be applied in confined spaces	☐ Yes	☐ No	
Solvents (including hydrocarbon solvents such as acetone, methyl ethyl ketone, toluene, xylene, and alcohols, as well as mixed solutions like antifreeze, heat-transfer fluid, turpentine, pipe-dope, and naphtha thinner)			
• Local exhaust ventilation will not be provided and work will involve breathing solvent vapors	☐ Yes	☐ No	
• Solvents will be used within confined spaces	☐ Yes	☐ No	
• Solvents will be applied using aerosols	☐ Yes	☐ No	
Thermal Insulation (including asbestos and non-asbestos materials like pipe lagging, fiberglass insulation, boiler insulation, packing materials, and floor or ceiling tiles)			
• Insulation will be disturbed, removed, or sampled	☐ Yes	☐ No	
Water-Treatment Chemicals (includes corrosive chemicals such as tri-sodium phosphate, hardness buffer, titrating solution, morpholine, caustic soda, citric acid, and nitric acid, as well as toxic chemicals such as mercuric nitrate, hydrazine, EDTA, and sodium nitrate)			
• Morpholine, EDTA, or harness buffer/titrating solution is to be used in poorly ventilated spaces	☐ Yes	☐ No	
• Powdered water-treatment chemicals will be used in a situation where chemical dusts may be breathed	☐ Yes	☐ No	
Welding/Brazing/Cutting			
• Welding will be performed in confined spaces	☐ Yes	☐ No	
• Welding galvanized metal or stainless steel	☐ Yes	☐ No	
• Brazing with cadmium or lead	☐ Yes	☐ No	
• Torch-cutting on coated/painted materials	☐ Yes	☐ No	
For Any of the Above-Listed Activities			
• An employee will be in the immediate area – within 10 feet of the job or operation; or	☐ Yes	☐ No	
• Employee will be inside confined space where activities are taking place; or	☐ Yes	☐ No	
• Employee will be inside a "controlled area" such as found in asbestos abatement, lead abatement, radiation control area, or a hazardous waste site	☐ Yes	☐ No	
Other			
• A chemical process procedure (e.g., hydrogen sulfide in refineries, ammonia as a refrigerant, chlorine in water disinfection, inert gas systems) required the use of a respirator or emergency escape respirator	☐ Yes	☐ No	
• Mine operations require issuance of an emergency escape respirator	☐ Yes	☐ No	
• Emergency response plan requires issuance of respirators to first responders	☐ Yes	☐ No	
• Radiological controls require use of a respirator	☐ Yes	☐ No	
• Laboratory Chemical Hygiene plan requires issuance of respirators	☐ Yes	☐ No	

URS	Health, Safety and Environment VOLUNTARY USE OF RESPIRATORS	Attachment 042-2 NA Issue Date: July 2000 Revision 3: February 2009

Instructions: Have the employee that is opting to use a respirator for non-overexposure conditions read this page, and then sign on the bottom of the page. Maintain a copy in the employee's training file.

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for employees. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the employee.

Sometimes employees may wear respirators to avoid exposures to hazards, even if the amount of the hazardous substance does not exceed the limits set by OSHA standards. If your employer provides respirators for your own voluntary use, or if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not pose a hazard.

1. Read and follow all instructions provided by the manufacture on use, maintenance, cleaning, and care, and warnings regarding the respirators limitations.
2. Choose respirators certified for use to protect against the contaminant of concern. NIOSH (the National Institute for Occupational Safety and Health) certifies respirators in the U.S. A label or statement of certification should appear on the respirator or respirator packaging; it will tell you what the respirator is designed for and how it will protect you.
3. Do not wear your respirator into atmospheres containing contaminants against which your respirator is not designed to protect. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, fumes, smoke, or very small solid particles.
4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.
5. If you have any health conditions (asthma; high blood pressure; emphysema; heart disease) that could be aggravated by using a respirator, you should check with your doctor before using one.

I have read and understand this information: Date:

Employee's Name (Please Print):
Employee's Signature:

URS	Health, Safety and Environment **FIT TEST RECORD**	Attachment 042-3 NA Issue Date: July 2000 Revision 3: February 2009

Employee Name _____ Employee Number _____

Division/Office/Project _____ Last Medical Exam _____

Fit Test Date _____ Corrective Lenses Needed Yes ☐ No ☐

Medically qualified to wear respirator? Yes ☐ No ☐

Briefed on fundamental principles of respiratory protection, use, selection, inspection, cleaning, maintenance, and storage of equipment? Yes ☐ No ☐

Test agent recognition: Yes ☐ No ☐ N/A ☐

	RESPIRATOR 1	RESPIRATOR 2	RESPIRATOR 3
Equipment Type			
Manufacturer's Name			
Model			
Size			
Facepiece Composition (Rubber/Silicone)			

TEST PERFORMED	RESPIRATOR 1	RESPIRATOR 2	RESPIRATOR 3
Negative Pressure Test:	Pass ☐ Fail ☐	Pass ☐ Fail ☐	Pass ☐ Fail ☐
Positive Pressure Test:	Pass ☐ Fail ☐	Pass ☐ Fail ☐	Pass ☐ Fail ☐
Isoamyl Acetate Test:	Pass ☐ Fail ☐	Pass ☐ Fail ☐	Pass ☐ Fail ☐
Irritant Smoke Test:	Pass ☐ Fail ☐	Pass ☐ Fail ☐	Pass ☐ Fail ☐
Bitrex:	Pass ☐ Fail ☐	Pass ☐ Fail ☐	Pass ☐ Fail ☐
Saccharin:	Pass ☐ Fail ☐	Pass ☐ Fail ☐	Pass ☐ Fail ☐
Generated Aerosol Quantitative Fit:	P ☐ F ☐ Fit Factor____	P ☐ F ☐ Fit Factor____	P ☐ F ☐ Fit Factor____
Ambient Aerosol Quantitative Fit:	P ☐ F ☐ Fit Factor____	P ☐ F ☐ Fit Factor____	P ☐ F ☐ Fit Factor____
Controlled Negative Pressure Quantitative Fit:	P ☐ F ☐ Fit Factor____	P ☐ F ☐ Fit Factor____	P ☐ F ☐ Fit Factor____

Examiner's Name (Please Print) **Examiner's Signature** **Date**

Employee's Signature **Date**

URS	Health, Safety and Environment **RESPIRATOR STANDARD OPERATING PROCEDURE**	Attachment 042-4 NA Issue Date: July 2000 Revision 3: February 2009

Job Task Reviewed: _____

Date Reviewed: _____

Task Review by: _____

ADMINISTRATIVE PROCEDURES

1. All respirator users must be medically qualified to use respirators.
2. Respirator users must be trained annually in respirator use, and must be fit-tested annually.
3. The respirator will be used only by the person to whom it was issued.
4. Persons using glasses who are required to use a full-face respirator may use contact lenses or eyeglass inserts designed for the respirator.

GUIDANCE FOR SELECTION OF RESPIRATOR AND CARTRIDGES/FILTERS

1. Respirators are currently being issued and used for the following job activities:

   _____

   _____

2. The respirator will be equipped with the following cartridges/filters:

   _____

3. Filters are to be changed when the breathing resistance increases.

4. Cartridges are to be changed _____ (frequency), or when the contaminant you are protecting yourself from can be smelled or tasted.

FIT TESTING & FIT CHECKING

1. Fit testing is required annually. To arrange for fit testing, call your local, project, or regional safety representative or qualified industrial hygienist.
2. Respirator users will "fit check" the respirator every time the respirator is put on:
   - **Negative Check** – Cover filters/cartridges with palms of hands and breath in: leakage should not be detected around the face seal of the respirator. Do not use if leakage is detected.
   - **Positive Check** – Cover the exhalation valve cover with palm of hand and blow out slightly: leakage should not be detected around the respirator seal.
   - **For Air Supply Respirators** – Kink or close off air supply hose and breath in: leakage should not be detected around the face seal of the respirator.

CLEANING AND MAINTENANCE OF RESPIRATOR

1. Clean and disinfect respirator after every use.
2. Inspect respirator at the end of work every day in use to ensure parts are not missing. Replace missing parts from stock supply.
3. Store clean respirator in labeled plastic bag out of direct sunlight.
4. Do not alter respirator in any way.

URS	Health, Safety and Environment **RESPIRATOR CARTRIDGE CHANGE SCHEDULE**	SMS 042 NA Supplemental Information A Issue Date: February 2009

A cartridge change schedule must be developed for cartridges or canisters used with air purifying respirators that do not have an End of Service Life Indicator (ESLI). The purpose of this is to prevent contaminants from breaking through the respirator's sorbent cartridge(s), and thereby over-exposing employees. NIOSH has approved ESLIs for only four cartridges or canisters (mercury vapor, carbon monoxide, ethylene oxide, and hydrogen sulfide). Historically we have relied on the warning properties (odor, irritation) of a contaminant to dictate cartridge change. OSHA no longer allows this as the sole basis for changing respirator cartridges. In developing a change schedule the following factors should be considered:

- Contaminants
- Concentration
- Frequency of use (continuously or intermittently throughout the shift)
- Temperature and humidity
- Work rate
- The presence of potentially interfering chemicals.

The worst-case conditions should be assumed to avoid early breakthrough. This must be documented in the project health and safety plan or, in the cases of office or labs, in the site specific Respiratory Protection Program.

Sources of Help

OSHA provides assistance in developing respirator cartridge change schedules on its website at http://www.osha.gov/SLTC/etools/respiratory/change_schedule.html.

Most cartridge manufacturers maintain on-line interactive cartridge service life programs that can be used to evaluate the service life against many contaminants. Typically, these do not evaluate the service life against mixtures (multiple contaminants).

Because of the complexity in evaluating mixtures, OSHA offers the following guidance:

- When the individual compounds in the mixture have similar breakthrough times (i.e., within one order of magnitude), service life of the cartridge should be established assuming the mixture stream behaves as a pure system of the most rapidly migrating component with the shortest breakthrough time (i.e., sum up the concentration of the components).
- Where the individual compounds in the mixture vary by 2 odors of magnitude or greater, the service life may be based on the contaminant with the shortest breakthrough time.

Rule of Thumb *("The Occupational Environment" - Its Evaluation and Control)*

- If the chemical's boiling point is >70 °C and the concentration is less than 200 ppm, you can expect a service life of 8 hours at a normal work rate.
- Service life is inversely proportional to work rate.
- Reducing concentration by a factor of 10 will increase service life by a factor of 5.
- Humidity above 85% will reduce service life by 50%.

OSHA Interpretation

The OSHA inspection procedures for the respiratory protection standard specifies that where contaminant migration is possible, respirator cartridges/canisters should be changed after each work shift where exposure occurs unless there is objective data to the contrary (description studies) showing the performance in the conditions and schedule of use/non-use found in the workplace.

A. A hazard analysis of the workplace must be performed before selecting respirators. The analysis must consider inhalation hazards under routine and foreseeable emergency conditions. Other factors to consider when choosing respirators include skin and eye exposure, the effects of heat or cold, use of protective clothing, employee conditioning, and workload.

B. Respiratory hazards that must be identified include:

1. Oxygen Deficiency
2. Air Contaminants
3. Particulates
4. Toxic Gases

C. Evaluating Exposures

There are several options on how to evaluate exposures:

1. One option is to rely on personal monitoring data of employees. Representative exposure data provided by industry or laboratory studies is acceptable as long as it applies to similar tasks and conditions at the worksite.
2. The professional judgment provided by the Division, RBU, SBU, Office, or Project HSE Manager and/or as recommended by a qualified industrial hygienist or safety professional may be employed for the task.
3. If the exposure cannot be identified or estimated, then the atmosphere is considered immediately dangerous to life or health (IDLH). Atmospheres with levels of oxygen below 19.5% are also defined as IDLH.
4. Trained and qualified technical personnel shall perform assessment of the degree of respiratory hazard through sampling and testing of the work environment. Problems requiring special respiratory protection should be discussed with the Division or Regional HSE manager or qualified industrial hygienist.
5. The Project HSE Manager shall establish procedures to control respiratory hazards through engineering or administrative controls, product/material substitution, respiratory protective devices, or a combination of these methods.
6. He/she shall also perform annual evaluations of the effectiveness of the project's respiratory protection program. These evaluations shall be documented.
7. The Project HSE Manager shall select and provide adequate respiratory protective devices for use on the project. This selection shall be based upon the specific type of air contaminant(s), the concentration of the contaminants(s) or oxygen deficiency in the work environment.
8. Establish a change schedule for air-purifying respirators based upon objective information or data that will ensure that cartridges are changed before the end of their useful life. OSHA has mandated that reliance on warning properties is no longer valid

A. A quantitative fit-test provides the most accurate information; qualitative fit testing depends on the respirator wearer's sense of smell and taste (subjective response). OSHA's standard requires fit-testing for any face mask (full or half) designed to have a tight seal along the face, whether it is used in a positive or negative pressure mode, and whether it is disposable or not. If the required fit factor is greater than 100, then a quantitative fit-test must be performed.

B. Each person will have a qualitative or quantitative fit test when first required to wear a respirator, every 12 months when respirators will be worn thereafter, or as hazards or respiratory needs change.

C. Each person will have a qualitative or quantitative fit test for each specific make(s) and model(s) of respirator(s) for which the worker may wear.

D. Under no circumstances shall a worker be allowed to use any respirator if the results of the qualitative fit test indicate that the worker is unable to obtain a satisfactory seal.

E. The eight exercises required by OSHA under the respiratory protection standard, 29 CFR 1910.134, Appendix A, are as follows (note that these are not required controlled negative pressure (CNP) quantitative fit testing):

   1. normal breathing
   2. deep breathing
   3. head side to side
   4. head up and down
   5. talking out loud
   6. grimacing (quantitative only)
   7. bending
   8. normal breathing

F. Qualitative and quantitative fit testing must be performed in negative pressure mode for all tight fitting respirators, whether the respirator is positive or negative pressure demand.

G. Qualitative and quantitative fit testing must be conducted according to one of the protocols found in 29 CFR 1910.134, Appendix A.

H. Employees using respirators when not required under the standard (i.e., dust masks or comfort masks for nuisance type dust without a specified exposure level) must be aware of the potential hazards of using a respirator. See Attachment 042-2 of this standard or Appendix D of 29 CRF 1910.134 for information program requirement.

A. Physical characteristics, functional capabilities, and performance limitations of various types of respirators shall be considered in the selection process.

B. Specifics regarding hazard classification, descriptions of respirator types and modes of operation, and the capabilities and limitations of respirators are listed in ANSIZ88.2-1992.

C. To select the correct respirator, the hazards must first be identified in the workplace and then follow these steps:

1. Determine if the environment is IDLH.
    a. All oxygen deficient atmospheres shall be considered IDLH.
    b. If the employee exposure cannot be reasonably estimated, the atmosphere must be considered IDLH.
2. Identify the contaminant(s) present in the atmosphere and answer the following questions:
    a. What is the concentration?
    b. Are they gaseous or particulate?
    c. Are the contaminants IDLH?
3. After completing the above steps select the appropriate respirator for the particular hazard(s).
    a. IDLH – Provide a full facepiece NIOSH certified pressure demand SCBA with a minimum service life of 30 minutes or a full facepiece pressure demand airline respirator with an auxiliary self-contained air supply.
    b. Non-IDLH – A respirator must be provided that is appropriate for the contaminant(s) identified.
4. For protection against gases and vapors, either an atmosphere-supplying respirator or an air-purifying respirator equipped with a NIOSH certified end-of-service-life indicator (ESLI) for the contaminant must be used. In lieu of an ESLI, a change schedule for cartridges based on objective information or data may be used to ensure cartridges are changed before the end of their service life occurs (see Supplemental Information A). In most cases, respirator cartridge manufacturers provide a product specific on-line or CD-ROM based "Service Life Calculator" that allows determination of useful service life of a cartridge based on expected concentration and environmental and work conditions. If neither an ESLI or change schedule is available, a supplied air respirator must be used.
5. For protection against particulates, an atmosphere-supplying respirator or an air-purifying respirator equipped with a NIOSH-certified high-efficiency particulate air (HEPA) filter under 30 CFR 11 or an air-purifying respirator equipped with a NIOSH certified filter for particulates under 42 CFR 84 must be used.

6. There are three classes of filters under NIOSH (N, R, and P series) with three levels of filter efficiency in each class – 95%, 99%, and 99.97% (classified as 100). All filters can be used regardless of aerosol size. The new filters are classified as follows:
    a. N – For solid particulates and non-oil aerosols that do not degrade filter performance.
    b. R – For solid particulates and degrading oil-based aerosols. R filters have "use limitations."
    c. P – For solid particulates and degrading oil-based aerosols. P filters generally have no "use limitations" other than those normally associated with particulate filters. The P100 filter is the replacement for the HEPA filter.

E. Particulate filters are tested with 200 mg of loading but in many cases, these filters may exceed this capacity. Filtration efficiency may actually increase as the filter cake develops on the filter. Increased resistance to breathing or obvious taste or odor in the respirator would be cause to examine, re-evaluate and replace the filter cartridge

A. Inspection

Routinely used air-purifying and airline respirators should be checked as follows before and after each use:

1. Examine the facepiece for:
    a. Excessive dirt.
    b. Cracks, tears, holes or physical distortions of shape from improper storage.
    c. Inflexibility of rubber facepiece (stretch and knead to restore flexibility).
    d. Cracked or badly scratched lenses in full facepieces.
    e. Incorrectly mounted full facepiece lenses, or broken or missing mounting clips.
    f. Cracked or broken air-purifying element holder(s), badly worn threads or missing gasket(s) if required.
2. Examine the head straps or head harness for:
    a. Breaks.
    b. Loss of elasticity.
    c. Broken or malfunctioning buckles and attachments.
    d. Excessively worn serrations on head harness, which might permit slippage (full facepieces only).
3. Examine the exhalation valve for the following after removing its cover:
    a. Foreign material, such as detergent residue, dust particles or human hair under the valve seat.
    b. Cracks, tears or distortion in the valve material.
    c. Improper insertion of the valve body in the facepieces.
    d. Cracks, breaks or chips in the valve body, particularly in the sealing surface.
    e. Missing or defective valve cover.
    f. Improper installation of the valve in the valve body.
4. Examine the air-purifying element for:
    a. Incorrect cartridge, canister, or filter for the hazard.
    b. Incorrect installation, loose connections, missing or worn gasket or cross threading in the holder.
    c. Expired shelf-life date on the cartridge or canister.
    d. Cracks or dents in the outside case of the filter, cartridge or canister, indicated by the absence of sealing material, tape, foil, etc., over the inlet.
5. If the device has a corrugated breathing tube, examine it for:

a. Broken or missing and connectors.

b. Missing or loose hose clamps.

c. Deterioration, determined by stretching the tube and looking for cracks.

6. Examine the harness of a front-or back-mounted gas mask for:

a. Damage or wear to the canister holder, which may prevent its being held in place.

b. Broken harness straps for fastening.

B. Self Contained Breathing Apparatus (SCBA)

Follow manufacturer specifications for storage, maintenance and cleaning of SCBA systems.

C. Manual Cleaning

A generalized cleaning procedure is typically found in the manufacturer's manual. Read the respirator manual and follow the manufacturer's recommendations.

1. Remove canisters, filters, valves, straps and speaking diaphragms from the facepiece.
2. Wash facepiece and accessories in warm soapy water or a commercially available cleaner, following the manufacturer's instructions. Gently scrub the respirator.
3. Rinse parts thoroughly in clean water.
4. Air dry in a clean place or wipe dry with a lint less cloth.

D. Machine Cleaning

Machines may be used to expedite the cleaning, sanitizing, rinsing, and drying of large numbers of respirators. Read the machine-cleaning manual and follow manufacturer's recommendations.

1. Extreme care must be taken to ensure against excessive tumbling and agitation, or exposure to temperatures above those recommended by the manufacturer (normally 120°F maximum), as these conditions are likely to result in damage to the respirators.
2. Ultrasonic cleaners, clothes-washing machines, dishwashers, and clothes dryers have been specially adapted and successfully used for cleaning and drying respirators.

E. Disinfection

1. Disinfection is required when more than one person uses the respirator. Recommended NIOSH disinfection procedures include immersion of the respirator body for two minutes in a 50 ppm chlorine solution (about 2 ml bleach to 1 liter of water). Rinse thoroughly in clean water and dry.

a. Immersion times have to be limited to minimize damage to respirators. The solutions can age rubber and rust metal parts. Caution must be

taken to thoroughly rinse the respirator after cleaning and disinfection to prevent dermatitis.

b. An alternate method is to purchase a commercially prepared solution for disinfection/decontamination and follow the directions recommended by the manufacturer.

2. Each person wearing a respirator shall examine the respirator before use in accordance with the training and instruction provided during fit testing.
3. After cleaning and sanitizing, each respirator shall be examined to determine if it is in proper working condition, if it needs replacement of parts or repairs, or if it should be discarded. Respirator inspection shall include, when applicable, a check for tightness of connections; for the condition of the respiratory inlet covering, head harness, valves, connecting tubes, harness assemblies, filters, cartridges, canisters, end-of-service life indicator, and shelf life date(s), and for the proper function of regulators, alarms, and other warning systems.
4. Each rubber or other elastomeric part shall be inspected for pliability and signs of deterioration. Each air and oxygen cylinder shall be inspected to ensure that it is fully charged according to the manufacturer's instructions.

F. Repair

Only persons trained in proper respirator assembly and correction of possible respirator malfunctions and defects shall do replacement of parts or repairs. Replacement parts shall be only those designed for the specific respirator being repaired. Reducing or admission valves, regulators, and alarms shall be returned to the manufacturer for repair or adjustment. The valve, regulator, or alarm manufacturer must approve instrumentation for valve, regulator, and alarm adjustments and tests.

G. Storage

Respirators shall be stored in a convenient, clean and sanitary location. The purpose of good respirator storage is to ensure that the respirators will function properly when used. Respirators shall be stored in a manner that will protect them against dust, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. Respirators shall be stored to prevent distortion of rubber or other elastomeric parts. This can be done by storing the respirators in hermetically sealed plastic bags, or plastic bags capable of being sealed. Emergency and rescue use respirators that are placed in work areas shall be quickly accessible at all times, and the storage cabinet or container in which they are stored shall be clearly marked.

URS SAFETY MANAGEMENT STANDARD 046
SUBCONTRACTOR HEALTH AND SAFETY REQUIREMENTS

URS SAFETY MANAGEMENT STANDARD
Subcontractor Health and Safety Requirements

1. Applicability

This procedure is applicable to subcontractors retained by URS Corporation and its subsidiary companies. This procedure is applicable to the operations of subcontractors and sub-subcontractors of any tier.

This procedure does not apply to third-party contractor operations where there is no subcontract relationship between the contractor and URS Corporation. Health, Safety, and Environment issues regarding third-party contractor operations are governed by project-specific contracts, and are not covered by this standard.

2. Purpose and Scope

This procedure provides requirements on the pre-evaluation of subcontractor safety programs. The attached procedures detail the manner in which this is accomplished by region.

3. Procedures

The associated implementing regional/divisional procedures for this standard are included as attachments:

URS Division

SMS 046 NA – North America

SMS 046 EU – UK and Ireland, Europe, and Middle East

SMS 046 AP8 – Asia Pacific

Washington Division

SMS 046 WD

EG&G Division

SMS 046 EG&G

URS SAFETY MANAGEMENT STANDARD
Subcontractor Health and Safety Requirements

1. Applicability

This standard is applicable to subcontractors retained by URS Divisions of URS Corporation and its subsidiary companies that perform:

- Intrinsically higher-risk construction-related activities (e.g., drilling, excavation, surveying, demolition, electrical contracting, steel erection etc.).
- Significant building or infrastructure alteration, demolition, and/or repair activities using their own workforce or equipment.
- Activities on hazardous waste sites.
- Activities in government services operations (e.g., aviation repair, vehicle repair, warehousing, facility operations, and maintenance) where the annual cost of the subcontract exceeds $1,000,000.
- An activity where URS Corporation does not supervise the day-to-day activities and work efforts of subcontractor workers, ***and*** the subcontractor has a designated Supervisor on the work site.

This procedure is applicable to the operations of subcontractors and sub-subcontractors of any tier.

This procedure does not apply to third-party contractor operations where there is no subcontract relationship between the contractor and URS. Health, Safety, and Environment issues regarding third-party contractor operations are governed by project-specific contracts, and are not covered by this standard.

2. Purpose and Scope

This procedure provides requirements on the pre-evaluation of subcontractor safety programs; contractual risk management; subcontractor safety performance on the job site; and the responsibilities of the Project Manager with respect to subcontractor jobsite safety performance.

Each URS subcontractor must be evaluated at least annually using Attachment 046-1 NA, "Subcontractor Safety Evaluation Form," or equivalent client or URS International Operations form, in order to perform work on any new URS projects.

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. Pre-qualification of Subcontractor – The Project Manager will complete the following procedures for all subcontractors retained on projects covered by this standard (the PM should also require subcontractors to follow these procedures with respect to pre-qualification of sub-subcontractors of any tier):

1. Request all subcontractor candidates to complete the attached Subcontractor Safety Evaluation Form (Attachment 046-1 NA).

2. Conduct an assessment of each subcontractor's qualifications with respect to the subcontractor health and safety evaluation criteria contained in Attachment 046-2 NA.

3. If the subcontractor does not meet the criteria established in Attachment 046-2 NA, and URS must retain the contractor, the Subcontractor Variance Form (Attachment 046-3 NA) must be completed and approved by a Corporate, Regional, or Strategic Business Unit (SBU) Health, Safety, and Environment (HSE) Manager.

4. Verify that subcontractors meet the insurance requirements as stated in Attachment 046-2 NA, or as approved by URS Legal Counsel or Contracting Manager/Officer.

5. If the subcontractor has been successfully evaluated within the last 12 months, that evaluation may be substituted.

6. For long-term operations, update this evaluation within 12 months of the previous evaluation.

B. Contractual and Risk Management Requirements of Subcontractors

1. Ensure that the subcontractor is contractually bound to comply with applicable client and URS HSE Program requirements.

2. Ensure that subcontractor is contractually bound to develop additional safety procedures for work that is exclusive to their activities on the site, and for which they may have superior knowledge.

3. Assess compliance of subcontractor's insurance with the URS Corporation subcontract requirements (including, but not limited to, necessary types and amounts of coverage, URS Corporation additional insured endorsement, etc.).

4. Ensure that URS has the right in its subcontract, without liability to URS, to stop the subcontractor's work in the event of any violations of the applicable Health and Safety Plan.

C. Subcontractor Safety Representative

1. Require each subcontractor to appoint a Subcontractor Safety Representative (SSR) who:

    a. Is knowledgeable of the subcontractor's activities.

    b. Understands the safety requirements of the subcontractor's activities.

    c. Has the ability to recognize and the authority to correct safety deficiencies and execute a stop work order should an imminent danger arise.

    d. Has the responsibility for the administration of the subcontractor Health and Safety Program.

    e. Will serve as the direct contact with URS Corporation regarding resolution of health and safety issues.

D. Communication

1. Provide the SSR with information regarding Site Safety Program including but not limited to:

    a. Client Requirements

    b. URS HSE Program

    c. Site Hazard Communication Program

    d. Site Emergency Action Plan

    e. Any additional safety information from other contractors or subcontractors working on the site.

2. Provide the SSR with the name of the URS project or site contact and alternate for addressing site Health and Safety issues.

3. Require the participation of subcontractors in all Site Safety Briefings.

4. Require subcontractor compliance with all safety directives and/or stop work orders issued by the URS site representatives.

E. Subcontractor Safety Performance

1. To the extent reasonable in light of URS' scope of work under the client contract, visit the site and periodically observe subcontractor's operations (i.e., conduct spot checks) to assess whether subcontractor appears to be conducting their operations in accordance with applicable health and safety requirements. Periodically review any required subcontractor health and safety written documentation for compliance with applicable requirements.

2. In the event that unsafe acts or unsafe conditions are observed, immediately stop work, and bring them to the attention of the SSR for resolution.

3. Investigate all injuries/illnesses related to subcontractor operations to identify causes and effect corrective actions.

4. In the event of serious and/or continuing subcontractor breaches of applicable health and safety requirements, contact legal counsel to assess whether formal contractual action is appropriate under the subcontract.

F. Subcontractor Database

1. A database is available to store Attachment 046-1 NA completed by subcontractors. The database is available to all URS Lotus Notes users.

2. A RBU or Regional HSE Manager can upload completed Attachment 046-1 NA. Contact your Office HSE Representative or Regional HSE Manager for information on how to access the database.

5. Documentation Summary

The following documentation will be maintained in the project file:

A. Subcontractor Health and Safety Evaluation Form (Attachment 046-1 NA)

B. Applicable and current Insurance Certificates

C. Names and telephone numbers of SSR for each subcontractor

D. Verification of Health and Safety documents transmitted to subcontractors and received from subcontractors

E. Identified safety deficiencies as applicable for subcontractors and verification of correction of conditions

F. All other safety related documentation between URS and subcontractor such as training certifications, etc.

G. Subcontractor safety plan, incident reports, and resolution reports

5. Resources

A. "Occupational Injury and Illness Rates by SIC," Bureau of Labor Statistics, U. S. Department of Labor (http://www.bls.gov/iif/oshsum.htm)

B. Managing Subcontractor Safety, Prepared by The Construction Industry Institute, Safety Task Force, Publication 13-1, The University of Texas at Austin, Austin, Texas, 1991 (http://www.construction-institute.org/)

C. American National Standard Construction and Demolition Operations—Safety and Health Program Requirements for Multi-Employer Projects, ANSI A10.33-1992, National Safety Council, Itasca, Illinois 60143-3201 (http://www.nsc.org)

D. "Liability, OSHA, and the Safety of Outside Contractors," Professional Safety, American Society of Safety Engineers, January 1993 (http://www.asse.org)

E. "Proactive Construction Management; Dealing With the Problem of Subcontractor Safety," Professional Safety, American Society of Safety Engineers, January 1990 (http://www.asse.org)

F. Attachment 046-1 NA – Subcontractor Safety Evaluation Form

G. Attachment 046-2 NA – Subcontractor Evaluation Criteria

H. Attachment 046-3 NA – Subcontractor Variance Form

URS	Health, Safety and Environment **SUBCONTRACTOR SAFETY EVALUATION FORM**	Attachment 046-1 NA Issue Date: July 1999 Revision 5: February 2009

It is the policy of URS to provide a safe and healthful environment for all of its employees through the prevention of occupational injuries and illnesses. As such, URS considers safety as paramount and requests the following information of all subcontractors.

Company Name: _____ Date: _____

Address: _____ Contact Name: _____

_____ Title: _____

City: _____ Telephone: _____

State: _____ Fax: _____

Zip: _____ Email: _____

Type of services performed: _____

North America Industry Classification System (NAICS) Code: _____

If you are in need of assistance with your company's NAICS Code, please visit http://www.osha.gov/oshstats/naics-manual.htmlor http://www.osha.gov/pls/imis/sicsearch.html.

Has your company previously performed work as a subcontractor to URS? ☐ Yes ☐ No

If "Yes" explain the nature of the work, project location, and project date, and URS Project Manager and telephone number.

_____

_____

_____

_____

_____

_____

How many years has your organization been in business under your firm's name? _____

If applicable, what was your organization's previous name(s)? _____

1. WORKERS' COMPENSATION EXPERIENCE INFORMATION

Insurance Carrier(s): _____

Contact for Insurance Information: _____

Title: _____ Telephone: _____ Fax: _____

A. List your firm's Interstate Worker Compensation Experience Modification Rate (EMR) for the three most recent years: (Information is available from your workers compensation insurance carrier.)

Year	EMR Interstate
_____	_____
_____	_____
_____	_____

B. We require verification of your EMR. Please attach the endorsement page from your policy listing your EMR, or have your insurance carrier or broker provide this information on their letterhead.

C. If your EMR is 1.0 or exceeds 1.0 for any one or more years above, please explain:

Comments: _____

_____

_____

_____

2. SAFETY PERFORMANCE

A. Please consolidate your firm's injury and illness data for the last 3 years and complete the table below. The information provided must be for your company as a whole, not an individual office location. **Provide copies of your OSHA 300 and 300A logs for the last 3 years.**

	YEAR	YEAR	YEAR
A. Average Number of Employees			
B. Number of Fatalities (Totals from Column G of OSHA 300 log)			
C. Number of cases that involved days away from work, or cases with job transfer or restriction, or both (Totals from Columns H and I of OSHA 300 log)			
D. Other Recordable Cases – Medical Only (Number of cases without lost or restricted workdays) (Totals from Column J of OSHA 300 log)			
E. Total Recordable Cases (Totals from columns G + H + I + J of OSHA 300 log)			
F. Total hours worked			
G. OSHA Total Recordable Incident Rate (E above) x 200,000 Employee Hours Worked (Given Year)			
H. OSHA Lost Workday Case Incident Rate (C above) x 200,000 Employee Hours Worked (Given Year)			

B. For each fatality, please attach a description of the accident, including cause, lessons learned, actions taken resulting from that fatality, actions taken to prevent future fatalities, and corporate management summary of their actions and attitudes.

C. Has your company been issued any health and safety related citations from any federal, state, or local regulatory agency during the past 3 years? ☐ Yes ☐ No

If "Yes", please explain the nature of the citation, classification, and final fine in an attachment to your evaluation form submittal.

3. RISK MANAGEMENT / INSURANCE DATA

A. Does your firm have insurance coverage with the following minimum limits? ☐ Yes ☐ No

(1)	**Workers' Compensation**	**Statutory**
	To the extent permitted by law, a waiver of subrogation in favor of URS is required. Coverage must include, if applicable U.S. Harbor Worker's and Longshoremen's, Outer Continental Shelf, and Jones Act coverage	
(2)	**Employer's Liability**	**$ 1,000,000 per occurrence**
(3)	**Commercial General and Contractual Liability**	**$ 1,000,000 per occurrence**
	Must include: XCU (explosion, collapse, and underground) hazard coverage, premises operations, independent contractors, products and completed operations, broad form contractual, personal injury, and broad form property damage. Where the Work involves diving, Diver's Liability must be included. URS must be named as additional insured, which coverage must be primary and non-contributing.	
(4)	**Automobile Liability**	**$ 1,000,000 per occurrence**
	Must include owned, non-owned, and hired vehicles. If any hazardous substances are transported must include a MCS-90 endorsement and Motor Carriers Act of 1980 coverage applicable in the jurisdiction where the operations of the insured are performed. URS must be named as additional insured, which coverage must be primary and non-contributing.	
(5)	**Umbrella Liability**	**$ 2,000,000 aggregate**
	In excess of (1), (2), (3), and (4) above.	
(6)	**Pollution Liability**	**$ 5,000,000 per occurrence**
	Required if Work involves invasive Work or hazardous substances. If the Work includes asbestos abatement, Asbestos Liability must be included. If the Work includes transportation, treatment, or disposal, such activities must be insured under the policy. URS must be named as additional insured, which coverage must be primary and non-contributing.	
(7)	**Professional Liability**	**$ 1,000,000 per claim / aggregate**
	Required if performing professional services.	
(8)	**Aviation Liability**	**$ 10,000,000 per occurrence**
	Required if using aircraft, including helicopters. Coverage must not exclude War and Terrorism coverage. URS must be named as an additional insured, which coverage must be primary and non-contributing. A waiver of subrogation in favor of URS is required.	
(9)	**Marine Liability**	**$ 10,000,000 per occurrence**
	Required if using watercraft. Must include Charterers' Liability and Hull Protection and Indemnity. URS must be named as an additional insured, which coverage must be primary and non-contributing.	

(Note that certain URS client contracts require insurance in excess of the levels noted above. Inability to supply insurance at levels required by URS' client contract could result in disqualification.)

B. Are you able to provide URS with insurance certificates naming URS, and if requested, URS' client as an additional insured? ☐ Yes ☐ No

C. Please provide proof of current Workers' Compensation and Employer's Liability Insurance coverage. (*Attach certificate naming URS as Additional Insured*).

4. HEALTH AND SAFETY PROGRAM

A. Does your company maintain a written Health and Safety program? ☐ Yes ☐ No
If "Yes," please include a copy of the Table of Contents.

B. Is your company capable of preparing safety procedures specific to the work proposed for this project? ☐ Yes ☐ No

C. Does your firm have a safety officer? ☐ Yes ☐ No
If "Yes," please provide name and telephone number.

Name: _____ Telephone: _____

D. Do you hold jobsite safety meetings?

1. How Often?

Daily ☐ Weekly ☐ Bi-Weekly ☐ Monthly ☐ Less Often, As needed ☐

2. Are the health and safety meetings documented? ☐ Yes ☐ No

E. Is a program in place for the reporting and correction of workplace hazards? ☐ Yes ☐ No

F. Are workers encouraged to intervene when unsafe conditions are observed? ☐ Yes ☐ No

G. Have the safety and health hazards associated with your job activities been identified? ☐ Yes ☐ No

1. Has a risk assessment been performed on these hazards? ☐ Yes ☐ No

5. ACCIDENT/INCIDENT REPORTING, INVESTIGATION, AND INJURY MANAGEMENT

A. Does your company have a process in place for immediate reporting, investigation, and follow-up of incidents, near-misses and occupational injuries? ☐ Yes ☐ No

If "Yes," who receives copies of the report? (Job Title) _____

(Job Title) _____

(Job Title) _____

B. Who is responsible for investigation and completion of your incident report forms? (Job Title) _____

Please provide your company's incident reporting procedures.

Please provide a copy of an investigation report conducted within the last year.

C. Does your company have an injury management procedure? ☐ Yes ☐ No
If "Yes," provide a copy of the injury management procedure.

D. Does your injury management procedure include the use of occupational clinics (for non-critical injuries) as a preferred method of medical care? ☐ Yes ☐ No

E. Does your company have a nurse or doctor on staff? ☐ Yes ☐ No

F. Does your company use a third party to provide medical advice to injured employees? ☐ Yes ☐ No

If "Yes," which third-party company is used? _____

6. HEALTH AND SAFETY TRAINING

A. Do you have or provide company paid safety/health training to your employees? ☐ Yes ☐ No

B. Does your company have a formal safety orientation program for new employees? *If "Yes," submit a copy for evaluation.* ☐ Yes ☐ No

Are records kept? ☐ Yes ☐ No

If "Yes," who conducts the orientation? (Job Title) _____

If "No," how are new employees informed of safety policies and procedures and expectations?

_____

_____

_____

C. Do you have additional safety and health training for newly hired or promoted foremen/superintendents? ☐ Yes ☐ No

Topics Covered:

_____

_____

_____

D. Do you maintain a record of all employees' training? ☐ Yes ☐ No

E. Are your employees enrolled in a Defensive Driving Training Program? ☐ Yes ☐ No

If "Yes," describe the training, including the training provider, who receives the training, and course length.

Please provide a copy of training records from a recent HSE training course.

7. MEDICAL / DRUG TESTING

A. Does your company have a Drug/Alcohol policy or program? ☐ Yes ☐ No

If "Yes," does your drug and alcohol program include the following:

- Pre-employment testing ☐ Yes ☐ No
- Testing for Cause ☐ Yes ☐ No
- Post-accident testing ☐ Yes ☐ No
- Random testing ☐ Yes ☐ No

B. Does your company have an ongoing medical surveillance program as required by applicable governmental regulations? ☐ Yes ☐ No

Do you conduct medical examinations for:

- Pre-employment ☐ Yes ☐ No
- Pre-placement Job Capability ☐ Yes ☐ No
- Hearing Function (Audiograms) ☐ Yes ☐ No
- Pulmonary ☐ Yes ☐ No
- Respiratory ☐ Yes ☐ No

8. COMPLIANCE ASSURANCE

A. Does your company conduct job site safety inspections? ☐ Yes ☐ No

1. How often? _____
2. Who conducts the inspection? (Job Title) _____
3. Who receives the reports? (Job Title) _____
4. Are inspections documented? *If "Yes," provide an example.* ☐ Yes ☐ No

Comment on any other areas of your company's safety program and policies that you think will be appropriate in our evaluation.

VERIFICATION OF DATA

Please have an officer of the Company sign below certifying that the information provided in this document is current and correct. Misrepresentation of data requested is grounds for immediate termination of contracts and disqualification from future consideration.

Name _____ Title _____

Signature _____ Date _____

REQUIRED INFORMATION SUBMITTAL

Please provide copies of the following documents with the completed evaluation form. **If the following information is not included, provide a written reason for the failure to do so.**

- ☐ EMR documentation from your insurance carrier
- ☐ OSHA 300 and 300A Logs (Past 3 Years) – *Employee names must be removed.*
- ☐ Description for any fatalities (if applicable)
- ☐ Insurance Certificate(s) – *Naming URS as Additional Insured*
- ☐ Safety, Health, and Environmental Program (Table of Contents)
- ☐ Accident/Incident Reporting Procedure
- ☐ Example of an Investigation Report conducted within the past year
- ☐ Injury Management Procedure
- ☐ Safety, Health & Environmental Orientation for New Hires (Outline)
- ☐ Example of Safety, Health and Environmental Training Records
- ☐ Example of Job Site Safety Inspection conducted within the past year

THIS PAGE IS TO BE COMPLETED BY URS CORPORATION.

Subcontractor Name: _____

Project or Site Manager Evaluation:

Pass ☐ Subcontractor meets the criteria established in Attachment 46-2, and no further action is required.

Fail ☐ Subcontractor does not meet the criteria established in Attachment 46-2 NA. If a unique business need exists, then a subcontractor variance must be initiated using Attachment 46-3 NA. The variance must be submitted to a Corporate, Regional, or Strategic Business Unit (SBU) HSE Manager for evaluation.

Project or Site Manager Name: _____

Signature: _____

Date: _____

Prior to engaging a subcontractor on a project, Project Managers are required to ensure that the contractor has an effective safety program, is capable of conducting its operations in a safe manner, and has appropriate insurance coverage. The following criteria shall be followed in determining whether the subcontractor may be used on a URS Corporation project.

Note: Some questions/answers (Sections 4 through 8) from Attachment 46-1 NA are not discussed in the evaluation criteria below. These questions are asked and the answers are intended to help the Project Manager understand the safety culture and/or safety priority of the subcontractor.

GENERAL INFORMATION

The subcontractor must be able to complete the header section on Page 1 of the questionnaire (Attachment 46-1 NA), including their North American Industry Classification System (NAICS) codes. For assistance determining the NAICS for a business, refer to the U.S. Census Bureau online at http://www.census.gov/epcd/naics02/.

If subcontractor has performed work for URS previously, check safety performance history with previous URS Corporation Project Manager.

The numbers in this section directly correspond to the questions in Attachment 46-1 NA.

WORKERS' COMPENSATON EXPERIENCE INFORMATION

1.A. For any EMR listed as greater than 1.0, the contractor has failed the sub-evaluation. Further consideration may not occur without referral to a URS Corporate, Regional, or Strategic Business Unit (SBU) Health, Safety, and Environment (HSE) Manager in your Region for further assessment.

If all EMRs listed are 1.0 or below, continue with the evaluation.

SAFETY PERFORMANCE

2. For any OSHA Total Recordable Incident Rate (line G in table) listed as greater than 4.0, the subcontractor has failed the evaluation. Further considerations may not occur without referral to a URS Corporate, Regional, or SBU HSE Manager in your Region for further assessment.

If the Total Recordable Incident Rates are at or below 4.0, continue with the assessment.

2.B. If the contractor has had a fatality, further consideration may not occur without referral to a URS Corporate, Regional, or SBU HSE Manager in your Region.

2.C. Determine the subcontractor's citation history at http://www.osha.gov/cgi-bin/est/est1. Click on Establishment Search, enter the subcontractor's name. Query Case Status Open

and Closed. Compare the published data to the subcontractor questionnaire. The subcontractor must explain any discrepancies.

Look for willful, serious, and repeat violations. If they suggest a problem, request information and refer to a URS Corporate, Regional, or SBU HSE Manager in your Region for further assessment.

RISK MANAGEMENT/INSURANCE DATA

3.A. The inability to provide insurance coverage at the stated amounts requires referral to the URS Legal Department.

3.B. The ability to provide Insurance Certificates naming URS Corporation as an additional insured is required. Refer any questions to the URS Legal Department.

3.C Proof of Workers' Compensation Insurance is required. Refer any questions to the URS Legal Department.

HEALTH AND SAFETY PROGRAM

For Sections 4 through 8, if a subcontractor answers 'No' to any of the questions, the Project Manager needs to consider the type of work the subcontractor will be performing (e.g. HAZWOPER work required medical surveillance exams) to determine if the answer is acceptable.

4.A. For small subcontractors, a 'No' answer is not unexpected and may be acceptable with good EMR and OSHA statistics. Generally, some minimal program is expected depending on the breadth and complexity of the work. Contact a URS Corporate, Regional, or SBU HSE Manager in your Region for further assessment if you have any questions or doubts.

4.B. It is expected that a subcontractor being hired to perform services on the project site should be the best prepared to address safety issues for their operations, especially when specialty work is being conducted, or for work in which the subcontractor possesses superior knowledge of their operations.

A "No" answer should be referred to a URS Corporate, Regional, or SBU HSE Manager in your Region for further assessment.

Exception:

If the subcontractor does not meet the other requirements outlined above, the decision will be that the subcontractor will not be used. However, if a unique business need exists (e.g., subcontractor is a specialty subcontractor), the Project Manager should initiate a Subcontractor Variance (Attachment 046-3 NA). The Subcontractor Variance must be approved by a Corporate, Regional, or SBU HSE Manager.

URS	Health, Safety and Environment **SUBCONTRACTOR VARIANCE FORM**	Attachment 046-3 NA Issue Date: July 1999 Revision 5: February 2009

Subcontractor Name: _____

Project or Site Location: _____

Description of Work to be Performed:

_____

_____

_____

_____

_____

Explain any of the following conditions that apply to the subcontractor:

- EMR greater than 1.0
- TRIR greater than 4.0
- Fatalities within the past 3 years
- Willful, serious, or repeat OSHA citations

_____

_____

_____

_____

_____

_____

_____

_____

Why should we use this subcontractor?

_____

_____

_____

_____

_____

_____

_____

Have other similar subcontractors been evaluated? If so, please explain.

Mitigations by URS to manage the risks.

Review:

	Project or Site Manager Requesting Variance	**HSE Manager Approval**
Name:		
Date:		
Signature:		

URS SAFETY MANAGEMENT STANDARD 047
BIOLOGICAL HAZARDS

URS SAFETY MANAGEMENT STANDARD
Biological Hazards

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 reduce or eliminate illnesses and injuries transmitted by plants, insects, animals, and pathogenic agents.

3. Procedures

The associated implementing regional procedures for this standard are included as attachments:

SMS 047 NA – North America

SMS 047 EU – UK and Ireland, Europe, and Middle East

SMS 047 AP7 – Asia Pacific

URS SAFETY MANAGEMENT STANDARD
Biological Hazards

1. Applicability

This standard applies to URS Corporation and its subsidiary companies where job activities are performed primarily in outdoor environments.

2. Purpose and Scope

The purpose of this standard is to provide information that will help eliminate or reduce illnesses and injuries transmitted by plants, insects, animals, and pathogenic agents. Although there are many animals and insects that are potentially harmful to humans (e.g., bees, spiders, bears, and rodents), this standard focuses on six common biological hazards: ticks, poison plants, mosquitoes, snakes, Valley Fever, and water-borne pathogenic agents. Refer to SMS 051 – Bloodborne Pathogens for additional information.

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. Ticks

1. Precautionary Measures

a. Background information: Ticks do not jump, crawl, or fall onto a person. They are picked up when clothing or hair brushes a leaf or other object the tick is on. Ticks are generally found within 3 feet of the ground. Once picked up, they will crawl until they find a likely site to feed. Often they will find a spot at the back of the knee, near the hairline, behind the ears, or at pressure points where clothing presses against the skin (underwear elastic, belts, neckline). The best way to prevent tick-borne diseases is not to be bitten by a tick. Ticks can carry a number of diseases, including the following:

i. *Lyme Disease* is an infection caused by the corkscrew-shaped bacteria *Borrelia burgdorferi* that is transmitted by the bite of deer tick (ixodes) and western black-legged ticks. The disease occurs in the forested areas of North America, Europe, and Asia. Symptoms that occur within 3 to 30 days following a tick bite include: a spreading 'bulls-eye" rash, fever, fatigue, headache, and joint and muscle aches. Prompt treatment with antibiotics is essential in order to prevent more serious complications that may occur if left untreated.

ii. *Rocky Mountain Spotted Fever* is an infection caused by the bacteria *Rickettsia rickettsii*. The disease occurs in North, Central, and South America. Other Rickettsia organisms cause disease worldwide (Mediterranean, Japan, Africa, North Asia). Symptoms which occur 2-6 days following a tick bite include: fever, nausea, vomiting, diarrhea, rash, muscle and joint pain. The disease is treated with antibiotics.

iii. *Babesiosis* is caused by hemoprotozoan parasites of the genus *Babesia*. It is transmitted by the ixodid tick. The geographic distribution is worldwide. Symptoms include fever, chills, fatigue, muscle aches, and an enlarged spleen and liver. The disease is treated with anti-protozoan drugs.

iv. *Ehrlichiosis* is caused by several bacteria of the genus *Ehrlichiae*. The geographic distribution is global, primarily in temperate regions. Symptoms which occur 5-10 days following a tick bite include fever, headache, fatigue, muscle aches, nausea, vomiting, diarrhea, confusion, and occasionally a rash. The disease is treated with antibiotics.

b. Avoidance of tick habitats

Whenever possible, persons should avoid entering areas that are likely to be infested with ticks, particularly in spring and summer when nymphal ticks feed. Ticks favor a moist, shaded environment, especially that provided by leaf litter and low-lying vegetation in wooded, brushy, or overgrown grassy habitat. Both deer and rodent hosts must be abundant to maintain the life cycle of the tick.

c. Personal Protective Equipment

i. Wear light colored clothing or white Tyvek® to allow you to see ticks that are crawling on your clothing.

ii. Tuck your pant legs into your socks or boots, wear high rubber boots, or use tape to close the opening where they meet so that ticks cannot crawl up the inside of your pant legs.

iii. Wear a hat, and tie back long hair.

iv. Apply repellents to discourage tick attachment. Repellents containing permethrin can be sprayed on boots and clothing, and will last for several days. Repellents containing DEET (n,n-diethyl-m-toluamide) can be applied to the skin, but will last only a few

hours before reapplication is necessary. Apply according to Environmental Protection Agency guidelines to reduce the possibility of toxicity.

d. Tick Check

i. Change clothes when you return from an area where ticks may be located.

ii. Shower to wash off any loose ticks.

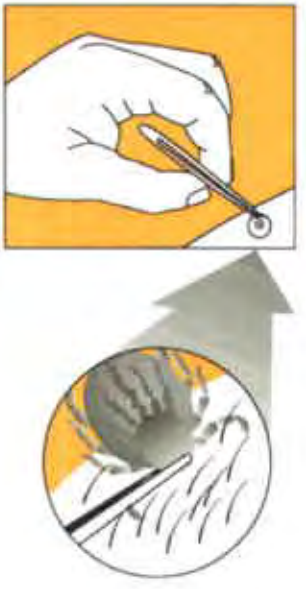
iii. Check your entire body for ticks. Use a hand held or full-length mirror to view all parts of your body.

iv. Place clothing worn in tick infested areas into the dryer for at least 30 minutes in order to kill any ticks.

2. Tick Removal

Because it takes several hours of attachment before microorganisms are transmitted from the tick to the host, prompt removal of attached or crawling ticks is an important method of preventing disease. Remember, folklore remedies of tick removal to do not work! Methods such as the use of petroleum jelly or hot matches may actually make matters worse by irritating the tick and stimulating it to release additional saliva or regurgitate gut contents, increasing the chances of transmitting disease.

The best method to remove an attached tick is with a set of fine tipped tweezers.



a. Use fine-tipped tweezers. When possible, avoid removing ticks with bare hands.

b. Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause the mouthparts to break off and remain in the skin. If this happens, remove mouthparts with the tweezers.

c. Do not squeeze, crush, or puncture the body of the tick because its fluids (saliva and gut contents) may contain infectious organisms.

d. After removing the tick, thoroughly disinfect the bite site and wash your hands with soap and water.

e. Disinfect the tweezers.

f. Save the tick for identification in case you become ill. This may help the doctor make an accurate diagnosis. Place the tick in a vial or plastic zip lock bag and put it in the freezer. Write the date of the bite on a piece of paper with a pencil and place it in the bag.

3. Medical Follow-Up

In most circumstances, medical treatment of persons who only have a tick bite is not recommended. However, individuals who are bitten by a tick should seek medical attention if any signs and symptoms of tick-borne disease develop over the weeks following the tick bite.

B. Poisonous Plants

1. Background Information

Poison ivy and poison oak plants are the most common cause of allergic contact dermatitis in North America. These poisonous plants can be a hazard for many various outdoor activities at work, home, and play. Skin contact with the oleoresins (urushiol) from these plants can cause an itchy, red, oozing, blistered rash in sensitive individuals. Oil content in the plants is highest in the spring and summer; however, the plants are even hazardous in the winter when they have dropped their leaves. There are three types of exposure:

a. Direct contact: An initial skin exposure is necessary to "sensitize" the individual. Subsequent contact in a sensitized person will result in a rash appearing within 4 to 48 hours. Approximately 50 to 70 percent of the population is sensitized. Poison plant dermatitis is usually characterized by areas of linear or streaked patches where branches of the plant brushed the skin.

b. Indirect contact: Skin exposure can happen indirectly. Clothing, shoes, tools, personal protective equipment, and other items can be contaminated with the oils and maintain potency for months.

c. Airborne smoke contact: Never burn poison plants. Droplets of oil can be carried by smoke and enter the respiratory system, causing a severe internal outbreak.

Poison plant rash is not contagious. Skin contact with blister fluid from an affected individual will not cause dermatitis in another sensitized person. Scratching the rash can only spread it to other parts of your body if the oil is still on your skin. After the oil has been washed off or absorbed by the skin, scratching will not spread the rash.

The most distinctive features of poison ivy and poison oak are their leaves, which are composed of three leaflets each and are green in the summer and red in the fall. Both plants also have greenish-white flowers and berries that grow in clusters. All parts of these plants are toxic.

Poison Ivy grows as a small plant, vine, and as a shrub. Leaves always consist of three glossy leaflets.

Poison Ivy

Poison Oak grows as a shrub or vine. It has three leaflets that resemble oak leaves.

Eastern Poison Oak

Poison Sumac grows as a woody shrub or small tree from 5 to 25 feet tall. It has 7 to 13 leaves that grow opposite each other with a leaflet at the tip.

Poison Sumac

2. Precautionary Measures

   a. The best approach is to learn to identify the plants and avoid them.

   b. Wear long pants and long sleeves, boots, and gloves.

   c. Barrier skin creams may offer some protection if applied before contact.

   d. Avoid indirect contact with tools, clothing, or other objects that have come into contact with a crushed or broken plant. Don't forget to wash contaminated clothing and clean up contaminated equipment.

e. If you can wash exposed skin areas within 3 to 5 minutes with cold running water, you may keep the urushiol from penetrating your skin. Proper washing may not be practical in remote areas, but a small wash-up kit with pre-packaged alcohol-based cleansing tissues can be effective.

3. Medical Follow-Up

Home treatment: Calamine lotion and an oatmeal (1 cup to a tub full of water) bath can help relieve itching. To prevent secondary skin infection, scratching is not helpful, and the finger nails should be cut to avoid damage to the skin. Over-the-counter hydrocortisone cream can decrease inflammation and itching; however, read the label and use according to directions.

When to see the doctor: Severe cases may require further treatment. A physician should be seen if the rash appears infected, is on the face or other sensitive body areas, or is too extensive to be easily treated at home.

C. Mosquito-Borne Diseases

1. Background Information

a. Arboviral encephalitis is a viral illness causing inflammation of the brain, and is transmitted to humans by the bite of infected mosquitoes. Globally, there are several strains, including: Eastern equine, Japanese, La Crosse, St. Louis, West Nile, and Western equine encephalitis. Some of the strains have a vaccine. Symptoms of infection are nonspecific and flu-like: fever, headache, and tiredness. Fortunately, only a small proportion of infected people progress to encephalitis. Treatment is supportive, antibiotics are not effective.

b. Malaria is a serious but preventable disease spread by the bite of an infected anopheline mosquito. It is caused by four species of the parasite *Plasmodium (P. falciparum, P. vivax, P. ovale, and P malariae)*. Malaria-risk areas include primarily tropical areas of Central and South America, Africa, India, Southeast Asia, and the Middle East. Symptoms of malaria, which occur 8 days to 1 year after infection, include fever, shaking, chills, headache, muscle ache, tiredness, jaundice, nausea, vomiting, and diarrhea. Malaria can be cured with prescription drugs.

c. Dengue Fever is a potentially life-threatening viral illness transmitted by the bite of the Aedes mosquito, found primarily in urban areas. The

disease is found in most of tropical Asia, the Pacific Islands, Central and South America, and Africa. There are four dengue virus serotypes. Symptoms include sudden onset, high fever, severe headache, joint and muscle pain, rash, nausea, and vomiting. There is no specific treatment and no vaccine.

d. Yellow Fever is a viral disease transmitted between humans by mosquitoes. It occurs only in Africa and South America. There is a vaccine that confers immunity lasting 10 years or more. Symptoms begin 3 to 6 days after the mosquito bite, and include fever, nausea, vomiting, headache, slow pulse, muscle aches, and restlessness. Treatment is symptomatic.

e. West Nile virus is a viral disease transmitted by mosquitoes. It occurs in North America, Europe, Africa, west and central Asia, and the Middle East. There is no vaccine for West Nile virus. Symptoms include nausea, vomiting, and diarrhea.

2. Precautionary Measures

a. Insect Repellent: Use insect repellants that contain DEET. The effect should last about 4 hours. Always use according to label directions. Use only when outdoors, and wash skin after coming indoors. Do not breathe in, swallow, or get into the eyes. Do not put on wounds or broken skin.

b. Protective Clothing: Wear long-sleeved shirts and long pants, especially from dusk to dawn. Avoid going outdoors during these hours.

c. Mosquito netting: Travelers who will not be staying in well-screened or air conditioned rooms should use a pyrethroid-containing flying insect spray in living and sleeping areas during evening and nighttime hours. Sleep under mosquito netting (bed nets) that has been sprayed with permethrin.

d. Malaria prophylaxis medications may be prescribed; however, they do not provide complete protection. The type of medication given depends on the area of travel.

D. Poisonous Snakes

1. Background Information

No single characteristic distinguishes a poisonous snake from a harmless one except the presence of poison fangs and glands. Only in dead specimens can you determine the presence of these fangs and glands without danger. Most poisonous snakes have both neurotoxic and hemotoxic venom; however, one type is dominant and the other is weak.

a. Hemotoxic venom. The folded-fang snakes (fangs can raise to an erect position) have venoms that affect the circulatory system, destroying blood cells, damaging skin tissues, and causing internal hemorrhaging.

b. Neurotoxic venom. The fixed-fang snakes (permanently erect fangs) have venoms that affect the nervous system, making the victim unable to breathe.

c. Poisonous snakes in the Americas: copperhead, coral snake, cottonmouth, and rattlesnake.

d. Poisonous snakes in Europe: adder, viper.

e. Poisonous snakes in Africa and Asia: viper, cobra, adder, green mamba.

f. Poisonous snakes in Australia: copperhead, adder, taipan, tiger snake.

2. Precautionary Measures

Bites occur when you don't hear or see the snake, when you step on them, or when you walk too close to them. Follow these simple rules to reduce the chance of accidental snakebite:

a. Don't put your hands into dark places, such as rock crevices, heavy brush, or hollow logs, without first investigating.

b. Don't step over a fallen tree. Step on the log and look to see if there is a snake resting on the other side.

c. Don't walk through heavy brush or tall grass without looking down. Look where you are walking.

d. Do not pick up any live snake. If you encounter a snake, walk around the snake, giving it plenty of room. A snake can strike half its length.

e. Don't pick up freshly killed snakes without first severing the head. The nervous system may still be active and a dead snake can deliver a bite.

3. Medical Follow-Up

If you are bitten by a snake, the primary goal is to get to a hospital as soon as possible to receive professional medical evaluation, and possible treatment with anti-venom if warranted. Initial first aid should include: Washing the bite with soap and water; immobilizing the bitten area and keeping it lower than the heart. Try to remain calm. If you are unable to reach a hospital within 30 minutes, a bandage, wrapped 2 to 4 inches above the bite, may help slow the venom. The bandage should not cut off blood flow from a vein or artery; make sure the bandage is loose enough that a finger can slip under it.

Research has shown the following to be potentially harmful: DO NOT apply ice, use a tourniquet, or make incisions into the wound.

E. Valley Fever

1. Background Information

Valley Fever is an illness that results from exposure to a fungal spore (*Coccidioides immitis*). It is endemic to the San Joaquin Valley in California, as well as areas of the Southwestern U.S., Mexico, and Central and South America, although it has been found in many other areas. It is particularly associated with arid soils that are not cultivated. Exposure is generally by inhalation of spores, though it may also enter through broken skin. Approximately 2 weeks after inhalation exposure, severe weakness and flu-like symptoms develop; severe pneumonia may occur. It may also affect the brain, bones, and joints causing disability, spinal meningitis, or death. Dermal forms of the infection can form disfiguring fungal lesions.

2. Precautionary Measures

Because it is associated with arid soils, personnel should avoid locations and activities that create dust. Persons at risk of exposure include geologists, surveyors, excavators, archaeologists, etc. Dust suppression methods should be employed and the use of particulate respirators should be considered for areas known to harbor the fungus. At one phase of the fungus' life cycle, cottony, spider-web–like growths may be seen on the soil surface. If observed, these growths must not be disturbed, and work should be relocated if possible.

3. Medical Follow-up

   Approximately 60 percent of exposed persons will not have symptoms. Persons that have been in areas associated with Valley Fever should be alert to the development of flu-like symptoms, fatigue, or skin rashes 2 to 4 weeks later. Valley Fever can be treated with anti-fungal medication. Early treatment is critical, as disseminated forms of the disease can result in chronic disease or death.

F. Pathogenic organisms

1. Background Information

   Employees who perform certain activities, such as disaster response, may be in areas where water-borne pathogens may be present. A partial list of agents includes: E. coli, Hepatitis A, typhoid, and cholera. Chemical hazards and molds and fungus may also be present. Refer to SMS 051– Bloodborne Pathogens for additional information.

2. Precautionary Measures

   All work must be performed within the scope of either a Health and Safety Plan or Safe Work Plan that identifies the task hazards, and specifies appropriate controls. A medical exam and/or inoculations may be required. See SMS 024 – Medical Screening and Surveillance, or contact the Occupational Health Manager for assistance.

   Where contact with water or wet materials may occur, personnel must use protection such as impervious coveralls, boots/waders, faceshields, etc, as specified in the project Health and Safety Plan or Safe Work Plan. Personnel must protect any areas of broken skin, eyes, nose, and mouth from contact with potentially infectious materials, and practice good personal hygiene before eating, drinking, etc.

3. Medical Follow-up

   Medical evaluation and/or an inoculation schedule may be required prior to beginning work. Because early evaluation and treatment is more successful, personnel should be alert to signs and symptoms of possible pathogenic organisms and seek prompt medical evaluation if illness develops or is suspected.

G. Natural disaster relief efforts

1. Natural disaster relief efforts present a variety of hazards, including biological hazards. Biological hazards potentially encountered during relief efforts include mold, sewage-contaminated water, various building materials that may puncture the skin and create various types of infections, and displaced animals and insects. Before work begins, each disaster relief site should be evaluated for the various types of biological hazards that may be encountered. Control measured must be developed to address the biological hazards.

5. Documentation Summary

Complete and distribute a URS Incident Report form 049-1 for all work-related biological exposure incidents.

6. Resources

A. Centers for Disease Control http://www.cdc.gov

B. U. S. Occupational Safety and Health Administration http://www.osha.gov

C. U.S. Food and Drug Administration - Treating and Preventing Venomous Snake Bites
http://www.fda.gov/fdac/features/995_snakes.html

D. ENature – Identify plant and animals hazards in a specific area.
http://enature.com/zipguides/index.asp?choice=poisonous

E. SMS 051 – Bloodborne Pathogens

F. SMS 024 – Medical Screening and Surveillance

G. SMS 049 – Injury / Illness / Incident Reporting & Notifications

H. ORC Pandemic Planning Guide

URS SAFETY MANAGEMENT STANDARD 049
INJURY/ILLNESS/INCIDENT REPORTING & NOTIFICATIONS

URS SAFETY MANAGEMENT STANDARD
Injury / Illness / Incident Reporting & Notifications

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 guidance for the timely reporting of work-related injuries, illness, and incidents. This procedure also defines incident notification procedures for URS employees. For incidents involving motor vehicles, the reporting and notification requirements of URS SMS 057 – Vehicle Safety Program – may also apply.

For significant incidents (e.g., fatality, serious injury, injury to members of the public), SMS 066 – Incident Investigation – is also required.

3. Procedures

The associated regional/divisional procedures for this standard are included as attachments:

URS and EG&G Divisions

SMS 049 NA – North America, UK and Ireland, Europe, and Middle East

SMS 049 AP11 – Asia Pacific

Washington Division

SMS 049 WD

URS SAFETY MANAGEMENT STANDARD
Injury / Illness / Incident Reporting & Notifications

1. Applicability

This standard applies to the operations of URS and EG&G Divisions of URS Corporation (URS) and its subsidiary companies.

2. Purpose and Scope

The purpose of this standard is to provide guidance for the timely reporting of work-related injuries, illness, and incidents. This procedure also defines incident notification procedures for URS employees. For incidents involving motor vehicles, the reporting and notification requirements of SMS 057 – Vehicle Safety Program – may also apply.

For significant incidents (e.g., fatality, serious injury, injury to members of the public), SMS 066 – Incident Investigation – is also required.

Note that this standard will also be used for investigation of critical injuries as defined by Canadian provincial regulations. See Supplemental Information A for definitions of critical injuries.

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. Reporting: All employees must immediately notify their appropriate level of management (line, project, and/or office) of a reportable incident. A reportable incident includes the following:

1. An injury or illness to any URS employee or subcontractor, even if the injury does not require medical attention.
2. An injury to a member of the public, or clients, occurring on a URS-controlled work site.
3. Illness resulting from suspected chemical exposure.
4. Chronic or re-occurring conditions such as back pain or cumulative trauma disorders (e.g., carpal tunnel syndrome).
5. Fire, explosion, or flash.

6. Any vehicle accidents occurring on site, while traveling to or from client locations, or with any company-owned, rented, or leased vehicle (including personal vehicles used for company business).
7. Property damage resulting from any URS or subcontractor activity.
8. Structural collapse or potential structural hazards.
9. Unexpected release or imminent release of a hazardous material.
10. Unexpected chemical exposures to workers or the public.
11. A safety-related complaint from the public regarding URS activities.
12. Incidents that could result in adverse public media interest concerning URS or a URS project.
13. Any incident that could or does result in an actual investigation by state, federal, provincial, or local regulatory or law enforcement agencies.
14. Any other significant occurrence that could impact safety, including a near-miss.

    Note: A near-miss is defined as an incident having the potential to cause significant injury or property damage as listed above, but did not. Examples of a near-miss include:

    a. A worker steps off a ledge, falls 3 feet (1 meter) to the floor, and is uninjured.
    b. A crane drops a 1,000-pound (454-kilogram) beam during a lift. Nobody is hurt, and no equipment is damaged.
    c. A work crew is conducting a survey along the highway. A vehicle leaves the roadway (driver asleep) and the vehicle enters the survey area at 50 miles per hour (80 kilometers per hour). The vehicle misses an employee by 3 feet (1 meter); the driver recovers control of the vehicle and leaves the area.

B. Actions: The following actions will be taken following a reportable incident:

1. Employees:

    a. If necessary, suspend operations and secure and/or evacuate the area.

b. Immediately notify your supervisor and/or project manager.

c. Contact appropriate emergency services and obtain appropriate medical attention, as required or directed by your supervisor. For additional information, refer to SMS 065 – Injury and Claims Management.

d. Record information pertaining to the incident (e.g., time, date, location, name and company of person(s) involved, witnesses, description of event, and actions taken) and initiate Attachment 049-1 NA – Incident / Near Miss Report. (Note: The international operations of URS Division will complete an on-line Incident Report instead, using the appropriate Health, Safety, and Environment (HSE) and Quality Improvement database).

e. Submit this information to your supervisor and/or Project Manager within 24 hours of the incident.

f. Assist with incident investigation as directed by management.

g. Implement corrective actions as directed by management.

h. *Do not* discuss the incident with members of the news media or legal representatives (except URS legal counsel or your personal legal advisor) unless directed to do so by URS management.

i. *Do not* make statements pertaining to guilt, fault, or liability.

2. Line/Project Management Responsibilities (U.S. and Mexico Operations)

   a. For instances involving employee or subcontractor death or hospitalization, or equipment damage to Company or customer equipment valued at more than $100,000 (USD), immediately notify by telephone or other direct means URS/EG&G Operations and the HSE team in the order listed below. If any level of contact is unsuccessful, continue down the list in sequence. After notification has been made, a detailed follow-up, via email, is required.

      i. Appropriate corporate leadership for the affected program up to the Regional Business Unit (RBU) or

Strategic Business Unit (SBU) Vice President for the affected Operations.

ii. The URS Occupational Health Manager (OHM).

iii. Appropriate RBU and SBU HSE Manager for the affected Operation.

Follow-up notification should be made by forwarding Attachment 049-1 NA to the OHM within 24 hours. See Attachment 049-1 NA for methods of distribution. Also, assure copies of the report are distributed as outlined on the form. For the international operations of URS Division, this follow-up notification is not required.

URS/EG&G Division HSE Management will make notification to federal and state authorities as appropriate.

b. For minor incidents involving only first aid treatment, minor damage to vehicle or equipment, etc., make notifications to a supervisor and OHM immediately and submit Attachment 049-1 NA to the OHM. See Attachment 049-1 NA for methods of distribution. Also, assure copies of the report are distributed as outlined on the form.

c. For a near-miss incident, complete Attachment 049-1 NA and submit to the OHM as soon as reasonable. Also, ensure copies of the report are distributed as outlined on the form.

d. Review circumstances (i.e., who, what, when, where, and how) of the incident with applicable employee(s) to determine apparent causes and to develop recommended corrective actions.

e. Discuss with department or project staff the circumstances surrounding the incident and corrective actions taken.

3. Line/Project Management Responsibilities (Canadian Operations)

a. If notified of an incident that is a critical injury (see Supplemental Information A for definition), serious accident, or other significant consequence:

i. Immediately contact URS Canada Human Resources at (905) 882-4401.

ii. Review circumstances (i.e., who, what, when, where, and how) of the incident with applicable employee(s) to determine apparent causes and to develop recommended corrective actions.

iii. Follow up notification by completing, signing, and delivering/faxing Attachment 049-1 NA to URS Canada Human Resources within 24 hours.

iv. URS Canada Human Resources will make notification to provincial authorities as appropriate.

b. If notified of an incident that is not a critical injury, nor a serious accident or other significant consequence:

i. Review circumstances (i.e., who, what, when, where, and how) of the incident with applicable employee(s) to determine apparent causes and to develop recommended corrective actions.

ii. Complete, sign, and deliver/fax Attachment 049-1 NA to URS Canada Human Resources within 24 hours.

iii. URS Canada Human Resources will make notification to provincial authorities as appropriate.

c. If notified of a near-miss incident:

i. Review circumstances (i.e., who, what, when, where, and how) of the incident with applicable employee(s) to determine apparent causes and to develop recommended corrective actions.

ii. Complete, sign, and deliver/fax Attachment 049-1 NA to URS Canada Human Resources as soon as practicable.

d. Discuss with department or project staff the circumstances surrounding the incident and corrective actions taken.

4. Local Office, Project, and/or Certified HSE Representative

a. Assist with incident evaluation.

b. With management, identify cause(s) of incident and identify corrective actions needed to avoid recurrence.

c. Review injury/incident report or the near-miss report for completeness and accuracy. Ensure the reports are distributed properly.

d. Ensure notifications are made in a timely manner.

e. Ensure that the injured employee is properly counseled/advised as directed by SMS 065 – Injury and Claims Management. Communicate with the OHM.

f. Note that "Certified" HSE Representatives are those who have received special training in occupational safety and health and have been certified by the Ontario Workplace Safety and Insurance Board. Certified HSE Representatives should be used at larger Canadian project sites where joint worker/employer safety committees are developed.

5. Occupational Health Manager

   a. Report work-related injuries and illness to workers' compensation carrier.

   b. Ensure that the employee's injury is managed in accordance with SMS 065 – Injury and Claims Management. Provide guidance for the affected office, project, and/or Certified HSE Representative.

   c. Periodically disseminate near-miss reporting summary information to the Regional, RBU/SBU, and Division HSE Managers.

6. URS Human Resources (Canadian Operations Only)

   a. Receive incident notifications from staff.

   b. For incidents involving critical injuries, serious accidents, or other significant consequences:

      i. Verbally notify the Office Manager immediately, via cell phone if necessary.

ii. Notify the Certified HSE Representatives (management and worker) as soon as possible (where necessary).

iii. Notify the OHM as soon as possible. Notification to the OHM should in no case occur later than the end of the work shift.

iv. Follow up notification by receiving from staff and forwarding Attachment 049-1 NA to the OHM within 24 hours. Also, assure copies of the report are distributed as outlined on the form.

c. For minor incidents involving only first aid treatment, minor damage to vehicle of equipment, etc.:

i. Notify the OHM as soon as reasonable during normal business hours.

ii. Receive from staff and forward Attachment 049-1 NA to the OHM within 24 hours.

Ensure copies of the report are distributed as outlined on the form.

d. Report work-related injuries and illness to the Workplace Safety and Insurance Board or appropriate workers' compensation carrier and other provincial or federal authorities as appropriate.

e. Ensure, in conjunction with the Office HSE Representative, that the employee's injury is managed in accordance with SMS 065 – Injury and Claims Management. Provide guidance for the affected Certified or Project HSE Representative.

f. Periodically disseminate near-miss reporting summary information to the Regional and Division HSE Managers.

7. Division HSE Management

a. Notify URS management of any significant occurrence, including lost-time injuries, deaths, or other serious result or circumstance.

b. The OHM will review all reported incidents to determine OSHA reporting and recording requirements with input from the appropriate Division HSE Manager. For a determination of recordability in those infrequent instances where there is not a clear answer, the Vice President of HSE will make the final determination. All decisions will be based strictly on current U.S. Occupational Safety and Health Administration (OSHA) regulations.

c. Official records (including required reports and logs for all reported incidents) will be maintained at one central location by the OHM.

d. Each January, the OHM will prepare and distribute the appropriate government injury/illness reports to each URS and EG&G establishment. These reports will summarize all required government information for incidents that occurred during the preceding calendar year.

5. Documentation Summary

File Attachment 049-1 NA in the appropriate safety files. Note that the international operations of URS Division will use the appropriate HSE and Quality Improvement database.

6. Resources

A. Occupational Health Managers (OHMs)

URS Division	EG&G Division
Jeanette Schrimsher, RN COHN-S	**BJ (Johnson) Heinrich, RN, BSN, COHN-S**
(866) 326-7321 (Toll Free-U.S.)	(866) 344-1415 (Toll Free-U.S.)
(512) 656-0203 (Cell)	(877) 878-9525 (Toll Free-International)
(512) 419-6413 (Confidential Fax)	(512) 656-8502 (Cell)
	(512) 419-5252 (Confidential Fax)

B. SMS 057 – Vehicle Safety Program

C. SMS 065 – Injury and Claims Management

D. SMS 066 – Incident Investigation

E. Attachment 049-1 NA – Injury/Near Miss Report Form

URS	Health, Safety and Environment **INCIDENT / NEAR MISS REPORT FORM**	Attachment 049-1 NA Issue Date: May 2001 Revision 7: February 2009

ADMINISTRATIVE INFORMATION

Database Office ID:

☐ URS Division	☐ EG&G Division
RBU:	SBU:
Region:	SBE Director:
Client Sector:	Program:

NOTIFICATION / LOCATION DATA

Site or Office:		Customer/Client Name:
Date of Event:	Time of Event:	Time Employee Started Work:
Date Supervisor Notified:	Time Supervisor Notified:	Name of Employee Submitting Report:
Client Notification Completed (if required)? ☐ Yes ☐ No		Project/Order Number:

TYPE OF EVENT (Check all applicable items)

Illness (Check one)
- ☐ Employee
- ☐ Subcontractor
- ☐ Other

Injury (Check one)
- ☐ Employee
- ☐ Subcontractor
- ☐ Other

NAME of Injured/Ill Employee: _____

Near Miss (Check the potential consequences):
- ☐ Injury
- ☐ Equipment Damage
- ☐ Property Damage
- ☐ Environmental release
- ☐ Other (describe)

Property Damage (Check one)
- ☐ Company (owned, leased, rented)
- ☐ Client/Customer
- ☐ Other

Vehicular Accident (Check one)
- ☐ Company (owned, leased, rented)
- ☐ Client/Customer
- ☐ Other

- ☐ Fire
- ☐ Explosion
- ☐ Flash
- ☐ Other (describe): _____

EVENT SUMMARY

Briefly state the facts contributing to the event. Attach additional pages and supporting information, as necessary. Avoid use of employees' names. *If this is an injury or illness, supply additional information as required on Page 2.*

ROOT CAUSE DETERMINATION

Root Cause (State the root or primary cause, then select the most appropriate cause category from Page 4):

CONTRIBUTING FACTORS

Contributing Causes (Describe any contributing causes, then select the applicable cause categories from Page 4):

CORRECTIVE ACTIONS

List methods of preventing/avoiding this type of incident/near miss in the future. There must be one or more corrective actions for each root cause.

NOTE: If this is a near miss report, no further information is required. Submit only the first page of the form. The preferred method of distribution of near miss reports is by e-mail attachment either in Word, or scanned to PDF. Forward URS near miss reports to incidentreport@urscorp.com. Alternatively, reports may be faxed to 512.419.6413.

Additional Distribution: ☐ Office/Site Manager ☐ Regional/SBE/SBU HSE Manager ☐ Office/Site HSE Representative

FOR INJURIES/ILLNESS ONLY

Employee Information

What was the employee's location when the injury/illness occurred (include city and state)?

What was the employee doing when the injury/illness occurred? Describe the activity as well as the tools, equipment, or material you were using.

What happened? Describe how the injury/illness occurred.

What was the injury or illness? Describe the part of the body that was affected and how it was affected. Use the Incident pick lists on Page 4 to aid in your description.

What level of medical treatment was received? ☐ First Aid ☐ Clinic/Physician ☐ Emergency Room ☐ Refused/None

List witnesses and/or other employees involved. Attach statements where applicable.

Do you feel URS/EG&G provided you with the proper safety instructions (including PPE usage) for the task you were performing at the time of the incident? ☐ Yes ☐ No (Explain below)

How do you think this type of incident could be prevented or avoided in the future?

Mark all PPE being used when the incident occurred:

☐ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☐ Safety Shoes
☐ Half-face Respirator	☐ Full-face Respirator	☐ Protective Gloves	☐ Chemical Gloves
☐ Hard Hat	☐ Hearing Protection	☐ Other (describe):	

Injured/Ill Employee Signature: _____ Date: _____

Name of Injured/Ill Employee (Please print clearly): _____

Employee Number: Contact Phone Number:

Additional Sheets Attached? ☐ Yes ☐ No (Include photos, maps, and/or diagrams when possible.)

Supervisor Information

Describe any additional/different details other than those provided on the previous page. Avoid use of employees' names, where possible. Attach additional sheets, drawings, or photos, as needed.

Were the required tools available at the time of the injury? ☐ Yes ☐ No (Explain below)

At the time of the injury, was the employee using the correct tools for the task? ☐ Yes ☐ No (Explain below)

Was the employee sent for substance screening? ☐ Yes ☐ No (Explain below)

How do you think this type of incident could be prevented or avoided in the future?

Supervisor Signature: _____ Date: _____

Supervisor Name (Please print clearly):

HSE Representative Comments

Signature: _____ Date: _____

Supervisor Name (Please print clearly):

Site/Office Manager Comments

Signature: _____ **Date:** _____

Supervisor Name (Please print clearly): _____

DISTRIBUTION

NOTE: *The preferred method of distribution of this report is by e-mail attachment either in Word, or scanned to PDF. Forward URS injury/illness reports to incidentreport@urscorp.com. Alternatively, reports may be faxed to 512.419.6413. Initial reports must be delivered within 24 hours of incident. More detailed follow-up reports may be submitted later.*

Additional Distribution: ☐ Program/Client Sector Manager ☐ Regional/SBE/SBU HSE Manager ☐ Office HSE Representative

ROOT CAUSE CATEGORIES

Check all cause categories that apply to the incident/near miss, then choose the root cause (or causes) category from the boxes checked. Enter where indicated on Page 1.

PHYSICAL/ENVIRONMENT

- ☐ Extreme cold/ice
- ☐ Extreme heat
- ☐ Working/walking surface unfavorable
- ☐ Inadequate lighting
- ☐ Excessive noise
- ☐ Chemical exposure
- ☐ Biological hazards (animal/plant)
- ☐ Other weather
- ☐ Other

SYSTEMS

- ☐ Inadequate training/instruction
- ☐ Inadequate management system
- ☐ Missing or incorrect procedures or planning
- ☐ Inadequate management emphasis on safety
- ☐ Corporate/operations procedures not communicated
- ☐ Other

PHYSICAL/EQUIPMENT, TOOLS, and PPE

- ☐ Failure due to improper maintenance
- ☐ Failure due to improper design
- ☐ Other

HUMAN

- ☐ Failure to adequately recognize hazards
- ☐ Failure to follow procedures
- ☐ Failure to recognize condition change
- ☐ Impaired state (drug, alcohol, other)
- ☐ Physical/psychological limitation for task
- ☐ Inadequate communications (i.e., supervisor/employee)
- ☐ Carelessness by affected person(s)
- ☐ Carelessness by other person(s)
- ☐ Improper selection of equipment/tool/PPE
- ☐ Improper use of equipment/tool/PPE
- ☐ Other

INCIDENT PICK LIST

NATURE OF INJURY/ILLNESS

- ☐ Amputation
- ☐ Burn
- ☐ Concussion
- ☐ Contusion/Abrasion
- ☐ Corneal Abrasion
- ☐ Dental
- ☐ Dermatitis
- ☐ Fatality
- ☐ Fracture
- ☐ Hearing Loss
- ☐ Heat-Related Illness
- ☐ Hernia
- ☐ Insect Bite
- ☐ Laceration/Puncture
- ☐ Other
- ☐ Respiratory Disorder
- ☐ Sprain/Strain

BODY PART

- ☐ Ankle/Foot
- ☐ Arm/Elbow
- ☐ Back
- ☐ Eyes
- ☐ Head
- ☐ Hip/Groin
- ☐ Internal Organs/Blood
- ☐ Leg/Knee
- ☐ Multiple Body Parts
- ☐ Neck/Cervical
- ☐ Respiratory
- ☐ Shoulder
- ☐ Trunk
- ☐ Wrist/Hand

DIRECT CAUSE

- ☐ Animal/Insect Contact
- ☐ Biological Agent
- ☐ Caught Between
- ☐ Ergonomics/Repetitive Trauma
- ☐ Exposure To
- ☐ Miscellaneous
- ☐ Motor Vehicle Wreck
- ☐ Overexertion
- ☐ Poisonous Plant
- ☐ Slips/Trips/Falls
- ☐ Struck Against
- ☐ Struck By

Per the Ontario Occupational Health and Safety Act, R.R.O. 1990, Regulation 834, a Critical Injury is defined as an injury of a serious nature that:

a. Places life in jeopardy;

b. Produces unconsciousness;

c. Results in substantial loss of blood;

d. Involves the fracture of a leg or arm but not a finger or toe;

e. Involves the amputation of a leg, arm, hand or foot, but not a finger or toe;

f. Consists of burns to a major portion of the body; or

g. Causes the loss of sight in an eye.

Per the British Columbia Workers Compensation Act, RSBC 1996, Chapter 492, a Critical Injury is defined as injury of a serious nature that includes the following:

a. Any incident that kills, causes risk of death, or seriously injures a worker;

b. Any blasting accident that results in injury, or unusual event involving explosives;

c. A diving incident that causes death, injury, or decompression sickness requiring treatment;

d. A major leak or release of a dangerous substance;

e. A major structural failure or collapse of a structure, equipment, construction support system or excavation; and any serious mishap.

URS SAFETY MANAGEMENT STANDARD 051
BLOODBORNE PATHOGENS

URS SAFETY MANAGEMENT STANDARD
Bloodborne Pathogens

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 (1) identify jobs and tasks where occupational exposure to bloodborne pathogens exists and (2) eliminate or significantly reduce the risk of infectious bloodborne diseases.

3. Procedures

The associated implementing regional procedures for this standard are included as attachments:

SMS 051 NA – North America

SMS 051 EU – UK and Ireland, Europe, and Middle East

SMS 051 AP7 – Asia Pacific

URS SAFETY MANAGEMENT STANDARD
Bloodborne Pathogens

1. Applicability

This standard applies to all operations of URS Corporation and its subsidiary companies, and to all employees who may incur exposure to blood or other potentially infectious body fluids as a result of performing their assigned job duties. Examples include: designated first aid and emergency responders, work assignment at a medical laboratory site, or janitorial work involving removal of red bag waste or sharps from medical facilities or clinics.

Sewage work does not typically involve exposure to bloodborne pathogens as covered under the Occupational Safety and Health Administration (OSHA) standard, even though other biological hazards may be present, and should be addressed in the task/job hazard analysis.

Employees serving on safety committees or who volunteer as first-aid–trained employees do not fall under the OSHA requirements for vaccination, but should have training on bloodborne pathogens as part of the curriculum of their first aid training.

2. Purpose and Scope

The purpose of this standard is to identify jobs and tasks where occupational exposure to bloodborne pathogens (e.g., Human Immunodeficiency Virus, that will eliminate or significantly reduce the risk of infectious bloodborne diseases in accordance with the OSHA Bloodborne Pathogen Standard (29 Code of Federal Regulations [CFR] 1910.1030). This standard also includes provisions for affected employees to receive personal protective equipment; Hepatitis B vaccinations; training; and if necessary, confidential medical evaluations and follow up.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility, site, or project location.

A. Program Administration – The Occupational Health Manager (OHM) and Vice President of Health, Safety, and Environment (or equivalent) of the Division is responsible for implementation and annual evaluation of the Exposure Control Plan (ECP) – Attachment 051-1 NA. The OHM will ensure that all medical actions required are performed, and that the appropriate employee health and OSHA records are maintained. The Vice President of Health, Safety, and Environment will oversee provisions of necessary personal protective equipment and supplies, training, documentation of training, and will make the written ECP available to employees and OSHA representatives.

4. Requirements

A. Risk Identification

1. The facility or site manager, with assistance from the site safety representative, will perform an exposure determination concerning which employee may or may not have exposure to bloodborne pathogens. Employees will be classified into two categories:

    a. Employees formally designated as part of their job to perform tasks that may involve direct contact with blood or potentially infectious body fluids.

        i. Requires initial and annual training

        ii. Hepatitis B vaccination series will be offered

        iii. Requires procedures be followed in ECP.

    b. Employees not assigned to jobs or tasks that involve exposure to blood or potentially infectious body fluids, but who could in extraordinary situations, voluntarily assist injured or ill individuals, and therefore could have exposure to bloodborne pathogens.

        i. Requires post-exposure procedures outlined in ECP.

2. The ECP will be reviewed and updated at least annually, and whenever necessary to include new or modified tasks and procedures. The ECP will be reviewed by non-managerial employees responsible for direct patient care who are potentially exposed to injuries from contaminated sharps. These employees will be trained in the identification, evaluation, and selection of effective engineering and work practice controls.

B. Exposure Control Methods

1. All employees will use universal precautions—an approach to infection control where all human blood and body fluids are treated as potentially infectious.

2. Use engineering and work practice controls (e.g., sharps disposal containers, perform procedures to prevent splashing) to eliminate or minimize exposure to employees.

3. Provide personal protective equipment (e.g. disposable gloves, face masks with eye protection, liquid impermeable gowns, CPR

pocket masks) and ensure use in order to place a barrier between the employee and the blood or body fluids.

4. Wash hands immediately with soap and water after removing gloves or performing any work with blood or body fluids.

5. Perform housekeeping and decontamination of work surfaces with U.S. Environmental Protection Agency (U.S. EPA)-registered germicides, or a bleach solution diluted 1:10 with water, as needed, to maintain a safe working environment.

6. Dispose of regulated biohazardous waste (contaminated sharps or items that are capable of releasing blood or body fluids through employee handling) in special waste receptacles lined with red bags, and incinerate per federal and state regulations. This does not include small amounts of waste from a minor wound, which can be sealed in a plastic bag and disposed of in a solid waste receptacle.

C. Provide the Hepatitis B Vaccination series to all employees who have been designated to perform tasks that involve direct exposure to bloodborne pathogens. Further, make this vaccination series immediately available to employees who have had an occupational bloodborne exposure incident, whether as a result of their assigned tasks, or occurring as a result of incidental contact.

   An employee who declines the vaccination must sign the wavier form located at the end of Attachment 051-1.

D. In the event that an employee is exposed to blood or body fluids, they should immediately flush the affected area with copious amounts of water. Arrange a confidential medical evaluation and follow-up with an occupational physician for the employee as soon as possible following the report of an exposure incident; preferably within 1 to 2 hours after the exposure incident has occurred.

E. Hazard Communication

   1. Use orange-red biohazard warning labels to identify lab areas or disposal containers with blood or other potentially infectious materials present.

   2. Conduct initial and annual training classes for all employees assigned to tasks where occupational exposure may occur.

F. Exposure Incident Investigation

The OHM and HSE Manager will review the circumstances of each exposure incident to determine if the appropriate work procedures were being followed at the time of the incident, and to assess and implement any necessary corrective actions, including changes required in the ECP.

5. Documentation Summary

A. Post-exposure medical records from consulting physician and exposure incident reports will be retained in employee's confidential medical record

B. Initial and annual training records

C. Regulated infectious medical waste manifest records will be stored by the site safety representative

6. Resources

A. U.S. OSHA 29 CFR 1910.1030 Occupational Exposure to Bloodborne Pathogens Standard, current revision.

B. Centers for Disease Control Morbidity and Mortality Weekly Report: "Public Health Service Guidelines for the Management of Health-Care Worker Exposure to HIV and Recommendations for Post-exposure Prophylaxis"

C. Centers for Disease Control Morbidity and Mortality Weekly Report: "Immunization of Health-Care Workers: Recommendations" December 26, 1997; Vol. 46, No. RR-18.

D. Centers for Disease Control Morbidity and Mortality Weekly Report: "Recommendations for Prevention and Control of Hepatitis C Virus (HCV) Infection and HCV-Related Chronic Disease" October 16, 1998; Vol. 47, No. RR-19.

E. Bloodborne pathogens standard and the construction industry (OSHA letter of interpretation 01-26-93)

F. Clarification on first aid requirements for hazardous waste sites (OSHA letter of interpretation 04-20-93)

G. SMS 024 – Medical Screening and Surveillance

H. Attachment 051-1 NA – Bloodborne Pathogens Exposure Control Plan

1. Introduction

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

2. Exposure Determination

The Medical Surveillance Evaluation form (Attachment 024-2) will be used to evaluate which employees may incur occupational exposure to blood or other potentially infectious materials when performing routine tasks and procedures. These exposure determinations will be made without regard to the use of personal protective equipment, and regardless of exposure frequency.

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

- Occupational health nurse
- Paramedics
- Registered nurses
- Designated first aid providers
- Medical laboratory employees
- Janitorial workers in medical facilities and clinics.

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

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

3. Exposure Control

A. "Universal precautions" are a required method of control to prevent exposure to blood and body fluids. This term refers to the concept that all human blood and certain human body fluids are treated as if known to be infectious for HIV, HBV, HCV, and other bloodborne pathogens, regardless of the perceived risk status of another individual. Universal precautions apply to blood, other body fluids containing visible blood,

semen, and vaginal fluids. Universal precautions do not apply to feces, nasal secretions, saliva, sweat, tears, sputum, urine, and vomitus unless they contain visible blood. Although these fluids have an extremely low or nonexistent risk for bloodborne pathogens, they are a potential source for other infectious diseases, and precautions must also be followed when these body fluids are present.

B. Engineering and Work Practice Controls

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

1. Accessible handwashing facilities. If soap and running water are not available, an antiseptic hand cleaner in conjunction with clean paper towels or antiseptic towelettes are acceptable temporary alternatives to running water. When this alternative method is used, employees must wash their hands with soap and running water as soon as feasible.
2. Containers for disposable contaminated sharps must be puncture-resistant, labeled a biohazard, leakproof, and have a closable top.
3. Containers for storage, transport, or shipment of blood or other potentially infectious materials, regulated waste, and contaminated laundry will be labeled with the biohazard symbol and site address, and have a securely closing lid.

Engineering controls will be reviewed and maintained on a regular basis to ensure effectiveness.

The following work practice controls must be strictly followed to minimize exposure, and isolate or remove bloodborne pathogens from the workplace:

1. Personal protective equipment will be provided at no cost to the employee, and will be chosen based on the anticipated exposure to blood. PPE is considered appropriate if it does not permit blood or other potentially infectious materials to reach or pass through clothes, skin, or mucous membranes of the eyes or mouth under normal conditions of use, and for the duration of time the equipment will be used. PPE must be readily accessible and will be removed prior to leaving the work area.
    a. Disposable single-use gloves must be used as a protective barrier in all situations in which contact with body fluids is anticipated. Gloves of the correct size will be provided. Disposable gloves will not be washed or disinfected for reuse, and will be replaced between employees, and if they become torn or punctured. Gloves are especially important

if the employee has cuts, abraded skin, chapped hands, or dermatitis.

b. Liquid-impermeable gowns, boots, and masks, in combination with eye-protective devices such as goggles and shatterproof glasses with solid-side shields or chin-length face shields, must be worn whenever splashing, spraying, or spattering of blood droplets or body fluids can be reasonably anticipated.

c. Disposable pocket mask ventilation devices must be provided in all first aid kits and used to avoid mouth-to-mouth contact during emergency cardiopulmonary resuscitation.

Examples of Recommended PPE (depending on task, more PPE may be needed).

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

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

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

4. All regulated biohazardous waste will be placed in a waste receptacle that has designated red biohazard bags and a closable top controlled by a foot peddle. When full, the bags shall be removed with gloved hands, tied off, and placed in a biohazard shipping carton, to be held for pick-up. If any biohazard bag appears to be leaking, it must be double-bagged. The waste will be incinerated per federal and state regulations.

B. Housekeeping

1. Universal precautions must be used when cleaning or decontaminating any surface or equipment that may be

contaminated. Appropriate PPE must be used for protection during decontamination.

2. All contaminated environmental work surfaces such as countertops or floors will be cleaned with a household bleach solution diluted 1:10 with water directly following contamination with blood or body fluids.
3. Instruments such as tweezers, bandage scissors, and thermometers must be disposable rather than reusable equipment, and must be disposed of in an appropriate manner.
4. Broken, contaminated glassware must not be picked up directly with the hands. It must be cleaned up using a mechanical means such as a brush and dustpan or tongs.

4. Hepatitis B Vaccination

Within 10 working days of placement, all employees assigned to tasks with potential occupational exposure to bloodborne pathogens must be offered the Hepatitis B vaccination at no cost to the employee, unless the employee has had a previous Hepatitis B vaccination series, antibody testing reveals the employee is immune, or the vaccine is contraindicated for medical reasons. Further, this vaccination series must be made immediately available to employees who have an occupational exposure, whether as a result of their assigned tasks, or occurring from an incidental contact.

The local occupational medical facility used for routine medical surveillance will administer the vaccinations.

Employees who decline the Hepatitis B vaccine must sign a copy of the waiver form located at the end of this attachment. The signed waiver will be stored in the employee's medical record with the Occupational Health Manager. Employees may initially decline the vaccination, but may decide to take them at a later date, while still covered under this plan. The vaccinations will be made available to the employee at that time.

Employees choosing to take the vaccination series will sign a consent form at the occupational clinic prior to receiving the injections, and are advised to read the package insert regarding the efficacy, safety, method of administration, and benefits of the vaccine. Employees may also ask questions directly of the Medical Service Provider or local occupational physician. Employees are not required to participate in a prescreening program (to determine immunity) before receiving the vaccinations. If a routine booster of Hepatitis B vaccine is recommended by the U.S. Public Health Service at a future date, such booster dose(s) will be made available to affected employees.

5. Post-Exposure Incident Evaluation And Follow-Up

All occupational bloodborne pathogen exposures must be reported to the HSE representative and Occupational Health Manager immediately after initial decontamination first aid is accomplished. Following the report of an exposure incident, a confidential medical evaluation with an occupational physician will be arranged as soon as possible, ideally no later than 1 to 2 hours after the incident has occurred. In some states, depending on applicable workers' compensation law, employees may choose treatment from their personal physician. A copy of the OSHA Bloodborne Pathogen Standard will be provided if the physician does not have a copy. A written incident report must be completed as soon as possible, fully describing the incident.

A. First aid protocol for treatment immediately after an exposure incident:

1. Lacerations, punctures, and abrasions should be washed under cool running water for at least 5 minutes, allowing free bleeding. Cleanse area well with soap or iodine solution. Apply sterile dressing as needed. Give tetanus booster if indicated (7 to10 years since last booster).
2. Ocular exposure requires irrigation of the eye with water or sterile normal saline solution for 15 minutes.
3. Mucous membrane exposure requires rinsing mouth with ½ strength 3 percent hydrogen peroxide for 30 seconds, four separate and consecutive times.

B. Confidential Medical Evaluation

1. The treating occupational physician will receive documentation of the routes of exposure, the circumstances surrounding the incident, and identification of the source individual (the individual the employee was exposed to). The blood of the source individual will be tested if possible, and after consent is obtained. When legally permissible, results of the source individual's tests will be made available to the exposed employee, with the exposed employee informed about the applicable laws and regulations concerning the disclosure of the identity and infectivity of the source individual.
2. Testing of the exposed employee's blood, if consented to (the employee may consent to baseline blood collection, but may request that the sample not be tested for HIV for up to 90 days, if at all), is recommended.
3. Post-exposure medical treatment will be offered in accordance with the current recommendations of the U.S. Public Health Services. This may include, but is not limited to:
    a. A series of HIV post-exposure blood tests

b. Hepatitis B vaccination and/or Hepatitis B immune globulin

c. HIV post-exposure prophylactic medications

d. Evaluation of acute febrile illnesses following exposure

e. Employee counseling concerning precautions to take during the period after the exposure incident, and information on signs and symptoms of potential illnesses.

C. Healthcare Professional's Written Opinion

The Occupational Health Manager must obtain and provide the employee with a copy of the evaluating physician's written opinion within 15 days of the completion of the medical evaluation. A copy will be maintained in the employee's confidential medical record. The written opinion must be in accordance with the requirements of the OSHA Bloodborne Pathogens Standard indicating that the employee has been informed of any medical conditions resulting from exposure that require further evaluation or treatment. All other findings or diagnoses must remain confidential and will not be included in the report.

6. Hazard Communication

A. Fluorescent red or orange-red warning labels bearing the universal biohazard symbol and the legend BIOHAZARD must be firmly affixed to all containers (e.g., waste cans, sharps containers, and refrigerators) used for the storage or shipment of blood or other potentially infectious materials.

B. All employees designated to perform tasks involving occupational exposure must receive bloodborne pathogens training at the time of initial assignment to the job. This training will be given during working hours and at no cost to employees. Refresher courses will be provided annually (within 1 year of previous training), and if new tasks or procedures are implemented. Material appropriate in content and vocabulary to education level, literacy, and language of the employees must be used for all required training.

Training will include: making accessible a copy of the regulatory text of the standard and explanation of its contents, general discussion on bloodborne diseases and their transmission, exposure control plan, engineering and work practice controls, personal protective equipment, Hepatitis B vaccine, response to emergencies involving blood, how to handle exposure incidents, the post-exposure evaluation and follow-up program, signs/labels/color-coding, and question and answer time with the trainer.

7. Exposure Incident Investigation

The site Health and Safety Representative will review the circumstances of any exposure incident to determine corrective actions. The incident report will include:

A. Engineering controls in use at the time

B. Work practices followed

C. A description of any equipment being used

D. A description of the work being performed

E. PPE that was used at the time of the incident

F. Date, time, and location of the incident

G. Employee's training.

Within 24 hours, a copy of this incident report will be forwarded to the Occupational Health Manager, who will evaluate what follow-up actions should be addressed, including if revisions need to be made to the Exposure Control Plan.

8. Recordkeeping

A. The Occupational Health Manager will be responsible for establishing and maintaining accurate, confidential workers' compensation medical records for each employee with occupational exposure for the duration of employment plus 30 years, in accordance with OSHA 29 CFR 1910.1020 – Access to Employee Exposure and Medical Records.

B. The HSE representative will be responsible for maintaining the bloodborne pathogens training class records for at least 3 years from the date of training. The records will include the date of the training class, a summary of the class contents, the names of the qualified instructors, and the names and job titles of personnel attending the training.

C. Employee medical records must be made available to employees (or their designated representative) with written consent by the employee within 15 working days of request.

D. An exposure incident will be evaluated by the Occupational Health Manager and Vice President of Health, Safety, and Environment to determine if the case meets OSHA's Recordkeeping Requirements (29 CFR 1904).

HEPATITIS B VACCINATION DECLINATION FORM

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

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

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

Name _____

Date _____

Witness _____

Date _____

URS SAFETY MANAGEMENT STANDARD 056
DRILLING SAFETY GUIDELINES

URS SAFETY MANAGEMENT STANDARD
Drilling Safety Guidelines

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 an overview for working safely around drilling operations with truck-mounted and other engine-powered drill rigs. The procedure addresses off-road movement of drill rigs, overhead and buried utilities, use of augers, rotary and core drilling, and other drilling operations and activities.

3. Procedures

The associated implementing regional procedures for this standard are included as attachments:

SMS 056 NA – North America, UK and Ireland, Europe, and Middle East

SMS 056 AP7 – Asia Pacific

URS SAFETY MANAGEMENT STANDARD
Drilling Safety Guidelines

1. Applicability

This standard applies to URS Corporation and its subsidiary companies on projects using truck-mounted or other engine-powered drill rigs. The primary responsibility for drilling safety is with the drilling contractor.

2. Purpose and Scope

The purpose of this standard is to provide an overview for working safely around drilling operations with truck-mounted and other engine-powered drill rigs. The procedure addresses off-road movement of drill rigs, overhead and buried utilities, the use of augers, rotary and core drilling, and other drilling operations and activities. More detailed drilling safety guidelines are provided in the document *Environmental Remediation Drilling Safety Guidelines*.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility, site, or project location.

Drill rig safety and maintenance is the responsibility of the drill rig operator. Drilling subcontractors must be qualified in accordance with SMS 046 – Subcontractor Health and Safety Requirements.

4. Requirements

A. General Safety Guidelines

URS technicians, geologists, engineers, or other field staff assigned to oversee drilling operations or collect soil samples will observe the following guidelines:

1. Require a meeting at project startup regarding the drill rig operator's responsibility for rig safety, and any site- and equipment-specific safety requirements.

2. Set up any sample tables and general work areas for the URS field staff at a distance of at least the height of the fully extended mast plus 5 feet (1.52 meters), and no less than 30 feet (10 meters) from the rig.

3. URS engineers, technicians, and geologists will limit their assistance to the drillers with the drilling equipment or supplies, and will not at any time operate the drill rig controls except to activate the emergency shutoff, if needed.

4. Require that all rotary drilling equipment have an emergency shut off/ kill switch. The location of the switch should be reviewed with all field staff.

B. Movement of Drill Rigs

1. Before moving a rig, the operator must do the following:

   a. To the extent practical, walk the planned route of travel and inspect it for depressions, gullies, ruts, and other obstacles.

   b. Check the brakes of the truck/carrier, especially if the terrain along the route of travel is rough or sloped.

   c. Discharge all passengers before moving on rough or steep terrain.

   d. Engage the front axle (on 4x4, 6x6, etc., vehicles) before traversing rough or steep terrain.

2. Driving drill rigs along the sides of hills or embankments should be avoided; however, if side-hill travel becomes necessary, the operator must conservatively evaluate the ability of the rig to remain upright while on the hill or embankment. The possibility must be considered that the presence of drilling tools on the rig may reduce the ability of the rig to remain upright (raises the center of mass of the rig).

3. Logs, ditches, road curbs, and other long and horizontal obstacles should be approached and driven over squarely, not at an angle.

4. When close lateral or overhead clearance is encountered, the driver of the rig should be guided by another person on the ground.

5. Loads on the drill rig and truck must be properly stored while the truck is moving, and the mast must be in the fully lowered position.

6. After the rig has been positioned to begin drilling, all brakes and/or locks must be set before drilling begins. If the rig is positioned on a steep grade and leveling of the ground is impossible or impractical, the wheel of the transport vehicle must be blocked and other means employed of preventing the rig from moving or toppling over.

C. Buried and Overhead Utilities

1. The location of overhead and buried utility lines must be determined before drilling begins, and the locations should be noted on boring plans and/or assignment sheets.

2. When overhead power lines are close by, the drill rig mast should not be raised unless the distance between the rig and the nearest power line is at the minimum distance stated in SMS 034 – Utility Clearances and Isolation. The drill rig operator or assistant should walk completely around the rig to make sure that adequate clearance exists.

3. The rig operator should be aware that when the drill rig is positioned near an overhead line, hoist lines and power lines can be moved towards each other by wind. When necessary and approved by the project manager, the utility and/or power lines may be shielded, shut down, or moved by the appropriate personnel.

4. Before performing work, for additional information, please refer to SMS 034 – Utility Clearances and Isolation.

D. Clearing the Work Area

1. Before a drill rig is positioned to drill, the area on which the rig is to be positioned must be cleared of removable obstacles and the rig must be leveled if it is sloped. The cleared/leveled area should be large enough to accommodate the rig and supplies.

E. Safe Use of Augers

1. Never place hands or fingers under the bottom of an auger flight or drill rods when hoisting the augers or rods over the top of another auger or rod in the ground or other hard surfaces, such as the drill rig platform.

2. Never allow feet to get under the auger or drill rod while they are being hoisted.

3. When the drill is rotating, stay clear of the drill string and other rotating components of the drill rig. Never reach behind or around a rotating auger for any reason.

4. Move auger cuttings away from the auger with a long-handled shovel or spade; never use hands or feet.

5. Never clean an auger attached to the drill rig unless the transmission is in neutral or the engine is off, and the auger has stopped rotating.

6. Do not wear loose clothing or jewelry while working near the drill rig. Long hair must be pulled back to avoid entanglement with moving parts.

7. Hearing protection is required when working near an operating drill rig.

F. Rod Separation

1. Do not use manual tools (e.g., pipe wrenches) in combination with rotation of the drill stem. Manual tools are not designed for the load, and may break. The use of such tools creates a significant impact hazard for those in the work area, because they rotate with the drill stem. URS does not permit drillers to use manual tools in combination with a rotating drill stem to break rods. Manual tools may be used if the drill stem is isolated/positively disengaged.

2. Mechanical means of rod separation that are permitted include:

   a. Opposing hydraulic controls.

   b. Rod locking devices.

   c. Hydraulic breakout tools.

   d. Hydraulic foot clamps.

G. Safe Use of Hand Tools

Review SMS 064 – Hand Safety for information regarding hand tools in addition to the guidelines provided below:

1. Use each tool to perform only tasks for which it was originally designed.

2. Repair damaged tools before use, or discard them.

3. Wear safety goggles or glasses when using a hammer or chisel. Nearby co-workers and bystanders are required to wear safety goggles or glasses also, or move away.

4. Clean tools and store them in an orderly manner when they are not in use.

H. Safe Use of Wire Line Hoists, Wire Rope, and Hoisting Hardware

1. Whenever wire line hoists, wire rope, or hoisting hardware are used, the safety rules described in Title 29 Code of Federal Regulations (CFR) 1926.552, and guidelines contained in the Wire Rope User's Manual published by the American Iron and Steel Institute, will be followed. The driller will provide written reports (upon request) documenting inspections of equipment.

I. Traffic Safety

1. Drilling in streets, parking lots, or other areas of vehicular traffic requires definition of the work zones with cones, warning tape, etc., and compliance with local police requirements. Refer to SMS 032 – Work Zone Traffic Control.

J. Fire Safety

1. Fire extinguishers (type ABC) will be kept on or near drill rigs for fighting small fires.

2. If methane or other flammable gases or vapors are suspected in the area, a combustible gas indicator (CGI) will be used to monitor the air near the borehole, with all work to stop at 20 percent of the Lower Explosive Limit (LEL).

3. Work must stop during lightning storms.

K. Drilling at Potential MEC/UXO Sites

If the project site is suspected of containing munitions and explosives of concern (MEC) or unexploded ordnance (UXO), the UXO team will conduct a reconnaissance and MEC/UXO avoidance to provide clear access routes to each site before drilling crews enter the area. The following procedures will be implemented:

1. Drilling operations on an MEC/UXO site will not be conducted until a complete plan for the site is prepared and approved by the URS UXO Safety Officer. MEC/UXO avoidance must be conducted during drilling operations on known or suspect MEC/UXO sites. Refer to SMS 039 – Munitions Response/Munitions and Explosives of Concern.

2. The UXO team will identify and distinctly mark the boundaries of a clear approach path for the drilling crews, vehicles, and equipment to enter the site. This path will be, at a minimum, twice the width of the

widest vehicle. No personnel will be allowed outside any marked boundary.

3. If MEC/UXO is encountered on the ground surface, the UXO team will clearly mark the area where it is found, report it to the proper authorities, and divert the approach path around it.

4. The UXO team will conduct an access survey using the appropriate geophysical instrument over the approach path for avoidance of MEC/UXO that may be in the subsurface. If a magnetic anomaly is encountered, it will be assumed to be MEC/UXO, and the approach path will be diverted around the anomaly. UXO personnel only will operate the appropriate geophysical instrument and identify MEC/UXO.

5. An incremental geophysical survey of the drill-hole location(s) will be initially accomplished by the UXO team using a hand auger to install a pilot hole. If MEC/UXO is encountered or an anomaly cannot be positively identified as inert material, Hazardous, Toxic, and Radioactive Waste (HTRW) sampling personnel will select a new drill-hole location.

6. Once the surface of a drilling site has been cleared and a pilot hole established as described above, the drilling contractor will be notified that the site is available for subsurface drilling.

7. Additional guidance for MEC/UXO support during drilling activities is provided in SMS 039 – Munitions Response/Munitions and Explosives of Concern.

L. Protective Gear

1. Minimum Protective Gear

   At a minimum, items listed below must be worn by all staff working within 30 feet (10 meters) of drilling activities.

   a. Hearing protection.

   b. Hard hat.

   c. Eye protection (safety glasses, goggles, or face-shield).

   d. Safety shoes (steel-toed shoes or boots).

2. Other Gear

   Items listed below must be worn when conditions warrant their use. Some of the conditions are listed after each item.

   a. Safety Harnesses and Lifelines: Safety harnesses and lifelines must be worn by all persons working on top of an elevated derrick beam or mast. Lifelines should be secured at a position that will allow a person to fall no more than 6 feet (2 meters). OSHA Fall Protection (1926 Subpart M) requirements apply. Refer to SMS 040 – Fall Protection for additional information.

   b. Life Vests: Life vests must be used for work over water. Refer to SMS 027 – Work Over Water for additional information.

5. Resources

A. International Association of Drilling Contractors Safety Alerts http://iadc.org/alerts.htm

B. U.S. Occupational Safety and Health Administration (OSHA) Standard Fall Protection – 29 CFR 1926 Subpart M

C. U.S. OSHA - 29 CFR 1926.552, Material Hoists, Personnel Hoists and Elevators

D. Environmental Remedial Safety Drilling Guidelines

E. SMS 026 – Noise and Hearing Conservation

F. SMS 027 – Work Over Water

G. SMS 032 – Work Zone Traffic Control

H. SMS 034 – Utility Clearances and Isolation

I. SMS 039 – Munitions Response/Munitions and Explosives of Concern

J. SMS 040 – Fall Protection

K. SMS 046 – Subcontractor Health and Safety Requirements

L. SMS 064 – Hand Safety

URS SAFETY MANAGEMENT STANDARD
Vehicle Safety Program

1. Applicability

This standard applies to the operations of URS Corporation and its subsidiary companies.

This standard applies to employees operating motor vehicles that are owned, rented or leased by the Company, and the use of personal or government supplied vehicles while on Company business.

This SMS does not apply to heavy equipment operations.

2. Purpose and Scope

This standard defines the policies that help URS minimize losses, injuries, and legal liabilities associated with improper vehicle use.

3. Procedures

The associated implementing regional procedures for this standard are included as attachments:

URS Division

SMS 057 NA – North America, UK and Ireland, Europe, and Middle East

SMS 057 AP7 – Asia Pacific

Washington Division

SMS 057 WD

EG&G Division

SMS 057 EG&G

URS SAFETY MANAGEMENT STANDARD
Vehicle Safety Program

1. Applicability

This standard applies to the operations of URS Division of URS Corporation and its subsidiary companies.

This standard applies to employees who operate motor vehicles that are owned, rented, or leased by URS and to employees who use personal or government-supplied vehicles while conducting URS business. This safety management standard (SMS) does not apply to heavy equipment operations (see SMS 019 – Heavy Equipment Operations).

2. Purpose and Scope

This standard defines the policies that help URS minimize losses, injuries, and legal liabilities associated with improper vehicle use. This policy also provides information for required training and makes all applicable employees aware of their respective duties and obligations when driving on URS business.

The standard applies to operations worldwide. For countries outside the United States, some terminology may need to be read in the context of local or national regulations.

3. Implementation

The overall responsibility for this standard implementation is with the URS Office Manager. Additional responsibilities are as follows:

Fleet Management	Participation in the Vehicle Safety Program, vehicle acquisition, insurance claims reporting, controlling access to vehicles, maintenance of vehicles, and participation in accident review processes.
Human Resources	Documentation of driver's license upon hire, and participation in accident review processes when necessary and any related performance management issues.
Health and Safety	Employee safety training, maintenance of the Vehicle Safety Program, and participation in accident review processes.
Employee	Familiarization with URS Vehicle Safety Program and compliance with its requirements.

4. Requirements

A. Authorized Drivers

1. Authorized Drivers are those individuals permitted to drive URS-owned, -rented, or -leased vehicles, and employees driving a personal vehicle for work purposes.

2. The Authorized Driver must be at least 18 years of age (noncommercial license) or 21 years of age (commercial license) and have a current driver's license for the appropriate class of vehicle (unless more stringent requirements are established by the leasing/renting agency). Employees with conditional licenses are prohibited from operating vehicles on URS business.

3. Human Resources/Administration will conduct an authorized background check, which includes a driving record, and will obtain a copy of the state-issued driver's license for all Authorized Drivers during the new hire process. The employee will not be permitted to be an Authorized Driver if the background check indicates legal action involving alcohol or drug use (e.g. driving under the influence [DUI]), a driving without a license violation, or a hit-and-run/leaving the scene of an accident within the past two years.

   URS employees that are Authorized Drivers will produce their driver's license upon request at any time. Authorized drivers who lose their driver's license through legal action or are otherwise unauthorized to drive *must* notify their Human Resources Representative immediately. The Human Resources Representative will notify the Fleet Manager, Office Manager, and Health, Safety and Environment (HSE) Representative of this employee's loss of authorization to drive for URS.

4. All Authorized Drivers will be asked annually to attest to their ability and authorization to drive. At that time, Authorized Drivers must attest that they understand the duties and responsibilities of an Authorized Driver and that the employee remains in good standing with his or her local Department of Motor Vehicles. If there is a change in an employee's status, it is the responsibility of the employee to immediately contact his or her Human Resources Representative.

5. Authorized drivers must

    a. Review SMS 057 – Vehicle Safety Program.

    b. Report any conviction for driving under the influence of drugs or alcohol to the Human Resources Representative responsible for the employee's office or operation.

    c. Complete vehicle safety training, including the URS online training module and other sanctioned driving courses described in Section 4.B, Training.

    d. Report all accidents. If the Authorized Driver has an accident in a vehicle owned, rented, or leased by URS, the accident must be reported to the Office Manager within 24 hours. Attachment 049-1 and Attachment 057-1 forms must be completed and submitted to the Fleet Manager and the Regional Health, Safety, and Environment (HSE) Manager (see Attachment 049-1 and Attachment 057-1 for reporting instructions).

    e. Cooperate with any URS investigation concerning the accident.

    f. Complete remedial driver safety training described in Section 4.B.3 as appropriate following an accident.

6. Non-URS employees (e.g., subcontractors, alliance partners) may operate URS-owned, -leased, or -rented vehicles only when this activity is specifically agreed to in the applicable contract and only within the parameters of the contract and project plans.

7. For URS operations or offices that plan vehicle use that requires compliance with Federal Motor Carrier Regulations, the affected manager directing operations at the facility or site must obtain approvals from the URS Vice President of Health, Safety, and Environment and the Fleet Manager. This requirement typically applies to vehicles with a gross vehicle weight over 10,000 pounds, vehicles carrying more than 15 passengers, or vehicles used for hazardous materials transport. The driver must have an appropriate commercial driver's license and may be subject to medical surveillance (see SMS 024 – Medical Screening and Surveillance).

8. Only Authorized Drivers can be reimbursed mileage for the use of their personal vehicle on URS business. Requests for reimbursements for mileage by nondesignated drivers may be denied.

B. Training

1. Within 1 month of their hire date, Authorized Drivers will complete basic driver safety training, including a review of the URS Vehicle Safety Program (SMS 057) and the 30-minute online Learning Management System (LMS) Vehicle Safety training module.

2. Authorized Drivers will complete the 4-hour web-based defensive driving training program provided through the National Safety Council (NSC). Other defensive driving training programs that are equivalent or exceed the NSC training (i.e., the Smith Driving System) may be substituted by approval of the Regional HSE Manager. The internet web site for the NSC training is located at http://www.safetyserve.com/urscorp. Use **URSDDC** as the access code. *All URS Authorized Drivers will complete this web-based defensive driver training or equivalent training by 2010.*

3. Additional training is required for employees who have been involved in a work-related, at-fault vehicle accident where $2,000 in damages was sustained or when the accident included a police citation. This additional training will be in the form of a behind-the-wheel training equivalent to the Smith Driving System.

C. General Operating Policy and Procedure (Applies to Authorized Drivers and Passengers Operating Motor Vehicles on Official URS Business)

1. Only properly licensed employees who are specifically authorized to drive URS vehicles may operate motor vehicles owned, rented, or leased by URS.

2. Authorized drivers required to operate vehicles with special hazards (i.e., trucks carrying fuel cells, vehicles used to tow trailers, vehicles with limited visibility, etc.) will be thoroughly briefed on the hazards and control measures necessary for safe operation of the vehicle. The local URS operation will maintain documentation of the briefing.

3. Drivers/operators will know and obey all federal, state, and local motor vehicle laws applicable to the operation of their vehicle.

4. A driver will not permit unauthorized persons to operate a vehicle owned, rented, or leased by URS.

5. URS policy regarding reimbursement and insurance coverage requirements for use of personal automobiles may be found in the Policies and Procedures Manual (Section 074.020). Only Authorized Drivers may be reimbursed mileage for the use of a personal vehicle.

6. Personal vehicles driven by Authorized Drivers for business use must satisfy the state's registration and inspection requirements and may not be modified beyond manufacturer's specifications.

7. All cargo extending 4 feet or more beyond the end of a truck, trailer, or similar vehicle will be clearly marked with a red warning flag or cloth measuring no less than 16 inches square. Red lights must be used at night.

8. URS-owned, -rented, or -leased vehicles are for official business use only and are not to be used for personal activities. Exceptions to this requirement can be made only with the specific approval of a Division Manager, Senior Vice President, or the URS Fleet Manager.

9. Seat belts and shoulder harnesses (occupant restraint systems) will be worn or used whenever the vehicle is in operation. The vehicle may not move until all passengers have fastened their restraints. Vehicles are not to be operated or used by URS employees if seatbelts are not included as part of the vehicle's safety equipment.

10. When parking or leaving a vehicle, the following procedures must be followed: Shut off the engine, engage the transmission in park (automatic transmission) or first gear (standard transmission), set the parking brake, remove the ignition keys, and lock the vehicle.

11. The vehicle's engine is to be turned off during refueling. Smoking or cellular phone use is not allowed while refueling.

12. Drivers/operators will not drive or operate vehicles while under the influence of alcohol or illegal drugs. Additional details on the URS Substance Abuse Policy are available in the Policies and Procedures Manual (Section 034.030).

13. Drivers/operators will not drive or operate vehicles while under the influence of medications when told by a physician, another

healthcare provider, or the manufacturer (i.e., instructions on the label) that the activity is unsafe.

14. Vehicle operators are responsible for any fines levied by law enforcement agencies for the operation of their vehicles.

15. Driver/operators may not deactivate or muffle any backup warning device.

16. Distractions while driving are a major cause of accidents. Distractions include the use of cellular phones (including texting), eating, drinking, smoking, and engaging in intense conversations. URS Authorized Drivers must exercise proper control of the vehicle at all times, including the management of possibly distracting actions and behaviors. If you have to eat, pull over and park. If you become engaged in an intense conversation to the point of distraction, pull over and park or end the conversation.

17. *The use of cellular phones/devices, including cellular phones with hands-free devices, while driving is prohibited.* If you need to make a call on a cellular phone, pull over and park in a safe area. This prohibition includes text messaging and other wireless devices (e.g., Blackberries).

18. The use of motorcycles on URS business is prohibited.

D. Field/Site Vehicle Safety

1. Define specific vehicle travel routes and parking areas at field sites. Use fencing, cones, or other markings to define roads and parking. SMS 032 – Work Zone Traffic Control provides additional information.

2. If parking on the shoulder of an active road, park as far off the road as possible.

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

4. URS will not transport DOT-placard quantities of hazardous materials. However, small quantities of hazardous materials (e.g., sample coolers) may be transported if properly packaged. Take precautions to prevent chemical contamination of the vehicle.

Further details on DOT shipping may be found in SMS 048 – Hazardous Materials/Dangerous Goods Shipping.

5. Nuclear density meters (e.g., Troxler units) may be transported only by employees who have been trained in the use of nuclear density meters (see SMS 044 – Radiation Safety for Portable Gauges). Nuclear density meters must be secured from movement and locked during transport. Nuclear Regulatory Commission (NRC) and state-specific regulations regarding transport documentation also apply.

6. When performing fieldwork that requires the blocking of traffic lanes (e.g., bridge inspection), follow SMS 032, the Manual on Uniform Traffic Control Devices for Streets and Highways (American National Standards Institute D6.1), and local police requirements for barriers, cones, and flaggers.

7. No employee may ride in the bed of a pickup truck unless seating and restraints are provided for this specific use.

8. Articles, tools, equipment, etc. placed in vehicles will be stored so as not to interfere with vision or the proper operation of the vehicle in any way. All items in the vehicle must be secured to prevent them from flying about or out of the vehicle during sudden stops, turning, etc.

9. Trucks or vehicles with obstructed rearview mirrors must observe the following procedures when backing up: Position an employee to act as a spotter at the rear of the vehicles, in the driver's line of sight, to ensure that the area behind the truck is clear. If no other employee is present, then the driver must step out of the vehicle and check the area behind the vehicle before backing up. As an added precaution, avoid backing up whenever possible.

10. All uncontrolled intersections (no traffic lights or traffic signs) will be treated as a four-way stop. The driver will exercise extreme caution at uncontrolled intersections.

11. URS drivers carrying more than 15 passengers will perform route planning using Journey Management Plan – Attachment 057-2 NA. Route planning will address hazards associated along the intended route, including lack of traffic controls, speed, and hazards associated with road conditions, weather, visibility, and other threats. Route planning will be verified by the Office or Site Manager.

12. On buses and vehicles capable of carrying more than 15 passengers, no passengers may ride in a seat in the driver's row, which would otherwise impede the driver's lateral visibility.

E. Accident Response and Reporting

1. In case of injury, call or have someone else call 9-1-1 immediately for emergency assistance. If you are involved in an accident and are not injured, the following requirements apply:
    a. Protect the accident scene.
    b. Do not admit liability or place any blame for the accident.
    c. Provide only your name, address, driver's license number, and vehicle insurance information.
    d. Complete the Auto Claim Report – Attachment 057-1 NA and obtain the following information:
        i. Name(s), addresses, and telephone number(s) of the owner(s).
        ii. Name(s) of the driver and any occupants of other vehicle(s).
        iii. The owner's insurance company.
        iv. Driver's license number.
        v. Year, make, model, and license number of the vehicle(s).
        vi. Name(s) and addresses of any witnesses.
    e. DO NOT
        - Make any admissions of guilt or culpability.
        - Call the insurance company; the Fleet Manager's office will do this (unless the incident involves your personal vehicle).
        - Give a statement to the press.
        - Give a signed statement to the claims adjuster representing the other driver's insurance company.

    Note: The Auto Claim Report for vehicles owned or leased by URS is located in the vehicle glove compartment. The driver must complete this form at the scene of the accident.

2. Notification

   All accidents with a URS-owned, -rented, or -leased vehicle or with a personally owned vehicle used for business must be reported to your Office Manager within 24 hours of the time of the accident. The Auto Claim Report must be completed and distributed as instructed on the form. Additionally, for motor vehicle accidents involving injured parties, the Incident/Near Miss Report Form – Attachment 049-1 NA must be completed.

F. Accident Review

1. A violation of this vehicle safety standard is subject to disciplinary action, including termination. The Fleet Manager will review all accidents involving URS-owned, -rented, or -leased vehicles.

2. URS may suspend the privilege to operate vehicles on URS business because of noncompliance with the URS Vehicle Safety Program, involvement in a motor vehicle accident, or resulting citations or other legal actions associated with motor vehicle violations. Personnel authorized to suspend an employee's status as an Authorized Driver include the following:

   a. A Project Manager with responsibility for dedicated vehicles on a site. The suspension is applicable to those site vehicles only.

   b. A URS Operations Manager responsible for the employee.

   c. The URS Fleet Manager.

   d. The Vice President of Health, Safety, and Environment.

3. The employee's driving privileges *will be* suspended for any of the following:

   a. Accidents or legal action involving alcohol or drug use (e.g., driving under the influence [DUI]).

   b. Driving without a license.

   c. Hit-and-run driving or leaving the scene of an accident.

   d. Unauthorized use of URS vehicles (i.e., using a URS vehicle for moving personal items, carrying passengers who are not associated with work activities, etc.).

4. The employee's driving privileges *may be* suspended for any of the following:

    a. Two or more at-fault accidents involving the same Authorized Driver within a 12-month period.

    b. Multiple complaints from other employees or members of the public about driving performance.

    c. Any accident caused by a URS Authorized Driver where damages exceed $2,000.

    d. Failure to comply with the cellular phone use policy.

    e. Gross misconduct or violation of policy.

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

    a. For any suspension resulting from law enforcement agency legal action involving drugs and alcohol on the part of the former Authorized Driver, driving privileges may be reinstated only by concurrent agreement from the URS Operating Unit Manager, the URS Fleet Manager, the Vice President of Health, Safety, and Environment, and the appropriate Human Resources Regional Manager.

    b. For those Authorized Driver's privilege suspensions that are not related to driving under the influence of drugs or alcohol, privileges may be reinstated with concurrent agreement by the URS Operating Unit Manager, the Vice President of Health, Safety, and Environment, and appropriate Human Resources Regional Manager upon completion of required remedial training (see Section 4.B.3).

6. Disciplinary action may include the following:

    a. Loss of URS driving privileges.

    b. Additional driver safety training (required for at-fault accidents resulting in more that $2,000 in damages, but optional for all other accidents). Refer to Section 4.B, Training.

    c. Disciplinary warning.

d. Termination.

G. Inspection

1. The driver is responsible for inspecting the vehicle prior to use and not driving a vehicle with obvious safety defects.

2. Basic safety checks must include the following:

a. Tire condition/pressure.

b. Lights/turn signals.

c. A clean windshield and adequate window washer fluid.

d. Gauges/warning lights indicating a normal condition.

e. Mirrors properly adjusted.

f. Brakes with adequate pedal pressure for proper braking.

Any defects must be reported to the local office Fleet Representative or Office Administrator.

H. Vehicle Maintenance

1. The Office Administrator (or designee) is to ensure that all vehicles owned or leased by URS are properly maintained.

2. Routine maintenance must be performed in accordance with the schedule provided in the owner's manual stored in the vehicle.

3. Reported defects/problems with vehicles must be repaired promptly.

5. Documentation Summary

The following documentation will be maintained in the office/project file:

A. Auto Claim Reports

B. Journey Management Plans

6. Resources

A. National Safety Council, Information on Defensive Driving Courses
http://www.nsc.org/psg/ddc.htm

B. AAA Foundation for Traffic Safety
http://www.aaafts.org/

C. Smith Driving System
http://smith-system.com/

D. 4-Hour Defensive Driver Training
http://www.safetyserve.com/urscorp password: URSDDC

E. American National Standards Institute (ANSI) D6.1 – Manual on Uniform Traffic Control Devices for Streets and Highways

F. SMS 019 – Heavy Equipment Operations

G. SMS 024 – Medical Screening and Surveillance

H. SMS 032 – Work Zone Traffic Control

I. SMS 044 – Radiation Safety for Portable Gauges

J. SMS 048 – Hazardous Materials/Dangerous Goods Shipping

K. SMS 049 – Injury/Illness/Incident Reporting and Notifications

L. Attachment 057-1 NA – Auto Claim Report

M. Attachment 057-2 NA – Journey Management Plan

URS	Health, Safety and Environment **AUTO CLAIM REPORT**	Attachment 057-1 NA Issue Date: February 2001 Revision 6: February 2009

To be used for **all** vehicle accidents involving URS-leased/rented/owned vehicles and for personal vehicles used on company business.

Name of Employee Involved in Accident _____

Was the employee injured? Yes No **Job Title:** _____

Was anyone else injured? Yes No **Details:** _____

Office Location _____ **Date of Accident** _____

Employee Phone/Cell # _____ **Office Phone #** _____

Describe injury (including medical treatment, if any):

Company Vehicle
Personal Vehicle

On Company business at the time of accident? Yes No
Vehicle Identification Number (company or personal):

Rental Vehicle
Government or Customer Vehicle
Year _____ Make _____ Model _____

Other Driver's Information

Name _____ Phone Number _____
Address _____
Insurance Co. _____ Policy # _____
License Plate # _____ Make _____ Model _____

Description of Accident

Time of Accident _____ Police Report # _____
Location of Accident _____ Police Department _____
Description (provide a clear, inclusive description of the accident):

_____
_____
_____
_____

Accidents should be reported immediately to the Office Manager, Regional HSE Manager and:

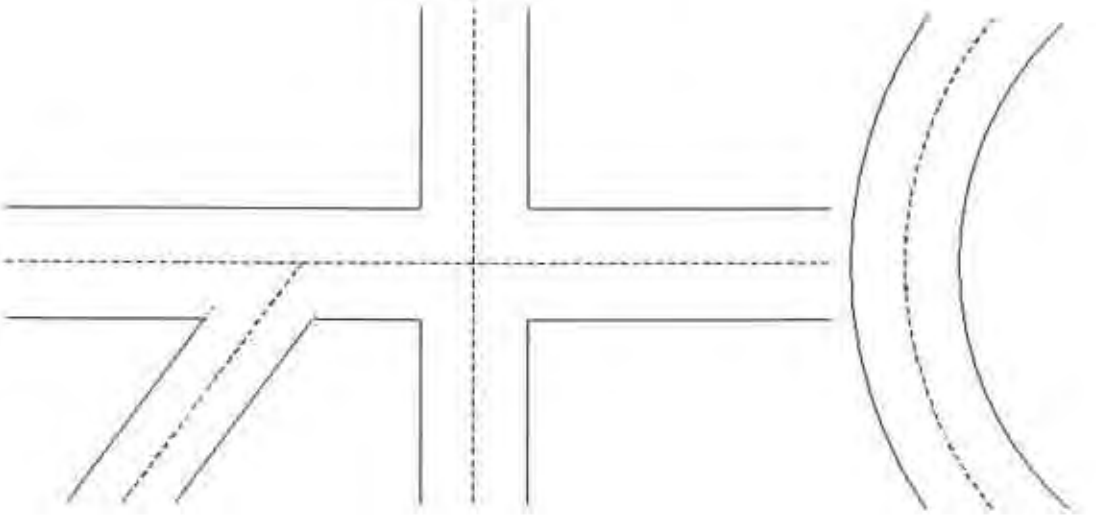
All accidents occurring outside the US will be reported to the Regional HSE Manager.

All accidents occurring in the US will be reported to:
PHH
Phone 800 446 7052 Fax 410 771 6181
e-mail: reporting@phh.com

URS	Health, Safety and Environment **AUTO CLAIM REPORT**	Attachment 057-1 NA Issue Date: February 2001 Revision 6: February 2009

To be used for **all** vehicle accidents involving URS-leased/rented/owned vehicles and for personal vehicles used on company business.

Draw a diagram showing the position of vehicles before and after the accident. Correct the diagram to fit your situation. Attach police report if available.



Check all applicable conditions on each subject

WEATHER	LIGHTING	ROAD SURFACE	ROAD DESCRIPTION
Clear	Daylight Dark	Dry	Straight Curve
Cloudy	Dusk Dawn	Wet	Level
Fog	Dark - no street lights on	Muddy	Hill Up Down
Rain	Dark - street lights on	Snowy	Paved Black top
Snow	Headlights	Snow-covered	One-way
Sleet	Headlights on dim	Ice in places	Two-way
Other	Headlights on bright	Ice -covered	Divided road
	No lights on	Other	Intersection

ACTION OF DRIVER	You	Other
Exceeding safe speed		
On wrong side of street		
Did not have right-of-way		
Disobeyed traffic signal		
Passed illegally		
Improper turning		
Improper backing		
Following too closely		
Failure to signal		
Improper lane change		
Misjudged clearance		
Other		

URS	Health, Safety and Environment AUTO CLAIM REPORT	Attachment 057-1 NA Issue Date: February 2001 Revision 6: February 2009

To be used for **all** vehicle accidents involving URS-leased/rented/owned vehicles and for personal vehicles used on company business.

What was speed limit?

_____ MPH

Witnesses?

Yes No

Traffic control

Signal lights
Caution lights
Stop sign
Police officer
None Other

Witness Name _____
Address _____
_____
_____

Name _____
Address _____
_____
_____

URS	Health, Safety and Environment **JOURNEY MANAGEMENT PLAN**	Attachment 057-2 NA Issue Date: February 2001 Revision 6: February 2009

Commencement Point	Destination Point

Issue #: 1 Date:

ROUTE DIRECTIONS	**PERSONAL PROTECTIVE EQUIPMENT**
TIME AND DISTANCE, ROUND TRIP	**SPECIAL INSTRUCTIONS** 1. Do not use cell phone or two-way communication devices while driving. 2. Use three points of contact when entering/exiting the cab. 3. Everyone has the authority and responsibility to stop work if conditions are unsafe. 4. Do not drive while under the influence of medication, drugs or alcohol. 5. Do not drive when you are fatigued.
SITE HAZARDS	
ROUTE HAZARDS	**EMERGENCY INFORMATION**
DESTINATION ENTRY INSTRUCTIONS	**EMERGENCY CONTACT NUMBERS** Fire/Ambulance/Police:
DESTINATION HAZARDS	**SITE CONTACT NUMBERS** Site Manager:
	Safety Manager:
DESTINATION EXIT INSTRUCTIONS	**CURRENT TRIP INFORMATION UPDATE**
RETURN JOURNEY	

ROUTE MAP

URS SAFETY MANAGEMENT STANDARD
Hand Safety

1. Applicability

This standard applies to the operations of URS Corporation and its subsidiary companies.

2. Purpose and Scope

This standard is intended to protect employees from activities that may expose them to injury when working with materials or equipment that presents the potential for hand injury.

3. Procedures

The associated implementing regional procedures for this standard are included as attachments:

SMS 064 NA – North America, UK and Ireland, Europe, and Middle East

SMS 064 AP7 – Asia Pacific

URS SAFETY MANAGEMENT STANDARD
Hand Safety

1. Applicability

This standard applies to URS Corporation and its subsidiary companies where the potential for hand injuries is present.

Appropriate gloves must be worn when persons work with materials or equipment that presents the potential for hand injury due to sharp edges, corrosives, flammable and irritating materials, extreme temperatures, splinters, etc.

2. Purpose and Scope

This standard is intended to protect employees from activities that may expose them to injury. This standard provides information on recognizing those conditions that require personal protective equipment (PPE) or specific work practices to reduce the risk of hand injury.

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. Hazard Assessment

1. Perform hazard assessments for those work activities likely to require PPE.

    a. Use the PPE Hazard Assessment Certification Form – Attachment 029-1 NA to perform the assessment. The Hazard Assessment Certification Form will accompany URS personnel at jobsites for use in the event of a job or task change.

    b. Reevaluate completed hazard assessments when the job or task changes.

2. If possible, eliminate the hazards identified through engineering or administrative controls. Examples of controls are chemical substitution, machine guarding, and use of different tools.

3. Select PPE that will protect employees if hazards cannot be eliminated.

    a. Review Material Safety Data Sheets for project or task-specific chemicals to determine appropriate PPE. If needed, consult with a URS safety representative for assistance.

b. Review glove manufacturer recommendations for both physical and chemical protection.

c. Obtain gloves of the correct size for project field staff.

d. When both chemical and physical protection is of concern, wear the chemical protection gloves (e.g., nitrile) inside the physical protection gloves (e.g., leather, Kevlar®).

e. Latex gloves are not recommended for chemical protection.

f. Do not wear metal or metal-reinforced gloves when working with electrical equipment or on electrical services. Proper leather and/or rubber gloves designed and tested for this purpose should be used.

4. Follow glove requirements in the project-specific safety plan.

B. Guidelines for Working With and Around Equipment (Hand Tools, Portable Powered Equipment)

1. General

a. Employees should be trained in the use of all tools.

b. Keep hand and power tools in good repair and use them only for the task for which they were designed.

c. Inspect tools before use and remove damaged or defective tools from service.

d. Operate tools in accordance with manufacturer's instructions.

e. Do not remove or bypass a guarding device for any reason.

f. Keep surfaces and handles clean and free of excess oil to prevent slipping.

g. Wear proper PPE, including gloves, as necessary.

h. Do not carry sharp tools in pockets.

i. Clean tools and return to the toolbox or storage area upon completion of a job.

j. Before applying pressure, ensure that wrenches have a good bite.

i. Brace yourself by placing your body in the proper position so you will not fall if the tool slips.

ii. Make sure hands and fingers have sufficient clearance in the event the tool slips.

iii. Always pull on a wrench, never push.

k. When working with tools overhead, place tools in a holding receptacle when not in use.

l. Do not throw tools from place to place or from person to person, or drop tools from heights.

m. Inspect all tools prior to start-up or use to identify any defects.

n. Powered hand tools should not be capable of being locked in the ON position.

o. Require that all power-fastening devices be equipped with a safety interlock capable of activation only when in contact with the work surface.

p. Do not allow loose clothing, long hair, loose jewelry, rings, and chains to be worn while working with power tools.

q. Do not use cheater pipes.

r. Make provisions to prevent machines from restarting through proper lockout/tagout (refer to SMS 023 – Lockout and Tagout Safety).

2. Cutting Tools

a. Always use the specific tool for the task. Tubing cutters, snips, self-retracting knives, concealed blade cutters, and related tools are task specific and minimize the risk of hand injury. For more information about cutting tools, see Supplemental Information A.

b. Fixed open-blade knives (FOBK) are prohibited from use. Examples of fixed open-blade knives include pocket knives, multitools, hunting knives, and standard utility knives.

c. When utilizing cutting tools, personnel will observe the following precautions to the fullest extent possible:

i. Use the correct tool and correct size tool for the job.

ii. Cut in a direction away from yourself and not toward other workers in the area.

iii. Maintain the noncutting hand and arm toward the body and out of the direction of the cutting tool if it were to slip out of the material being cut.

iv. Ensure that the tool is sharp and clean; dirty and dull tools typically cause poor cuts and more hazard than a sharp, clean cutting tool.

v. Store these tools correctly with covers in place or blades retracted, as provided by the manufacturer.

vi. On tasks where cutting may be very frequent or last all day (e.g., liner samples), consider Kevlar® gloves in the PPE evaluation for the project.

vii. Do not remove guards on paper cutters.

3. Moving/Rotating Equipment

   a. General Requirements for Rotating Equipment (feed augers, chippers, conveyors, etc.)

      i. Never place hands, fingers, or extremities near hoppers and operational areas of machinery.

      ii. When the equipment is rotating, stay clear of the rotating components and only operate equipment with proper machine guarding in place.

      iii. Never clean a jammed piece of equipment unless the transmission is in neutral and the power source or the engine is off, and the moving parts of the equipment have stopped rotating. Refer to SMS 023 – Lockout and Tagout Safety.

4. Other Physical Hazards

   a. Activities such as drum handling, fencing, work near razor wire, manhole cover removal, and demolition also pose hazards to hands.

   b. Plan work to avoid pinch points for hands when moving drums, moving manhole covers into position, and handling other heavy objects.

   c. Work handling scrap metal or other sharp edges requires proper hand PPE (Kevlar® or leather gloves).

C. Ergonomics – Hand and Wrist Care

1. Keep your wrist in neutral. Avoid using your wrist in a bent (flexed), extended, or twisted position for long periods of time. Instead try to maintain a neutral (straight) wrist position. Ergonomic tools may be needed for long-term work.

2. Watch your grip. Gripping, grasping, or lifting with the thumb and index finger can put stress on your wrist. When practical, use the whole hand and all the fingers to grasp an object.

3. Minimize repetition. Even simple, light tasks may eventually cause injury. If possible, avoid repetitive movements or holding an object in the same way for extended periods of time.

4. Reduce speed and force. Reducing the speed with which you do a forceful, repetitive movement gives your wrist time to recover from the effort. Using power tools helps reduce the force.

5. Rest your hands. Periodically give your hands a break by letting them rest briefly. Or you may be able to alternate easy and hard tasks, switch hands, or rotate work activities.

D. Biological Impacts

1. Poisonous Plants

   a. Personnel in regions where there is the potential for contact with poisonous plants should be aware of the hazard.

      i. Avoid contact with poisonous plants.

      ii. Wear appropriate PPE.

      iii. Clean hands thoroughly after contact before performing additional work tasks.

2. Further information can be obtained from SMS 047 – Biological Hazards.

E. Cleaning Hands

1. Avoid contamination of hands by proper use of gloves when contact with physical, chemical, or biological hazards is possible.

2. Use soap and water for normal hand cleaning. Do not use solvents for cleaning as they remove essential oils in the skin and may cause dermatitis. Do not use pressure washers for hand cleaning.

3. If the hands contact a corrosive (e.g., nitric acid), wash the area with water for fifteen minutes and then seek medical attention.

4. Use antibiotic ointment and skin protection on minor breaks/scratches of the skin.

5. Documentation Summary

The following documentation will be maintained in the project file:

A. Hand tool training records, as applicable.

6. Resources

A. U.S. OSHA Regulation - 29 Code of Federal Regulations (CFR) 1910.138 – Hand Protection

B. Chemical resistant glove selection: http://www.bestglove.com/

C. SMS 016 – Hand Tools and Portable Equipment

D. SMS 023 – Lockout and Tagout Safety

E. SMS 029 – Personal Protective Equipment

F. SMS 047 – Biological Hazards

G. SMS 054 – Office Ergonomics

H. SMS 056 – Drilling Safety Guidelines

7. Supplemental Information

A. Safer Alternative Tools

Types of safety knives or alternative cutting tools:

Self-retracting utility knives (brands – OLFA, Martor, Allway Tools)

Guarded utility knives (brands – The Safety Knife Co., Martor)

Shears, snips, scissors (brands – Ridgid, Craftsman, Wolfcraft)

Concealed blade cutters (brands – The Safety Knife Co., Martor)

Pipe cutters (brands – Ridgid, Empire)

Specialty cutter (brand – Geoprobe)

URS SAFETY MANAGEMENT STANDARD
Manual Material Handling

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 prevent common injuries caused by the practice of manual materials handling (MMH). For this procedure, MMH is defined as the movement of items by lifting, lowering, pushing, pulling, carrying, holding, or restraining.

3. Procedures

The associated implementing regional procedures for this standard are included as attachments:

SMS 069 NA – North America

SMS 069 EU – UK and Ireland, Europe, and Middle East

SMS 069 AP7 – Asia Pacific

URS SAFETY MANAGEMENT STANDARD
Manual Material Handling

1. Applicability

This standard applies to URS Corporation and its subsidiary companies where personnel perform manual handling of materials. For this procedure, manual material handling (MMH) is defined as the movement of items by lifting, lowering, pushing, pulling, carrying, holding, or restraining.

2. Purpose and Scope

The purpose of this standard is to prevent common injuries caused by the practice of MMH. Immediate or short-term effects include lacerations, bruises, and muscle fatigue. Long-term effects include chronic pain, frequently in the lower back but also in limb joints and ligaments.

3. Implementation

Implementation of this standard is the responsibility of the URS manager directing activities of the facility, site, or project.

4. Requirements

A. General

1. Prior to lifting, lowering, pushing, pulling, carrying, holding, or restraining an object of any significant size or weight, employees must evaluate the object and the required task to determine whether they can handle the object safely.
2. If the employee has any doubt about whether he or she can safely move the object alone, the employee should obtain additional manual or mechanical help.
3. Healthy employees with no physician-imposed restrictions should be able to lift and carry a maximum of 50 pounds (23 kilograms) using proper lifting and carrying techniques. Physical and workplace factors may reduce this recommended weight limit (RWL) significantly and should be considered prior to attempting lifts of this magnitude. Examples of physical and workplace factors may include the following:
    a. Physical size of an object.
    b. Slippery container surface or poor grip ability.
    c. Sharp edges.
    d. Slippery floors or obstacles on the floor.
    e. Cold or hot objects surfaces.
    f. Distance and route of travel.

4. An employee's personal "safe" MMH capability is defined as the employee's personal capability to manually lift, carry, push, or pull an object alone. This "safe" limit must consider the employee's past experience and training with MMH, health status, and any other personal or environmental characteristics affecting the employee's ability to perform these tasks. An employee's "safe" MMH capability is typically at or below the calculated RWL. In some cases, a trained and physically conditioned employee may exceed the MMH capability limit, but only after a complete hazard review of the task has determined an acceptable risk for minimizing injury.
5. An MMH task that exceeds an employee's personal "safe" MMH capability or RWL should be brought to the attention of the applicable manager or safety supervisor for the project.
6. If, due to a medical or health condition, the employee's physician or the employee has set a personal "safe" MMH capability, then appropriate medical documentation must be provided to the applicable manager to define these limits. The manager and appropriate safety supervisor should evaluate the tasks to which that employee is assigned and recommend a specific course of action to limit the potential for injury. This should include periodic monitoring of the employee and his/her work environment.
7. A recommended RWL can be calculated using the factors described in Supplemental Information A. The weight limit derived from these calculations is considered to be a load that over 99% of men and over 75% of women can safely handle without application of engineering or administrative controls. **Implementation of the calculations in Supplemental Information A should be attempted only with the assistance of a safety professional knowledgeable in the application of these factors. The calculations are intended to determine RWLs for repetitive lifting scenarios rather than occasional lifts.**
8. Prior to any manual lift, it is suggested that the employee warm up his or her muscles and joints using a combination of stretching and flexing.

B. Preplanning

1. Where MMH will be a necessary function of the task, the manager and/or safety supervisor should perform a thorough evaluation of the activities to determine ergonomic solutions to reduce or eliminate conditions that can cause or contribute to MMH injuries.

2. If a heavy object is to be moved to another location, the safest transport route should be determined prior to the activity.
3. The area around the object and the route over which it will be transported should be checked for slip, trip, and fall hazards. Hazards should be removed prior to initiation of the task.
4. The object to be moved should be inspected for grasping or handling hazards, such as slivers, sharp edges, grease, water, etc. Eliminate or abate any identified hazards where possible. Safe grasping or handling points on the object should be determined. Whenever possible, containers with carrying handles should be used for objects because they increase the manual grip strength for holding the object, thus providing better control and reduced muscle fatigue.
5. The distance to be traveled and the length of time that a grip on the object must be maintained should be considered before moving objects. If the travel distance is greater than 10 feet (3 meters) at maximum RWL, the employee should consider using an alternative method, rather than manually carrying the object.

C. Lifting/Lowering Guidelines

1. Reduce or eliminate manual lifting and lowering tasks where possible. Determine whether there are ways to abate the safety and ergonomic hazards associated with manual lifting.
2. The recommended technique for two-handed manual lifting/lowering involves five maneuvers:
    a. Get a firm footing. Keep your feet apart for a stable base. Put one foot slightly in front of the other.
    b. Bend your knees. Do not bend at the waist. When grasping the object, a firm grip should be obtained before lifting/lowering.
    c. Lift/lower with your legs. Lift/lower the load slowly and in a straight line, avoiding sudden movements.
    d. Keep the load close to the body. Generally, the closer the load is to the body, the less force it exerts on your back.
    e. Keep your back straight, your head and shoulders up, and your stomach muscles tights. Do not add the weight of your body to the load. Avoid twisting.

3. When a turn or change of direction is necessary, the object should be lifted or lowered into a carrying position, then the whole body should be turned with the feet, avoiding any trunk twisting motion.
4. Objects to be lifted to shoulder height should first be lifted to waist height, then rested on a level surface so the grasping position can be changed prior to lifting to a higher level.
5. Employees should never lift a load above their head.

D. Carrying/Holding Guidelines

1. Manual carrying is an inefficient way of transporting materials in the work place. Where possible, reduce or eliminate manual carrying tasks.
2. Never carry a load above the head.
3. Carry an object close to the body using both hands. One-handed carries are awkward and tend to unbalance the employee.
4. Do not carry objects that are so large they will obstruct visibility.
5. Do not change grips on an object while carrying or holding an object. Rest the object on a secure surface prior to changing grip.
6. If an object is of a size, shape, or mass that it requires two people to carry, use two people of similar size and physique. Two-person lifts should be planned and coordinated before performing the lift. Lift the item in unison.
7. Avoid carrying objects on stairs, particularly where the line of sight may be obstructed or the object can interfere with leg movement. All travel on stairs requires use of a handrail at all times, so only carry objects that can be safely handled with one hand. Always maintain handrail contact when carrying an object up or down stairs.

E. Pushing/Pulling Guidelines

1. Check the condition of the floor, ground, or other surface prior to pushing or pulling an object across it.
2. Be aware of the "break out" force of the object; this is the force at which a push or pull overcomes the frictional force between the surface and object. Adjust posture to avoid losing balance when this point is reached.
3. Get assistance when moving or guiding a large load.
4. Where possible, always push rather than pull a load.

5. Never load the cart or load-carrying device in such a manner that visibility is obstructed in the path of travel.
6. When pushing or pulling an object on an inclined surface, be certain that you can control the load and direction of travel before proceeding. Obtain additional support to control the load if necessary.
7. Never leave carts or loads in an area that will present a hazard to other workers. Make sure carts or transport devices are secured in position before leaving them unattended.

F. Workplace Design

1. Store heavy or bulky materials at heights between the knee and shoulder to avoid the need to stretch or bend. Use step stools to access objects above shoulder height.
2. Pack or arrange items to be lifted to avoid shifting of weight in the package. If a box has hand cutouts (e.g., file archive boxes) do not load the box so full that the handles cannot be used for carrying the box.
3. Design work areas to avoid the need to lift, carry, push, or pull heavy or bulky materials for extended distances.
4. Design workplaces with the following in mind:
    a. Lifts from the floor should be avoided.
    b. The torso should never twist while handling loads.
    c. Asymmetrical or unbalanced one-handed lifts should be avoided.
    d. Loads should not be lifted with sudden movements.
    e. Loads should not be lifted over obstacles.
    f. Loads should not be lifted at extended forward or sideway reaches.
    g. Uncomfortable or static postures should not be necessary throughout the work cycle.
    h. Environmental factors (e.g., task lighting, dry work surfaces, heat or cold stress) should be considered.

G. Training

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

a. Showing personnel how to avoid unnecessary physical stress and strain during MMH operations.
b. Teaching personnel to become aware of what they can comfortably handle without undue strain.
c. Instructing personnel on the proper use of equipment.
d. Teaching personnel to recognize potential hazards and how to prevent or correct them.

2. This training must be completed prior to an employee being assigned to a task that involves MMH activities.
3. Assistance with training or training materials is available through the HSE staff.

5. Documentation Summary

The following documentation will be maintained in the project file:

A. Training rosters.
B. Other proof of completion of MMH training.

6. Resources

A. National Institute for Occupational Safety and Health (NIOSH) – Work Practices Guide for Manual Lifting http://www.cdc.gov/niosh

B. Canadian Centre for Occupational Health and Safety http://www.ccohs.ca/oshanswers/ergonomics/

C. Oregon OSHA – Ergonomics of Manual Materials Handling http://www.cbs.state.or.us/external/osha/pdf/workshops/206w.pdf

D. North Carolina Department of Labor – A Guide to Manual Materials Handling and Back Safety http://www.nclabor.com/osha/etta/indguide/ig26.pdf

7. Supplemental Information

A. Recommended Weight Limit (RWL) Calculations

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

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

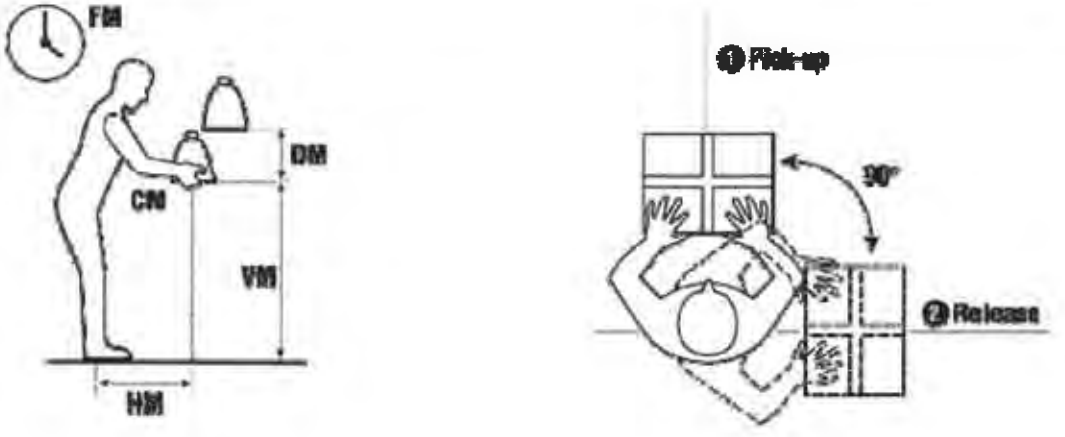
- The horizontal distance (H) the load is lifted (distance of hands from midpoint between ankles),
- The starting height of the hands from the ground (V),
- The vertical distance of lifting (D),
- The time between lifts or frequency of lifting (F),
- The angle of the load in relation to the body (e.g.,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

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

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

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

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



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

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

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

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

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

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

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

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

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

This equation applies to most workers for:

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

FACTORS USED IN RWL CALCULATIONS

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

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

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

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

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

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

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

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

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

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

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

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

URS SAFETY MANAGEMENT STANDARD
Behavior Based Safety

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 describe the URS approach to implementing our behavior based safety program.

Behavior based safety is a process that provides a higher level of safety excellence by promoting proactive responses, building ownership, and developing opportunities which relate to employee safety. A primary concept is that most accidents are due to unsafe behavior, and behavior changes may be made that significantly reduce accident risk.

3. Procedures

The associated implementing regional procedures for this standard are included as attachments:

SMS 072 NA – North America, UK and Ireland, Europe, and Middle East

SMS 072 AP4 – Asia Pacific

URS SAFETY MANAGEMENT STANDARD
Behavior-Based Safety

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 describe the URS approach to implementing our behavior-based safety program.

Behavior-based safety is a process that provides a higher level of safety excellence by promoting proactive involvement, building ownership, and fostering communication that relates to employee safety. A primary concept is that most accidents are due to at-risk behavior, and behavioral changes may be made that significantly reduce accident potential.

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. Definitions

1. At-Risk Behavior: Individual actions that increase the chance of injury, despite knowledge of the hazard. An example is excessive speed while driving.

2. Activators: Items that are intended to produce desired behaviors. URS activators for safety include, but are not limited to, policy statements, safety management standards (SMS), training, safety slogans, posters and signs, health and safety plans, safe work plans, safety meetings, and rules and regulations.

3. Behaviors: Visible actions on the part of individuals and can be characterized as safe (following health and safety plans, using work practices that minimize risk, coaching others on safe behavior, having safety as a priority over speed and convenience, etc.), or at-risk.

4. Consequences: Result of safe and at-risk behaviors, and can therefore be positive or negative. Examples of consequences include self-approval, reprimand, peer approval, penalty, feedback, inconvenience, and comfort. The most effective consequences are positive, immediate, and certain.

B. Values of Behavior-Based Safety

1. Employees hold safety as a core value.

2. Each employee feels responsible for the safety of their coworkers as well as themselves, and takes action accordingly.

3. Each employee is willing and able to "go beyond the call of duty" on behalf of the safety of others.

C. Roles for Safe Behavior

1. Supervisor's Role:

   a. Provide clearly defined safety expectations and encourage/reinforce the implementation of safety observations using the SMS 072-1 NA checklist or equivalent.

   b. Provide consequences for observed behaviors throughout the course of the work shift.

2. Co-Worker Role

   a. Intervene when observing at-risk behavior.

   b. Provide positive feedback for safe behavior.

   c. Volunteer to be observed.

C. Identification of At-Risk Behaviors

Observations and review of incident and near miss data will be used by URS Safety Officers to help identify at-risk behavior.

1. Employee observations.

   a. Observation checklists, either project-specific or Attachment 072-1 NA, will be used as a tool to help identify safe and at-risk behaviors and why the behavior(s) occurred.

   b. Employees will be instructed on using the checklists.

   c. Checklists will be included in the site-specific health and safety plan or the safe work plan.

   d. The checklists will include the expected safe behaviors.

e. Peers will complete the checklist for applicable work tasks.

f. Checklists may change throughout the project to include additional behaviors.

E. Feedback to Employees

1. Observers will immediately provide one-on-one feedback to the observed, noting both safe and at-risk behaviors.

2. Observer and observee will discuss the identified barriers to safe behavior, and potential solutions.

3. Near-Miss and Incident Reports will be reviewed to identify at-risk behaviors and corrective actions.

4. Management and Health, Safety, and Environment staff will verify compliance with this standard.

F. Feedback Follow-up

1. Observation checklists will be collected and discussed at periodic safety meetings.

2. The manager will review the trends for at-risk and safe behavior, and report the trends to the employees.

3. Project-specific trends are analyzed and areas of additional action are identified.

5. Documentation Summary

The following documentation will be maintained in the project file:

A. Behavior-Based Safety Checklists.

6. Resources

Attachment 072-1 NA – Behavior-Based Safety Checklist

URS	Health, Safety and Environment **BEHAVIOR BASED SAFETY CHECKLIST**	Attachment 072-1 NA Issue Date: September 2003 Revision 2: February 2009

Job Location: _____ Date: _____

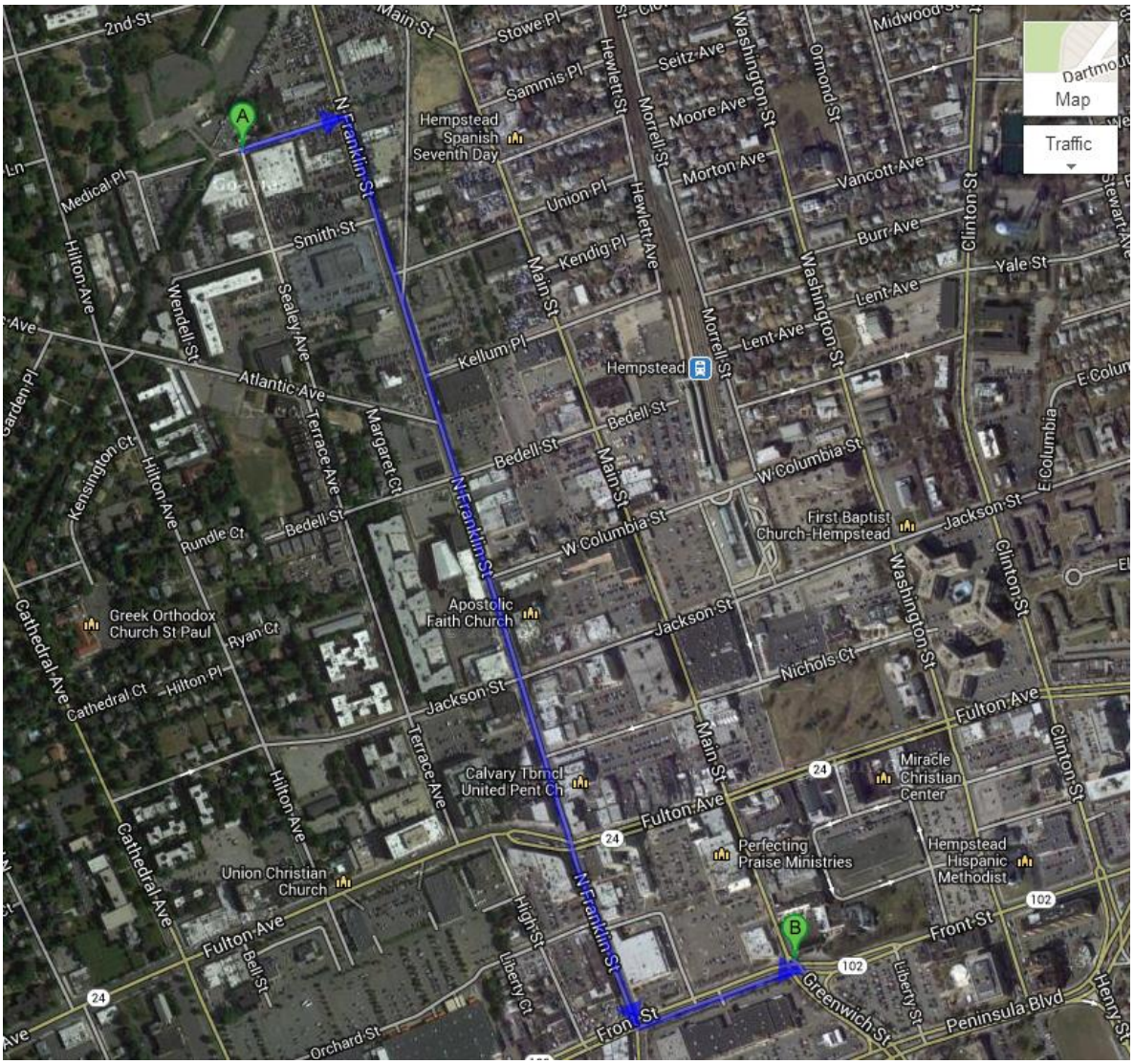
Task/Work Observed: _____ Observer: _____

	Safe	Unsafe	Comments *
Personal Protective Equipment			
Head	☐	☐	
Hand	☐	☐	
Feet	☐	☐	
Eyes/Face	☐	☐	
Skin	☐	☐	
Hearing	☐	☐	
Fall Protection	☐	☐	
Equipment / Tools			
Proper tool for the job	☐	☐	
Condition	☐	☐	
Proper Use	☐	☐	
Body Use / Position			
Lifting	☐	☐	
Pinch Point	☐	☐	
Ladder / stairs	☐	☐	
Hand placement	☐	☐	
Travel path / speed	☐	☐	
Body position	☐	☐	
Work Practices			
Follow Safety Plan / Procedures	☐	☐	
Housekeeping	☐	☐	
Other			
_____	☐	☐	
_____	☐	☐	
_____	☐	☐	

* Use comment column when unsafe behavior / conditions were observed. Describe what was observed and why this occurred.

ATTACHMENT 3
OCCUPATIONAL HEALTH CLINIC AND HOSPITAL ROUTE MAPS

OCCUPATIONAL CLINIC DIRECTIONS



Driving directions to Hempstead Main Medical Center

Intersection St
Hempstead, NY 11550

1. Head **east** on **Intersection St** toward **N Franklin St**

469 ft

2. Turn right onto **N Franklin St**

0.8 mi

3. Turn left onto **Front St**

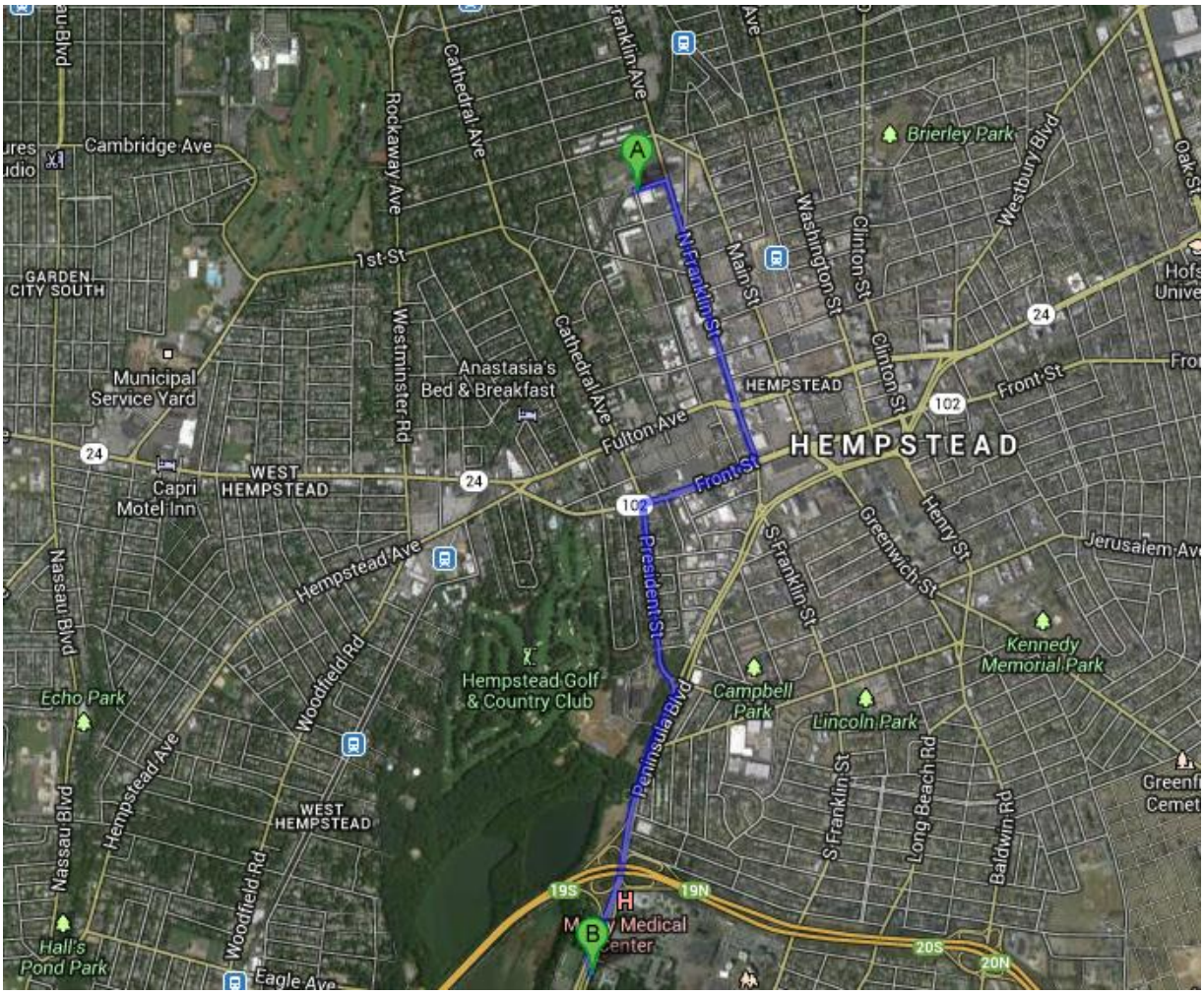
0.1 mi

4. Turn left onto **Main St**
Destination will be on the right

66 ft

Hempstead Main Medical Center
2 Main St
Hempstead, NY 11550

HOSPITAL DIRECTIONS



Driving directions to Mercy Hospital

Intersection St
Hempstead, NY 11550

1. Head **east** on **Intersection St** toward **N Franklin St** — 469 ft

2. Turn right onto **N Franklin St** — 0.8 mi

3. Turn right onto **Front St** — 0.3 mi

4. Turn left onto **President St** — 0.5 mi

5. Turn right onto **Peninsula Blvd** — 0.8 mi

6. Slight left toward **N Village Ave** — 272 ft

7. Continue straight onto **N Village Ave** — 30 ft

Mercy Hospital

ATTACHMENT 4

REAL TIME MONITORING INSTRUMENTATION SPECIFICATION SHEETS

DUSTTRAK™ Aerosol Monitor

The DUSTTRAK™ Aerosol Monitor measures aerosols in a wide variety of environments, from offices and industrial workplaces to outdoor environmental and construction sites. TSI's DUSTTRAK provides reliable exposure assessment by measuring particle concentrations corresponding to PM10, PM2.5, PM1.0 or respirable size fractions.

The DUSTTRAK is a portable, battery-operated laser photometer which gives you a real-time digital readout with the added benefits of a built-in data logger. Suitable for clean office settings as well as harsh industrial workplaces and outdoor applications, the DUSTTRAK detects potential problems with airborne contaminants such as dust, smokes, fumes and mists.

The DUSTTRAK is easy to use, too. You can perform quick spot checks or you can program the advanced logging modes for long-term sampling. You can program the start/stop times, recording intervals and other parameters. You can even set up the instrument for continuous unattended operation.

The DUSTTRAK's new continuous analog output and adjustable alarm output allow remote access to real-time particle concentration data. Applications include site perimeter monitoring, ambient monitoring, process area monitoring and other remote uses. The alarm output with user-defined setpoint alerts you when upset or changing conditions occur. This feature allows you to program a switch closure at a concentration value of your choosing.

The DUSTTRAK provides a real-time measurement based on 90° light scattering. A pump draws the sample aerosol through an optics chamber where it is measured. A sheath air system isolates the aerosol in the chamber to keep the optics clean for improved reliability and low maintenance.

TSI®

Specifications

Model 8520 DustTrak Aerosol Monitor

Sensor Type	90° light scattering
Range	0.001 to 100 mg/m³ (Calibrated to ISO 12103-1, A1 test dust)
Resolution	±0.1% of reading or ±0.001 mg/m³, whichever is greater
Zero Stability	±0.001 mg/m³ over 24 hours using 10-second time-constant
Particle Size Range	0.1 to approximately 10 micrometers
Flow Rate	Adjustable 1.4 to 2.4 l/min (1.7 nominally)
Temperature Coefficient	+0.001 mg/m³ per °C (for variations from temperature at which the DustTrak was zeroed)
Operating Temperature	32° F to 120° F (0°C to 50°C)
Storage Temperature	-4° F to 140° F (-20°C to 60°C)
Operating Humidity	0 to 95% rh (non-condensing)
Time Constant	Adjustable from 1 to 60 seconds
Data Logging	31,000 data points (21 days of logging once/minute)
Logging Interval	Adjustable from 1 second to 1 hour
Physical	
External Dimensions	8.7 in. × 5.9 in. × 3.4 in. (221 mm × 150 mm × 87 mm)
Instrument Weight	3.3 pounds with batteries (1.5 kg)
Serial Interface	RS-232 1200 baud
Power	
AC	AC adapter (included)
Battery	Four C-size alkaline batteries (included)
Battery Run-time	Alkaline 16 hours

Analog Output Specifications

Analog Output Voltage	0 to 5 VDC
Analog Output Scaling[1]	0 to 100 mg/m³ 0 to 10.0 mg/m³ 0 to 1.00 mg/m³ 0 to 0.100 mg/m³
Output Impedance	0.01 ohm
Maximum Output Current	15 mA

The DustTrak comes complete with TSI's TrakPro™ Data Analysis Software to allow you to perform a more comprehensive analysis of your measurement results. This exclusive Windows®-based program helps you generate the detailed graphs and reports needed to effectively communicate your findings.

Specifications are subject to change without notice.
Windows is a registered trademark of the Microsoft Corporation.

Alarm Output Specifications

Type	Non-latching, MOSFET solid state (polarized)[2] analog switch
Setpoint Range[1]	0.010 to 100 mg/m³
Maximum Voltage	15 VDC
Maximum Current	1 Amp
Deadband	-5% of alarm setpoint
Connector	4-Pin, Mini-DIN connector

1 User selectable through TrakPro™ Data Analysis Software.
2 See TSI Application Note ITI - 074 for important wiring information.

Ordering Information

Model	Description
8520	The DustTrak Aerosol Monitor and accessories includes: Auxiliary Analog and Alarm Outputs, Carrying Case, Alkaline Batteries, TrakPro™ Data Analysis Software, Filter, Computer Cable, 25-pin to 9-pin Adapter, Operation Service Manual, Calibration Certificate, 10 mm Nylon Dorr-Oliver Cyclone, Inlet Conditioning Kit 1.0 and 2.5 µm, Sampling Extension Tube, Miscellaneous Service Tools and Two-Year Warranty.

Optional Accessories

Model	Description
8520-1	Environmental Enclosure

TSI Incorporated
500 Cardigan Road, Shoreview, MN 55126 USA
Tel: 651 490 2811 **Toll Free:** 1 800 874 2811 **Fax:** 651 490 3824 **E-mail:** answers@tsi.com
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TSI Sweden—Tel: +46-18-52-70-00 **Fax:** +46-18-52-70-70 **E-mail:** tsi@tsi.se

For current information www.tsi.com

ISO 9001 CERTIFIED

P/N 2980077 Rev. C

Printed in U.S.A.

MultiRAE Plus

One-to-Five Gas Monitor with VOC Detection

The **MultiRAE Plus** combines a PID (Photoionization Detector) with the standard four gases of a confined space monitor (O_2, LEL, and two toxic gas sensors) in one compact monitor with sampling pump. Like the Leatherman™ tool, the **MultiRAE Plus** gets the job done in more circumstances than any other gas detector. With more than 10,000 units in the field today, its versatility makes it the gas meter of choice for some of the highest profile HazMat/WMD teams in the United States. The **MultiRAE Plus** is quickly and easily changed from a sophisticated technician instrument to a simple text-only monitor. The same monitor can be used as a personal monitor, a hand-held sniffer or as a continuous-operation area monitor.

Key Features

- **O_2, LEL, PID and any two plug-in "smart" toxic sensors:** CO, H_2S, SO_2, NO, NO_2, Cl_2, HCN, NH_2, PH_2
- **0-2,000 ppm measurement of VOCs** (volatile organic compounds) with 0.1 ppm resolution
- **Measure more chemicals than with any other PID** With over 60 Correction Factors built into the **MultiRAE Plus** memory and the largest printed list of Correction Factors in the world (300+), RAE Systems offers the ability to accurately measure more ionizable chemicals than any other PID!
- **Drop-in Battery** When work schedules require putting in more than the 14 hours supplied by the advanced Lithium-ion (Li-ion) battery, the drop-in alkaline pack supplied with every **MultiRAE Plus** allows you to finish the job.
- **User friendly** screens make it easy to use for simple applications and flexible enough for sophisticated options.
- **Rugged Rubber Boot** assures that the **MultiRAE Plus** survives the bumps and knocks of tough field use
- **Strong, built-in sample pump** draws up to 100 feet (30m) horizontally or vertically. Large external filter and automatic low flowage
- **Large keys** are operable with 3 layers of gloves
- **Easy-to-read display** with backlight
- **Store up to 80 hours of data** at one minute interval for all 5 sensors for down-load to PC (with the optional datalogging)
- **Loud audible alarm** that varies for different alarm conditions and an optional external vibration alarm for noisy areas
- **Access sensors and battery in seconds** with the new, improved case

Applications

HazMat/Homeland Security

- Initial PPE (personal protective equipment) assessment
- Leak detection
- Perimeter establishment and maintenance
- Spill delineation
- Decontamination
- Remediation

Confined Space Entry

- Aviation/wing tank entry with jet fuel
- Shipyard and maritime confined spaces with diesel fuel
- Pulp and paper industry for confined space entry in turpentine environments

Environmental

- Soil and water headspace analysis
- Leaking underground storage tanks (LUST)
- Landfill monitoring

Industrial Hygiene, Plant Health & Safety

- Confined Space Entry
- Indoor Air Quality (IAQ)

ATEX

RAE Systems Inc.
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Tel: 877.723.2878 • Fax: 408.952.8480
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RAE Systems (Hong Kong) Ltd.
Room 8, 6/F, Hong Leong Plaza, 33 Lok Yip Road, Fanling, N.T. • Hong Kong
Tel: 852.2669.0828

Specifications*

Sensor Specifications

Sensor	Range	Resolution
Oxygen	0-30%	0.1%
Combustible Gas	0-100% LEL	1% LEL
VOCs	0-200 ppm	0.1 ppm
	200-2000 ppm	1 ppm
Carbon Monoxide	0-500 ppm	1 ppm
Hydrogen Sulfide	0-100 ppm	1 ppm
Sulfur Dioxide	0-20 ppm	0.1 ppm
Nitric Oxide	0-250 ppm	1 ppm
Nitrogen Dioxide	0-20 ppm	0.1 ppm
Chlorine	0-10 ppm	0.1 ppm
Hydrogen Cyanide	0-100 ppm	1 ppm
Ammonia	0-50 ppm	1 ppm
Phosphine	0-5 ppm	0.1 ppm

Detector Specifications

Size	4.65"L x 3.0"W x 1.9"H (11.8 x 7.6 x 4.8 cm)
Weight	16 oz.with battery (454g)
Sensors	Up to 5 sensors including: • Photoionization detector for VOCs, 10.6 eV lamp standard • Protected catalytic bead for combustible gases • Interchangeable electrochemical sensors for oxygen and toxic gases (2)
Battery	• Interchangeable Li-ion and alkaline battery packs • Rechargeable units include Lithium-ion battery pack with internal smart charging, 120V AC/DC wall adapter, and spare alkaline battery pack
Operating Hours	• 14 hours continuous with Li-ion (typical) • Unit will run and charge simultaneously
Display	2 line, 16 digit LCD with LED backlighting automatically in dim light or alarm condition
Keypads	1 operation and 2 programming keys
Direct Readout	Instantaneous values (up to 5): • Oxygen as percentage by volume • Combustible gas as percentage of lower explosive level (LEL) • Toxic gases and VOCs as parts per million by volume (VOC scaleable using correction factors) • High and low values for all gases • STEL and TWA values of toxic gases and VOCs • Battery and shut down voltage • Date, time, elapsed time, temperature
Alarms	90 dB buzzer and flashing red LED to indicate exceeded preset limits: • High: 3 beeps and flashes per second • Low: 2 beeps and flashes per second • STEL and TWA: 1 beep and flash per second • Automatic reset or latching with manual override • Additional diagnostic alarms and display messages for low battery and pump stall
EM/RFI	Highly resistant to EMI/RFI. Compliant with EMC Directive 89/336/EEC
IP Rating	IP-55: protected against dust, protected against low pressure jets of water from all directions
Datalogging & Communication	Optional 80 hours, 5 channels at one minute intervals download to PC with serial number of unit, user ID, site number, and calibration date
Calibration	Two-point field calibration for zero span gas
Sampling Pump	Internal two-speed pump. Flow rates: • Low: ~150 cc/min • High: ~250 cc/min
Low Flow Alarm	Auto shut-off pump at low flow condition

Detector Specifications (continued)

Hazardous Area Approval	• US and Canada: UL, cUL, Classified as Intrinsically Safe for use in Class I, Division I Groups A, B, C, D, T3C • Europe: ATEX II 2G EEx ia d IIC T3 & T4
Temperature	-4° to 113 °F (-20 to 45°C)
Humidity	0% to 95% relative humidity (non-condensing)
Attachment	Durable yellow boot with belt clip and wrist strap; Shoulder strap; optional tripod/wall mounting bracket
Warranty	Lifetime on non-consuming components (per RAE Systems Standard Warranty), 2 years for O_2, LEL, CO, and H_2S sensors, 1 year all other sensors, 1 year pump, 1 year battery, 1 year for 10.6eV PID lamp

*Ongoing projects to enhance our products means that these specifications are subject to change

MultiRAE Plus Accessories

Monitor only includes:

- Sensors as specified
- Calibration adapter
- Training CDROM
- Operation and maintenance manual
- Rubber boot with belt clip
- Alkaline battery adapter
- Rechargeable units additionally include:
  - Standard Lithium-ion (Li-ion), optional extended duration Lithium-ion battery, or ATEX-certified charger and barrier kit
  - 120/230 V AC/DC Wall Adapter (if specified)
- 3 external filters
- 3-inch inlet probe

Monitor with accessories kit also includes:

- Hard transport case with pre-cut foam
- Sampling wand with 15 feet (5m) of self-coiling Teflon® tubing
- Tool Kit

Black boot is available for tactical operations (part number 027-3042-000)

Optional calibration kit also includes:

- Four-gas mix in a 34L cylinder; (50% LEL, 20.9% O_2, 25 ppm Hydrogen Sulfide, 50 ppm Carbon Monoxide)
- 100 ppm Isobutylene in 34L cylinder
- Calibration regulator(s) and tubing

Datalogging Monitors also include:

- Software ProRAE Suite Package for Windows 98, NT, 2000 and XP
- Computer interface cable

Optional Guaranteed Cost of Ownership Program:

- 4-year repair and replacement guarantee
- Annual maintenance and servicing

DISTRIBUTED BY:

MultiRAE Plus

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Tel: 852.2669.0828

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ATTACHMENT 5
HASP COMPLIANCE AGREEMENT

HASP COMPLIANCE AGREEMENT

I have attended a Site Safety Briefing for this project, and have been given an opportunity to review the project-specific HASP and to have my questions, if any, answered. I understand the HASP 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 HASP.

URS CORPORATION

	Signature	**Name**	**Date**
URS Site Manager			
URS Site Safety Officer			
URS Site Personnel			
URS Site Personnel			
URS Site Personnel			
URS Site Personnel			

SUBCONTRACTORS

Company	**Signature**	**Name**	**Date**

ATTACHMENT 6
TASK HAZARD ASSESSMEN

Each day, based on the information provided in the Initial JSA and relevant site-specific information for that day (e.g., weather conditions, other work being performed at the Site, results of previous work at the Site), the team shall prepare a Task Hazard Assessment for all tasks which are anticipated to be conducted that day (i.e., the “Daily THA”). The Daily THA must include, in addition to applicable information contained in the Initial JSA, the previously described relevant site-specific information for that day if this information impacts how the work will be conducted. No work task can be performed unless a Daily THA for the specific work activities needed to accomplish that task has been prepared and discussed with all site personnel.

TABLES

TABLE 1

JOB HAZARD ANALYSES

AECOM **National Grid** **Hempstead** **MGP Site**	**DATE** Jan 15, 2015	**Revised New** June 9, 2016	**PAG** **E 1 of 1**
WORK ACTIVITY (Description): Potential Drilling/Boring operations including utility clearance			
DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY:	POSITION/TITLE
Mike Akerbergs	Project Manager	Peter Gregory	SH&E Area Manager
Megan Dascoli	Site Geologist (SSO)		
MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR TASK-SPECIFIC REQUIREMENTS)			
REFLECTIVE VEST HARD HAT SAFETY GLASSES PPE CLOTHING Level D with long pants or as required by changing conditions as determined by SSO	SAFETY SHOES Steel-toe HEARING PROTECTION AS REQUIRED	AIR PURIFYING RESPIRATOR required as specified in SSHP Addendum and determined by SSO	GLOVES nitrile/leather as required by task-specific critical actions of JSA OTHER All PPE must be worn as specified in task-specific critical actions of JSA

JOB STEPS[1]	**POTENTIAL HAZARDS[2]**	**CRITICAL ACTIONS TO MITIGATE HAZARDS[3]**
Mobilization, Equipment Lay Down, Boring/Well Markouts and Utility Clearance	Vehicular traffic	Reflective vests required
		Use cones or other barricades as necessary
		Be aware of traffic and Site traffic patterns. Try and place borings away from heavy traffic routes.
	Underground Utilities	Contact Dig-Safe
		Mark utility locations in the field prior to drilling. Pre-dig clearance prior to drilling
		Receive Dig Permit/clearances.
		Coordinate with National Grid personnel and obtain approval for drilling locations
	Adjacent Site Activities	Keep aware of any adjacent activities and traffic
	Spray Paint	Keep can pointed away from face
		Do not use damaged cans.
		Wear gloves
		Wear appropriate PPE (safety glasses/goggles) to prevent flying debris from causing eye or other injuries

TABLE 1 (CONT.)

JOB HAZARD ANALYSES

AECOM **National Grid** **Hempstead** **MGP Site**	**DATE** January 14,2015	**REVISED**	**PAGE 1 of 1**
WORK ACTIVITY (Description): Potential Drilling and Well Installation			
DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY:	POSITION/TITLE
Mike Akerbergs	Project Manager	Peter Gregory	Area SH&E Manager
Megan Dascoli	Site Geologist (SSO)		
MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR TASK-SPECIFIC REQUIREMENTS)			
REFLECTIVE VEST HARD HAT SAFETY GLASSES PPE CLOTHING: Level D with long pants or as required by changing conditions as determined by SSO	SAFETY SHOES Steel-toe HEARING PROTECTION ear plugs not required for personnel outside 30-ft safety zone or if operator's vehicle door and window is closed	AIR PURIFYING RESPIRATOR required as specified in SSHP Addendum and determined by SSO	GLOVES nitrile/leather as required by task-specific critical actions of JSA OTHER All PPE must be worn as specified in task-specific critical actions of JSA

JOB STEPS[1]	**POTENTIAL HAZARDS[2]**	**CRITICAL ACTIONS TO MITIGATE HAZARDS[3]**
Drilling and Monitoring Well Installation (may include air rotary, hollow stem auger, and/or direct push drilling techniques)	Vehicular traffic	Reflective vests required
		Use cones, caution tape, or other barricades as necessary
		Be aware of bus and other traffic and Site traffic patterns.
	Particulates (airborne dust) and flying debris	Wear appropriate PPE, monitor particulates with appropriate and calibrated particulate monitors
	Potential explosive/flammable or ignitable conditions	Monitor with O2/LEL meter, adhere to action limits as specified in the HASP. Use non- sparking equipment.
	Chemical exposure to Site contaminants (PAHs, PCBs, VOCs,) (dermal and inhalation)	Use appropriate and calibrated monitoring equipment including: PID, O2 sensors, LEL
		Wear nitrile gloves and other PPE as necessary.
		Adhere to action limits as specified in HASP
	Noise (>85 dB)	Hearing protection required.
	Heavy Equipment	Avoid blind spots designated by operator.
		Inspect equipment daily
		Reflective vests required while working near rigs.
		Wear appropriate PPE (hard hat safety glasses, steel-toed boots)
	Heat Stress	Wear appropriate clothing
		Take frequent breaks
		Drink plenty of liquids
		SSO will monitor work shifts

TABLE 1 (CONT.)

JOB HAZARD ANALYSES

AECOM **National Grid Hempstead MGP Site**	**DATE** January 14, 2015	**REVISED**	**PAGE 1 of 1**
WORK ACTIVITY (Description): **Groundwater Sampling/Purging/**			
DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY:	POSITION/TITLE
Mike Akerbergs	Project Manager	Peter Gregory	Area SH&E Manager
Megan Dascoli	Site Geologist (SSO)		
MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR TASK-SPECIFIC REQUIREMENTS)			
REFLECTIVE VEST HARD HAT SAFETY GLASSES PPE CLOTHING Level D with long pants or as required by changing conditions as determined by SSO	SAFETY SHOES Steel-toe HEARING PROTECTION ear plugs not required for personnel outside 30-ft safety zone or if operator's vehicle door and window is closed	AIR PURIFYING RESPIRATOR required as specified in SSHP Addendum and determined by SSO	GLOVES nitrile/leather as required by task-specific critical actions of JSA OTHER All PPE must be worn as specified in task-specific critical actions of JSA

JOB STEPS[1]	**POTENTIAL HAZARDS[2]**	**CRITICAL ACTIONS TO MITIGATE HAZARDS[3]**
Groundwater Sampling/purging/ water level check	Vehicular traffic	Reflective vests required
		Use cones, caution tape, or other barricades as necessary
		Be aware of traffic and Site traffic patterns.
	Splashing (airborne droplets)	Wear appropriate eye protection
	Potential explosive/flammable or ignitable conditions	Monitor with O2/LEL meter, adhere to action limits as specified in the HASP. Use non- sparking equipment.
	Chemical exposure to Site contaminants (PAHs, PCBs, VOCs,) (dermal and inhalation)	Use appropriate and calibrated monitoring equipment including: PID, O2 sensors, LEL
		Wear nitrile gloves, Tyvek and other PPE as necessary.
		Adhere to action limits as specified in HASP
	Heavy Equipment	Avoid blind spots designated by operator.
		Inspect equipment daily
		Reflective vests required while working near rigs.
		Wear appropriate PPE (hard hat safety glasses, steel-toed boots)
	Heat Stress	Wear appropriate clothing
		Take frequent breaks (SSO to monitor work shifts)
		Drink plenty of liquids

TABLE 1 (CONT.)

JOB HAZARD ANALYSES

AECOM **National Grid** **Hempstead** **MGP Site**	**DATE** January14, 2015	**Revised**	**PAGE 1 of 1**
WORK ACTIVITY (Description): **NAPL recovery and disposal**			
DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY:	POSITION/TITLE
Mike Akerbergs	Project Manager	Peter Gregory	Area SH&E Manager
Megan Dascoli	Site Geologist (SSO)		
MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR TASK-SPECIFIC REQUIREMENTS)			
REFLECTIVE VEST HARD HAT SAFETY GLASSES PPE CLOTHING Level D with long pants or as required by changing conditions as determined by SSO	SAFETY SHOES Steel-toe HEARING PROTECTION ear plugs not required for personnel outside 30-ft safety zone or if operator's vehicle door and window is closed	AIR PURIFYING RESPIRATOR required as specified in SSHP Addendum and determined by SSO	GLOVES nitrile/leather as required by task-specific critical actions of JSA OTHER All PPE must be worn as specified in task-specific critical actions of JSA

JOB STEPS[1]	**POTENTIAL HAZARDS[2]**	**CRITICAL ACTIONS TO MITIGATE HAZARDS[3]**
Product Sampling and Recovery	Vehicular traffic	Reflective vests required
		Use cones, caution tape, or other barricades as necessary
		Be aware of traffic and Site traffic patterns.
	Chemical exposure to Site contaminants (PAHs, PCBs, VOCs,) (dermal and inhalation	Use appropriate and calibrated monitoring equipment including: PID, O2 sensors, LEL
		Wear nitrile gloves (inner) and outer chemical resistant gloves, **coated** Tyvek and other PPE as necessary.
		Adhere to action limits as specified in HASP
	Heat Stress	Wear appropriate clothing
		Take frequent breaks
		Drink plenty of liquids
	Potential Electrical / Explosive Hazards	If using extension cords and powered equipment, check cords and equipment before use.
		Use non-sparking and intrinsically safe equipment
	Injury during lifting	Lift with knees
		Ask for assistance with heavy objects
		Keep back straight and do not twist
	Manage contaminated materials	Keep generation of excess contaminated materials to a minimum and manage according to work plan.

TABLE 2

CHEMICAL CONTAMINANTS OF CONCERN

Volatile Organic Compounds (major constituents)

Specific Contaminant Known or Suspected (CAS #)	PEL, or TLV (ppm)	IDLH (ppm)	Acute Effects	Ionization Potential	Appropriate Monitoring Instrument
Benzene (C) (71-43-2)	1.0 – OSHA 0.5 – ACGIH	500	Human Carcinogen Irritation of eyes, nose, respiratory tract giddiness, headache, nausea, fatigue.	9.25 (NIOSH Occupational Health Guide 0049, 1988)	Drager or other benzene- specific PID
Toluene (108-88-3)	100 – NIOSH 200 - OSHA	500	Irritated eyes, nose, dizziness.	8.82	PID
Xylenes (p:106-42-3; m:108-38-3; o:95-47-6)	100	900	Irritated nose, eyes, dizziness.	8.56	
Ethylbenzene(100-41-4)	100	800	Eye, Mucous Membrane & Skin Irritant	8.76	

TABLE 2 (cont.)
CHEMICAL CONTAMINANTS OF CONCERN

Semi Volatile Organic Compounds (major components)

Specific Contaminant Known or Suspected (CAS#)	PEL, or TLV (ppm)	IDLH (ppm)	Acute Effects	Ionization Potential	Appropriate Monitoring Instrument
Phenol (108-95-2)	5.0 (skin adsorption hazard)	250	Irritated eyes, nose, throat Anorexia, weight loss Skin burns, convulsions	8.5	PID
4-Methylphenol (cresol) (106-44-5)	5.0 (skin adsorption hazard)	250	Irritated eyes, skin Mucous membrane Weakness, exhaustion Headache, drowsiness, CNS	8.93 - 8.97 (NIOSH Occupational Health Guide 0156, 1988)	
Naphthalene (91-20-3)	10 (skin adsorption hazard)	250	Irritated eyes, skin Mucous membrane Confusion, excitement	8.12	
2-methyl phenol (cresol) (95-48-7)	2.3 - NIOSH 5.0 - OSHA	250	Irritated eyes, skin Mucous membrane CNS, skin burns	8.93 - 8.97 (NIOSH Occupational Health Guide 0154, 1988	
2,4-dimethylphenol (105-67-9)	NA	NA	Irritated eyes, skin Mucous membrane skin burns, headache	NA	

TABLE 2 (cont.)
CHEMICAL CONTAMINANTS OF CONCERN

Specific Contaminant Known or Suspected	PEL, REL or TLV	IDLH	Acute Effects	Ionization Potential	Appropriate Monitoring Instrument
Lead (7439-92-1)	0.05 mg/m^3	100 mg/m^3	Lassitude, insomnia, Facial pallor, tremor	N/A	Particulate monitor
Mercury (7439-97-6)	0.025 TLV 0.10 PEL (Ceiling)	2 mg/m^3	vision, hearing disturbance; spasticity jerking limbs; dizziness; salivation		
Coal Tar Pitch Volatiles	0.2 mg/m^3 (as benzene-soluble aerosol)		Dermatitis, bronchitis, Carcinogen		
Polychlorinated biphenyls (PCB)	0.5 mg/m^3 [54%]	5 mg/m^3	Carcinogen, skin/liver damage		Lab sample

TABLE 2 (cont.)
CHEMICAL CONTAMINANTS OF CONCERN

NOTES:

NS = No Standard

<=Less than

ppm = parts per million

eV = Electron Volt

AC=Avoid contact with media

TLV = Threshold Limit Value

IDLH = Immediately Dangerous to Life and Health

mg = milligrams

cu.m = cubic meters

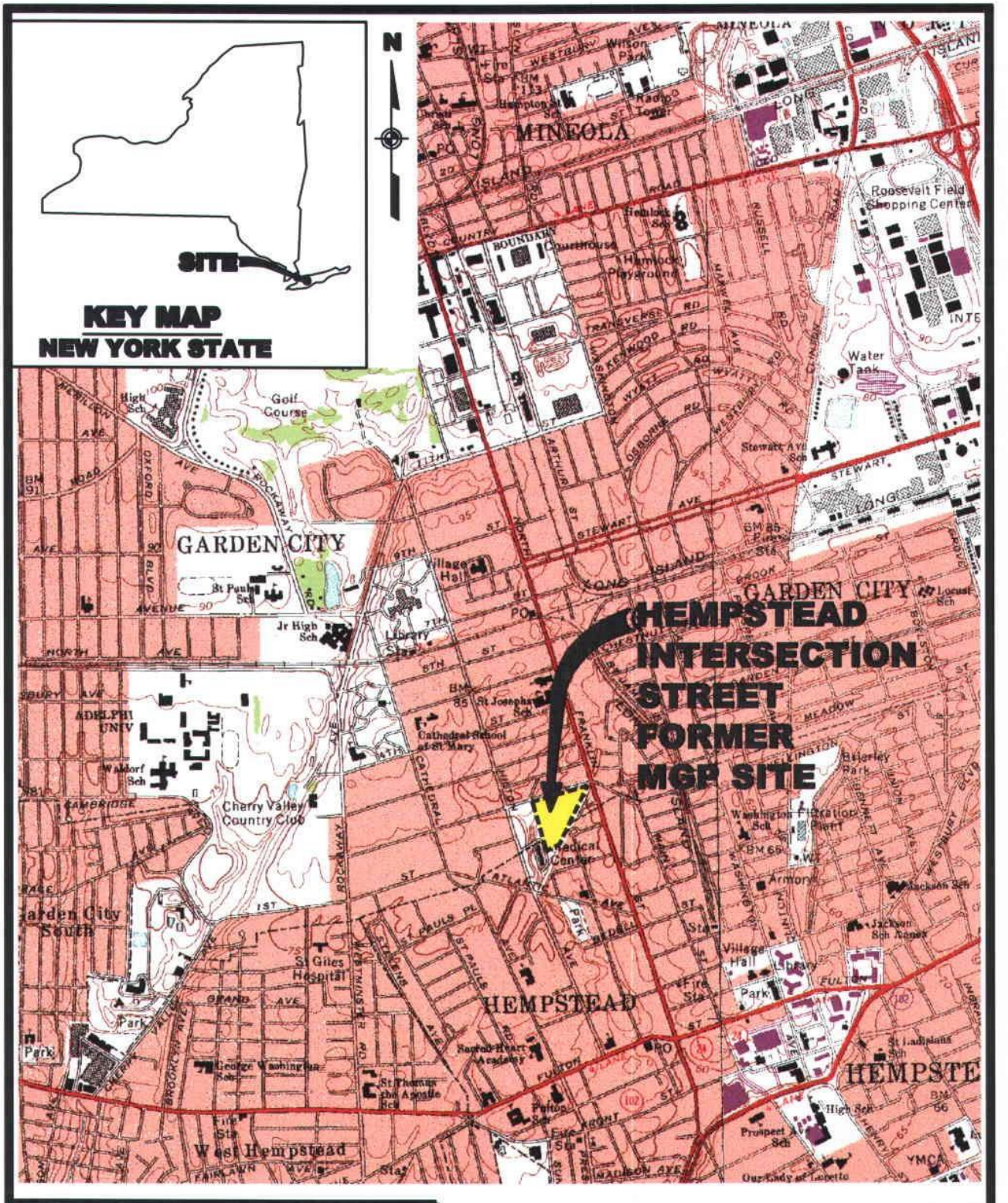
NA = Not Applicable

H_2O = Water

PEL = Permissible Exposure Limit

C = Carcinogen

FIGURES



NATIONAL GRID
HEMPSTEAD INTERSECTION STREET FORMER MGP SITE
HEMPSTEAD/GARDEN CITY, NY

SOURCE:
USGS 7.5 MINUTE SERIES
TOPOGRAPHICAL QUANDRANGLES:
FREEPORT, NY (1969)
LYNBROOK, NY (1969)

URS Corporation

LOCATION MAP

FIGURE 1

J:\11175065.00000\CAD\DRAFT\TASK2\HEMPSTEAD\GROUNDWATER MONITORING\FIGURE-1.dwg 3/13/09 - 1 RAL

APPENDIX C2

EXAMPLE COMMUNITY AIR MONITORING PLAN

HEMPSTEAD INTERSECTION STREET FORMER MANUFACTURED GAS PLANT SITE
VILLAGES OF GARDEN CITY AND HEMPSTEAD, LONG ISLAND, NEW YORK

Prepared for:

National Grid
One Metrotech Center
Brooklyn, New York 11201

Prepared by:

URS Corporation
257 West Genesee Street
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Buffalo, New York 14203

January 2015

1.0 COMMUNITY AIR MONITORING PLAN

Real time air monitoring for volatile organic compounds (VOCs) and particulates will be conducted at the perimeter of the Exclusion Zone during invasive activities such as excavation, drilling, well installation, soil sampling, groundwater sampling, and non-aqueous phase liquid (NAPL) recovery/disposal in accordance with the *New York State Department of Health Generic Community Air Monitoring Plan* (New York State Department of Environmental Conservation [NYSDEC] DER-10, Appendix 1A). The activity-specific Community Air Monitoring Plan (CAMP) will also provide a contingency plan that addresses potential site control measures that may be implemented in response to elevated levels of target compounds or odor. The CAMP requirements for this project are summarized below:

- VOCs and dust particulates will be monitored at the downwind perimeter of the Exclusion Zone on a continuous basis. If total organic vapor levels exceed 5 parts per million (ppm) above background, work activities will halted and monitoring continued under the provisions of a Vapor Emission Response Plan. All readings will be recorded and be made available for the NYSDEC and the New York State Department of Health (NYSDOH) personnel to review if requested.
- If particulates levels at the downwind station exceed particulate levels at the upwind station by more than 100 micrograms per cubic meter ($\mu g/m^3$), work activities will be halted and appropriate dust suppression measures will be employed. All readings will be recorded and be made available for the NYSDEC and the NYSDOH personnel to review if requested.

1.1 Vapor Emission Response Plan

If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily suspended and monitoring continued. If the total organic vapor levels readily decrease (per instantaneous readings) below 5 ppm above background, work activities will resume with continued monitoring. If the organic vapor levels are greater than 5 ppm over background but less than 25 ppm over background at the perimeter of the exclusion zone, activities can resume provided the

total organic vapor levels 200 feet downwind of the exclusion zone or half the distance to the nearest residential or commercial structure (whichever is less) is below 5 ppm over background.

If the total organic vapor level is above 10 ppm at the perimeter of the exclusion zone, activities will be shut down. When work shutdown occurs, downwind air monitoring as directed by the Site Safety Officer (SSO) will be implemented to ensure that vapor emissions do not impact the nearest residential or commercial structure levels exceeding those specified in the Major Vapor Response Plan described below.

If total organic vapor levels exceed 25 ppm, at the perimeter of the work area, activities will be shutdown.

1.2 Major Vapor Emission Response Plan

If any total organic vapor levels greater than 5 ppm over background are identified 200 feet downwind of the Exclusion Zone or half the distance to the nearest residential or commercial structure (whichever is less) all work activities will be halted.

If, following the cessation of work activities, or as a result of an emergency, total organic vapors persist above ppm above background 200 feet downwind from the Exclusion Zone or half the distance to the nearest residential or commercial structure (whichever is less), then the air quality will be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20-foot zone).

If efforts to abate the emission source are unsuccessful and total organic vapor levels approaching 5 ppm persist for more than 30 minutes in the 20-foot zone, then the Major Vapor Emission Response Plan shall be immediately placed into effect. Also the Major Vapor Emission Response Plan shall be immediately placed into effect if the 20-foot zone total organic vapor levels are greater than 10 ppm above background.

Upon activation of the Major Vapor Emission Response Plan, the following activities will be undertaken:

- All Emergency Response Authorities will be contacted by the SSO and advised of the situation (NYSDEC, NYSDOH, and Local Fire Dpt.)

- Air monitoring will be conducted at 30-minute intervals within the 20-foot zone. If two successive readings below the action levels are measured, air monitoring may be halted or modified by the SSO.

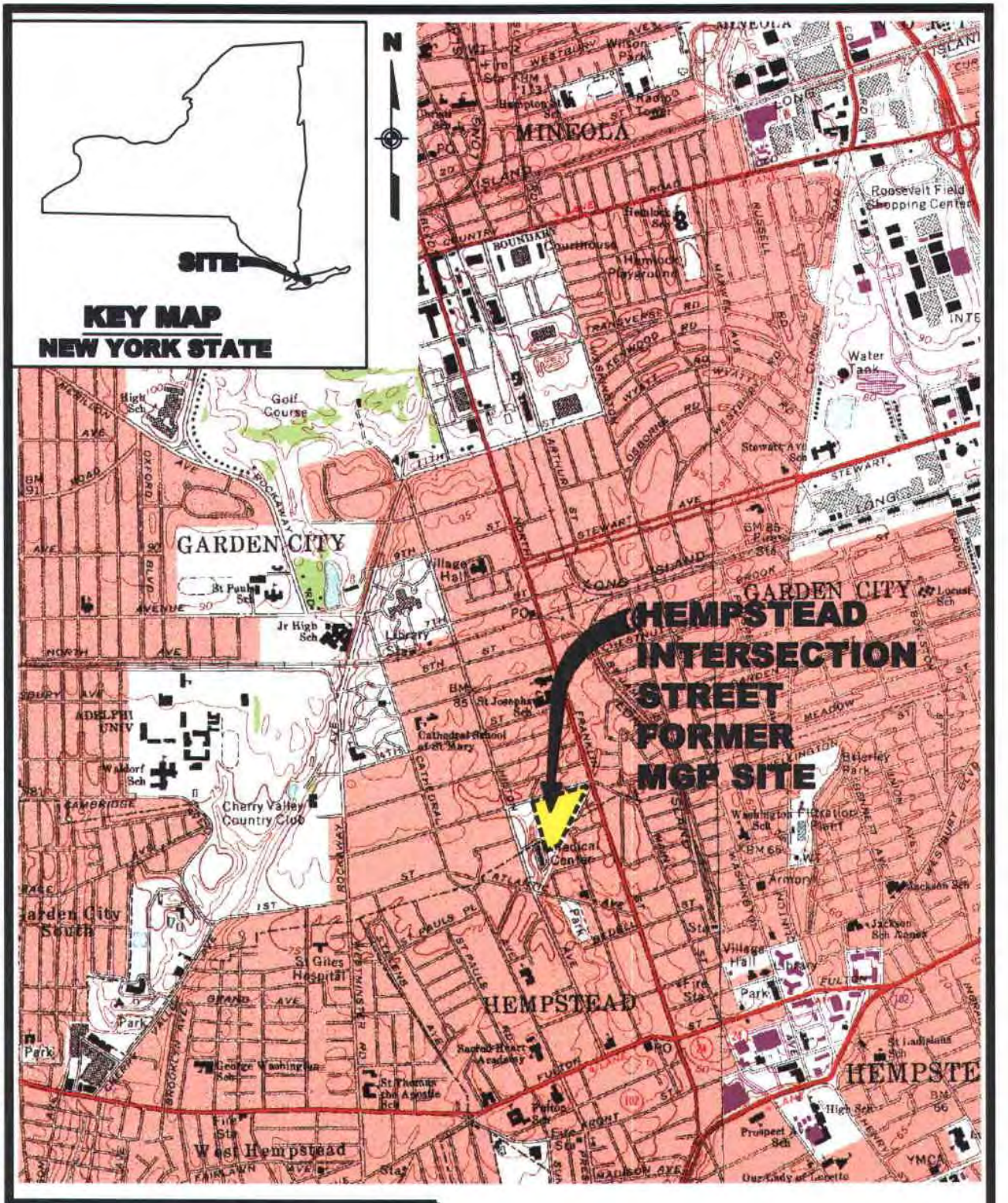
1.3 Particulate Monitoring, Response Levels and Actions

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations except on days where precipitation warrant suspension of such monitoring. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level of 150 $\mu g/m^3$. In addition, fugitive dust migration will be visually assessed during all work activities.

If the downwind PM-10 particulate levels are 100 $\mu g/m^3$ greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work may continue with dust suppression provided that downwind PM-10 particulate levels do not exceed 150 $\mu g/m^3$ above the upwind concentration and provided that no visible dust is migrating from the work area.

If, after the implementation of dust suppression activities, downwind PM-10 levels are greater than 150 $\mu g/m^3$ above the upwind levels, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 $\mu g/m^3$ of the upwind level and visible dust migration is prevented.

All data will be recorded and made available to the NYSDEC and NYSDOH personnel for review.



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