SITE-SPECIFIC HEALTH AND SAFETY PLAN (HASP)

Site:	**NATIONAL GRID ROCKAWAY PARK FORMER MANUFACTURED GAS PLANT (MGP) SITE AND ASSOCIATED OFF-SITE AREAS**
Location:	**ROCKAWAY PARK, QUEENS NEW YORK**
Date Prepared:	**MAY 2008**
Revision:	**1**
Project Description:	**Mob/Demob, Construction, Excavation & Trenching, Materials Handling/Staging, Off-site Transportation & Disposal, Barrier Wall Installation, Backfill & Grading, Site Restoration, Soil Sampling(Pre-Characterization, Cert Clean Fill, & Confirmatory), and Installation of NAPL Recovery Wells**
Waste types:	Impacted Soils and Groundwater
Primary Characteristics:	Volatile/Semi Volatile, & Toxic
Secondary Characteristics:	PCBs, ACM
Status:	Industrial
Background Review:	Site Investigations have been performed
Overall Hazard:	Medium

SAFETY AND HEALTH POLICY FOR POSILLICO ENVIRONMENTAL

The purpose of this policy is to develop a high standard of safety throughout all operations of Posillico Environmental and to ensure that no employee is required to work under any conditions, which are hazardous or unsanitary.

We believe that each employee has the right to derive personal satisfaction From his/her job and the prevention of occupational injury or illness is of such consequence to this belief that it will be given top priority at all times

It is our intention here at Posillico Environmental to initiate and maintain complete accident prevention and safety training programs. Each individual from top management to the working person is responsible for the safety and health of those persons in their charge and coworkers around them. By accepting mutual responsibility to operate safely, we will all contribute to the well being of our employees.

CONTRACTOR APPROVALS

By their signature, the undersigned hereby certify that this HASP has been reviewed, modified for site-specific hazards and approved for use at the National Grid Rockaway Park, New York site.

PROJECT MANAGER	DATE
PROJECT ENVIRONMENTAL HEALTH AND SAFETY MANAGER	DATE

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1.0 INTRODUCTION

1.1 Purpose

This site-specific Health and Safety Plan (HASP) addresses the health and safety practices that will be employed by workers participating in investigation and remediation activities at the site that are under the direction of Posillico Environmental, Inc. (Posillico). This work will be performed at the National Grid Former Manufactured Gas Plant (MGP) Rockaway Park, NY site (Site). The HASP takes into account the specific hazards inherent to the Site, and presents procedures to be followed by Posillico, Posillico subcontractors, and all third parties in order to avoid and if necessary, protect against health and/or safety hazards. Activities performed under this HASP will comply with applicable parts of OSHA Regulations, primarily 29 CFR Parts 1910 and 1926 and attached National Grid policies and procedures. A copy this HASP will be maintained on-site for the duration of work.

All workers who may participate in activities at the Site under the direction of Posillico are required to comply with the provisions specified in this HASP. All third parties who enter designated work zones must also comply with this HASP. Refusal or failure to comply with the HASP or violation of any safety procedures by field personnel and/or subcontractors performing work covered by this HASP may result in immediate removal from the site following consultation with the Project Manager and Project Environmental Safety Manager.

1.2 Scope

This HASP has been developed to address the health and safety concerns at the Site during remedial actions under the direction of Posillico. Although the HASP addresses all activities listed below, work at individual locations may include all, or only some of these tasks.

The HASP addresses the following activities:

Mobilization/Demobilization

- Mobilization/Demobilization of Equipment and Supplies
- Establishment of Site Security, Work Zones and Staging Areas

Pre Construction, Excavation, and Trenching Activities

- Locate All Utilities to and from the Site
- Locate All Active Utility Lines on Site

Construction Activities

- Utility Connections (Water, Sewer, Electrical)
- Excavation and Trenching (see Excavation and Trenching Activities)

Excavation and Trenching Activities

- Excavate Overburden Material
- Stockpile and Segregate Overburden Material
- Confined Space Entry/Trench Box Use
- Trenching
- Break Lines
- Cut, Fill and Cap Lines
- Backfill Excavation
- Site Restoration

Other Remediation Activities

- Construction of temporary fabric excavation structure
- Installation of Waterloo Barrier® Steel Sheet Piles
- Well abandonment
- Drilling operations
- Operation and Maintenance Tasks

Soil and Groundwater Sampling Activities

- Soil Borings and Soil Sampling
- Monitoring Well Development, and Sampling

1.3 Application

The HASP applies to all personnel authorized to access the Site, including those involved in the tasks under the direction of Posillico, accessing the active work zones, supervising on-site activities, and conducting visits to the Site. These personnel include but are not limited to:

- National Grid representatives, National Grid consultants, and National Grid subcontractors performing tasks under the direction of Posillico;
- Federal, State or local representatives;
- Posillico employees; and
- Posillico subcontractors.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

This section specifies Posillico Project Organization and responsibilities.

2.1 Project Manager (PM) Michael Perciballi

The PM responsibilities include the following:

- Ensures implementation of the HASP;
- Participates in incident investigations;
- Ensures the HASP has all of the required approvals before any site work is conducted;
- Ensures that the Site Manager is informed of project changes which require modifications of the site safety plan; and
- Has overall project responsibility for Project Health and Safety.

2.2 Site Manager (SM) Christopher Hurst

The Site Manager's responsibilities include the following:

- Ensures that the HASP is implemented in conjuction with the designated PESM and HSS;
- Ensures that work is scheduled with adequate personnel and equipment resources to complete the job safely;
- Ensures that adequate communication between field crews and emergency response personnel is maintained;
- Ensures that site personnel are adequately trained and qualified to work at the site ;
- Enforces site health and safety rules;
- Investigates major accidents;
- Coordinate directly with HSS regarding the conduct and documentation of daily safety briefings, periodic inspections, and work stoppage as necessary;
- Acts as the primary point of contact with National Grid for site related activities and coordination with non-project related site operations; and
- Acts as the Emergency Coordinator (see Section 12.0)

2.3 Project Environmental and Safety Manager (PESM) Selso Salazar and Donald Campbell

The PESM is an individual certified by the American Board of Industrial Hygiene as a Certified Industrial Hygienist (CIH) or by the Board of Certified Safety Professionals as a Certified Safety Professional (CSP) or possesses equivalent remedial construction health and safety experience. The PESM responsibilities include the following:

- Provides for the development and approval of the HASP;
- Serves as the primary contact to review health and safety matters that may arise;
- Approves revised or new safety protocols for field operations;
- Approves individuals who are assigned HS responsibilities;
- Coordinates revisions of this HASP with field personnel;
- Coordinates upgrading or downgrading of personal protective equipment with the SM; and
- Assists in the investigation of all accidents/incidents.

2.4 Health and Safety Supervisor (HSS) Robert Delmonte

The Health and Safety Supervisor responsibilities include the following:

- Ensures that all health and safety activities identified in this HASP are conducted and/or implemented;
- Identifies operational changes which require modifications to health and safety procedures and site safety plans, and ensures that the procedure modifications are implemented and documented through changes to the HASP, with Project Environmental and Safety Manager (PESM) approval; Directs and coordinates health and safety monitoring activities;
- Ensures that monitoring instruments are calibrated correctly;
- Ensures proper personal protective equipment is utilized by field teams;
- Conducts routine safety inspections of work areas;
- Monitors compliance with this HASP;
- Notifies PESM of accidents/incidents;
- Determines upgrades or downgrades of personal protective equipment (PPE) based on site conditions and/or real-time monitoring results; and
- Reports to the PESM to provide summaries of field operations and progress.

2.5 Site Personnel: Steve Klaus (General Foreman)

The Site Personnel responsibilities include the following:

- Report any unsafe or potentially hazardous conditions to the SM;
- Maintain knowledge of the information, instructions and emergency response actions contained in the HASP;
- Comply with rules, regulations and procedures as set forth in this HASP and any revisions;
- Prevent admittance to work sites by unauthorized personnel; and
- Inspect all tools and equipment, including PPE, prior to use each day.

2.6 Competent person

Requirements of OSHA 29 CFR, 1926.65

- Steve Klaus- General Foreman
- Christopher Hurst- Site Manager

With respect to crane, derrick and hoisting

- Derrick Wilson- Dock Builder Supervisor

3.0 SITE HISTORY AND PROJECT DESCRIPTION

3.1 Location

The Rockaway Park Former MGP Site encompasses approximately 9.8 acres. It is located in the Rockaway Park section on the north shore of the Rockaway Peninsula in Queens County, New York. See the Site-Specific Information provided in Appendix A for the Site Location Map.

The site formerly contained a natural gas regulator station that has been relocated, and a three story building that has been demolished. The overall layout of the Rockaway Park Former MGP Site is depicted on Design Drawing C-01.

Properties surrounding the Site include the following:

- North – Beach Channel Drive. North of Beach Channel Drive is a New York City owned strip of land encompassing approximately 0.6 acres. This area referred to as the Bulkhead Area will have a single 70 foot deep NAPL migration barrier installed. Further to the north of the bulkhead is Jamaica Bay.
- East – Beach 108th Street. East of Beach 108th Street is a New York City sewage treatment plant.
- South – Rockaway Freeway. South of Rockaway Freeway is the Metropolitan Transit Authority (MTA) subway tracks and a rail yard. Further to the south is a residential area of Rockaway Park
- North West – Electrical Substation. The northwestern corner of the site is bounded by an active electrical substation, that is used to provide power to the Rockaways. Overhead and underground 33 kV transmission lines run along the north side of the site south of Beach Channel Drive.
- West – Rockaway Freeway. West of Rockaway Freeway are properties occupied by auto service and retail businesses.

3.2 Background and Site Description

The Rockaway Park MGP began operations in the late 1870s. The plant was operated by Rockaway Electric Light Co., Town of Hempstead Gas & Electric Company and later the Queensboro Gas and Electric Company from the late 1870s to 1926. In 1926, Queensboro Gas and Electric Company became a subsidiary of the Long Island Lighting Company (LILCO). LILCO operated the plant from 1926 to approximately 1958 when most of the facilities were demolished. In 1998, Keyspan Corporation acquired the former MGP property through a merger of LILCO and Brooklyn Union Gas Company. In 1894, the plant consisted of two gas holders, generator, purifiers and scrubbers. The records indicate the MGP operated carbureted water gas and coal carbonization processes during early gas production. After 1905, the carbureted water gas process was the only process

used during gas production. In 1912, the MGP expanded to the north and east and a portion of the southern property boundary was located beneath the present Rockaway Freeway. The plant now included a half-million cubic foot gas holder, several oxide tanks, generator and boiler buildings, engine room, several oil tanks, and a condenser. The plant expanded in the mid-1920s to a strip of land to the north of the then existing plant. This land was created when Jamaica Bay was filled in during Beach Channel Drive Construction. By 1933, the plant included several additional structures that could allow increase gasification, tar and oil separation and storage, and coke and gas storage. These structures included a 2-million cubic foot gas holder, drip oil tanks, skimming basin, condensers, oxide enclosure, generator ash storage bin, tar separator, tar settling and drying tanks, and tar de-emulsifier. The MGP plant ceased operations circa 1958 when most of the facilities were demolished. Five industrial supply wells were also located on the former MGP property. A mixture of clay, liquid mud, and cement were used to abandon these wells. Three of the wells were abandoned in the 1930s and the abandonment dates of the other two wells are not known. Several drainpipes were identified by Dvirka and Barilucci on plant construction drawings. These lines appeared to lead to Jamaica Bay. The pipes were identified as saltwater drain lines, an oil line, and a sump drain line.

4.0 POTENTIAL HAZARDS AT THE SITE

This section presents an assessment of the chemical, biological, and physical hazards that may be encountered during the tasks specified under Section 1.2. A Hazard Communication Program is included in Appendix B. The Hazard Communication Program describes the procedures for determining hazards posed by a chemical, providing proper training on those hazards and transmitting the hazard information to those who could come in contact with the chemical.

4.1 Chemical Hazards

The characteristics of compounds at the Site are discussed below for informational purposes. Adherence to the safety and health guidelines in this HASP will reduce the potential for exposure. Extensive analytical testing has been performed and personnel shall familiarize themselves with the characteristics of the known chemicals and their properties. Table 4-1 presents the chemical data regarding exposure and monitoring for the following chemicals:

Polyaromatic hydrocarbons (PAHs) are present at the Site in impacted soil and groundwater and as a dense nonaqueous phase liquid (DNAPL) by-product of gas production. These compounds generally have a depressant effect on the central nervous system (CNS), may cause chronic liver and kidney damage, and some are suspected human carcinogens. Acute exposure may include headache, dizziness, nausea, and skin and eye irritation.

Volatile organic chemicals (VOCs), such as benzene, toluene, ethyl benzene, and xylene (BTEX) may be present as soil and groundwater contaminants and in some cases as free product in abandoned pipelines. These compounds generally have a depressant effect on the CNS, may cause chronic liver and kidney damage, and some are suspected human carcinogens. Benzene is a known human carcinogen. Acute exposure may include headache, dizziness, nausea, and skin and eye irritation.

Polychlorinated Biphenyls (PCBs) have also been detected at the Site in certain areas. The primary routes of exposure for PCBs are inhalation, absorption, ingestion, and contact. This compound causes eye irritation, liver damage and an acne-like skin rash (chloracne).

The Site potentially contains elevated levels of lead and arsenic. The primary routes of this exposure for these compounds are inhalation and ingestion. Exposure to lead may cause acute symptoms such as eye irritation, weakness, weight loss, abdominal pain, and anemia. Chronic exposure to lead may result in kidney disease, effects to the reproductive system, blood forming organs, and CNS. Acute exposure to arsenic may cause dermatitis, GI disturbances and respiratory irritation. Chronic exposure to arsenic has resulted in lung cancer in humans.

The Site potentially contains asbestos containing materials (ACM) in the forms of ACM pipe insulation and asbestos cement pipe. The primary route of exposure for asbestos is inhalation. Chronic exposure to asbestos may cause asbestosis and mesothelioma.

The Site potentially contains hydrogen cyanide and sulfide gas compounds that are a common by-product of the MGP process. The primary route of exposure is inhalation, skin absorption or ingestion. Cyanide compounds target the CNS, thyroid, blood, respiratory and cardiovascular systems, and can cause asphyxia, weakness, confusion, nausea and thyroid and blood changes.

4.1.1 Other Chemical Hazards

Chemicals not identified in this HASP may be used during investigation and remediation activities. Prior to the initiation of these tasks, Material Safety Data Sheets (See MSDS Binder) will be obtained for each of the chemicals to be used and all site workers and visitors who may potentially be exposed will be made aware of these hazards.

If the PESM determines that monitoring will be required to determine if these chemicals are potentially migrating off-site, a monitoring program will be established that is consistent with the provisions stated in Section 7.0.

4.2 Biological Hazards

During the course of the project, there is a potential for workers to come into contact with biological hazards such as animals, insects and plants. Workers will be instructed in hazard recognition, health hazards, and control measures during site-specific training.

4.2.1 Animals

During the conduct of site operations, wild animals such as stray dogs or cats, raccoons, and mice may be encountered. Workers shall use discretion and avoid all contact with wild animals. If these animals present a problem, efforts will be made to remove these animals from the site by contacting a licensed animal control technician.

4.2.2 Insects

Insects, including bees, wasps, hornets, and spiders, may be present at the Site making the chance of a bite possible. Some individuals may have a severe allergic reaction to an insect bite or sting that can result in a life threatening condition; any individuals who have been bitten or stung by an insect should notify the SM. The following is a list of preventive measures:

- Apply insect repellent prior to performing any field work and as often as needed throughout the work shift.
- Wear proper protective clothing (work boots, socks and light colored pants).
- When walking in wooded areas, avoid contact with bushes, tall grass, or brush as much as possible.
- Field personnel who may have insect allergies shall have bee sting allergy medication on site and should provide this information to the SM prior to commencing work.

4.2.3 Lyme Disease

Lyme disease is caused when spirochete is transferred from an infected tick to the worker through a painless bite. The tick, which often embeds itself within the skin will transmit the virus as it is uses the bloodstream to feed.

Lyme disease may cause a variety of medical conditions including arthritis, which can be treated successfully if the symptoms are recognized early and medical attention is received. Treatment with antibodies has been successful in preventing more serious symptoms from developing. Early signs may include a flu-like illness, an expanding skin rash and joint pain. If left untreated, Lyme disease can cause serious nerve or heart problems as well as a disabling type of arthritis.

Symptoms can include a stiff neck, chills, fever, sore throat, headache, fatigue and joint pain. This flu-like illness is out of season, commonly happening between May and October when ticks are most active. A large expanding skin rash usually develops around the area of the bite. A person may develop more than one rash, in some instances. The rash may feel hot to the touch and may be painful. Rashes vary in size, shape, and color, but often look like a red ring with a clear center. The outer edges expand in size. It's easy to miss the rash and the connection between the rash and a tick bite. The rash develops from three days to as long as a month after the tick bite. Almost one third of those with Lyme disease never get the rash.

Joint or muscle pain may be an early sign of Lyme disease. These aches and pains may be easy to confuse with the pain that comes with other types of arthritis. However, unlike many other types of arthritis, this pain seems to move or travel from joint to joint.

Lyme disease can affect the nervous system. Symptoms include stiff neck, severe headache, and fatigue usually linked to meningitis. Symptoms may also include pain and drooping of the muscles on the face, called Bell's Palsy. Lyme disease may also mimic symptoms of multiple sclerosis or other types of paralysis.

The disease can also cause serious but reversible heart problems, such as irregular heartbeat. Finally, Lyme disease can result in a disabling, chronic type of arthritis that most often affects the knees. Treatment is more difficult and less successful in later stages. Often, the effects of Lyme disease may be confused with other medical problems.

It is recommended that personnel check themselves when in areas that could harbor ticks, wear light color clothing and visually check themselves and their buddy when coming from wooded or vegetated areas. If a tick is found biting an individual, the SM should be contacted immediately. The tick can be removed by pulling gently at the head with tweezers. The affected area should then be disinfected with an antiseptic wipe. The employee will be offered the option for medical treatment by a physician, which typically involves prophylactic antibiotics. If personnel feel sick or have signs similar to those above, they should notify the SM immediately.

4.2.4 Plants

The potential for contact with poisonous plants exists when performing field work in undeveloped and wooded areas. Poison ivy, sumac, and oak may be present on site. Poison ivy can be found as vines on tree trunks or as upright bushes. Poison ivy consists of three leaflets with notched edges. Two leaflets form a pair on

opposite sides of the stalk, and the third leaflet stands by itself at the tip. Poison ivy is red in the early spring and turns shiny green later in the spring. Poison sumac can be present in the form of a flat-topped shrub or tree. It has fern-like leaves, which are velvety dark green on top and pale underneath. The branches of immature trees have a velvety "down." Poison sumac has white, "hairy" berry clusters. Poison oak can be present as a sparingly branched shrub. Poison oak is similar to poison ivy in that it has the same leaflet configuration; however, the leaves have slightly deeper notches. Prophylactic application of Tecnu may prevent the occurrence of exposure symptoms. Post exposure over the counter products are available and should be identified at the local pharmacist. Susceptible individuals should notify the SM.

Contact with poison ivy, sumac, or oak may lead to a skin rash, characterized by reddened, itchy, blistering skin which needs first aid treatment. If you believe you have contacted one of these plants, immediately wash skin thoroughly with soap and water, taking care not to touch your face or other body parts.

4.3 Physical Hazards

A variety of physical hazards may be present during Site activities. The most common hazards are struck-by/against hazards; slips, trips, and falls; and temperature extreme (cold and heat) stress. Other physical hazards are due to the use of hand and power tools and material handling. These hazards are not unique and are generally familiar to hazardous waste workers. Additional specific safety requirements may be covered during safety briefings at the Site.

4.3.1 Cold Stress

At certain times of the year, workers may be exposed to the hazards of working in cold environments. Potential hazards in cold environments include frostbite, trench foot or immersion foot, hypothermia as well as slippery surfaces, brittle equipment, poor judgment and unauthorized procedural changes. The procedures to be followed are found in Appendix C, the Cold Stress Program.

4.3.2 Heat Stress

Heat stress is a significant potential hazard, which is greatly exacerbated with the use of PPE in hot environments. The potential hazards of working in hot environments include dehydration, cramps, heat rash, heat exhaustion, and heat stroke. A heat stress prevention program will be implemented when ambient temperatures exceed 70°F for personnel wearing impermeable clothing. The procedures to be followed are found in Appendix D, the Heat Stress Program.

4.3.3 Noise

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps and generators. Site workers who will perform suspected high noise tasks and operations for short durations (less than 1-hour) will be provided with earplugs. If deemed necessary by the SM, the PESM will be consulted on the need for additional hearing protection and the need to monitor sound levels for site activities.

4.3.4 Hand and Power Tools

In order to complete the various tasks for the project, personnel will utilize hand and power tools. The use of hand and power tools can present a variety of hazards, including physical harm from being struck by flying objects, being cut or struck by the tool, fire, and electrocution. Work gloves, safety glasses, and hard hats will be worn by the operating personnel at all times when utilizing hand and power tools and GFI-equipped circuits will be used for all power tools.

4.3.5 Slips, Trips, and Falls

Working in and around the site will pose slip, trip and fall hazards due to slippery surfaces that may be oil covered, or from surfaces that are wet from rain or ice. Excavation at the sites will cause uneven footing in the trenches and around the spoil piles.

4.3.6 Fire and Explosion

When conducting excavating activities, the opportunity of encountering fire and explosion hazards exists from contamination in the soil and the possibility of free product in the underground pipelines. This will be especially hazardous when pipelines are sawed or broken to grout the ends. Additionally, the use of a diesel engine on excavating equipment could present the possibility of encountering fire and explosion hazards. See Appendix M for further precautions and procedures in dealing with Fire and Explosions.

4.3.7 Manual Lifting

Manual lifting of heavy objects such as sections of pipe may be required. Failure to follow proper lifting technique can result in back injuries and strains. Site workers will be instructed to use power equipment to lift heavy loads whenever possible and to evaluate loads before trying to lift them (i.e. they should be able to easily tip the load and then return it to its original position). Carrying heavy loads with a buddy and proper lifting techniques, 1) make sure footing is solid, 2) make

back straight with no curving or slouching, 3) center body over feet, 4) grasp the object firmly and as close to your body as possible, 5) lift with legs, and 6) turn with your feet, to avoid stress in the lower back. Back injuries are a serious concern as they are the most common workplace injury, often resulting in lost or restricted work time, and long treatment and recovery periods. In addition, hand digging for pipes may present lifting/ergonomic hazards.

4.3.8 Steam, Heat, Splashing

Exposure to steam/heat/splashing hazards can occur during steam cleaning activities. Exposure to steam/heat/splashing can result in scalding/burns, eye injury, and puncture wounds. Proper PPE will be worn during all steam cleaning activities including rain gear or tyvek, hardhat equipped with splashguard, and water resistant gloves and boots.

4.3.9 Heavy Equipment Operations

Excavators, loaders, bulldozers, compactors, and dump trucks will be utilized in trenching, excavation, and backfilling operations. Pile drivers will be used to install the Waterloo Barrier® Steel Sheet Piles. Cranes will be used to install the Waterloo Barrier® Steel Sheet Piles and the temporary fabric excavation structure. Drill rigs will be used to abandon and install monitoring and DNAPL recovery wells. Working with or near heavy equipment poses many potential hazards, including electrocution, fire/explosion, being struck by or against, or pinched/caught/crushed by, and can result in serious physical harm.

4.3.10 Electrocution

The use of power tools and extension cords may pose electrical hazards to workers. Additionally overhead or underground electrical lines and the electrical substation located in the NW corner of the Site are of potential concern during excavation, trenching, sheet pile driving, tent mobilization and demobilization, and drilling operations. Potential adverse effects of electrical hazards include shocks, burns, and electrocution, which could result in death.

5.0 ACTIVITY HAZARD ANALYSIS

Activity Hazard Analysis (AHAs) are a systematic way of identifying the potential health and safety hazards associated with the activities required for completion of the work and the methods to avoid, control and mitigate those hazards. The AHAs will be used to train work crews in proper safety procedures during training prior to each phase of work.

AHAs have been developed for the following phases of work and are included in Appendix E of the HASP.

Mobilization/Demobilization

- Mobilization and Demobilization of Equipment and Supplies
- Establishment of Site Security, Work Zones and Staging Areas
- Utility Connections (Water, Sewer, Communications and Electrical) for all temporary facilities
- Site restoration (re-establishment of vegetation cover, site grading, replacement of fences, etc)

Pre Construction and Site Preparation

- Delineate and Protect Utilities located on site and those leading to and from the Site
- Site Preparation (on-site roads, installation of soil erosion measures, temporary facilities, etc)
- Clearing and Grubbing
- Prepare decontamination pads and facilities

General Construction Activities

- Crane operations
- Construction activities near electrical transmission lines (above and below ground)

Decontamination

- Steam Clean of Heavy Equipment/Vehicles
- Dry Decon of Heavy Equipment/Vehicles
- Sampling Equipment Decontamination

Drilling Operations

- Abandonment of existing wells
- Installation of DNAPL recovery wells

Trenching Activities for Installation of Waterloo® Sheet Pile Barriers

- Excavation of material for creation of the trench
- Stockpile and Segregation of trench material
- Shoring and support of the trench
- Trench safety and atmosphere monitoring
- Backfill of the trench with stockpiled material not impacted with source material

Excavation of Shallow Excavation Areas

- Installation of sheet piling to support shallow excavations
- Benching for slope protection in the Shallow Excavation Areas
- Erection, maintenance, relocation and removal of temporary fabric enclosure(s)
- Protect and support excavation areas in proximity to overhead utilities
- Excavation of materials from Shallow Excavation Areas
- Staging and Stockpiling Materials
- Operations in proximity to overhead and underground utilities
- Removal of subsurface obstructions
- Backfill and compaction of Shallow Excavation Areas

Site Wide Cap

- Excavation of materials to facilitate the site wide cap
- Staging and Stockpiling Materials
- Removal of subsurface obstructions
- Operations in proximity to overhead and underground utilities
- Construction of site wide cap

Other Remediation Activities

- Operation and Maintenance Tasks
- Disconnection, Capping and Sealing of former industrial piping
- Dewatering (if required)

Soil and Groundwater Sampling Activities

- Soil Borings and Soil Sampling
- Monitoring Well Development, and Sampling

An AHA for the following activity will be submitted prior to work start by the Posillico subcontractor performing the work.

Installation of Waterloo® Sheet Pile Barriers (Separate Submittal from Waterloo) – also for Allsite or Universal temporary structure

- Installation of Waterloo Barrier® Steel Sheet Piles
- Joint Flushing of Waterloo® Sheet Pile Barriers
- Joint Grouting of Waterloo® Sheet Pile Barriers
- Field Modifications (cutting and welding) of Waterloo® Sheet Pile Barriers
- Crane Operations (See Construction Activities)
- Removal of subsurface obstructions

6.0 PERSONAL PROTECTIVE EQUIPMENT

The personal protective equipment (PPE) specified in Table 6-1 represents the hazard analysis and PPE selection required by 29 CFR 1910.132. Specific information on the selection rationale for each activity can be found in Section 4.0, Appendix E – AHAs, and Appendix F - Personal Protective Equipment (PPE): Selection and Use. For the purposes of PPE selection, the PESM and HSS are considered competent persons. The signatures on the front of the HASP constitute certification of the hazard assessment. For activities not covered by Table 6-1, the PESM or ESS will conduct the hazard assessment and select the PPE using the information provided in Appendix F. PPE selection will be made in consultation with the PESM.

Modifications for initial PPE selection may also be made by the HSS in consultation with the PESM. A written justification for major downgrades will be provided to the PESM for approval on a field change request form.

Table 6-1 describes the anticipated task-specific PPE.

6.1 PPE Abbreviations

HEAD PROTECTION HH = Hard Hat HEARING PROTECTION EP = ear plugs EM = ear muffs	EYE/FACE PROTECTION APR = Full Face Air Purifying Respirator MFS = Mesh Face shield PFS =Plastic Face shield SG = ANSI approved safety glasses with side shields	FOOT PROTECTION Neo = Neoprene OB = Overboot Poly = polyethylene coated boot Rub = rubber slush boots STB = Leather work boots with steel toe.
HAND PROTECTION Cot = cotton But = Butyl LWG = Leather Work Gloves Neo = Neoprene Nit = Nitrile	BODY PROTECTION Cot Cov = Cotton Coveralls Poly = Polyethylene coated tyvek coveralls Saran = Saranex coated tyvek coveralls Tyvek = Uncoated paper tyvek coveralls WC = Work clothes	RESPIRATORY PROTECTION Level D = No respiratory protection required Level C = Full face air purifying respirator with approved cartridges Level B = Full face air supplied respirator with escape bottle

TABLE 6-1

PERSONAL PROTECTIVE EQUIPMENT SELECTION

TASK	HEAD	EYE/FACE	FEET	HANDS	BODY	HEARING	RESPIRATOR
Mobilization/Demobilization							
Mobilization/ demobilization of equipment and supplies	HH	SG	STB	LWG	WC	EP as needed	Level D
Establishment of site security, work zones and staging area	HH	SG	STB	LWG	WC	EP as needed	Level D
Utility Connections	HH	SG	STB	LWG	WC	EP as needed	Level D
Site Restoration	HH	SG	STB	LWG	WC	EP as needed	Level D
Pre Construction and Site Preparation							
Delineate and Protect Utilities	HH	SG	STB	LWG	WC	EP as needed	Level D
Site Preparation	HH	SG	STB	LWG	WC	EP as needed	Level D
Clearing and Grubbing	HH	SG	STB	LWG	WC	EP as needed	Level D
Prepare Decontamination Pad and Facilities	HH	SG	STB	LWG	WC	EP as needed	Level D
Drilling Activities							
Abandonment of existing wells	HH	SG	STB	Nit	WC, Poly	EP as needed	Level D initially Level C as needed
Installation of DNAPL Recovery Wells	HH	SG	STB	Nit	WC, Poly	EP	Level D initially Level C as needed
Construction Activities							
Heavy equipment decontamination	HH	SG, PFS	STB, OB	Nit	WC, Poly	EP as needed	Level D
Trenching Activities for Installation of Waterloo® Sheet Pile Barriers							
Excavation of material for creation of trench	HH	SG	STB STB + OB for entry	LWG Nit	WC WC + Tyvek for entry	EP or EM Note: EM may not be worn over hardhat liner	As required based upon real-time monitoring results as compared to action levels in Table 7-1.
Stockpile and	HH	SG	STB, OB	Nit, LWG	WC, tyvek	EP as needed	Level D initially,

TASK	HEAD	EYE/FACE	FEET	HANDS	BODY	HEARING	RESPIRATOR
Segregation of Trench Material					or Poly as needed		Level C as needed
Shoring and support of the Trench	HH	SG	STB STB + OB for entry	LWG Nit	WC WC + Tyvek for entry	EP or EM Note: EM may not be worn over hardhat liner	As required based upon real-time monitoring results as compared to action levels in Table 7-1.
Backfill of the Trench	HH	SG	STB, OB	LWG	WC, tyvek or Poly as needed	EP as needed	Level D
Installation of Waterloo® Sheet Pile Wall							
Installation of Waterloo Barrier® Steel Sheet Piles	HH	SG	STB	LWG	WC, tyvek or Poly as needed	EP, EM as needed	Level D
Joint Flushing	HH	SG, PFS as needed	STB	Nit , LWG	WC, tyvek or Poly as needed	EP as needed	Level D initially, Level C as needed
Joint Grouting	HH	SG, PFS as needed	STB	Nit , LWG	WC, tyvek or Poly as needed	EP as needed	Level D initially, Level C as needed
Removal of Subsurface Obstruction	HH	SG, APR as needed	STB, OB	Nit , LWG	WC, tyvek or Poly as needed	EP as needed	Level D initially, Level C as needed
Excavation of Shallow Excavation Areas							
Installation of sheet piles	HH	SG	STB	LWG	WC, tyvek or Poly as needed	EP, EM as needed	Level D
Benching for slope protection	HH	SG	STB, OB	LWG	WC, tyvek or Poly as needed	EP as needed	Level D
Excavate materials	HH	SG	STB STB + OB for entry	LWG Nit	WC WC + Tyvek for entry	EP or EM Note: EM may not be worn over hardhat liner	As required based upon real-time monitoring results as compared to action levels in Table 7-1.
Sorting and Stockpiling	HH	SG	STB, OB	LWG	WC, tyvek	EP as needed	Level D

TASK	HEAD	EYE/FACE	FEET	HANDS	BODY	HEARING	RESPIRATOR
materials					or Poly as needed		
Loading of material for off-site disposal	HH	SG	STB, OB	LWG	WC, tyvek or Poly as needed	EP as needed	Level D
Removal of subsurface obstructions	HH	SG, APR as needed	STB, OB	Nit,LWG	WC, tyvek or Poly as needed	EP as needed	Level D initially, Level C as needed
Backfill and Compaction	HH	SG	STB, OB	LWG	WC, tyvek or Poly as needed	EP as needed	Level D
Site Wide Cap							
Excavation of materials to facilitate cap	HH	SG	STB,OB	LWG	WC WC + Tyvek for entry	EP or EM Note: EM may not be worn over hardhat liner	As required based upon real-time monitoring results as compared to action levels in Table 7-1.
Sorting and stockpiling of materials	HH	SG	STB, OB	LWG	WC, tyvek or Poly as needed	EP as needed	Level D
Loading of material for off-site disposal	HH	SG	STB, OB	LWG	WC, tyvek or Poly as needed	EP as needed	Level D
Removal of subsurface obstructions	HH	SG, APR as needed	STB, OB	Nit,LWG	WC, tyvek or Poly as needed	EP as needed	Level D initially, Level C as needed
Construction of site wide cap	HH	SG	STB, OB	LWG	WC, tyvek or Poly as needed	EP as needed	Level D
Other Remediation Activities							
OM&M Tasks	HH	SG	STB	Nit,LWG	WC	EP as needed	Level D
Disconnection of former industrial piping	HH	SG, APR as needed	STB, OB	Nit,LWG	WC, tyvek or Poly as needed	EP as needed	Level D initially, Level C as needed
Cutting and Capping of former industrial piping	HH	SG, APR as needed	STB, OB	Nit,LWG	WC, tyvek or Poly as needed	EP as needed	Level D initially, Level C as needed

TASK	HEAD	EYE/FACE	FEET	HANDS	BODY	HEARING	RESPIRATOR
Installation of DNAPL Wells	HH	SG, PFS as needed	STB	Nit,LWG	Tyvex or Poly as needed	EP as needed	Level D
Soil and Groundwater Sampling Activities							
Soil Borings and Sampling	HH	SG	STB	Nit,LWG	WC, Tyvek or Poly as needed	EP as needed	Level D
Well Development and sampling	HH	SG	STB	Nit,LWG	WC, Tyvek or Poly as needed	EP as needed	Level D

6.2 OSHA Requirements for Personal Protective Equipment

All personal protective equipment used during the course of this field investigation must meet the following OSHA standards:

Type of Protection	Regulation	Source
Eye and Face	29 CFR 1910.133	ANSI Z87.1-1968
Respiratory	29 CFR 1910.134	ANSI Z88.1-1980
Head	29 CFR 1910.135	ANSI Z89.1-1969
Foot	29 CFR 1910.136	ANSI Z41.1-1967

ANSI = American National Standards Institute

Any on-site personnel who have the potential to don a respirator must have a valid fit test certification and documentation of medical clearance. The HSS will maintain such information on file for Posillico personnel, Posillico subcontractors, National Grid consultants, and National Grid contractors, and other third party personnel. The HSS will obtain such information from the subcontractor's site supervisor prior to the initiation of any such work.

Both the respirator and cartridges specified for use in Level C protection must be fit-tested prior to use in accordance with OSHA regulations (29 CFR 1910.1025; 29 CFR 1910.134). Air purifying respirators cannot be worn under the following conditions:

- Oxygen deficiency;
- IDLH concentrations; and
- If contaminant levels exceed designated use concentrations.

6.3 Respirator Cartridge Change-Out Schedule

A respirator cartridge change-out schedule has been developed in order to comply with 29 CFR 1910.134. The respirator cartridge change-out schedule for this project is, as follows:

- Cartridges shall be removed and disposed of at the end of each shift, when cartridges become wet or wearer experiences breakthrough, whichever occurs first; and
- If the humidity exceeds 85%, then cartridges shall be removed and disposed of after 4 hours of use, if average PID/FID readings exceed 10 ppm.

Respirators shall not be stored at the end of the shift with contaminated cartridges left on. Cartridges shall not be worn on the second day, no matter how short of time period they were used the day before.

The schedule was developed based on the following scientific information and assumptions:

- Analytical data that is available regarding Site contaminants;
- Using the Rule of Thumb provided by the AIHA;
- Total airborne concentration of contaminants is anticipated to be less than 100 ppm;
- The humidity is expected to be less than 85%; and
- Desorption of the contaminants (including those with poor warning properties) after partial use of the chemical cartridge can occur after a short period (hours) without use (e.g., overnight) and result in a non-use exposure.

The following is a partial list of factors that may affect the usable cartridge service life and/or the degree of respiratory protection attainable under actual workplace conditions. These factors have been considered when developing the cartridge change-out schedule.

- Type of contaminant(s)
- Contaminant concentration
- Relative humidity
- Breathing rate
- Temperature
- Changes in contaminant concentration, humidity, breathing rate and temperature
- Mixtures of contaminants
- Accuracy in the determination of the conditions
- The contaminant concentration in the workplace can vary greatly. Consideration must be given to the quality of the estimate of the workplace concentration
- Storage conditions between multiple uses of the same respirator cartridges. It is recommended that the chemical cartridges be replaced after each work shift. Contaminants absorbed on a cartridge can migrate through the carbon bed without airflow.
- Age of the cartridge
- Condition of the cartridge and respirator
- Respirator and cartridge selection Respirator fit
- Respirator assembly, operation and maintenance
- User training, experience and medial fitness
- Warning properties of the contaminant
- The quality of the warning properties should be considered when establishing the chemical cartridge change schedule. Good warning properties may provide a secondary or back-up indication for cartridge change-out.

7.0 MONITORING

Environmental Health and Safety Monitoring will be performed in accordance with this section.

7.1 On-Site Monitoring During Remedial Activities

The following monitoring instruments will be available for use during field operation as necessary:

- Photoionization Detector (PID), Photovac Microtip with 10.6 eV lamp or equivalent; or
- Flame Ionization Detector (FID), Foxboro OVA model 128 or equivalent; and
- Dust Meter, MIE Miniram model PDM-3 or equivalent; and
- Combustible Gas Indicator (CGI)/Oxygen (O_2) / H2S / HCN meter, MSA model 361 or equivalent; and
- Sound Level and vibration meters for sheet installation and other activities when deemed necessary by the SM, PESM, National Grid, National Grid Consultants, or NYSDEC/NYSDOH. The type of monitoring will be appropriate for the activities performed.

All air monitoring equipment will be calibrated and maintained in accordance with manufacturer's requirements and the Monitoring Instruments: Use, Care, and Calibration program included in Appendix G.

Organic vapor concentrations shall be measured using the PID and/or FID during excavating and other intrusive activities. During intrusive operations, organic vapor concentrations shall be measured continuously; during other activities, readings shall be taken at least once every hour, or as required by the Community Air Monitoring Plan (CAMP). Organic vapor concentrations shall be measured upwind of the work site(s) to determine background concentrations at least twice a day, (once in the morning and once in the afternoon). The SM will interpret monitoring results using professional judgment.

A dust meter shall be used to measure airborne particulate matter during intrusive activities. Monitoring will be continuous and readings will be averaged over a 15-minute period for comparison with the action levels. Monitoring personnel will make a best effort to collect dust monitoring data from downwind of the intrusive activity. If off-site sources are considered to be the source of the measured dust, upwind readings will also be collected.

A CGI/O_2 meter shall be used to monitor for combustible gases and oxygen content in trenches, excavations, surrounding areas and elsewhere as necessary. The CGI will also be equipped with a hydrogen sulfide sensor and hydrogen cyanide sensor. H2S monitoring will be completed every fifteen minutes, or if a sulfur odor is present, monitoring will be continuous. HCN monitoring will be completed every fifteen minutes, or if an almond odor is detected, monitoring will be continuous.

All trenches will be monitored before entry and as required to ensure a safe working atmosphere. A competent person shall be present during the monitoring.

Guidelines have been established by the National Institute for Occupational Safety and Health (NIOSH) concerning the action levels for work in a potentially explosive environment. These guidelines are as follows: 10% LEL- Limit all activities to those which do not generate sparks, 20% LEL- Cease all activities in order to allow time for the combustible gases to vent.

TABLE 7-1

REAL TIME AIR MONITORING ACTION LEVELS

Air Monitoring Instrument	Monitoring Location	Action Level	Site Action	Reason
PID/FID	Breathing Zone	0.5 ppm	Use detector tube for benzene	1/2 of PEL for benzene
PID/FID	Breathing Zone	0 - 10 ppm	No respiratory protection is required	
		10 - 250 ppm	Level C	
		> 250 ppm	Stop work, withdraw from work area; notify PESM	
Oxygen meter	Breathing Zone	< 19.5%	Stop work; withdraw from work area; notify PESM.	Low oxygen
		> 22%	Stop work; withdraw from work area; notify PESM.	Oxygen enriched atmosphere; explosion hazard
H2S meter	Breathing Zone	<5 ppm	No respiratory protection is required	
		>5 ppm	Stop work, cover excavation, notify PESM	
HCN meter	Breathing Zone	<2.5 ppm	No respiratory protection is required	
		>2.5 ppm	Stop work, cover excavation, notify PESM	
CGI	Excavation	< 10 % LEL	Investigate possible causes, allow excavation to ventilate; use caution during procedures.	Increasing potential for ignition of vapors
		> 10% LEL	Stop work; allow excavation, borehole to ventilate to < 10% LEL; if ventilation does not result in a decrease to < 10% LEL, withdraw from work area; notify PESM.	Potential for ignition of vapors
Dust Meter	Excavation	> 1.5 mg/m^3	Implement work practices to reduce/minimize airborne dust generation, e.g., spray/misting of soil with water	Potential inhalation source for airborne contaminants adhering to dust
		> 2.5 mg/m^3	Upgrade to Level C PPE	1/2 PEL for respirable dust

7.2 Community Air Monitoring Plan

Refer to the Community Air Monitoring Plan (CAMP) contained within the approved Remedial Design Report (RDR)

7.3 Data Quality Assurance

7.3.1 Calibration

Instrument calibration shall be documented and included in a dedicated safety and health logbook or on separate calibration pages. All instruments shall be calibrated before and after each shift. Calibration checks may be used during the day to confirm instrument accuracy. Duplicate readings may be taken to confirm individual instrument response.

7.3.2 Operations

All instruments shall be operated in accordance with the manufacturer's specifications. Manufacturers' literature, including an operations manual for each piece of monitoring equipment will be maintained on-site by the SM for reference.

7.4 Noise Monitoring

Work areas or tasks that pose an exposure risk greater than 85 dBA will require hearing protection. If there is a reasonable possibility that workers may be exposed to an 8-hour time-weighted average exceeding 85 dBA, noise monitoring will be conducted.
In addition, during the installation of the migration barriers and the shoring system for the shallow excavations, the driving of sheet piles will likely create noise levels in excess of background conditions. Noise monitoring will be conducted during all sheet pile deriving activities being implemented as part of remedial construction activities. Noise will be monitored at locations identified in the Noise, Vibration, and Odor Monitoring and Mitigation Program.

Noise monitoring during installation of the migration barriers and the shoring systems will be performed using a Bruel and Kjaer Modular Precision Sound Level Meter or equivalent equipment. Monitoring will be conducted continuously during periods of active sheet pile driving. All monitoring and surveillance equipment will be operated, maintained and calibrated in accordance with the manufacture's instructions and the established quality assurance procedures. All equipment will be checked daily for proper operation. Field validation logs will be maintained on-site.

7.5 Temperature Extremes Monitoring

A heat stress prevention program will be implemented when ambient temperatures exceed 70 F for personnel wearing impermeable clothing and for other personnel when the wet bulb globe thermometer (WBGT) index exceeds the ACGIH TLVs. Heat Stress monitoring will be conducted in accordance with the heat stress monitoring program found in Appendix D.

7.6 Vibration Monitoring

Vibration monitoring will be conducted during all sheet pile driving activities being implemented as part of the remedial construction activities. Vibration will be monitored at locations to be determined along the perimeter of the installation area. Additional vibration monitoring will be conducted at several distances from the sheet pile driving activities and/or near sensitive structures/receptors in close proximity to the sheet pile driving activity. Potential sensitive receptors include, but are not limited to, the existing substation, the sewer treatment plant, the elevated MTA subway tracks and adjacent business and residential structures.

On-site vibration monitoring will be performed sing GeoSonics SSU 2000KD Seismograph and Acoustic Monitor or equivalent equipment. A vibration criterion of 0.5 inches per second (in/sec) peak particle velocity (PPV) will be used as the threshold criteria for ground-born vibrations measurement during remedial construction activities.

All monitoring and surveillance equipment will be operated, maintained and calibrated in accordance with the manufacturer's instructions and the established quality assurance procedures. All equipment will be checked daily for proper operation. Field validation logs will be maintained on-site.

8.0 ZONES, PROTECTION, AND COMMUNICATION

8.1 Site Control

Site zones are intended to control the potential spread of contamination and to assure that only authorized individuals are permitted into potentially hazardous areas. A three-zone approach will be utilized. It shall include an Exclusion Zone (EZ), Contamination Reduction Zone (CRZ) and a Support Zone (SZ). Specific zones shall be established on the work site when operations begin for each task requiring such delineation (i.e. construction, excavation, trenching in impacted areas of the site). Maps will be available at the Site and used during initial site-specific training.

This project is being conducted under the requirements of 29 CFR 1910.120, and any personnel working in an area where the potential for exposure to site contaminants exists, will only be allowed access after proper training and medical documentation as required by Posillico. These records shall be maintained by the PESM, and copies will be provided to the SM prior to mobilization for project activities.

The following shall be used for guidance in revising these preliminary zone designations, if necessary.

Support Zone - The SZ is an uncontaminated area that will be the field support area for most operations. The SZ provides for field team communications and staging for emergency response. Appropriate sanitary facilities and safety equipment will be located in this zone. Potentially contaminated personnel/materials are not allowed in this zone. The only exception will be appropriately packaged/decontaminated and labeled samples.

Contamination Reduction Zone - The CRZ is established between the EZ and the SZ. The CRZ contains the contamination reduction corridor and provides an area for decontamination of personnel and portable hand-held equipment, tools and heavy equipment. A personnel decontamination area will be prepared at each exclusion zone. The CRZ will be used for Exclusion Zone entry and egress in addition to access for heavy equipment and emergency support services.

Exclusion Zone - All activities which may involve exposure to site contaminants, hazardous materials and/or conditions should be considered an exclusion zone. This zone will be clearly delineated by cones, tapes or other means. The SM may establish more than one EZ where different levels of protection may be employed or different hazards exist. The size of the EZ shall be determined by the site SM allowing adequate space for the activity to be completed by field members and emergency equipment.

8.2 Contamination Control

8.2.1 Personnel Decontamination Station

Personnel hygiene, coupled with diligent decontamination, will significantly reduce the potential for exposure.

8.2.2 Minimization of Contact With Contaminants

During completion of all site activities, personnel should attempt to minimize the degree of contact with contaminated materials. This involves a conscientious effort to keep "clean" during site activities. All personnel should minimize kneeling, splash generation, and other physical contact with contamination. This may ultimately minimize the degree of decontamination required and the generation of waste materials from site operations.

Field procedures will be developed to control over spray and runoff and to ensure that unprotected personnel working nearby are not affected.

8.2.3 Personnel Decontamination Sequence

Consideration will be given to prevailing wind directions so that the decontamination line, the support zone, and contamination reduction zone exit is upwind from the exclusion zone and the first station of the decontamination line. Decontamination will be performed by removing all PPE used in EZ and placing in drums/trash cans at CRZ. Baby wipes shall be available for wiping hands and face.

8.2.4 Emergency Decontamination

If circumstances dictate that contaminated clothing cannot be readily removed, then remove gross contamination, wrap injured personnel with clean garments/blankets to avoid contaminating other personnel or transporting equipment.

If the injured person can be moved, he/she will be moved to the exclusion zone boundary and decontaminated by site personnel as described above before emergency responders handle the victim. If the person cannot be moved because of the extent of the injury (a back or neck injury) provisions shall be made to ensure that emergency response personnel will be able to respond to victim without being exposed to potentially hazardous atmospheric conditions. If the potential for inhalation hazards exist, such as with open excavation, this area will be covered with poly to eliminate any potential inhalation hazards. All emergency personnel are to be immediately informed of the injured person's condition, potential contaminants, and provided with all pertinent chemical data.

8.2.5 Hand Held Equipment Decontamination

Hand held equipment includes all monitoring instruments, samples, and hand tools. The hand held equipment is dropped at the first decontamination station to be decontaminated by one of the decontamination team members. These items must be decontaminated or discarded as waste prior to removal from the exclusion zone.

To aid in decontamination, monitoring instruments can be sealed in plastic bags or wrapped in polyethylene. This will also protect the instruments against contaminants. The instruments will be wiped clean using wipes or paper towels if contamination is visually evident.

Decontamination procedures for sampling equipment, hand tools, etc., shall include the use of steam cleaning or a detergent wash, as appropriate for the site conditions.

8.2.6 Heavy Equipment Decontamination

Decontamination of chemically contaminated heavy equipment will be accomplished using high -pressure steam or with brushes and shovels (dry decon). Decontamination shall take place on a decontamination pad and all liquids used in the decontamination procedure will be collected. Vehicles or equipment brought into an exclusion zone will be treated as contaminated, and will be decontaminated prior to removal. All liquids used in the decontamination procedure will be collected, stored and disposed of in accordance with federal, state and local regulations. Personnel performing this task will wear the proper PPE as prescribed in Table 6-1.

8.3 Communications

The following communications equipment shall be specified as appropriate:

- Telephones - A cellular telephone will be located in the SZ for communication with emergency support services/facilities and the home office. Personnel in the EZ can carry cellular telephones for communication as well if Level D PPE has been determined to be appropriate.

- Hand Signals - Hand signals shall be used by field teams along with the buddy system. They shall be known by the entire field team before operations commence and their use covered during site-specific training. Typical hand signals are the following:

Signal	Meaning
Hand gripping throat	Out of air, can't breathe
Grip on a partner's wrist or placement of both hands around a partner's waist	Leave area immediately, no debate
Hands on top of head	Need assistance
Thumbs up	Okay, I'm all right, I understand.
Thumbs down	No, negative.

9.0 MEDICAL SURVEILLANCE PROCEDURES

All personnel performing field work where potential exposure to contaminants exists at the site are required to have passed a complete medical surveillance examination in accordance with 29 CFR 1910.120(f) and, where applicable, expanded health standards.

9.1 Medical Surveillance Requirements

A physician's medical release for work will be confirmed by the HSS before a worker can enter the exclusion zone. The examination will be taken annually at a minimum and upon termination of hazardous waste site work if the last examination was not taken within the previous six months. Additional medical testing may be required by the PESM in consultation with the HSS if an over-exposure or accident occurs, if an employee exhibits symptoms of exposure, or if other site conditions warrant further medical surveillance.

10.0 SAFETY CONSIDERATIONS

An HSS will be present on-site at all times during work activities and shall provide all monitoring and health and safety support in order to ensure the adequacy of protective equipment and safety procedures.
During all activities, personnel shall strictly adhere to the following:

- The buddy system or line of sight will be used during intrusive work;
- If field personnel perceive an unsafe condition or situation, the HSS will be notified immediately; and
- All site personnel shall be aware of the work rules presented in Appendix H.

Activities to be conducted at the site may involve operations that have the potential for a serious injury to occur, to include the following:

- Sample handling
- Lockout/Tagout
- Heavy Equipment Operation
- Drill Rigs
- Crane Operations
  - High Wind Operations
  - Operations in Proximity to Overhead/Underground Lines
- Excavation and Trenching
  - Excavation in Proximity to Overhead/Underground Lines
- Confined Space Entry
- Line Breaking
- Fall Protection
- Bulkhead/water work

10.1 Sample Handling

Personnel responsible for the handling of samples should wear the prescribed level of protection. Samples should be identified as to their hazard and packaged as to prevent spillage or breakage. Sample containers shall be decontaminated in the CRZ or EX before entering a clean Support Zone area. Any unusual sample conditions, odors, or real-time readings should be noted. Laboratory personnel should be advised of sample hazard level and the potential contaminants present. This can be accomplished by a phone call to the lab coordinator and/or including a written statement with the samples reviewing lab safety procedures in handling, in order to assure that the practices are appropriate for the suspected contaminants in the sample.

10.2 Lockout-Tagout

Site personnel will assume that all electrical equipment (surface, subsurface and overhead) is energized, until a National Grid representative has designated the electrical equipment as de-energized. If the equipment cannot be designated as de-energized, work

shall stop and the SM, PM or PESM will meet to determine a safe path forward. National Grid will be notified prior to working adjacent to electrical equipment. Prior to beginning work personnel shall verify that the equipment is energized or de-energized in the vicinity of the construction area. The Control of Hazardous Energy Program "Lock Out/Tag Out" is included in Appendix I.

All power lines that have been indicated to be de-energized must be locked out, such that the lines cannot be energized when personnel are working near them. The lines shall not be unlocked and re-energized until National Grid is notified that they have completed work in the area and that all personnel are clear of the area.

National Grid representatives will thoroughly familiarize Site personnel with site-specific lockout/tagout procedures during the site orientation. Lockout/tagout procedures are presented in Appendix I.

If power lines cannot be de-energized, the SM will consult with Long Island Power Authority (LIPA) safety personnel to determine the safe working distance from the energized line. Work tasks will only commence after determination that a safe working distance can be maintained and all personnel working in the area have been informed of the limitation, and received activity specific training.

10.3 Heavy Equipment Operation

Heavy equipment will be operated under the following conditions:

- The operation of heavy equipment will be limited to authorized personnel specifically trained in its operation. The subcontractor site supervisors must provide this information to the SM.
- The operator will use the safety devices provided with the equipment, including seat belts. Backup warning indicates and horns will be operable at all times.
- While in operation, all personnel not directly required in the area will keep a safe distance from the equipment.
- Personnel directly involved in activity will avoid moving in the path of operating equipment or any portion thereof. Areas blinded from the operator's vision will be avoided. Spotters will be used when personnel may be in areas where the operator's view is obstructed.
- Additional riders will not be allowed on equipment unless it is specifically designed for that purpose.

10.4 Drill Rigs

When conducting drilling activities, the opportunity of encountering fire and explosion hazards exists from underground utilities and gases. The locations of underground utilities will be verified prior to performing any intrusive activities.

Additionally, because of the inherently hazardous nature of drilling operations, safety and accident prevention are crucial when drilling operations are performed. Most drilling accidents occur as a direct lack of training and supervision, improper handling of equipment, and unsafe work practices. Hazards include: assembling and disassembling rigs, rotary and auger drilling, and grouting.

10.5 Crane Operations

All Crane operations will be planned out by prior to execution. Load charts developed for the crane model will be used to design the crane picks to ensure that the radius and weight of picks do not exceed the manufacturer's design criteria. National Grid and National Grid Consultants will be provided a copy of the lifting plan with corresponding calculations prior to the commencement of work.

10.5.1 High Wind Crane Operations

The Rockaway Park Former MGP Site is located south of Jamaica Bay and is subject to high winds. The wind level will be monitored and action levels will be developed for corresponding wind speeds. The crane manufacturers technical specifications will be used to develop the applicable actions for wind speeds recorded on site. These actions may include reduced lifting capacity, additional lines to steady load during installation, work stoppage.

For example, when operating a lattice boom crane under high wind conditions (over 20 mph), the following chart may be used as a guide for capacity reductions required for emergency, one time lifts for any boom length up to 250 feet. Actual lifts will require a lifting plan with wind restrictions included in the calculations.

If the wind Velocity Exceeds	All Crane Capacities Must be Reduced:
20 mph	20%
30 mph	40%
40 mph	70%
45 mph	Crane operations must be shutdown and the boom lowered to the ground.

10.5.2 Crane Operation Near Overhead and Underground Utilities

During work in proximity to active overhead and underground utilities, methods will be developed to ensure the safety of the work and workers. Some methods to mitigate the danger of active utilities are:

- Swing brake to ensure the crane is not capable of swinging into utilities.
- Visible markings on overhead lines, and staking out underground utilities.

- Using a spotter for crane operations to ensure clearance are maintained during work.

In addition, the guidelines specified in Section 10.7 below will be adhered to strictly during operations in close proximity to Overhead and Underground Utilities.

10.6 Excavation and Trenching

The safety requirements for each excavation must be determined by a competent person who is capable of identifying existing and predictable hazards and work conditions that are unsanitary, hazardous, or dangerous to employees. The competent person must also have the authorization to take prompt corrective measures to eliminate unsatisfactory conditions.

The following are general requirements for work activities in and around excavations:

- Prior to initiation of any excavation activity, the location of underground installations will be determined. The New York State one-call center will be contacted by the excavation subcontractor a minimum of 72 hours prior to excavation activities.
- All excavations will be inspected daily by the competent person prior to commencement of work activities. Evidence of cave-ins, slides, sloughing, or surface cracks or excavations will be cause for work to cease until necessary precautions are taken to safeguard employees.
- Excavated and other materials or equipment that could fall or roll into the excavation shall be placed at least 5 feet from the edge of the excavation.

10.7 Intrusive Activities Near Overhead and Underground Utilities

An active electric substation is located in the northwest corner of the Site. This substation provides electrical service to the Rockaways. In addition, there are overhead distribution and transmission lines that extend along 108th Street and along Beach Channel Drive. Extreme care will be used during the implementation of the remedial construction activities so as not to damage or interfere with these utilities. The minimum setbacks from these overhead lines for all equipment and personal are as follows:

- 15 feet for the 33 kV overhead electrical lines;
- 10 feet for the 13 kV overhead electrical lines; and
- 5.5 feet fort the insulated 33 kV overhead electrical line.

In addition to overhead utilities, there are underground utilities that exist in proximity to the work areas. Extreme care will be used during the implementation of the remedial construction activities so as not to damage or interfere with these

underground utilities and shall support and protect these utilities as required. In addition, there are two electrical manholes that exist on the eastern portion of the site near Beach 108th Street. These electrical manholes and associated electrical conduit will be eventually abandoned by National Grid. However, should the electrical manholes and associated electrical conduit not be abandoned prior to the commencement of the remedial construction activities, they will be protected and supported as required and approved by National Grid.

No remedial work that can potentially interrupt, interfere with or damage the overhead electrical utilities shall be performed during peak summer months (i.e. June 1st to September 1st).

10.8 Confined Space Entry

All trenches and excavations deeper than five feet will be considered potential Permit Required Confined Spaces. All trenches deeper than 5 feet will be monitored for oxygen content, combustible gases, and toxic gases and vapors if entry is required. All trenches which contain hazardous atmospheres at concentrations above the action levels found in Table 7-1 will be classified as Permit Required Confined Spaces. All entry into these trenches will be performed in accordance with the Confined Space/Hot Work Permitting Procedure which is found in Appendix J.

10.9 Line Breaking

During line breaking activities, the potential exists for exposure to suspect asbestos containing materials (ACM). If suspect ACM is encountered, work will stop and will not resume until involved personnel have been upgraded to gray tyvek and Level C respiratory protection, and water is available to keep the work area and the suspect ACM wetted. Workers are to have completed asbestos awareness training prior to working with suspect ACM. The PM and PESM are to be notified if suspect ACM is encountered.

10.10 Fall Protection

During the remedial construction, there is a potential for injuries caused by falls from unprotected leading edges. Posillico Environmental Inc. shall take precautions to ensure that all leading edges of excavations and trenches are protected in accordance with OSHA 29 CFR 1926. If during the installation of the sheet piles a worker is required to assist the process in a bucket truck, they shall be protected from falls by an appropriate harness and latching system as described in OSHA CFR 1926.

10.11 Bulkhead/Water Work

During work in the bulkhead area when workers are exposed to water related hazards, employees in that area will be required to wear approved floatation devices when working within ten feet of a leading edge over water and when a handrail is not present.

11.0 DISPOSAL PROCEDURES

All discarded materials, waste materials or other objects shall be handled in such a way as to preclude the potential for spreading contamination, creating a sanitary hazard or causing litter to be left on site. All potentially contaminated materials, e.g., clothing, gloves, etc., will be bagged or drummed as necessary, labeled and segregated for disposal. All non-contaminated materials shall be collected and bagged for appropriate disposal as non-hazardous solid waste. The waste management procedures, as specified in the Final 100% Remedial Design Report, will be complied with.

12.0 EMERGENCY RESPONSE / CONTINGENCY PLAN

This section establishes procedures and provides information for use during a project emergency. Emergencies happen unexpectedly and quickly, and require an immediate response; therefore, contingency planning and advanced training of staff are essential. Specific elements of emergency support procedures which are addressed in the following subsections include communications, local emergency support units, preparation for medical emergencies, first aid for injuries incurred on-site, record keeping, and emergency site evacuation procedures. A list of emergency contacts and a map of the route to the nearest hospital are provided in Appendix A.

12.1 Responsibilities

12.1.1 Project Environmental and Safety Manager (PESM)

The PESM oversees and approves the Emergency Response/Contingency Plan and performs audits to determine that the plan is in effect and that all pre-emergency requirements are met. The PESM acts as a liaison to applicable regulatory agencies and notifies OSHA of reportable accidents.

12.1.2 Health and Safety Supervisor (HSS)

The HSS is responsible for ensuring that all personnel are evacuated safely and that machinery and processes are shut down or stabilized in the event of a stop work order or evacuation. The HSS is required to immediately notify the SM and PESM of any fatalities or catastrophes (three or more workers injured and hospitalized) so that the PESM can notify OSHA within the required time frame. The PESM will be notified of all OSHA recordable injuries, fires, spills, releases or equipment damage in excess of $500 within 24 hours.

12.1.3 Emergency Coordinator

The Site Manager is the Emergency Coordinator. In the event of an emergency, the Emergency Coordinator, with National Grid representatives, shall make contact with Local Emergency Response personnel. In these contacts, the Emergency Coordinator will inform response personnel about the nature of work on the Site, the type of contaminants and associated health or safety effects, and the nature of the emergency, particularly if it is related to exposure to contaminants.

The Emergency Coordinator shall review this plan and verify emergency phone numbers and identify hospital routes prior to beginning work on Site. The Emergency Coordinator shall make necessary arrangements to be prepared for any emergencies that could occur.

The Emergency Coordinator shall implement the Emergency Response/Contingency Plan whenever conditions at the Site warrant such action.

12.1.4 Site Personnel

Site personnel are responsible for knowing the Emergency Response/Contingency Plan and the procedures contained herein. Personnel are expected to notify the Emergency Coordinator of situations that could constitute a Site emergency.

12.2 Communications

A variety of communication systems may be utilized during emergency situations. These are discussed in the following sections.

The primary form of communication during an emergency between field groups in the exclusion zone and the Emergency Coordinator will be verbal communications. During an emergency situation, the lines will be kept clear so that instructions can be received by all field teams.

12.2.1 Telephone Communications

A cellular telephone or land line telephone will be available on-site.

12.2.2 Air Horns

Air horns will be used to alert Site personnel of emergencies. The following signals will be used:

- Two short blasts – shut down equipment, await instructions
- Three short blasts – injured employee, first-aid providers respond
- One continuous blast – Site evacuation

12.2.3 Hand Signals

Hand signals will be employed by downrange field teams where necessary for communication during emergency situations. Hand signals are found in Section 8.3.

12.3 Pre-Emergency Planning

Before the field activities begin, the local emergency response personnel may be notified by National Grid of the schedule for field activities and about the materials that are thought to exist on the site so that they will be able to respond quickly and effectively in the event of a fire, explosion, or other emergency.

In order to be able to deal with any emergency that might occur during remedial activities at the Site, emergency telephone numbers will be readily available in the SM vehicle or Construction Office. These telephone numbers are presented in the Site Specific Appendix A to this Health and Safety Plan. Hospital route maps and MSDS sheets will also be readily available in the SM vehicle and/or Construction Office. The Emergency phone numbers listed are preliminary. Immediately prior to mobilization the SM shall verify all numbers, and document any changes in the Site Logbook.

12.4 Emergency Medical Treatment

The procedures and rules in this HASP are designed to prevent employee injury. However, should an injury occur, no matter how slight, it shall be reported to the SM immediately. First-aid equipment will be available on-site.

During the site safety briefing, project personnel will be informed of the location of the first aid station(s) that have been set up. Unless they are in immediate danger, severely injured persons will not be moved until paramedics can attend to them. Some injuries, such as severe cuts and lacerations or burns, may require immediate treatment. Any first aid instructions that can be obtained from doctors or paramedics, before an emergency-response squad arrives at the site or before the injured person can be transported to the hospital, shall be followed closely.

12.5 Emergency Site Evacuation Routes and Procedures

In the event of a Site Emergency that would require the evacuation of personnel, the Emergency Coordinator will immediately contact the project-specific dedicated National Grid contact (this person may or may not be on-site).

All project personnel will be instructed on proper emergency response procedures and locations of emergency telephone numbers during the initial site safety meeting. If an emergency occurs at the work area, including but not limited to fire, explosion or significant release of toxic gas into the atmosphere, immediate evacuation of all personnel is necessary due to an immediate or impending danger. All heavy equipment will be shut down and all personnel will evacuate the work areas and assemble at a pre-determined location.

If any task covered under this HASP has the potential for significant hazards, evacuation drills will be performed as deemed necessary by the SM and PESM.

12.6 Fire Prevention and Protection

In the event of a fire or explosion, procedures will include immediately evacuating the work area. The Emergency Coordinator will then immediately notify the local fire and police departments. No personnel will fight a fire beyond the stage where it can be put out with a portable extinguisher (incipient stage).

Fires will be prevented by adhering to the following precautions:

- Good housekeeping and storage of materials
- Storage of flammable liquids and gases away from oxidizers
- No smoking in the exclusion zone or any work area
- No hot work without a properly executed hot work permit
- No hot work with the presence of Coal Tar Waste without proper precautions
- Shutting off engines to refuel
- Grounding and bonding metal containers during transfer of flammable liquids
- Use of UL approved flammable storage cans
- Fire extinguishers rated at least 10 pounds ABC located on all heavy equipment, in all trailers and near all hot work activities
- Monthly inspections of all fire extinguishers

The person responsible for the maintenance of fire prevention and/or control equipment is the HSS. The person responsible for the control of fuel source hazards is the SM.

12.7 Overt Chemical Exposure

The following are standard procedures to treat chemical exposures. Other, specific procedures detailed on the Material Safety Data Sheet will be followed as necessary. If first aid or emergency medical treatment is necessary the Emergency Coordinator will contact the appropriate emergency facilities.

SKIN AND EYE CONTACT:	Use copious amounts of soap and water. Wash/rinse affected areas thoroughly, than provide appropriate medical attention. Eyes should be rinsed for 15 minutes upon chemical contamination. Skin should also be rinsed for 15 minutes if contact with caustics, acids or hydrogen peroxide occurs.
INHALATION:	Move to fresh air. Decontaminate and transport to hospital or local medical provider.
INGESTION:	Decontaminate and transport to emergency medical facility.
PUNCTURE WOUND OR LACERATION:	Decontaminate and transport to emergency medical facility.

12.8 Decontamination During Medical Emergencies

If emergency life-saving first aid and/or medical treatment are required, normal decontamination procedures may need to be abbreviated or postponed. The SM or designee will accompany contaminated victims to the medical facility to advise on matters involving decontamination, when necessary. The outer garments can be removed if they do not cause delays, interfere with treatment or aggravate the problem. Respiratory equipment must always be removed. Protective clothing can be cut away. If the outer contaminated garments cannot be safely removed on site, a plastic barrier between the injured individual and clean surfaces should be used to help prevent contamination of the inside of ambulances and/or medical personnel. Outer garments

may then be removed at the medical facility. No attempt will be made to wash or rinse the victim if his/her injuries are life threatening, unless it is known that the individual has been contaminated with an extremely toxic or corrosive material which could also cause severe injury or loss of life to emergency response personnel. For minor medical problems or injuries, the normal decontamination procedures will be followed.

12.9 Accident/Incident Reporting

Incident reporting will be done following the guidelines established in the Incident Reporting Program presented in Appendix K.

Written confirmation of verbal reports shall be submitted within 24 hours. The accident/incident report can be found in Appendix K.

In addition to the incident reporting procedures and actions described in the HASP, the SM will coordinate with National Grid relative to reporting and notification for all environmental, safety, and other incidents.

If necessary, a site safety briefing will be held to discuss accidents/incidents and any findings from the investigation of the incident. The HASP will be modified if deemed necessary by the PESM.

12.10 Adverse Weather Conditions

In the event of adverse weather conditions, the SM will determine if work can continue without potentially risking the safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress and heat-related injuries
- Potential for cold stress and cold-related injuries
- Treacherous weather-related working conditions (hail, rain, snow, ice, high winds)
- Limited visibility (fog)
- Potential for electrical storms
- Earthquakes
- Other major incidents

Site activities will be limited to daylight hours, or when suitable artificial light is provided, and acceptable weather conditions prevail. The SM will determine the need to cease field operations or observe daily weather reports and evacuate, if necessary, in case of severe inclement weather conditions.

12.11 Spill Control and Response

All small hazardous spills/environmental releases shall be contained as close to the source as possible. Whenever possible, the MSDS will be consulted to assist in determining the best means of containment and cleanup. For small spills, absorbent

materials such as sand, sawdust or commercial absorbents should be placed directly on the substance to contain the spill and aid recovery. Any acid spills should be diluted or neutralized carefully prior to attempting recovery. Berms of earthen or absorbent materials can be used to contain the leading edge of the spills. Drains or drainage areas should be blocked. All spill containment materials will be properly disposed. An exclusion zone of 50-100 feet around the spill area should be established depending on the size and type of the spill.

The following steps should be taken by the Emergency Coordinator:

1. Determine the nature, identity and amounts of major spill components;
2. Make sure all unnecessary persons are removed from the spill area;
3. Notify appropriate response teams and authorities;
4. Use proper PPE in consultation with the SM;
5. If a flammable liquid, gas or vapor is involved, remove all ignition sources and use nonsparking and/or explosive proof equipment to contain or clean up the spill (diesel only vehicles, air operated pumps, etc.);
6. If possible, try to stop the leak with appropriate material; and,
7. Remove all surrounding materials that can react or compound with the spill.
8. Notify the Project-Specific National Grid Corporation Dedicated Contact.

12.12 Emergency Equipment

The following minimum emergency equipment shall be kept and maintained on-site.

- Industrial first aid kit
- Portable eye washes
- Fire extinguishers (one per vehicle and heavy equipment)
- Absorbent material

12.13 Postings

The following information shall be posted or be readily visible and available at conspicuous locations throughout the site:

- Emergency telephone numbers
- Hospital Route Map

12.14 Restoration and Salvage

After an emergency, prompt restoration of utilities, fire protection equipment, medical supplies and other equipment will reduce the possibility of further losses. Some of the items that may need to be addressed are:

- Refilling fire extinguishers;
- Refilling medical supplies;
- Recharging eyewashes and/or showers
- Replenishing spill control supplies
- Replacing used air horns

13.0 TRAINING

13.1 General Health and Safety Training

In accordance with 29 CFR 1910.120, hazardous waste site workers shall, at the time of job assignment, have received a minimum of 40 hours of initial health and safety training for hazardous waste site operations unless otherwise noted in the above reference. At a minimum, the training shall have consisted of instruction in the topics outlined in the standard. Personnel who have not met the requirements for initial training shall not be allowed to work in any site activities in which they may be exposed to hazards (chemical or physical). Proof of training shall be submitted to the SM prior to the start of field activities.

13.2 Annual Eight-Hour Refresher Training

Annual eight-hour refresher training will be required of all hazardous waste site field personnel in order to maintain their qualifications for fieldwork. The training will cover a review of 29 CFR 1910.120 requirements and related company programs and procedures.

13.3 Supervisor Training

Personnel acting in a supervisory capacity shall have received 8 hours of instruction in addition to the initial 40 hours training.

13.4 Asbestos Awareness Training

Prior to commencement of intrusive activities, all employees who may contact, but not disturb ACM, must have a minimum of two hours of asbestos awareness training. A licensed contractor will be used for removal of asbestos if encountered and disturbance is necessary.

13.5 Site-Specific Training

Prior to commencement of field activities, all field personnel assigned to the project will have completed training that will specifically address the activities, procedures, monitoring, and equipment used in the site operations. It will include site and facility layout, hazards and emergency services at the site and will highlight all provisions contained within this HASP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity. Personnel that have not received site-specific training will not be allowed on-site.

13.6 On-Site Safety Briefings

Project personnel and visitors will be given health and safety briefings daily by the SM to assist site personnel in safely conducting their work activities. The briefings will include information on new operations to be conducted, changes in work practices or changes in the site's environmental conditions, as well as periodic reinforcement of previously discussed topics. The briefings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety inspections. The meetings will also be an opportunity to periodically update the crews on monitoring results.

13.7 First Aid and CPR

The SM will identify individuals requiring first aid and CPR training in order to ensure that emergency medical treatment is available during all work shifts. The training will be consistent with the requirements of the American Red Cross Association and will include training on bloodborne pathogens.

13.8 Hazard Communication

Hazard communication training will be provided in accordance with the requirements contained in the Health and Safety Hazard Communication Program in Appendix B.

14.0 LOGS, REPORTS, AND RECORD KEEPING

The following is a summary of required health and safety logs, reports, and record keeping.

14.1 Medical and Training Records

Copies or verification of training (40 hour, 8 hour, supervisor, asbestos awareness, and site-specific training) and medical clearance for hazardous waste site work and respirator use will be maintained by the PESM and copies provided to the SM prior to the initiation of work on-site.

14.2 On-Site Log

A log of personnel on-site each day will be kept by the SM in a logbook or as individual sheets maintained in a file.

14.3 Exposure Records

All personal monitoring results, laboratory reports, calculations and air sampling data sheets will be maintained by the SM during site work. At the end of the project they may be maintained in employee files if deemed necessary by the PESM.

14.4 Accident/Incident Reports

The incident reporting and investigation during site work will follow the Incident Reporting Program in Appendix K.

14.5 OSHA Form 300

An OSHA Form 300 will be kept on-site by the SM. All recordable injuries or illnesses will be recorded on this form. All supplemental incident reports and records must be maintained with the OSHA Form 300 for all recordable injuries or illnesses.

14.6 Hazard Communication Program/MSDS

Material Safety Data Sheets (MSDSs) will be obtained for applicable substances and included in the site hazard communication file. The hazard communication program will be maintained on-site in accordance with 29 CFR 1910.1200 and the Hazard Communication Program in Appendix B.

14.7 Work Permits

All work permits, including confined space entry, hot work, lockout/tagout, and line breaking permits will be maintained in the project files. Copies of the work permits shall also be provided to the SM, and the Project-Specific National Grid Corporation Dedicated Contact.

15.0 FIELD PERSONNEL REVIEW

This form serves as documentation that field personnel have read, or have been informed of, and understand the provisions of this HASP for the Rockaway Park, NY Site. It is maintained on-site by the SM as a project record. Each field team member shall sign this section after training in the contents of this HASP has been completed. Site workers must sign this form after site-specific training is completed and before being permitted to work on-site.

I have read, or have been informed of, the Health and Safety Plan and understand the information presented. I have also completed site-specific training for the work detailed in the project Work Plan. I will comply with the provisions contained therein.

NAME (PRINT AND SIGN)	DATE
Alan Noel	6/09/08
Christopher Hurst	6/9/08
Donald Campbell	6/9/08
Stephen Klaus	6/9/08
Stephen Klaus	6-9-08
Don Eck	6-9-08
Andrew Allen	6-9-08
Rob Delmonte	6/9/08
Paul Goodman	6/9/08
Lee Kaplan	6/8/08
Carl Pedersen	6/16/08
Ernesto Santiago	6-16-08
Kevin McGourty	6-16-08

TOOL BOX SAFETY MEETING REPORT

JOB #: _____ JOB NAME/LOCATION: _____

DATE OF MEETING: _____ TIME: _____ AM/PM

TOOL BOX SAFETY TOPIC: _____ PERSON CONDUCTING MEETING: _____

WEEKLY SAFETY REVIEW POINTS:

- ☐ Location of first-aid facilities.
- ☐ Proper actions in case of emergencies, including exit routes, where applicable.
- ☐ On-the-job review of practices necessary to perform job assignments in safe manner (as necessary).
- ☐ Reviewed walk-around safety inspection conducted since last Tool Box Safety Meeting (describe).
- ☐ Reviewed any safety-related citations issued since last Tool Box Safety Meeting (describe).
- ☐ Reviewed any accident investigations conducted since last Tool Box Safety Meeting (describe).

DETAIL THE SPECIFIC SAFETY POINTS COVERED:

1. _____
2. _____
3. _____
4. _____

ATTENDEES: We have attended a Safety Meeting/Training and by signing below confirm that these are the minutes of the meeting and that we have been instructed as indicated on this report.

PRINT NAME	SIGNATURE	PRINT NAME	SIGNATURE

SUPERVISOR'S NAME _____ SIGNATURE _____

CREW SAFETY MEETING

DAILY

Company/Contractor Name	Address	
Date	Time	# of employees attending
Subjects discussed		

Minutes:

Crew Leader Comments:

Minutes taken by_____

15.0 FIELD PERSONNEL REVIEW

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I have read, or have been informed of, the Health and Safety Plan and understand the information presented. I have also completed site-specific training for the work detailed in the project Work Plan. I will comply with the provisions contained therein.

NAME (PRINT AND SIGN)	DATE

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I have read, or have been informed of, the Health and Safety Plan and understand the information presented. I have also completed site-specific training for the work detailed in the project Work Plan. I will comply with the provisions contained therein.

NAME (PRINT AND SIGN)	DATE

APPENDIX A

SITE-SPECIFIC INFORMATION

EMERGENCY INFORMATION

The appropriate telephone numbers are listed below for medical emergencies. For non-life threatening emergencies, Immedicenters can be used if distance permits.

ANY SERIOUS EMERGENCY - DIAL 911

Nearest Hospital: Peninsula Hospital Center
51-15 Beach Channel Drive
Far Rockaway, NY 11691

Hospital Emergency Room Telephone Number: (718) 734-2700
Hospital Main Telephone Number: (718) 734-2000

Directions to Hospital (road map with driving directions to hospital is on Figure 2)

1: Head Northwest on Beach 108th St toward Beach Channel Drive (go 0.1 miles)
2: Turn Right onto Beach Channel Drive (go 1.2 miles)
3: Continue straight onto Rockaway Freeway (go 0.5 miles)
4: Continue on Beach Channel Drive (go 1.1 miles)
5: Arrive at 51-15 Beach Channel Drive, Far Rockaway NY. The hospital will be on your left.

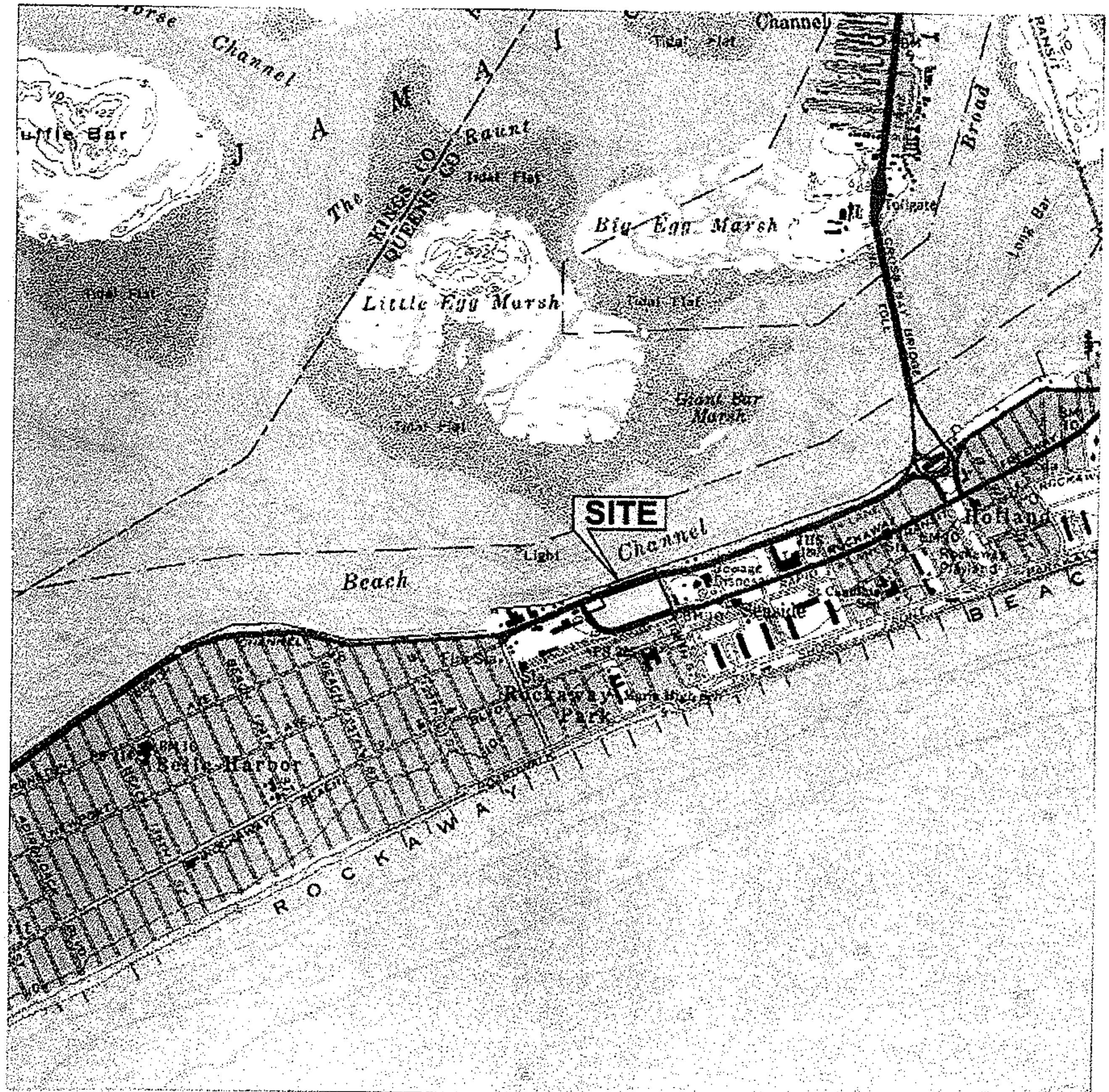
Other Emergency Numbers

Agency	Contact	Phone Number
Police Emergency		911
Fire Emergency		911
Rescue Squad		911
New York Poison Control Center		(212) 764-7667
National Response Center and Terrorist Hotline		(800) 424-8802
American Association of National Poison Control		(800) 222-1222
Center for Disease Control		(800) 311-3435
Dig Safely New York		(800) 272-4480
U.S. Coast Guard National Response Center		(800) 424-8802
Chemtrec (Chemical Spills)		(800) 424-9300
USEPA-Region 2		(212) 637-3668
NYSDEC Project Manager	Douglas MacNeal	(518) 402-9662
NYSDEC Region 2- Solid & Hazardous Waste Engineer		(718) 482-4996
KeySpan Corporation – Project Manager	Thomas Campbell	(516) 545-2555
KeySpan Media Hotline		(718) 403-2503

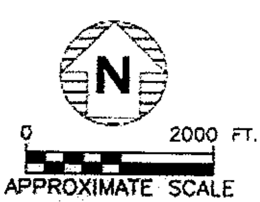
KeySpan Media Hotline		(718) 403-2503
KeySpan Corporation - Community Affairs	Renee McClure	(718) 403-3400
Construction Manager (ARCADIS)	Scott Morris (ARCADIS)	(516) 328-0464
Remedial Design Engineer (PS&SPC)	Keith Bogatch	(732) 584-0289
Posillico EHS Director	Selso Salazar	(516) 315-3079
Posillico Project Manager	Christopher Hurst	(516) 523-0295
Air Monitoring Contractor	To Be Determined	To Be Determined

Utilities

Electric	LIPA	Number:	(800) 222-1222
Gas	KeySpan	Number:	(800) 490-0045
Phone	Verizon	Number:	(718) 890-0910
Water	NY DEP	Number:	311
Other		Number:	



SOURCE: FAR ROCKAWAY, N.Y. QUADRANGLE, 1969.
7.5 MINUTE SERIES (USGS TOPOGRAPHIC MAP)



Posillico
1610 NEW HIGHWAY
FARMINGDALE, NY 11735

SITE LOCATION MAP

ROCKAWAY PARK FORMER MANUFACTURING GAS PLANT
ROCKAWAY PARK – QUEENS, NY

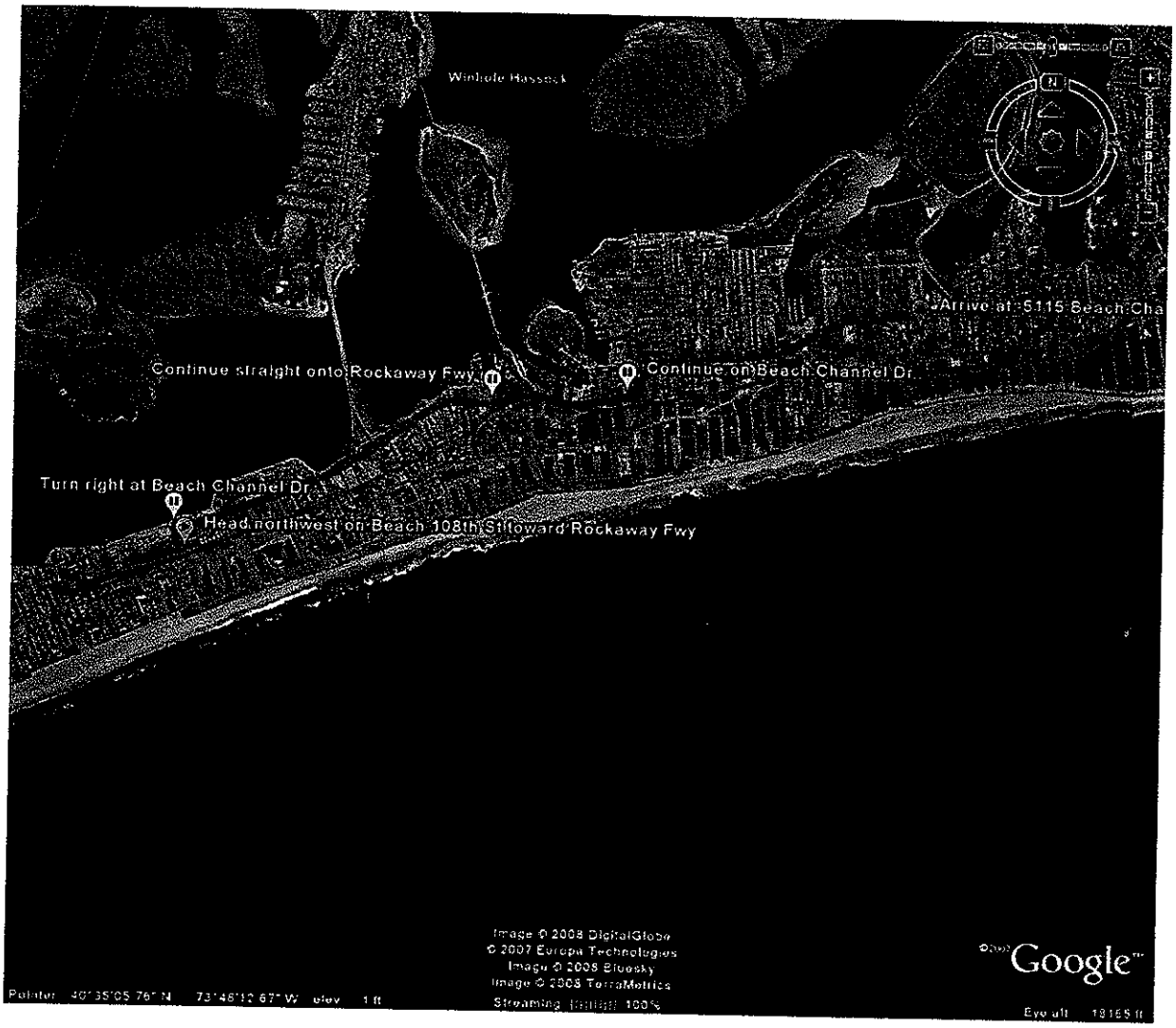
JOB NO.: 157128.0000.0000

PP/LB	DATE: JANUARY 2008	FIGURE: 1

FILE: M:\CAD FILES\VISION PROJECTS\157128\157128_SLM.DWG, DATE: 01/22/2008 03:04:09PM

DRIVING DIRECTIONS FROM SITE TO PENINSULA HOSPITAL CENTER

51-15 Beach Channel Drive
Far Rockaway, NY 11691
Main Number:(718) 734-2000 Emergency Room Number: (718) 734-2700



1: Head Northwest on Beach 108th St toward Beach Channel Drive (go 0.1 miles)
2: Turn Right onto Beach Channel Drive (go 1.2 miles)
3: Continue straight onto Rockaway Freeway (go 0.5 miles)
4: Continue on Beach Channel Drive (go 1.1 miles)
5: Arrive at 51-15 Beach Channel Drive, Far Rockaway NY. The hospital will be on your left.

Total Est. Time: 10 minutes **Total Est. Distance:** 2.9 miles

APPENDIX B

HAZARD COMMUNICATION PROGRAM

POSILLICO HAZARD COMMUNICATION PROGRAM

1.0 INTRODUCTION

The intent of the Hazard Communication Program is to provide employees with information about the potential health hazards from exposure to workplace chemicals in accordance with the OSHA Hazard Communication Standard promulgated on August 24, 1987. In order to accomplish its goal of transmitting this information to its employees, a written hazard communication program specifying how this goal will be achieved has been formulated. This document represents Posillico's Hazard Communication Program (HCP).

Employee participation is the key ingredient to the HCP. It is extremely important that employees not only follow the procedures, but also understand the reasoning. The Hazard Communication Program is an integral part of Posillico's effort to provide its employees with a healthy and safe workplace.

Although most Posillico field projects do not involve the use of hazardous substances it is imperative that all hazardous materials be managed in accordance with this program. This applies to any usage of hazardous materials regardless of volume. Each Office must maintain a copy of this program and review it with affected employees.

1.1 Purpose

To make information available to employees concerning chemical hazards known to be present in the workplace (i.e., Posillico facilities or client locations) under normal conditions, or in a foreseeable emergency.

1.2 Scope

This Hazard Communication Program (HCP) applies to any chemical obtained in excess of retail amounts known to be present in the workplace that employees may be exposed to under normal conditions of use, or may be exposed to in a foreseeable emergency. The HCP describes procedures for: determining chemical hazards in Posillico operations; providing training on chemical hazards to employees; and transmitting chemical hazard information through proper labeling and Material Safety Data Sheets (MSDSs). A master compilation of MSDSs is maintained at the Posillico Headquarters and copies of applicable MSDSs are maintained at each office. Field staff are responsible for keeping MSDSs for work performed at each job site. A complete chemical inventory is included as Attachment C in this section. This inventory list is used to conduct annual inventory checks of Posillico's stored chemicals.

1.3 Responsibilities

The following individuals and groups are responsible for implementing the Hazard Communication Program (HCP).

1. Health and Safety Assessment Division

    a. Provide general training to all new and existing employees as appropriate under the HCP. This training will include hazardous material monitoring and recognition, emergency response and understanding labels.

    b. Maintain documentation for HCP training, inform division/section managers of annual training requirements.

    c. Periodically update and review Hazard Communication Program.

    d. Maintain file of current MSDSs and arrange for retention of all obsolete MSDSs.

    e. Review operations with division/section managers to determine what jobs require HCP training.

    f. Obtain all missing MSDSs.

    g. Audit job sites and work areas for compliance with the HCP.

    h. Annually audit chemical listing to ensure that the most current MSDSs are on file and maintain a complete chemical inventory of chemicals in use.

    i. Act as liaison to outside authorities responding to chemical emergencies or conducting inspections to verify compliance with the HCP.

2. Department/Section Manager

    a. Inventory and compile listing of chemicals used in Department/Section annually and each job site.

    b. Provide specific training as appropriate for Department/Section/Client location.

    c. Notify H&S Division of any changes in operations that could affect the way hazardous chemicals are handled.

    d. Identify all jobs requiring the use or handling of hazardous chemicals.

    e. Notify H&S Division of employees requiring hazard specific training.

    f. Notify H&S Division when new hazards are presented.

g. Ensure proper labeling procedures and MSDS review is being followed.

3. Employee

a. Follow HCP procedures.

b. Use PPE as instructed by training procedures.

c. Inform division/section manager or H&S Division of:

- Any symptoms of overexposure that may be related to handling hazardous chemicals.
- Missing or inappropriate labels.
- Missing or unavailable MSDSs.
- Malfunctioning or unavailable safety equipment.
- Read, understand and comply with information on labels and MSDSs.
- Leave labels affixed to containers.
- Use only approved containers for hazardous chemicals.
- Know the location of emergency equipment on site and in the facility (if applicable).
- Know your role in contingency plans.
- Understand all changes in chemical handling and procedures.
- Attend training sessions as scheduled.

4. Purchasing Department

a. Request Material Safety Data Sheets (MSDS) from suppliers on each order of a chemical subject to this Program.

b. Document the request for an MSDS on the purchase order.

1.4 Training

1. General Training: Training on this program will be part of Posillico's annual refresher training or supplied on an as-needed basis.

General training will consist of the following items:

a. Requirement of OSHA HCS (29 CFR 1910.1200)

b. Details of Posillico's HCP including:

- Labeling
- MSDSs
- How employees can obtain and use appropriate hazard information.

c. Detailed explanation on how to read and interpret an MSDS including:
   - Description
   - Sections
   - Explanations of each section
   - Usefulness of each section
   - Applicability of each section

2. Specific Training

   a. Listing of hazardous materials in each department/location/site.

   b. Location of MSDSs in each department/site.

   c. Written hazard evaluation procedures as referenced in Attachment A – Posillico Hazardous Chemical Label.

   d. Methods and observations to detect hazardous materials in the workplace, including:
      - Exposure monitoring
      - Continuous monitoring
      - Visual inspection
      - Odor
      - Other physical or unusual appearances

   e. Physical and health hazards of chemicals present in the workplace.

   f. Protection measures and procedures:

      - Appropriate work practices
      - Emergency procedures
      - PPE

   g. Field operations where hazardous chemicals are present.

1.4.1 Non-routine Tasks

Posillico typically uses low quantities of hazardous materials on job sites and in the laboratory. Posillico projects that involve large quantities of hazardous materials, extremely hazardous substances or exposure to a client's hazardous materials that are not on Posillico's inventory are to be reviewed on a case by case basis to determine the necessary training to safely work with these materials. Clients regulated under the Process Safety Management program require affected Posillico employees to attend the

Client's site specific safety training program before being allowed access to the site. The Posillico Safety Department will provide training to employees when client training is not provided. All training will be documented and repeated as necessary. For example, Posillico does provide task specific training to DOT regulated employees for General Awareness, Shipping and Driving for workers involved in the shipping of hazardous materials and this training is provided every three years. Project Managers will notify the Safety Department when conducting non-routine tasks or when working with extremely hazardous substances in order to properly train employees before the project commences.

1.5 Training, Documentation

1. Record names of attendee(s).
2. Request that employees initial by their names.
3. Complete training documentation form.
4. Submit copies to H&S Coordinator for employee training file.

1.6 Material Safety Data Sheets (MSDSS)

1. MSDS Requirements

a. An MSDS must be available for each hazardous material used in the workplace. A master compilation of MSDSs is maintained at the as Posillico Headquarters and copies of applicable MSDSs are maintained at each site. Field staff are responsible for keeping MSDSs for work performed at each job site. Copies of MSDSs can be obtained by contacting the Safety Department. MSDSs for each office should be located near the area where hazardous materials are stored.

b. The H&S Assessment Division will ensure that all MSDSs are complete, legible and in English. Employees that cannot read or understand English will be provided training as needed in a manner that the employee can understand.

c. A file containing appropriate MSDSs for each Posillico facility will be readily available to all employees.

d. A cover sheet will identify all MSDSs in the file – Attachment B.

e. The H&S Assessment Division will audit the file.

f. The Facility Manager will keep a master list of chemicals by department and listed alphabetically, by division.

g. The H&S Assessment Division will distribute, to each department, new or updated MSDSs as they become available and make changes in the master list.

h. Old MSDSs will remain on file permanently.

i. MSDSs must be capable of being cross-referenced to their container labels, where appropriate.

j. Where a process or group of hazardous chemicals presents a health hazard greater than or not indicated by the individual MSDSs, written operating procedures will also be provided or readily accessible. Standard operating procedures by the manufacturer, job descriptions, etc. may be useful for this information.

2. Procedure for Obtaining MSDSs

a. The Purchasing Department will make an initial request for an MSDS from the manufacturer, either by phone, facsimile or mail. A copy of the request will be maintained with the name of the individual contacted and the date and included in the purchase order.

b. Employees who are working at a manufacturing location should request a MSDS from the site contact for both raw materials and finished product.

c. If MSDSs are not received within a reasonable time, approximately 30 days, the H&S Assessment Division or Facility Manager will send a second request to the manufacturer via certified mail, with a return receipt requested.

d. If, after the second request, no MSDS is sent, the H&S Assessment Division will contact the appropriate local OSHA area office by telephone, informing them of Posillico 's inability to obtain an MSDS from the manufacturer.

e. The H&S Assessment Division will document the following information: date; name; title of OSHA contact; and, summary of conversation.

f. A copy of this information will be placed in the master file with the H&S Division for a 30-day period.

g. If the MSDS is not received or OSHA does not contact the H&S Assessment Division within 30 days, H&S Assessment Division will contact the local OSHA area office again.

h. If the MSDS is not received within 60 days, the H&S Assessment Division will contact the regional OSHA office.

3. Labeling

a. All manufacturers' labels will be left on containers.

b. All container labels will be legible, prominently displayed, and in English as well as any other prevalent language. Posillico will provide interpretation to employees who do not read or understand English when necessary.

c. Minimum label contents include chemical identity; appropriate hazard warnings; and the name and address of the manufacturer.

d. All labels must contain the information described in Attachment A. Posillico has generated a label for use when portable containers are poured off from the original container to a compatible unlabeled container for field, laboratory or facility use. This label should also be used for samples and mixtures suspected of containing hazardous materials. The appropriate MSDS will be referenced in order to complete the "Hazard Warning" portion of the label and determine if the chemical is compatible with the container in which it is being stored.

e. Posillico uses the International Air Transport Association/Department of Transportation Hazard Classification System for labeling hazardous material shipments by Posillico. Each office that ships hazardous materials must obtain appropriate labels for the shipment and transport of hazardous materials. Copies of the labels for the nine classes of hazardous materials are included in Attachment A.

4. Outside Contractors

a. Unless required by the nature of services to be provided, Posillico will attempt to restrict contractors from contact with hazardous chemicals on Posillico property or projects.

b. The Office Manager will notify the H&S Coordinator of all outside contractors on Posillico property or subcontracted to perform on Posillico projects.

c. The Project Manager will review the work and determine all hazardous chemicals to which the outside contractor's employees may be exposed.

d. The Project Manager will provide to the contractor a list of hazardous chemicals to which their employees may be exposed, and copies of corresponding MSDSs.

e. The Project Manager will inform the contractor of precautionary measures contained within the MSDS.

f. The Project Manager will inform the contractor of the labeling system used in the location of the contractor's work.

g. The Project Manager will document and obtain the contractor's signature on form Posillico-3. Contractors will not be allowed to begin work until the form is completed.

h. Records will be retained permanently with the H&S Coordinator.

5. References:

29 CFR 1910.1200, Hazard Communication.

OSHA Instruction CPL 2-2.38A, CH-1, July 18, 1986.

ACGIH, Threshold Limit Values and Biological Exposure Indices for 2004.

International Agency for Research on Cancer, *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans*, Supplement 7, pgs. 31-32, 41-46.

U.S. Department of Health and Human Services, Fifth Annual *Report on Carcinogens, Public Health Service, National Toxicology Program,* 1989.

Genium Publishing Corporation, MSDS Pocket Dictionary, August, 1988.

National Institute of Occupational Safety and Health, Pocket Guide to Chemical Hazards, June, 2002.

United States Department of Agriculture, Hazard Communication: A Program Guide for Federal Agencies; August, 1987.

ATTACHMENT A

POSILLICO HAZARDOUS CHEMICAL LABEL

HAZARDOUS CHEMICAL

IDENTITY: _____

HAZARD WARNING: _____

_____

MANUFACTURER:

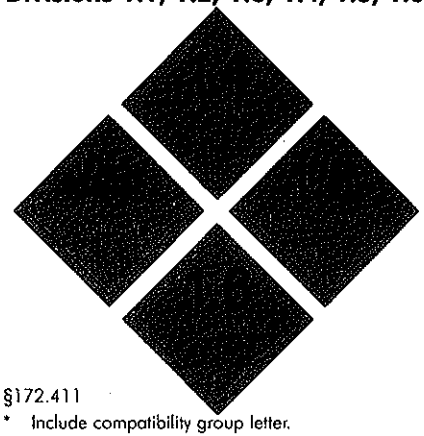
ADDRESS: City _____ State _____

TELEPHONE: _____

Hazardous Materials Warning Labels

Actual label size: at least 10 mm (3.9 inches) on all sides

CLASS 1 Explosives: Divisions 1.1, 1.2, 1.3, 1.4, 1.5, 1.6

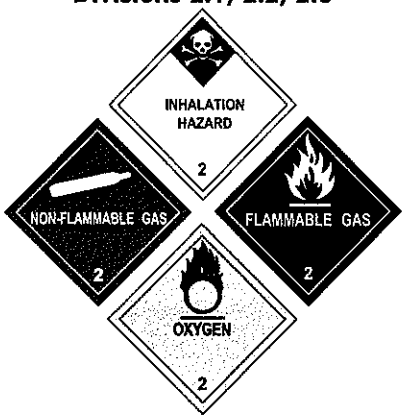


§172.411

* Include compatibility group letter.

** Include division number and compatibility group letter.

CLASS 2 Gases: Divisions 2.1, 2.2, 2.3



§172.405(b), §172.415, §172.416, §172.417

CLASS 3 Flammable Liquid

§172.419

CLASS 4 Flammable Solid, Spontaneously Combustible, and Dangerous When Wet: Divisions 4.1, 4.2, 4.3

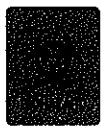
§172.420, §172.422, §172.423

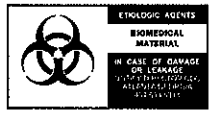
CLASS 5 Oxidizer, Organic Peroxide: Divisions 5.1 and 5.2

Organic Peroxide, Transition-2011

§172.426, §172.427

CLASS 6 Poison (Toxic), Poison Inhalation Hazard, Infectious Substance: Divisions 6.1 and 6.2

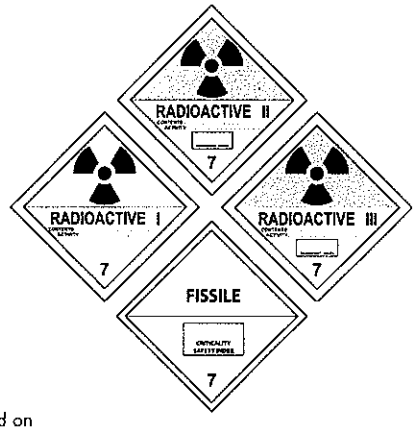




For Regulated Medical Waste (RMW), an Infectious Substance label is not required on an outer packaging if the OSHA Biohazard marking is used as prescribed in 29 CFR 1910.1030(g). CDC Etiologic Agent label must be used as prescribed in 42 CFR 72.3 and 72.6. A bulk package of RMW must display a BIOHAZARD marking.

§172.323, §172.405(c), §172.429, §172.430, §172.432

CLASS 7 Radioactive

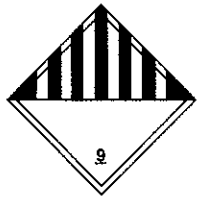


§172.436, §172.438, §172.440, §172.441

CLASS 8 Corrosive

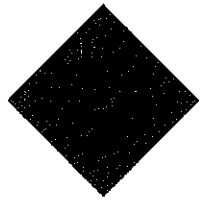
§172.442

CLASS 9 Miscellaneous Hazardous Material



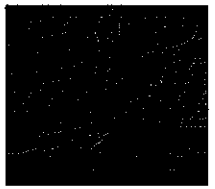
§172.446

Subsidiary Risk Label



§172.411

Cargo Aircraft Only



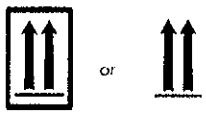
§172.448

Empty Label

§172.450

Hazardous Materials Markings

Package Orientation (Red or Black)

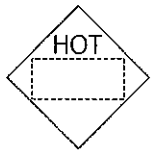


§172.312(a)

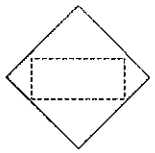
§172.317

October 1, 2007

§173.25(a)(4)



§172.325



§172.3[illegible](a)

Fumigant Marking (Red or Black)

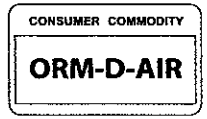
§172.302(g) and §173.9

Biological Substances, Category B

§173.199(a)(5)

§172.322

§172.313(a)



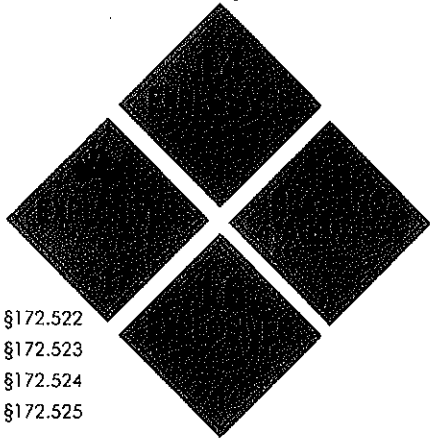
§172.316(a)

Keep a copy of the Emergency Response Guidebook handy!

Hazardous Material Warning Placards

Actual placard size: at least 2[illegible]m (10.8 inches) on all sides

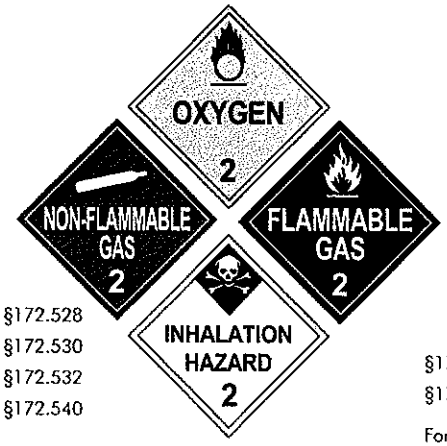
CLASS 1 Explosives



§172.522
§172.523
§172.524
§172.525

* For Divisions 1.1, 1.2, or 1.3, enter division number and compatibility group letter, when required; placard any quantity. For Divisions 1.4, 1.5, and 1.6, enter compatibility group letter, when required; placard 454 kg (1,001 lbs) or more.

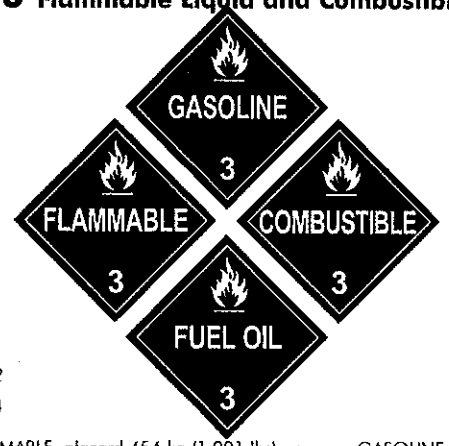
CLASS 2 Gases



§172.528
§172.530
§172.532
§172.540

For NON-FLAMMABLE GAS, OXYGEN (compressed gas or refrigerated liquid), and FLAMMABLE GAS, placard 454 kg (1,001 lbs) or more gross weight. For POISON GAS (Division 2.3), placard any quantity.

CLASS 3 Flammable Liquid and Combustible Liquid



§172.542
§172.544

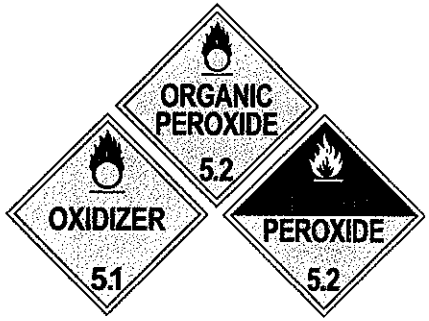
For FLAMMABLE, placard 454 kg (1,001 lbs) or more. GASOLINE may be used in place of FLAMMABLE placard displayed on a cargo tank or portable tank transporting gasoline by highway. Placard combustible liquid transported in bulk. See §172.504(f)(2) for use of FLAMMABLE placard in place of COMBUSTIBLE. FUEL OIL may be used in place of COMBUSTIBLE on a cargo or portable tank transporting fuel oil not classed as a flammable liquid by highway.

CLASS 4 Flammable Solid, Spontaneously Combustible, and Dangerous When Wet

§172.546, §172.547, §172.548

For FLAMMABLE SOLID and SPONTANEOUSLY COMBUSTIBLE, placard 454 kg (1,001 lbs) or more. For DANGEROUS WHEN WET (Division 4.3), placard any quantity.

CLASS 5 Oxidizer & Organic Peroxide



Organic Peroxide, Transition-2011 (rail, vessel, and aircraft) 2014 (highway)

§172.550, §172.552

For OXIDIZER and ORGANIC PEROXIDE (other than TYPE B, temperature controlled), placard 454 kg (1,001 lbs) or more. For ORGANIC PEROXIDE (Division 5.2), Type B, temperature controlled, placard any quantity.

CLASS 6 Poison (Toxic) and Poison Inhalation Hazard

§172.504(f)(10), §172.554, §172.555

For POISON (PGI or PGII, other than inhalation hazard) and POISON (PGIII), placard 454 kg (1,001 lbs) or more. For POISON-INHALATION HAZARD (Division 6.1), inhalation hazard only, placard any quantity.

CLASS 7 Radioactive

§172.556

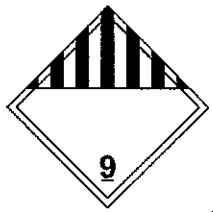
Placard any quantity - packages bearing RADIOACTIVE YELLOW-III labels only. Certain low specific activity radioactive materials in "exclusive use" will not bear the label, but the radioactive placard is required for exclusive use shipments of low specific activity material and surface contaminated objects transported in accordance with §172.504(e) Table 1 and §173.427(a)(6).

CLASS 8 Corrosive

§172.558

For CORROSIVE, placard 454 kg (1,001 lbs) or more.

CLASS 9 Miscellaneous



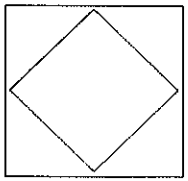
§172.560

Not required for domestic transportation. A bulk packaging containing a Class 9 material must be marked with the appropriate ID number displayed on a Class 9 placard, an orange panel, or a white square-on-point display.

Dangerous

§172.521

A freight container, unit load device, transport vehicle, or rail car which contains non-bulk packages with two or more categories of hazardous materials that require different placards specified in Table 2 may be placarded with DANGEROUS placards instead of the specific placards required for each of the materials in Table 2. However, when 1,000 kg (2,205 lbs) or more of one category of material is loaded at one loading facility, the placard specified in Table 2 must be applied.



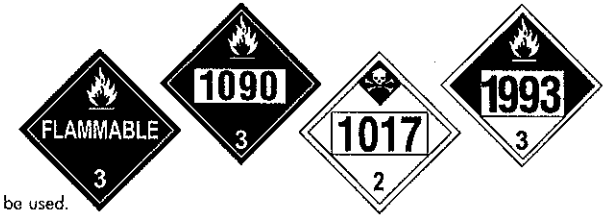
§172.527

White square background required for placard for highway route controlled quantity radioactive material and for rail shipment of certain explosives and poisons, and for flammable gas in a DOT 113 tank car (§172.507 and §172.510).

PLACARDS OR ORANGE PANELS

§172.332

and



Appropriate placard must be used.

Identification Number Displays

MUST BE DISPLAYED ON: (1) Tank Cars, Cargo Tanks, Portable Tanks, and other Bulk Packagings; (2) Vehicles or containers containing 4,000 kg (8,820 lbs) in non-bulk packages of only a single hazardous material having the same proper shipping name and identification number; and (3) 1,000 kg (2,205 lbs) of materials poisonous by inhalation in Hazard Zone A or B. See §172.301(a)(3) and §172.313(c).

Response begins with identification!

APPENDIX C

COLD STRESS PROGRAM

COLD STRESS PROGRAM

1.0 PURPOSE AND INTRODUCTION

The purpose of this document is to educate the employee about exposure to cold environments and the effects of hypothermia and other cold-related injuries. Through proper use of Personal Protective Equipment (PPE), engineering and administrative controls; and education, cold injury, both to the extremities and the body's core temperature, can be prevented.

1.1 Scope

This program is intended for use by employees engaged in work with the potential for exposure to cold environments. This program will be reviewed annually by the Health and Safety Division. Training will be provided annually to all those potentially affected, and will include this written program.

1.2 Working in Cold Environments

Metabolic Responses

The human body is designed to function best at a rectal temperature of 99-100F. The body maintains this temperature in two ways: by gaining heat from food and muscular work; or, by losing it through radiation and sweating. By constricting blood vessels of the skin and/or shivering, the body uses its first line of cold defense.

Temperature control of the body is better understood by dividing the body into two main parts: the shell; and, the core. The shell is comprised of the skin, capillaries, nerves, muscles and fat. Other internal organs such as the heart, lungs, brain and kidneys make up the core.

During exposure to cold, the skin is first affected. Blood in the peripheral capillaries is cooled, sending a signal to a portion of the brain called the hypothalamus. Regulating body temperature is one of the many basic body functions of the hypothalamus. Acting like a thermostat, adjustments are performed in order to maintain normal body temperatures. When a chill signal is received, two processes are begun by the hypothalamus: conserve heat already in the body; and, generate new heat.

Heat conservation is performed through constriction of the blood vessels in the skin (shell), thus reducing heat loss from the shell and acting as an insulator for the core. Sweat glands are also inhibited, thus preventing heat loss by evaporation.

Additional fuel for the body is provided in the form of glucose. Glucose causes the heart to beat faster, sending oxygen and glucose-rich blood to the tissue where needed. In an attempt to produce heat, the muscles rapidly contract. This process is better known as "shivering", and generates heat similarly to that created by strenuous activity, raising the body's metabolic rate.

During physical activity and fatigue, the body is more prone to heat loss. As exhaustion approaches, blood vessels can suddenly enlarge, resulting in rapid loss of heat. Exposure to extreme cold causes nerve pulses to be slowed, resulting in fumbling, sluggish and clumsy reactions.

1.3 Cold Injuries

Cold injuries are classified into two categories: local; or, general. Local injuries include frostbite, frostnip, chilblain and trenchfoot. General injuries include hypothermia and blood vessel abnormalities (genetically or chemically induced). Major factors contributing to cold injury are exposure to humidity and high winds; contact with wetness or metal; inadequate clothing; age; and, general health. Allergies, vascular disease, excessive smoking and/or drinking, and certain drugs and medicines are physical conditions that can compound the effects of exposure to a cold environment.

1. Hypothermia

Hypothermia is a condition of reduced body temperature. Most cases develop in air temperatures between 30-50°F, not taking windchill factor in consideration.

Symptoms of hypothermia are uncontrolled shivering and the sensation of cold. The heartbeat slows and sometimes becomes irregular, weakening the pulse and changing blood pressure. Changes in the body chemistry cause severe shaking or rigid muscles; vague or slow slurred speech; memory lapses; incoherence; and, drowsiness. Cool skin, slow irregular breathing, low blood pressure, apparent exhaustion, and fatigue after rest can be seen before complete collapse.

As the core temperature drops, the victim can become listless, confused, and make little or no effort to keep warm. Pain in the extremities can be the first warning of dangerous exposure to cold. Severe shivering must be taken as a sign of danger. At a core body temperature of about 85°F, serious problems develop due to significant drops in blood pressure, pulse rate and respiration. In some cases, the victim may die.

Sedative drugs and alcohol increase the risk of hypothermia. Sedative drugs interfere with the transmission of impulses to the brain. Alcohol dilates blood vessels near the skin's surface, increasing heat loss and lowering body temperature.

Table I, in Attachement A, provides information on the onset of hypothermia and metabolic responses at different body temperatures.

2. Raynaud's Phenomenon

Raynaud's Phenomenon is the abnormal constriction of the blood vessels of the fingers on exposure to cold temperatures, resulting in blanching of the ends of the fingers. Numbness, itching, tingling or a burning sensation may occur during related attacks. The disease is also associated with the use of vibrating hand tools in a condition sometimes called White Finger Disease. Persistent cold sensitivity, ulceration and amputations can occur in severe cases.

3. Acrocyanosis

Acrocyanosis is caused by exposure to the cold and reduces the level of hemoglobin in the blood, resulting in a slightly blue, purple or gray coloring of the hands and/or feet.

4. Thromboangitis Obliterans

Thromboangitis obliterans is clotting of the arteries due to inflammation and fibrosis of connective tissue surrounding medium-sized arteries and veins. This is one of the many disabling diseases that can also result from tobacco use. Gangrene of the affected limb often requires amputation.

5. Frostbite

Frostbite is the freezing of the body tissues due to exposure to extremely low temperatures, resulting in damage to and loss of tissue. Frostbite occurs because of inadequate circulation and/or insulation, resulting in freezing of fluids around the cells of the body tissues. Most vulnerable parts of the body are the nose, cheeks, ears, fingers and toes.

Frostbite can affect outer layers of skin or can include the tissues beneath. Damage can be serious, with permanent loss of movement in the affected parts, scarring, necrotic tissue, and amputation are all possibilities. Skin and nails that slough off can grow back.

The freezing point of the skin is about 30F. As wind velocity increases, heat loss is greater and frostbite will set in more rapidly.

There are three (3) degrees of frostbite: first degree, freezing without blistering and peeling; second degree, freezing with blistering and peeling; and, third degree, freezing with death of skin tissues and possibly the deeper tissues.

The following are symptoms of frostbite:

a. Skin changes color to white or grayish-yellow, progresses to reddish-violet, and finally turns black as the tissue dies;

b. Pain may be felt at first, but subsides;

c. Blisters may appear;

d. Affected part is cold and numb.

The first symptom of frostbite is usually an uncomfortable sensation of coldness followed by numbness. Tingling, stinging, cramping and aching feelings will be experienced by the victim. Frostbite of the outer layer of the skin has a waxy or whitish look and is firm to the touch. Cases of deep frostbite cause severe injury. The tissues are cold, pale and solid. The victim is often unaware of the frostbite until someone else observes these symptoms. It is therefore important to use the "buddy system" when working in cold environments, so that any symptoms of overexposure can be noted.

Table II, in Attachement A, describes the cooling power of wind on exposed flesh. This information can be used as a guide for determining equivalent chill temperatures when the wind is present in cold environments.

6. Trench Foot and Chilblains

Trench foot is swelling of the foot caused by long, continuous exposure to cold without freezing, combined with persistent dampness or immersion in water. Edema (swelling), tingling, itching and severe pain occurs, followed by blistering, necrotic tissue and

ulcerations. Chilblains have similar symptoms as trench foot, except that other areas of the body are affected.

7. Frostnip

Frostnip occurs when the face or extremities are exposed to a cold wind, causing the skin to turn white.

1.4 Prevention of Cold Stress

Cold Stress can be prevented through a combination of various factors: acclimation; water and salt displacement; medical screening, proper clothing selection; and, training and education. Through the use of engineering controls, work practices, work/rest schedules, environmental monitoring and consideration of the windchill temperature, the employee can be protected.

1. Acclimation

Acclimation can be achieved to some degree. Sufficient exposure to cold causes the body to undergo changes to increase comfort and reduce the risk of injury. But, these changes are minor and require repeated exposure to cold and uncomfortable temperatures to induce them.

2. Dehydration

The dryness of cold air causes the body to lose a significant amount of water through the skin and lungs. It is essential that caffeine-free, non-alcoholic beverages be available at the worksite for fluid replacement. Dehydration also increases the risk of injury due to cold and affects blood flow to the extremities.

3. Diet

A well-balanced diet is important for employees working in cold environments. Diets restricted only to certain foods may not provide the necessary elements for the body to withstand cold stress, leaving the worker vulnerable.

4. Control Measures

When the windchill factor results in an equivalent temperature of -26F, continuous exposure of the skin will not be permitted. Any worker exposed to temperatures of 36F or less who becomes immersed in water will be given dry clothing immediately and treated for hypothermia at the local hospital if any symptoms of hypothermia are present. Notification of this incident will be provided to the Health and Safety Division immediately after sending the worker to the hospital.

5. Engineering Controls

The following are some ways that environmental controls can be used to reduce the effects of a cold environment:

a. General or spot heating should be used to increase temperature in certain areas in the workplace;

b. Warm air jets, radiant heaters or contact warm plates can be used to warm the worker's hands if fine work is to be performed with bare hands for 10 to 20 minutes or more;

c. Shield the work area if air velocity at the work site is increased by wind, draft or ventilating equipment;

d. Metal handles of tools and control bars should be covered with thermal insulating material at temperatures below 30F;

e. Unprotected metal chair seats will not be used in cold environments;

f. When appropriate and feasible, equipment and processes will be substituted, isolated, relocated, or redesigned;

g. Power tools, hoists, cranes or lifting aids will be used to reduce the metabolic workload;

h. Heated warming shelters will be made available for continuous work being performed in an equivalent temperature of 20F or below. Workers will be encouraged to use the shelters regularly.

6. Administrative Work Practice Controls

Work practices and guidelines can be designed and developed to reduce exposure to cold stress. Some of these may include:

a. Work-rest schedules to reduce the peak of cold stress;

b. Enforce scheduled breaks;

c. Enforce intake of caffeine-free, non-alcoholic beverages;

d. Schedule work that has potential exposure to cold stress for the warmest part of the day;

e. Move work to warmer areas, whenever possible;

f. Assign extra workers for high-demand tasks;

g. Provide relief workers for other workers needing breaks;

h. Teach basic principles of recognizing and preventing cold stress;

i. Use the buddy system for work at 10F or below, and keep within eyeshot;

j. Allow new employees to adjust to the conditions before they work full-time in cold environments;

k. Minimize sitting and standing in one place for long periods of time;

l. Include weight and bulkiness of clothing when estimating work performance requirements and weights to be lifted;

Table III, in Attachement A, provides a work/warm-up schedule for cold environments, with wind chill taken into account.

7. Special Considerations

Older workers and workers with circulatory problems should be extra careful in cold environments. Sufficient sleep and good nutrition are important preventive measures for maintenance tolerance to the cold. Double shifts and overtime work should be avoided when working in cold environments.

If any of the following symptoms are observed on site, the affected worker will immediately go to warm shelter:

- Onset of heavy shivering;
- Frostnip;
- Feeling of excessive fatigue;
- Drowsiness;
- Euphoria.

After entering the warm shelter, the outer layer of clothing should be removed. If the clothing is wet from sweat and perspiration, dry clothing should be provided. If this is not feasible, then the clothing should be loosened to allow sweat to evaporate.

Anyone working in cold environments and on prescribed medication should consult their physician concerning any possible side effects due to cold stress. Those individuals suffering from diseases and/or taking medication that interferes with normal body temperature regulation or reduces the tolerance to cold will not be allowed to work in temperatures of 30F or below.

1.5 Personal Protective Equipment (PPE)

In choosing PPE for cold environments, it is important to maintain airspace between the body and outer layer of clothing to retain body heat. The more air pockets, the better the insulation. The clothing should also allow for the evaporation of sweat if the skin is wet.

The most important parts of the body to protect are the feet, hands, head and face. Hands and feet become cooled most easily, because of their distance from the heart. Keeping the head covered is equally important. As much as 40% of body heat loss is through the head when it is exposed.

Ideal clothing for exposure to cold environments is made of cotton. Cotton picks up sweat off the body and brings it to the surface. Loosely fitted clothing also aids in sweat evaporation. Recommended clothing may include the following:

a. Polypropylene under shirt and shorts under thermal underwear (preferably two-piece);
b. Wool socks;
c. Wool or thermal pants, lapped over boot tops to keep out snow and water;
d. Suspenders (belts can constrict and reduce circulation);

e. Insulated work boots, preferably waterproof. Safety toe, if necessary;
f. Wool or cotton shirt;
g. Parka;
h. Knit cap/hard hat liner;
i. Wool mittens or gloves (depending on the dexterity required);
j. Face mask or scarf.

Dirty or greasy clothing loses much of its insulation value. Dirty clothing crushes air pockets, allowing air to escape more easily. Also, denim is not a good protective fabric. It is loosely woven and allows water to penetrate and wind to blow away body heat.

ATTACHMENT A

COLD STRESS GUIDANCE TABLES

TABLE I
Progressive Clinical Presentation of Hypothermia*

Core Temperature Deg. C	Deg. F	Clinical Signs
37.6	99.6	"Normal" rectal temperature.
37	98.6	"Normal" oral temperature.
36	96.8	Metabolic rate increases in an attempt to compensate for heat loss.
35	95.0	Maximum shivering.
34	93.2	Victim conscious and responsive, with normal blood pressure.
33	91.4	Severe hypothermia below this temperature.
32	89.6	Consciousness clouded; blood pressure becomes difficult to obtain;
31	87.8	pupils dilated but react to light; shivering ceases.
30	86.0	Progressive loss of consciousness; muscular rigidity increases;
29	84.2	pulse and blood pressure difficult to obtain; respiratory rate decreases.
28	82.4	Ventricular fibrillation possible with myocardial irritability.
27	80.6	Voluntary motion ceases; pupils non-reactive to light; deep tendon and superficial reflexes absent.
26	78.8	Victim seldom conscious.
25	77.0	Ventricular fibrillation may occur spontaneously.
24	75.2	Pulmonary edema.
22	71.6	Maximum risk of ventricular fibrillation.
20	68.0	Cardiac standstill.
18	64.4	Lowest accidental hypothermia victim to recover.
17	62.6	Isoelectric electroencephalogram.
9	48.2	Lowest artificially cooled hypothermia patient to recover.

* Presentations approximately related to core temperature. Reprinted from the January 1982 issue of American Family Physician, published by the American Academy of Family Physicians.

TABLE II

Cooling Power of Wind on Exposed Flesh as Equivalent Temperature (under calm conditions)*

Estimated Wind Speed (mph)	Actual Temperature Reading (Degrees Fahrenheit)											
	50	**40**	**30**	**20**	**10**	**0**	**-10**	**-20**	**-30**	**-40**	**-50**	**-60**
	Equivalent Chill Temperature (□F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect).	LITTLE DANGER In < hr with dry skin. Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute.			GREAT DANGER Flesh may freeze within 30 seconds.				
	Trenchfoot and immersion foot may occur at any point on this chart.											

* Developed by the U.S. Army Research Institute of Environmental Medicine, Natick, MA

Note #1: Wind speeds greater than 40 mph have little additional effect.

Note #2: Trenchfoot and immersion foot may occur at any point on this chart

TABLE III
Threshold Limit Values Work/Warm-up Schedule for 4 Hour Shift (*)

Air Temp.-Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°C (approx)	°F (approx)	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
-26° to -28°	-15° to -19°	(Norm. Breaks)	1	(Norm.Breaks)	1	75 min.	2	55 min.	3	40 min.	4
-29° to -31°	-20° to -24°	(Norm. Breaks)	1	75 min	2	55 min.	3	40 min.	4	30 min.	5
-32° to -34°	-25° to -29°	75 min	2	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease	
-35° to -37°	-30° to -34°	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease			
-38° to -39°	-35° to -39°	40 min.	4	30 min.	5	Non-emergency work should cease					
-40° to -42°	-40° to -44°	30 min.	5	Non-emergency work should cease							
-43° & below	-45° & below	Non-emergency work should cease									

Notes for TABLE III:

1. Schedule applies to moderate to heavy work activity with warm-up breaks of 10 minutes in a warm location. For light to moderate work (limited physical motion), apply the schedule one step lower. For example, at -30F with no noticeable wind (step 4, a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4 hour period.

2. The following is suggested as a guide for estimating wind velocity if accurate information is not available: 5 mph, light flag moves; 10 mph, light flag fully extended; 15 mph, raises newspaper sheet; 20 mph, blowing drifting snow.

3. If only the windchill cooling rate is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be: 1) special warm-up breaks should be initiated at a windchill cooling rate of about 17 W/m2; 2) all non-emergency work should have ceased at or before a windchill of 2250 W/m2. In general the warm-up schedule provided above slightly under-compensates for the wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart over-compensates for the actual temperatures in the colder ranges, since windy conditions prevail at extremely low temperatures.

4. TLVs apply only for workers in dry clothing.

* Adapted from Occupational Health and Safety Division, Saskatchewan Department of Labor.

APPENDIX D

HEAT STRESS PROGRAM

HEAT STRESS PROGRAM

1.0 PURPOSE AND INTRODUCTION

The purpose of this document is to create an awareness among employees concerning the body's physiologic responses to heat; different types of heat stress that can affect the body; recognition of signs and symptoms; first aid treatment; and, preventive measures.

Heat stress is one of the most common (and potentially serious) illnesses at job sites. Although it is caused by a number of interacting factors, the wearing of PPE puts the worker at a much higher risk during warmer environmental conditions. The results of heat stress range from fatigue to serious illness or death. Through regular fluid replacement and other preventive measures, heat stress can be controlled, leading to increased efficiency and a higher level of safety on the job.

2.0 SCOPE

This program is intended for use by employees engaged in work with the potential for exposure to hot environments. This program will be reviewed annually by the Health and Safety Division. Training will be provided annually to all those potentially affected, and will include this written program.

3.0 SOURCES OF HEAT

There are two sources of heat that are important to anyone working in a hot environment:

- Internally generated metabolic heat;
- Externally imposed environmental heat.

4.0 PHYSIOLOGIC RESPONSES TO HEAT

The human body maintains a fairly constant internal temperature, even though it is exposed to varying environmental temperatures. To keep internal body temperatures within safe limits, the body must get rid of its excess heat, primarily through varying the rate and amount of blood circulation through the skin and the release of fluid onto the skin by the sweat glands. These automatic responses usually occur when the temperature of the blood exceeds 98.6°F and are kept in balance and controlled by the brain. In this process of lowering internal body temperature, the heart begins to pump more blood, blood vessels expand to accommodate the increased flow, and the microscopic blood vessels (capillaries) which thread through the upper layers of the skin begin to fill with blood. The blood circulates closer to the surface of the skin, and the excess heat is lost to the cooler environment.

If the heat loss from increased blood circulation through the skin is not adequate, the brain continues to sense overheating and signals the sweat glands in the skin to release large quantities of sweat onto the skin surface. Evaporation of sweat cools the skin, eliminating large quantities of heat from the body.

As environmental temperatures approach normal skin temperature, cooling of the body becomes more difficult. If air temperature is as warm as or warmer than the skin, blood brought to the body

surface cannot lose its heat. Under these conditions, the heart continues to pump blood to the body surface, the sweat gland pour liquids containing electrolytes onto the surface of the skin, and the evaporation of the sweat becomes the principal effective means of maintaining a constant body temperature. Sweating does not cool the body unless the moisture is removed from the skin by evaporation. In high humidity, the evaporation of sweat from the skin is decreased and the body's efforts to maintain an acceptable body temperature may be significantly impaired. These conditions adversely affect an individual's ability to work in the hot environment. With so much blood going to the external surface of the body, relatively less goes to the active muscles, the brain, and other internal organs; strength declines; and fatigue occurs sooner than it would otherwise. Alertness and mental capacity also may be affected. Workers who must perform delicate or detailed work may find their accuracy suffering, and others may find their comprehension and retention of information lowered.

When temperature differences exist between two or more bodies, heat can be transferred. Net heat transfer is always from the body (or object) of higher temperature to that of lower temperature and occurs by one or more of the following mechanisms:

Conduction. The transfer of heat from one point to another within the body, or from one body to another when both bodies are in physical contact. Conduction can be a localized source of discomfort from direct physical contact with a hot or cold surface, it is normally not a significant factor to total heat stress.

Convection. The transfer of heat from one place to another by moving gas or liquid. Natural convection results from differences in density caused by temperature differences. Thus warm air is less dense than cool air.

Radiation. The process by which energy, electromagnetic (visible and infrared), is transmitted through space without the presence or movement of matter in or through this space.

5.0 PREDISPOSING FACTORS TO HEAT STRESS

Factors that may predispose an individual to heat stress vary according to the individual. These factors include:

- Lack of physical fitness;
- Lack of acclimatization;
- Age;
- Dehydration;
- Obesity;
- Drug/alcohol abuse;
- Infection;
- Sunburn;
- Diarrhea;
- Chronic disease.

Predisposing factors and an increased risk of excessive heat stress are both directly influenced by the type and amount of PPE worn. PPE adds weight and bulk, reduces the body's access to normal heat exchange mechanisms (evaporation, convection and radiation) and increases energy expenditure.

6.0 FORMS OF HEAT STRESS AND FIRST AID

(The following excerpts were taken from NIOSH Publication No. 86-112, Working in Hot Environments):

"Excessive exposure to a hot work environment can bring about a variety of heat-induced disorders. Among the most common are heat stroke, heat exhaustion, heat cramps, fainting and heat rash.

Heat Stroke

Heat Stroke is the most serious of health problems associated with working in hot environments. It occurs when the body's temperature regulatory system fails and sweating becomes inadequate. The body's only effective means of removing excess heat is compromised with little warning to the victim that a crisis stage has been reached.

A heat stroke victim's skin is hot, usually dry, red or spotted. Body temperature is usually 105°F or higher, and the victim is mentally confused, delirious perhaps in convulsions, or unconscious. Unless the victim receives quick and appropriate treatment, death can occur.

Individuals with signs or symptoms of heat stroke require immediate hospitalization. First aid should be immediately administered. This includes removing the victim to a cool area, thoroughly soaking the clothing with water, and vigorously fanning the body to increase cooling. Further treatment, at a medical facility, should be directed to the continuation of the cooling process and the monitoring of complications which often accompany heat stroke. Early recognition and treatment are the only means of preventing permanent brain damage or death.

Heat Exhaustion

Heat Exhaustion includes several clinical disorders having symptoms which may resemble the early symptoms of heat stroke. Heat exhaustion is caused by the loss of large amounts of fluid by sweating, sometimes with excessive loss of salt. A worker suffering from heat exhaustion still sweats but experiences weakness or fatigue, giddiness, nausea or headache. In more serious cases, the victim may vomit or lose consciousness. The skin is clammy and moist, the complexion is pale or flushed, and the body temperature is normal or only slightly elevated.

In most cases, treatment involves having the victim rest in a cool place and drink plenty of liquids. Victims with mild cases of heat exhaustion usually recover spontaneously with this treatment. Those with severe cases may require extended care for several days. There are no known permanent effects.

Heat Cramps

Heat cramps are painful spasms of the muscles that occur among those who sweat profusely in heat, drink large quantities of water, but do not adequately replace the body's salt loss. The drinking of large amounts of water tends to dilute the body's fluids, while the body continues to lose salt. Shortly after, the low salt level in the muscles causes painful cramps. The affected muscles may be part of the arms, legs, or abdomen; but tired muscles (those used in performing the work) are usually the ones most susceptible to cramps. Cramps may occur during or after work hours and may be relieved by taking salted liquids by mouth.

Fainting

Fainting occurs in workers not accustomed to hot environments and who stand erect and immobile in the heat.

With enlarged blood vessels in the skin and in the lower part of the body due to the body's attempts to control internal temperature, blood may pool there rather than return to the heart to be pumped to the brain. Upon lying down, the worker should soon recover. By moving around, and thereby preventing blood from pooling, the patient can prevent further fainting.

Heat Rash (Prickly Heat)

Heat rash, also known as prickly heat, is likely to occur in hot, humid environments where sweat is not as easily removed from the surface of the skin by evaporation and the skin remains wet most of the time. The sweat ducts become plugged, and a skin rash soon appears. When the rash is extensive or when it is complicated by infection, prickly heat can be very uncomfortable and may reduce a worker's performance. The worker can prevent this condition by resting in a cool place part of each day and by regularly bathing and drying the skin."

7.0 SELECTION OF PERSONAL PROTECTIVE EQUIPMENT (PPE)

During work periods where the increased risk of heat stress exists, each item's benefit will be carefully evaluated. Once the PPE is chosen, safe work durations/rest periods will be determined based on the following conditions:

- Anticipated work rate;
- Ambient temperature and humidity;
- Level of protection.

8.0 PREVENTION OF HEAT STRESS

Prevention of heat stress will be addressed in the following manner:

1. Adjustment of work schedules (See Attachment A).

    a. Modify work/rest schedules.
    b. Enforce work slowdowns, as needed.
    c. Rotate personnel to minimize overstress or overexertion.
    d. When possible, work will be scheduled and performed during cooler hours.

1. Provide shelter or shaded areas to protect personnel during rest periods.

2. Maintain worker's body fluids at normal levels.

    a. Drink approximately 12 to 16 ounces of non-caffeinated liquid (preferably water, Gatorade or equivalent) prior to the start of work. Caffeinated fluids act to dehydrate the worker.

    b. Workers will be urged to drink a cup or two every 15 to 20 minutes, or at each break. A total of 1 to 1.5 gallons of water per individual per day are recommended for fluid replacement under heat stress conditions, but more may be required.

3. Encourage physical fitness among the workers.

Gradually acclimatize workers on site to help build up an "immunity" to the conditions.

- Heat acclimatization can usually be induced in 5 to 7 days of exposure at a hot job. For workers with previous experience with the job, acclimatization will include exposures of 50% for day 1, 60% for day 2, 80% for day 3, and 100% for the remaining additional days.

4. Provide cooling devices during prolonged work or severe heat exposure.

    a. Supply field showers or hose down areas.

    b. Supply personnel with cooling jackets, vests, and suits.

5. Train workers in recognition and treatment of heat stress.

6. Use of the buddy system that depends on the recognition of signs and symptoms of heat stress.

7. Identification of heat-intolerant individuals through medical screening.

ATTACHEMENT A

HEAT STRESS
WORK/REST REGIMES AND MONITORING

Introduction

Establishing a work/rest regimen that allows work to be completed in a timely manner while providing adequate rest time to prevent heat stress requires involvement of the ESS, FOL, and individuals involved. In many cases, particularly when wearing normal field type clothing (i.e., level D), awareness and communication are the key elements to a successful program. Allowing rest periods on an "as needed" basis while ensuring vigilance for initial symptoms of heat stress, encourages this success.

There are times when this approach is not appropriate. When heat stress contributing protective clothing (e.g., respirators, impermeable coveralls) are worn for extended periods, or when "as needed" work/rest regimens adversely impact either the individuals exposed to the heat source or work completion, a more formal work/rest regimen will be established.

Formal work/rest regimens are based either on 1) monitoring ambient conditions (e.g., with a WBGT), estimating work loads and establishing work/rest times, 2) monitoring physiological conditions and adjusting work/rest periods, or 3) using personal heat stress monitors.

The WBGT, physiological monitors, and personal heat stress monitors will be used in accordance with manufacturer's instructions. Personnel heat stress monitors will be approved for use by the PESM.

I. WBGT Based Work/Rest Regimens

A. Work/Rest Regimens

When required, the WBGT will be used in conjunction with the work load to determine the appropriate work/rest regimen for personnel wearing regular work clothing or semipermeable disposal coveralls (uncoated Tyvek). Light work examples include sitting or standing or performing light hand or arm work. Moderate work includes walking about with moderate lifting and pushing. Heavy work corresponds to pick and shovel-type work.

The work/rest regimen using the WBGT procedure will be used as a guideline. Table A-1 outlines the work/rest regimen guidelines based upon WBGT temperature and work load. Table A-2 identifies the correction factors. The WBGT temperature will be determined in accordance with Section B of this attachment.

Table A-1. Examples of Permissible Heat Exposure Threshold Limit Values.
(Values are given in °F WBGT)*

		Workload	
Work – Rest Regimen	**Light**	**Moderate**	**Heavy**
Continuous Work	86	80	77
75%Work -	87	82	78
25% Rest, each hour			
50% Work -	89	85	82
50% Rest, each hour			
25% Work -	90	88	86
75% Rest, each hour			

*Notes on Table B-1

1) These values are for fully acclimated workers wearing light weight pants and shirts. For conditions other than this use this table with the correction factors from Table B-2.

2) These values assume that workers drink frequently and have properly increased salting of food prior to exposure.

3) These values are guidelines. Actual levels may be modified based on individual physiological response and actual work and rest conditions.

4) These values assume that the rest location is cool enough to alleviate heat load conditions.

Table A-2. Correction Factors for Table B-1 in °F*

Clothing Type	**WBGT Correction**
Summer work uniform	0
Cotton overalls	-3.5
Winter work uniform	-7
Water barrier, permeable	-11
Condition	**WBGT Correction**
Unacclimatized worker, moderate work load	-4.5

*To use this table, identify the most restrictive applicable clothing type and whether unacclimatized workers are involved. Add the two. Modify Table B-1 temperatures by this amount. For example, the Table B-1 TLV for continuous work, light workload is 86°F. If cotton overalls (-3.5) are work and acclimatized workers are acclimatized (no additional change) the modified limit is 82.5°F.

B. WBGT Determination

If the Web Bulb Globe Temperature (WBGT) is used to determine if field conditions are conducive to heat stress, the WBGT is determined through the following equations:

(1)

Outdoors with solar load:

WBGT=0.7 NWB+0.2GT+0.1DB

(2)

Indoors or outdoors with no solar load:

WBGT=0.7 NWB+0.3GT

Where:

WGBT = Wet Bulb Globe Temperature Index
NWB = Natural Web-Bulb Temperature
DB = Dry-Bulb Temperature
GT = Globe Thermometer Temperature

The factors involved in the above equations can be measured in the following manner:

- Through the use of a direct-reading heat stress monitor capable of measuring all of the individual factors associated with the WBGT equation. For example, the Reuter-Strokes Wibet No. RSS-214 heat stress monitor.

- By measuring the individual factors manually using the following type of equipment

  Natural Wet-Bulb Temperature Thermometer
  Dry-Bulb Temperature Thermometer
  Globe Temperature Thermometer Stand

II. Adjusted Temperature Based Work/Rest Regimens

When wearing impermeable protective clothing, the use of work/rest regimens based on WBGT is not recommended. The WBGT index is designed to account for the effects of evaporative cooling. Vapor barrier clothing impedes the evaporation of sweat and renders the WBGT an inappropriate physiological model. The most important environmental conditions related to heat stress for workers wearing impermeable protective clothing have been suggested to be the ambient dry bulb temperature and the radiant solar heat. These factors are combined into an index called the adjusted temperature using the following formula:

T° adjusted = ambient dry bulb temperature + (13 x % sunshine)

where % sunshine is an estimate of the amount of time the sun is covered by clouds thick enough to product a shadow. The thermometer bulb should be shielded from radiant heat when taking measurements.

The adjusted temperature values are then used to determine the initial work/rest regimen and physiological monitoring frequency. Table B-3 gives the work period and monitoring frequency. Initially, rest periods will be at least 15 minutes. Physiological monitoring that is normally recommended is pulse rate and body temperature. Procedures for each are described below. Initially, both should be done. Pulse rate monitoring may be discontinued with the approval of the PESM if temperature monitoring proves to be effective.

WORK/REST REGIMENS

A. Pulse Rate Monitoring

Take the pulse immediately at the start of the rest period (P1). Take the pulse again 2 ½ to 3 minutes into the rest period (P2). If any of the following conditions exist, shorten the next work period by a third:

P1 > 110 beats per minute (bpm)
P2 > 90 pbm
P1 – P2 > 10 pbm

Pulse rates can be taken with an electric pulse meter, or manually with a stopwatch for 30-seconds.

B. Oral Temperature

Take the oral temperature immediately at the start of the rest period. If the oral temperature exceeds 99.5° shorten the next work period by a third. Do not return the worker to hot work in semipermeable or impermeable clothing until the oral temperature is less than 99.5°F.

Oral temperatures may be taken with disposable oral thermometers or infrared ear drum scanners, such as the Thermoscan. Note: If a Thermoscan unit is purchased, the Pro Model should be selected. The home model available through drugstores cannot be recalibrated.

C. Removal from Exposure

If an individual requires a shortening of the work period on more than two consecutive monitoring periods, or repeatedly over a few days, they should be removed from exposure to hot environments wearing semipermeable impermeable protective clothing until examined and cleared for such work by the consulting physician.

Table B-3. Initial Work Period and Physiological Monitoring Frequency [1]

ADJUSTED TEMPERATURES	SCHEDULE
90°F or above	15 Minutes
87.5° - 90°F	30 Minutes
82.5° - 87.5°	60 Minutes
77.5° - 82.5°F	90 Minutes
70° - 77.5°F	120 Minutes

[1] Schedule is for fit and acclimatized workers in impermeable protective clothing.

APPENDIX E

ACTIVITY HAZARD ANALYSIS

Activity Hazard Analysis For Mobilization/Demobilization
Rockaway Former MGP Site
Rockaway Park, Queens, New York

Phase of Work: Mobilization/Demobilization

Tasks:

- Mobilization and Demobilization of Equipment and Supplies
- Establishment of Site Security, Work Zones and Staging Areas
- Utility Connections (Water, Sewer, Communications and Electrical) for all temporary facilities
- Site restoration (re-establishment of vegetation cover, site grading, replacement of fences, etc)

HAZARDS	CONTROL MEASURES
Slips/trips/falls	• Maintain site awareness and alertness to slip/trip/fall hazards; • Maintain good housekeeping; • Personnel will use caution when working on slopes, plastic, wet or muddy areas, or oily areas; • Walk, do not run; and • Wear footwear with soles that grip.
Manual lifting and material handling	• Use proper lifting techniques; and • Team lifting will be used for heavy loads or use mechanical lifting devices.
Temperature extremes	• Drink plenty of fluids; • Train personnel of signs/symptoms of heat/cold stress; • Monitor air temperatures when extreme weather conditions are present; • Stay in visual and verbal contact with your buddy; and • Use Temperature Extremes program (Appendices C and D).
Hand tool usage	• Daily inspections will be performed; • Remove broken or damaged tools from service; • Use the tool for its intended purpose; and • Use in accordance with manufacturer instructions.
Back injuries	• Follow proper lifting techniques: lift with legs, keep load close to the body, do not bend or twist with load, test load prior to lift; get help for heavy or awkward loads, clear path. • Site personnel will be instructed on proper lifting techniques; mechanical devise should be used to reduce manual handling of materials; team lifting should be utilized if mechanical devices are not available.
Vehicular Traffic	• Spotters will be used when backing up trucks and heavy equipment and when moving equipment. • Personnel maintain Site awareness and wear high visibility/reflective clothing • Implement proper traffic controls when working within public road ROW

Activity Hazard Analysis For Mobilization/Demobilization
Rockaway Former MGP Site
Rockaway Park, Queens, New York

HAZARDS	CONTROL MEASURES
Overhead Hazards	• Personnel will be required to wear hard hats that meet ANSI Standard Z89.1; • All ground personnel will stay clear of suspended loads; • All equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects; and • All overhead hazards will be identified prior to commencing work operations.
Noise	• Ear plugs or ear muffs.
Dropped Objects	• Steel toe boots meeting ANSI Standard Z41 will be worn.
Eye Injuries	• Safety glasses meeting ANSI Standard Z87 will be worn.
Fire/Explozion	• ABC type fire extinguishers shall be readily available; • No smoking in work areas • Non sparking tools in high VOCs/potentially explosive atmospheres and maintain a well ventilated work area.
Electrocution	• Equipment will be equipped with GFCI; • All electrical work will be conducted by a licensed electrician; • All equipment will stay a minimum of 15 feet from overhead energized electrical lines (33 kV). This distance will increase .4 inches for each 1 kV above 33 kV. 10 feet for 13kV line and 5.5 feet for insulated 33kVline
Pinch/Cut/Smash	• Cut resistant Kevlar work gloves will be worn when dealing with sharp objects; • All hand and power tools will be maintained in safe condition; and • Guards will be kept in place while using hand and power tools.
Biological hazards	• Be alert to the presence of biological hazards; • Wear insect repellent; • Follow procedures in Section 4.2.3 for tick bites; • HSS should be aware of on-site personnel with allergic reactions in insect bites and stings.

Activity Hazard Analysis For
Pre-Construction and Site Preparation
Rockaway Former MGP Site
Rockaway Park, Queens, New York

Phase of Work: Pre-Construction and Site Preparation

Tasks:

- Delineate and Protect Utilities located on site and those leading to and from the Site
- Site Preparation (on-site roads, installation of soil erosion measures, temporary facilities, etc)
- Clearing and Grubbing
- Prepare decontamination pads and facilities

HAZARDS	CONTROL MEASURES
Slips/trips/falls	• Maintain site awareness and alertness to slip/trip/fall hazards; • Maintain good housekeeping; • Personnel will use caution when working on slopes, plastic, wet or muddy areas, or oily areas; • Walk, do not run; and • Wear footwear with soles that grip.
Manual lifting and material handling	• Use proper lifting techniques; and • Team lifting will be used for heavy loads or use mechanical lifting devices.
Temperature extremes	• Drink plenty of fluids; • Train personnel of signs/symptoms of heat/cold stress; • Monitor air temperatures when extreme weather conditions are present; • Stay in visual and verbal contact with your buddy; and • Use Temperature Extremes program (Appendices C and D).
Hand tool usage	• Daily inspections will be performed; • Remove broken or damaged tools from service; • Use the tool for its intended purpose; and • Use in accordance with manufacturer instructions.
Back injuries	• Follow proper lifting techniques: lift with legs, keep load close to the body, do not bend or twist with load, test load prior to lift; get help for heavy or awkward loads, clear path. • Site personnel will be instructed on proper lifting techniques; mechanical devise should be used to reduce manual handling of materials; team lifting should be utilized if mechanical devices are not available.
Vehicular Traffic	• Spotters will be used when backing up trucks and heavy equipment and when moving equipment. • Personnel will maintain site awareness and wear high visibility/reflective clothing • Implement proper traffic controls when working withing public road ROW

Activity Hazard Analysis For
Pre-Construction and Site Preparation
Rockaway Former MGP Site
Rockaway Park, Queens, New York

HAZARDS	CONTROL MEASURES
Overhead Hazards	• Personnel will be required to wear hard hats that meet ANSI Standard Z89.1; • All ground personnel will stay clear of suspended loads; • All equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects; and • All overhead hazards will be identified prior to commencing work operations.
Noise	• Ear plugs or ear muffs.
Dropped Objects	• Steel toe boots meeting ANSI Standard Z41 will be worn.
Eye Injuries	• Safety glasses meeting ANSI Standard Z87 will be worn.
Fire/Explosion	• ABC type fire extinguishers shall be readily available; • No smoking in work areas. • Non sparking tools in high VOCs/potentially explosive atmospheres, and maintain well ventilated work area.
Electrocution	• Equipment will be equipped with GFCI; • All electrical work will be conducted by a licensed electrician; • All equipment will stay a minimum of 15 feet from overhead energized electrical lines (30 kV). This distance will increase .4 inches for each 1 kV above 30 kV. 10 feet for 13kV line and 5.5 feet for insulated 33kVline
Pinch/Cut/Smash	• Cut resistant Kevlar work gloves will be worn when dealing with sharp objects; • All hand and power tools will be maintained in safe condition; and • Guards will be kept in place while using hand and power tools.
Biological hazards	• Be alert to the presence of biological hazards; • Wear insect repellent; • Follow procedures in Section 4.2.3 for tick bites; • HSS should be aware of on-site personnel with allergic reactions in insect bites and stings.

Activity Hazard Analysis For
General Construction Activities
Rockaway Former MGP Site
Rockaway Park, Queens, New York

Phase of Work: General Construction Activities

Tasks:

- Crane operations
- Construction activities near electrical transmission lines (above and below ground)
- Installation of the Waterloo Barrier Sheets

HAZARDS	CONTROL MEASURES
Chemical	• Wear appropriate PPE per Table 6-1; • Perform air monitoring per Tables 7-1 • Practice contamination avoidance; • Follow proper decontamination procedures; and • Wash hands/face before eating, drinking, or smoking.
Slips/trips/falls	• Maintain site awareness and alertness to slip/trip/fall hazards; • Maintain good housekeeping; • Personnel will use caution when working on slopes, plastic, wet or muddy areas, or oily areas; • Walk, do not run; and • Wear footwear with soles that grip.
Temperature extremes	• Drink plenty of fluids; • Train personnel of signs/symptoms of heat/cold stress; • Monitor air temperatures when extreme weather conditions are present; • Stay in visual and verbal contact with your buddy; and • Use Temperature Extremes program (Appendices C and D).
Hand tool usage	• Daily inspections will be performed; • Remove broken or damaged tools from service; • Use the tool for its intended purpose; and • Use in accordance with manufacturer instructions.
Back injuries	• Follow proper lifting techniques: lift with legs, keep load close to the body, do not bend or twist with load, test load prior to lift, get help for heavy or awkward loads, clear path. • Site personnel will be instructed on proper lifting techniques; • Mechanical devices should be used to reduce manual handling of materials; • Team lifting should be utilized if mechanical devices are no available.
Vehicular Traffic	• Spotters will be used when backing up trucks and heavy equipment and when moving equipment. • Personnel to maintain site awareness and wear high

Activity Hazard Analysis For
General Construction Activities
Rockaway Former MGP Site
Rockaway Park, Queens, New York

HAZARDS	CONTROL MEASURES
	visibility/reflective clothing • Implement proper traffic controls when working within public road ROW
Overhead Hazards	• Personnel will be required to wear hard hats that meet ANSI Standard Z89.1; • All ground personnel will stay clear of suspended loads; • All equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects; and • All overhead hazards will be identified prior to commencing work operations.
Noise	• Ear plugs or ear muffs.
Eye Injuries	• Safety glasses meeting ANSI Standard Z87 will be worn.
Fire/Explosion	• ABC type fire extinguishers shall be readily available; and • No smoking in work areas. • Non sparking tools in high VOCs/potentially explosive atmospheres, and maintain well ventilated work area.
Electrocution	• Equipment will be equipped with GFCI; • All electrical work will be conducted by a licensed electrician; • All equipment will stay a minimum of 15 feet from overhead energized electrical lines (33 kV). This distance will increase .4 inches for each 1 kV above 33 kV. 10 feet for 13kV line and 5.5 feet for insulated 33kVline
Pinch/Cut/Smash	• Cut resistant Kevlar work gloves will be worn when dealing with sharp objects; • All hand and power tools will be maintained in safe condition; and • Guards will be kept in place while using hand and power tools.
Biological hazards	• Be alert to the presence of biological hazards; • Wear insect repellent; • Follow procedures in Section 4.2.3 for tick bites; • HSS should be aware of on-site personnel with allergic reactions in insect bites and stings.

Activity Hazard Analysis For Decontamination Operations
Rockaway Former MGP Site
Rockaway Park, Queens, New York

Phase of Work: Decontamination

Tasks:

- Steam Cleaning of Heavy Equipment/Vehicles
- Dry Decontamination of Heavy Equipment/Vehicles
- Decontamination of Sampling Equipment

HAZARDS	CONTROL MEASURES
Chemical	• Wear appropriate PPE per Table 6-1; • Practice contamination avoidance; • Follow proper decontamination procedures; and • Wash hands/face before eating, drinking or smoking.
Steam/Heat/Splashing	• Use face shield and safety glasses or goggles; • Stay out of the splash/steam radius; • Do not direct steam at anyone; • Do not hold objects with your foot or hands and steam area near it; • Ensure that direction of spray minimizes spread of constituents of concern; • Use shielding as necessary; • Pressure washer will be equipped with a dead man's switch; and • Use wand extenders.
Back Injuries	• Follow proper lifting techniques: lift with legs, keep load close to the body, do not bend or twist with load, test load prior to lift, get help for heavy or awkward loads, clear path. • Site personnel will be instructed on proper lifting techniques; mechanical devices should be used to reduce manual handling of materials; team lifting should be utilized if mechanical devices are not available.
Vehicular Traffic	• Spotters will be used when backing up trucks and heavy equipment and when moving equipment.
Noise	• Ear plugs or ear muffs.
Dropped Objects	• Steel toe boots meeting ANSI Standard Z41 will be worn.
Eye Injuries	• Safety glasses meeting ANSI Standard Z87 will be worn.
Fire/Explosion	• ABC type fire extinguishers shall be readily available; no smoking in work area. • No smoking within active decontamination areas.
Pinch/Cut/Smash	• Cut resistant Kevlar work gloves will be worn when dealing with sharp objects; • All hand and power tools will be maintained in safe condition; • Guards will be kept in place while using hand and power tools.

Activity Hazard Analysis For Decontamination Operations
Rockaway Former MGP Site
Rockaway Park, Queens, New York

HAZARDS	CONTROL MEASURES
Slips/Trips/Falls	• Maintain site awareness and alertness to slip/trip/fall hazards; • Maintain good housekeeping; • Personnel will use caution when working on slopes, plastic, wet or muddy areas, or oily areas; • Walk, do not run; and • Wear footwear with soles that grip.
Biological Hazards	• Be alert to the presence of biological hazards; • Wear insect repellent; • Follow procedures in Section 4.2.3 for tick bites; • ESS should be aware of on-site personnel with allergic reactions in insect bites and stings.
Temperature Extremes	• Drink plenty of fluids; • Train personnel of signs/symptoms of heat stress; • Monitor air temperatures when extreme weather conditions are present; • Stay in visual and verbal contact with your buddy; and • Use Temperature Extremes Program (Appendices C and D).

Activity Hazard Analysis For Drilling Operations
Rockaway Former MGP Site
Rockaway Park, Queens, New York

Phase of Work: Drilling Operations

Tasks:

- Abandonment of existing wells
- Installation of DNAPL recovery wells
- Well Development

HAZARDS	CONTROL MEASURES
Chemical	• Wear appropriate PPE per Table 6-1; • Practice contamination avoidance; • Follow proper decontamination procedures; and • Wash hands/face before eating, drinking or smoking.
Hand and Power Tool Use	• Equip all electrical equipment with GFCI's; • Inspect all electrical equipment and tools prior to use; • Daily inspections will be performed; • Remove broken or damaged tools from service; • Use the tool for its intended purpose; • Use in accordance with manufacturer instructions; and • Tag and remove defective equipment.
Temperature Extremes	• Drink plenty of fluids; • Train personnel of signs/symptoms of heat stress; • Monitor air temperatures when extreme weather conditions are present; • Stay in visual and verbal contact with your buddy; and • Use Temperature Extremes Program (Appendices C and D).
Back Injuries	• Follow proper lifting techniques: lift with legs, keep load close to the body, do not bend or twist with load, test load prior to lift, get help for heavy or awkward loads, clear path. • Site personnel will be instructed on proper lifting techniques; mechanical devices should be used to reduce manual handling of materials; team lifting should be utilized if mechanical devices are not available.
Vehicular Traffic	• Spotters will be used when backing up trucks and heavy equipment and when moving equipment.
Overhead Hazards	• Personnel will be required to wear hard hats that meet ANSI Standard Z89.1. All ground personnel will stay clear of suspended loads. All equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects. All overheard hazards will be identified prior to commencing work operations.
Dropped Objects	• Spotters will be used when backing up trucks and heavy equipment and when moving equipment.
Eye Injuries	• Safety glasses meeting ANSI Standard Z87 will be worn.

Activity Hazard Analysis For
Drilling Operations
Rockaway Former MGP Site
Rockaway Park, Queens, New York

HAZARDS	CONTROL MEASURES
Fire/Explosion	• ABC type fire extinguishers shall be readily available; no smoking in work area. • No smoking in restricted work areas • Non-sparking tools in high VOCs/potentially explosive atmospheres, and maintain well ventilated work area.
Pinch/Cut/Smash	• Cut resistant Kevlar work gloves will be worn when dealing with sharp objects; • All hand and power tools will be maintained in safe condition; • Guards will be kept in place while using hand and power tools.
Biological Hazards	• Be alert to the presence of biological hazards; • Wear insect repellent; • Follow procedures in Section 4.2.3 for tick bites; • ESS should be aware of on-site personnel with allergic reactions in insect bites and stings.
Heavy Equipment	• Ground personnel will stay clear of all suspended loads; • Spill and absorbent materials will be readily available; drip pans, polyethylene sheeting or other means will be used for secondary containment; • Ground personnel will stay out of the swing radius; • Eye contact with operators will be made before approaching equipment; • Equipment will not be approached on blind sides; and • All equipment will be equipped with backup alarms.
Slips/Trips/Falls	• Maintain site awareness and alertness to slip/trip/fall hazards; • Maintain good housekeeping; • Personnel will use caution when working on slopes, plastic, wet or muddy areas, or oily areas; • Walk, do not run; and • Wear footwear with soles that grip.
Noise	• Ear plugs or ear muffs for all jackhammer use.

Activity Hazard Analysis For
Trenching Activities for Installation of Waterloo® Sheet Pile Barriers
Rockaway Former MGP Site
Rockaway Park, Queens, New York

Phase of Work: Trenching Activities for Installation of Waterloo® Sheet Pile Barriers

Tasks:

- Excavation of material for creation of the trench
- Stockpile and Segregation of trench material
- Shoring and support of the trench
- Trench safety and atmosphere monitoring
- Backfill of the trench with stockpiled material not impacted with source material

HAZARDS	CONTROL MEASURES
Chemical	• Wear appropriate PPE per Table 6-1; • Perform air monitoring per Tables 7-1; • Practice contamination avoidance; • Follow proper decontamination procedures and • Wash hands/face before eating, drinking, or smoking.
Slips/trips/falls	• Maintain site awareness and alertness to slip/trip/fall hazards; • Maintain good housekeeping; • Personnel will use caution when working on slopes, plastic, wet or muddy areas, or oily areas; • Walk, do not run; and • Wear footwear with soles that grip.
Temperature extremes	• Drink plenty of fluids; • Train personnel of signs/symptoms of heat/cold stress; • Monitor air temperatures when extreme weather conditions are present; • Stay in visual and verbal contact with your buddy; and • Use Temperature Extremes program (Appendices C and D).
Hand tool usage	• Daily inspections will be performed; • Remove broken or damaged tools from service; • Use the tool for its intended purpose; and • Use in accordance with manufacturer instructions.
Back injuries	• Follow proper lifting techniques: lift with legs, keep load close to the body, do not bend or twist with load, test load prior to lift, get help for heavy or awkward loads, clear path. • Site personnel will be instructed on proper lifting techniques; • Mechanical devices should be used to reduce manual handling of materials; • Team lifting should be utilized if mechanical devices are no available.
Vehicular Traffic	• Spotters will be used when backing up trucks and heavy equipment and when moving equipment.

Activity Hazard Analysis For
Trenching Activities for Installation of Waterloo® Sheet Pile Barriers
Rockaway Former MGP Site
Rockaway Park, Queens, New York

HAZARDS	CONTROL MEASURES
Overhead Hazards	• Personnel will be required to wear hard hats that meet ANSI Standard Z89.1; • All ground personnel will stay clear of suspended loads; • All equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects; and • All overhead hazards will be identified prior to commencing work operations.
Noise	• Ear plugs or ear muffs.
Eye Injuries	• Safety glasses meeting ANSI Standard Z87 will be worn.
Fire/Explosion	• ABC type fire extinguishers shall be readily available; and • No smoking in work area. • Non sparking tools in high VOCs/potentially explosive atmospheres and maintain well ventilated work area.
Electrocution	• Equipment will be equipped with GFCI; • All electrical work will be conducted by a licensed electrician; • All equipment will stay a minimum of 15 feet from overhead energized electrical lines (33 kV). This distance will increase .4 inches for each 1 kV above 33 kV. 10 feet for 13kV line and 5.5 feet for insulated 33kVline.
Pinch/Cut/Smash	• Cut resistant Kevlar work gloves will be worn when dealing with sharp objects; • All hand and power tools will be maintained in safe condition; and • Guards will be kept in place while using hand and power tools.
Biological hazards	• Be alert to the presence of biological hazards; • Wear insect repellent; • Follow procedures in Section 4.2.3 for tick bites; • HSS should be aware of on-site personnel with allergic reactions in insect bites and stings.

Activity Hazard Analysis For
Excavation of Shallow Excavation Areas
Rockaway Former MGP Site
Rockaway Park, Queens, New York

Phase of Work: Excavation of Shallow Excavation Areas

Tasks:

- Installation of sheet piling to support shallow excavations
- Benching for slope protection in the Shallow Excavation Areas
- Erection, maintenance, relocation and removal of temporary fabric enclosure(s)
- Protect and support excavation areas in proximity to overhead utilities
- Excavation of materials from Shallow Excavation Areas
- Staging and Stockpiling Materials
- Operations in proximity to overhead and underground utilities
- Removal of subsurface obstructions
- Backfill and compaction of Shallow Excavation Areas

HAZARDS	CONTROL MEASURES
Chemical	• Wear appropriate PPE per Table 6-1; • Perform air monitoring per Tables 7-1; • Practice contamination avoidance; • Follow proper decontamination procedures; and • Wash hands/face before eating, drinking, or smoking.
Slips/trips/falls	• Maintain site awareness and alertness to slip/trip/fall hazards; • Maintain good housekeeping; • Personnel will use caution when working on slopes, plastic, wet or muddy areas, or oily areas; • Walk, do not run; and • Wear footwear with soles that grip.
Temperature extremes	• Drink plenty of fluids; • Train personnel of signs/symptoms of heat/cold stress; • Monitor air temperatures when extreme weather conditions are present; • Stay in visual and verbal contact with your buddy; and • Use Temperature Extremes program (Appendices C and D).
Hand tool usage	• Daily inspections will be performed; • Remove broken or damaged tools from service; • Use the tool for its intended purpose; and • Use in accordance with manufacturer instructions.
Back injuries	• Follow proper lifting techniques: lift with legs, keep load close to the body, do not bend or twist with load, test load prior to lift, get help for heavy or awkward loads, clear path. • Site personnel will be instructed on proper lifting techniques; • Mechanical devices should be used to reduce manual handling of materials; • Team lifting should be utilized if mechanical devices are no

HAZARDS	CONTROL MEASURES
	available.
Vehicular Traffic	• Spotters will be used when backing up trucks and heavy equipment and when moving equipment.
Overhead Hazards	• Personnel will be required to wear hard hats that meet ANSI Standard Z89.1; • All ground personnel will stay clear of suspended loads; • All equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects; and • All overhead hazards will be identified prior to commencing work operations.
Noise	• Ear plugs or ear muffs.
Eye Injuries	• Safety glasses meeting ANSI Standard Z87 will be worn.
Fire/Explosion	• ABC type fire extinguishers shall be readily available; and • No smoking in work area. • Non sparking tools in high VOCs/potentially explosive atmospheres and maintain well ventilated work area.
Electrocution	• Equipment will be equipped with GFCI; • All electrical work will be conducted by a licensed electrician; • All equipment will stay a minimum of 15 feet from overhead energized electrical lines (33 kV). This distance will increase .4 inches for each 1 kV above 33 kV. 10 feet for 13kV line and 5.5 feet for insulated 33kVline
Pinch/Cut/Smash	• Cut resistant Kevlar work gloves will be worn when dealing with sharp objects; • All hand and power tools will be maintained in safe condition; and • Guards will be kept in place while using hand and power tools.
Biological hazards	• Be alert to the presence of biological hazards; • Wear insect repellent; • Follow procedures in Section 4.2.3 for tick bites; • HSS should be aware of on-site personnel with allergic reactions in insect bites and stings.

Activity Hazard Analysis For
Site Wide Cap
Rockaway Former MGP Site
Rockaway Park, Queens, New York

Phase of Work: Site Wide Cap

Tasks:

- Excavation of materials to facilitate the site wide cap
- Staging and Stockpiling Materials
- Removal of subsurface obstructions
- Operations in proximity to overhead and underground utilities
- Construction of site wide cap

HAZARDS	CONTROL MEASURES
Chemical	• Wear appropriate PPE per Table 6-1; • Perform air monitoring per Tables 7-1; • Practice contamination avoidance; • Follow proper decontamination procedures; and • Wash hands/face before eating, drinking, or smoking.
Slips/trips/falls	• Maintain site awareness and alertness to slip/trip/fall hazards; • Maintain good housekeeping; • Personnel will use caution when working on slopes, plastic, wet or muddy areas, or oily areas; • Walk, do not run; and • Wear footwear with soles that grip.
Temperature extremes	• Drink plenty of fluids; • Train personnel of signs/symptoms of heat/cold stress; • Monitor air temperatures when extreme weather conditions are present; • Stay in visual and verbal contact with your buddy; and • Use Temperature Extremes program (Appendices C and D).
Hand tool usage	• Daily inspections will be performed; • Remove broken or damaged tools from service; • Use the tool for its intended purpose; and • Use in accordance with manufacturer instructions.
Back injuries	• Follow proper lifting techniques: lift with legs, keep load close to the body, do not bend or twist with load, test load prior to lift, get help for heavy or awkward loads, clear path. • Site personnel will be instructed on proper lifting techniques; • Mechanical devices should be used to reduce manual handling of materials; • Team lifting should be utilized if mechanical devices are no available.
Vehicular Traffic	• Spotters will be used when backing up trucks and heavy equipment and when moving equipment.
Overhead Hazards	• Personnel will be required to wear hard hats that meet ANSI

Activity Hazard Analysis For
Site Wide Cap
Rockaway Former MGP Site
Rockaway Park, Queens, New York

HAZARDS	CONTROL MEASURES
	Standard Z89.1; • All ground personnel will stay clear of suspended loads; • All equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects; and • All overhead hazards will be identified prior to commencing work operations.
Noise	• Ear plugs or ear muffs.
Eye Injuries	• Safety glasses meeting ANSI Standard Z87 will be worn.
Fire/Explosion	• ABC type fire extinguishers shall be readily available; and • No smoking in work area.
Electrocution	• Equipment will be equipped with GFCI; • All electrical work will be conducted by a licensed electrician; • All equipment will stay a minimum of 15 feet from overhead energized electrical lines (33 kV). This distance will increase .4 inches for each 1 kV above 33 kV. 10 feet for 13kV line and 5.5 feet for insulated 33kVline
Pinch/Cut/Smash	• Cut resistant Kevlar work gloves will be worn when dealing with sharp objects; • All hand and power tools will be maintained in safe condition; and • Guards will be kept in place while using hand and power tools.
Biological hazards	• Be alert to the presence of biological hazards; • Wear insect repellent; • Follow procedures in Section 4.2.3 for tick bites; • HSS should be aware of on-site personnel with allergic reactions in insect bites and stings.

Activity Hazard Analysis For
Other Remediation Tasks
Rockaway Former MGP Site
Rockaway Park, Queens, New York

Phase of Work: Other Remediation Tasks

Tasks:

- Operation and Maintenance Tasks
- Disconnection, Capping and Sealing of former industrial piping
- Dewatering (if required)

HAZARDS	CONTROL MEASURES
Chemical	• Wear appropriate PPE per Table 6-1; • Perform air monitoring per Tables 7-1; • Practice contamination avoidance; • Follow proper decontamination procedures; and • Wash hands/face before eating, drinking, or smoking.
Slips/trips/falls	• Maintain site awareness and alertness to slip/trip/fall hazards; • Maintain good housekeeping; • Personnel will use caution when working on slopes, plastic, wet or muddy areas, or oily areas; • Walk, do not run; and • Wear footwear with soles that grip.
Temperature extremes	• Drink plenty of fluids; • Train personnel of signs/symptoms of heat/cold stress; • Monitor air temperatures when extreme weather conditions are present; • Stay in visual and verbal contact with your buddy; and • Use Temperature Extremes program (Appendices C and D).
Hand tool usage	• Daily inspections will be performed; • Remove broken or damaged tools from service; • Use the tool for its intended purpose; and • Use in accordance with manufacturer instructions.
Back injuries	• Follow proper lifting techniques: lift with legs, keep load close to the body, do not bend or twist with load, test load prior to lift, get help for heavy or awkward loads, clear path. • Site personnel will be instructed on proper lifting techniques; • Mechanical devices should be used to reduce manual handling of materials; • Team lifting should be utilized if mechanical devices are no available.
Vehicular Traffic	• Spotters will be used when backing up trucks and heavy equipment and when moving equipment.
Overhead Hazards	• Personnel will be required to wear hard hats that meet ANSI Standard Z89.1; • All ground personnel will stay clear of suspended loads;

Activity Hazard Analysis For Other Remediation Tasks
Rockaway Former MGP Site
Rockaway Park, Queens, New York

HAZARDS	CONTROL MEASURES
	• All equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects; and All overhead hazards will be identified prior to commencing work operations.
Noise	• Ear plugs or ear muffs.
Eye Injuries	• Safety glasses meeting ANSI Standard Z87 will be worn.
Fire/Explosion	• ABC type fire extinguishers shall be readily available; and • No smoking in work area. • Non sparking tools in high VOCs/potentially explosive atmospheres and maintain well ventilated work area.
Electrocution	• Equipment will be equipped with GFCI; • All electrical work will be conducted by a licensed electrician; • All equipment will stay a minimum of 15 feet from overhead energized electrical lines (33 kV). This distance will increase .4 inches for each 1 kV above 33 kV. 10 feet for 13kV line and 5.5 feet for insulated 33kVline
Pinch/Cut/Smash	• Cut resistant Kevlar work gloves will be worn when dealing with sharp objects; • All hand and power tools will be maintained in safe condition; and • Guards will be kept in place while using hand and power tools.
Biological hazards	• Be alert to the presence of biological hazards; • Wear insect repellent; • Follow procedures in Section 4.2.3 for tick bites; • HSS should be aware of on-site personnel with allergic reactions in insect bites and stings.

Activity Hazard Analysis For
Soil Sampling Activities
Rockaway Former MGP Site
Rockaway Park, Queens, New York

Phase of Work: Soil Sampling Activities

Tasks:

- Soil Sampling
- Waste Characterization Sampling
- Pre-Characterization Soil Sampling

HAZARDS	CONTROL MEASURES
Chemical	• Wear appropriate PPE per Table 6-1; • Perform air monitoring per Tables 7-1; • Practice contamination avoidance; • Follow proper decontamination procedures; and • Wash hands/face before eating, drinking or smoking.
Temperature Extremes	• Drink plenty of fluids; • Train personnel of signs/symptoms of heat stress; • Monitor air temperatures when extreme weather conditions are present; • Stay in visual and verbal contact with your buddy; and • Use Temperature Extremes Program (Appendices C and D).
Back Injuries	• Do not overexert when using sampling tools; • Follow proper lifting techniques: lift with legs, keep load close to the body, do not bend or twist with load, test load prior to lift, get help for heavy or awkward loads, clear path. • Site personnel will be instructed on proper lifting techniques; mechanical devices should be used to reduce manual handling of materials; team lifting should be utilized if mechanical devices are not available.
Vehicular Traffic	• Spotters will be used when backing up trucks and heavy equipment and when moving equipment.
Noise	• Ear plugs or ear muffs.
Dropped Objects	• Steel toe boots meeting ANSI Standard Z41 will be worn.
Eye Injuries	• Safety glasses meeting ANSI Standard Z87 will be worn.
Heavy Equipment	• Ground personnel will stay clear of all suspended loads; • Spill and absorbent materials will be readily available; drip pans, polyethylene sheeting or other means will be used for secondary containment; • Ground personnel will stay out of the swing radius; • Eye contact with operators will be made before approaching equipment; • Equipment will not be approached on blind sides; and • All equipment will be equipped with backup alarms.
Slips/Trips/Falls	• Maintain site awareness and alertness to slip/trip/fall hazards;

Activity Hazard Analysis For
Soil Sampling Activities
Rockaway Former MGP Site
Rockaway Park, Queens, New York

HAZARDS	CONTROL MEASURES
	• Maintain good housekeeping; • Personnel will use caution when working on slopes, plastic, wet or muddy areas, or oily areas; • Walk, do not run; and • Wear footwear with soles that grip.
Biological Hazards	• Be alert to the presence of biological hazards; • Wear insect repellent; • Follow procedures in Section 4.2.3 for tick bites; • ESS should be aware of on-site personnel with allergic reactions in insect bites and stings.

Activity Hazard Analysis For
Ground Water Sampling Activities
Rockaway Former MGP Site
Rockaway Park, Queens, New York

Phase of Work: Ground Water Sampling Activities

Tasks:

- Monitoring Well Sampling

HAZARDS	CONTROL MEASURES
Chemical	• Wear appropriate PPE per Table 6-1; • Practice contamination avoidance; • Follow proper decontamination procedures; and • Wash hands/face before eating, drinking or smoking.
Injury/Exposure of Worker's Eyes, Face, Hands, Skin due to Pressure, Bursting of Lines and Backspray During Pumping	• PPE and air monitoring as per the EHS Plan; • Proper operation of each type of system (i.e., hookup, pressure regulation, flowrate and work practices) by an experienced pump operator (e.g., plastic sheeting); and • Use splashshield around pressure hookups to minimize worker exposure to groundwater/oil.
Releases	• Place all liquid transfer equipment on double lined plastic areas during work with a bermed area according to the work plan.
Temperature Extremes	• Drink plenty of fluids; • Train personnel of signs/symptoms of heat stress; • Monitor air temperatures when extreme weather conditions are present; • Stay in visual and verbal contact with your buddy; and • Use Temperature Extremes Program (Appendices C and D).
Back Injuries	• Follow proper lifting techniques: lift with legs, keep load close to the body, do not bend or twist with load, test load prior to lift, get help for heavy or awkward loads, clear path. • Site personnel will be instructed on proper lifting techniques; mechanical devices should be used to reduce manual handling of materials; team lifting should be utilized if mechanical devices are not available.
Dropped Objects	• Steel toe boots meeting ANSI Standard Z41 will be worn.
Pinch/Cut/Smash	• Cut resistant Kevlar work gloves will be worn when dealing with sharp objects; • All hand and power tools will be maintained in safe condition; • Guards will be kept in place while using hand and power tools.
Biological Hazards	• Be alert to the presence of biological hazards; • Wear insect repellent; • Follow procedures in Section 4.2.3 for tick bites; • ESS should be aware of on-site personnel with allergic reactions in insect bites and stings.

Activity Hazard Analysis For
Ground Water Sampling Activities
Rockaway Former MGP Site
Rockaway Park, Queens, New York

HAZARDS	CONTROL MEASURES
Hand and Power Tool Use	• Equip all electrical equipment with GFCI's; • Inspect all electrical equipment and tools prior to use; • Daily inspections will be performed; • Remove broken or damaged tools from service; • Use the tool for its intended purpose; • Use in accordance with manufacturer instructions; and • Tag and remove defective equipment.
Slips/Trips/Falls	• Maintain site awareness and alertness to slip/trip/fall hazards; • Maintain good housekeeping; • Personnel will use caution when working on slopes, plastic, wet or muddy areas, or oily areas; • Walk, do not run; and • Wear footwear with soles that grip.

APPENDIX F

PERSONAL PROTECTIVE EQUIPMENT (PPE) PROGRAM: SELECTION AND USE

PERSONAL PROTECTIVE EQUIPMENT (PPE) PROGRAM: SELECTION AND USE

1.0 PURPOSE

This program has been written to help the worker choose the correct Personal Protective Equipment (PPE) for the job. Familiarity with the different levels of protection (A, B, C and D) will help speed up the selection process. Careful selection and use of adequate PPE should protect the respiratory system, skin, eyes, face, hands, feet, head, body and hearing. Posillico employees may work at a variety of job sites and locations which may require different types of protective equipment. Client specific requirements will always be adhered to. Posillico will supply all PPE or reimburse the employee for the costs of PPE if the PPE is required as part of the project.

2.0 SCOPE

This program establishes criteria for the selection, use, donning and doffing, inspection, maintenance, storage, decontamination of PPE, and evaluation. This information is general, and specific PPE use should be included in the site-specific health and safety plan (SSHSP) prepared for each project.

3.0 OSHA REQUIREMENTS (29 CFR 1910.120)

A written personal protective equipment program, which is part of the employer's safety and health program and also part of the site-specific health and safety plan shall be established. The PPE program shall address the elements listed below.

- PPE selection based upon site hazards;
- PPE use and limitations of the equipment;
- Work mission duration;
- PPE Maintenance and storage;
- PPE decontamination and disposal;
- PPE training and proper fitting;
- PPE donning and doffing procedures;
- PPE inspection procedures prior to, during and after use;
- Evaluation of the effectiveness of the PPE program; and
- Limitations during temperature extremes, heat stress, and other appropriate medical considerations.

OSHA Standard 29 CFR 1910.132 requires employers to assess the employer's workplace and determine if hazards are present that necessitate the use of personal protective equipment (PPE). This assessment must be certified in writing and documented. Due to the variety of job sites and situations that Posillico personnel may be involved in, it is important that Posillico maintain a consistent approach in complying with health and safety procedures. The project manager and/or site supervisor are responsible for ensuring that all personnel wear the appropriate PPE. Failure to comply with these requirements may result in disciplinary action. Employee safety is a paramount concern for all Posillico managers and employees. We all must make every effort to protect ourselves and each other from harm.

These procedures will now require the following:

1. Protective footwear must be worn by all field personnel working in the field. Footwear must at a minimum include steel toe and shank protection. Posillico will reimburse employees up to $90 for the purchase of protective footwear which must be dedicated for work. Protective footwear must meet ANSI Z41-1991. Additionally, chemical protective footwear may also be required if the potential for contaminated materials exists. This type of protection will be required on a site-specific basis.

2. Eye protection must be worn by all field personnel during all sampling activities, stack sampling, and inside manufacturing facilities. Eye protection must include side shields. Prescription lenses worn as eye protection and other protective eyewear must meet ANSI Z87.1.

3. Hardhats are to be worn by all field personnel when in the field. New hardhats must meet ANSI Z89.

4. Hand protection is to be worn on a site-specific basis. The hand protection must be selected based on the chemical hazards expected to be encountered. Posillico maintains a stock of a variety of gloves including:

   Best: Nitrile N-Dey
   PVC
   Vinyl
   Solvex, Nitrile
   Leather Work Gloves

   Additionally, nitrile coated Kevlar gloves or other types of puncture resistant gloves are to be worn by all personnel working with or cleaning glass impingers. Manufacturers that supply these gloves include Ansell, Edmont, Jomac and Wells Lamont. Insulated electrical gloves with outer leather gloves is required when working around high-voltage systems.

   Posillico is responsible for supplying all personal protective equipment required for Posillico's projects

4.0 WORK MISSION DURATION

Before donning any PPE ensembles, workers will estimate their anticipated work duration. There are several limiting factors that affect the length of work time. These factors must be addressed:

- Air supply consumption
- Permeation and penetration of the Chemical Protective Clothing/ensemble;
- Ambient temperature; and
- Coolant supply (ice or chilled area to keep the worker's body temperature at a normal temperature).

5.0 LEVEL OF PROTECTION

The following section describes the different levels of protection (A through D). Each level is described in the following manner: the protection provided; when this particular level of protection should be used; recommended and optional equipment; and, any limiting criteria.

1. Level A

   a. Protection provided:

      - Level A provides the highest available level of respiratory, skin and eye protection.

   b. Should be used when:

      - The chemical substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on any of the following circumstances;
      - Measured (or potential for) high concentration of atmospheric vapors, gases or particulates;
      - Site operations and work functions involving a high potential for splash, immersion, or exposure to unexpected vapors, gases or particulates of materials that are harmful to skin or capable of being absorbed through intact skin;
      - Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible;
      - The Operations must be conducted in confined, poorly ventilated areas until absence of conditions requiring Level A protection is determined.

   c. Recommended equipment:

      - Pressure-demand, full facepiece SCBA or pressure-demand supplied-air respirator with escape SCBA;
      - Fully-encapsulating, chemical-resistant suit (pressure-tested immediately before use);
      - Inner chemical-resistant suit;
      - Inner chemical-resistant gloves;
      - Chemical-resistant safety boots/shoes;
      - High Visibility/Reflective Clothing (e.g., light-weight workers Vests)
      - Two-way radio communications.

   d. Optional equipment:

      - Cooling unit;
      - Coveralls;
      - Long cotton underwear;
      - Hard hat; and
      - Disposable gloves and boot covers.

e. Limiting criteria:

- Fully encapsulating suit material must be compatible with the substances involved.

2. Level B

a. Protection provided:

- The same level of respiratory protection, but less skin protection than Level A.

b. Should be used when:

- The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection. This involves atmospheres with IDLH concentrations of specific substances that do not represent a severe skin hazard, or that do not meet the criteria for use of air purifying respirators;
- Atmospheres contain less than 19.5% oxygen; and
- Presence of incompletely identified vapors or gases indicated by direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the intact skin.

c. Recommended equipment:

- Pressure-demand, full facepiece SCBA or pressure-demand supplied-air respirator with escape SCBA;
- Chemical-resistant clothing (overalls and long-sleeved jacket; hooded, one- or two-piece chemical splash suit; disposable chemical-resistant one-piece suit);
- Inner and outer chemical-resistant gloves;
- Chemical-resistant safety boots/shoes;
- Hard hat;
- High Visibility/Reflective Clothing (e.g., light-weight workers Vests)
- Two-way radio communications.

d. Optional equipment:

- Coveralls;
- Disposable boot covers;
- Face shield; and
- Long cotton underwear.

e. Limiting criteria:

- Use only when the vapors or gases present are not suspected of containing high concentrations of chemicals that are harmful to skin or capable of being absorbed through the intact skin.
- Use only when it is highly unlikely that the work being done will generate either high concentrations of vapors, gases or splashes of material that will affect the exposed skin.

3. Level C

a. Protection provided:

- Level C provides the same level of skin protection as Level B, but a lower level of respiratory protection.

b. Should be used when:

- The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect any exposed skin;
- The types of air contaminants have been identified, concentrations measured, and a canister/ cartridge is available that can remove the contaminant; and
- All criteria for the use of air-purifying respirators are met.

c. Recommended equipment:

- Full facepiece or half facepiece air-purifying negative pressure respirator;
- Chemical-resistant clothing;
- Inner and outer chemical-resistant gloves;
- Chemical-resistant safety boots and shoes;
- Disposable boot covers;
- Hard hat;
- High Visibility/Reflective Clothing (e.g., light weight workers Vests)
- Two-way radio communications.

d. Optional equipment:

- Coveralls;
- Face shield;
- Escape bottle; and
- Long cotton underwear.

e. Limiting criteria:

- Atmospheric concentration of chemicals must not exceed IDLH levels; and
- The atmosphere must contain at least 19.5% oxygen.

4. Level D

   a. Protection provided:

      - No respirator protection and minimal skin protection.

   b. Should be used when:

      - The atmosphere contains no known hazard; and
      - Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

   c. Recommended equipment:

      - Coveralls;
      - Safety boots/shoes;
      - Safety glasses or chemical splash goggles;
      - High Visibility/Reflective Clothing (e.g., light weight workers Vests)
      - Hardhat.

   d. Optional equipment:

      - Gloves;
      - Escape bottle; and
      - Face shield.

   e. Limiting criteria:

      - The atmosphere must contain at least 19.5% oxygen.

6.0 LEVEL OF PROTECTION UTILIZED

Due to the nature of our work, it can be reasonably expected that personnel will not be performing any work that will require the use of Level A protection. Posillico will not directly undertake assignments and Posillico does not generally train or equip its personnel to handle circumstances involving Level A protection. If Posillico is working on a site and Level A is deemed necessary, the work will be subcontracted to a qualified firm. Posillico personnel should not directly undertake these tasks.

Sites where Posillico is working often require the use of Level C or D, with Level B equipment available on-site for emergency rescue. Any questions concerning the level of protection necessary to complete a certain task will be directed to the Health and Safety Assessment Division before setting up the job.

7.0 TYPES OF PPE TO BE POTENTIALLY UTILIZED BY POSILLICO

The following list contains types of PPE utilized by Posillico and their uses on the job, as they may apply to a specific site.

1. Respiratory Equipment:

   a. SCBAs:

      - Used for emergency rescue and exposures greater than maximum use concentration limits set for canister/cartridge type negative pressure respirators.

   b. Supplied-air respirators:

      - MSA Premaire system.

   c. Negative pressure respirators:

      - Half face and full face, used for exposure to certain types of acid gases, organic vapors and particulates not greater than the canister/cartridge maximum use concentration limit.

2. Chemical protective apparel suits:

   a. Polycoated Tyvek, Saranex, Chemrel and Tyvek (porous). Provide protection against certain liquid chemicals.

      - Tyvek provides protection against particulates only.

   b. Fire/flame retardant coveralls:

      - Provide protection against flash fires.

3. Insulated clothing (Provides protection against exposure to the cold:

   a. Chemical resistant gloves:

      - Provide protection for the hands against chemical splashes.

   b. Disposable boot covers:

      - Protect safety boots from contamination and feet from contact with chemicals.

4. Eye protection:

   a. Safety glasses and chemical splash goggles.

      - Safety glasses protect the eyes against large particles and projectiles.

- Chemical splash goggles protect the eyes against vaporized chemicals, splashes, large particles, and projectiles.

b. Vented goggles do not provide protection against vapors and are not adequate for splashes, as material may seep inside the goggles.

5. Hard hat:

a. Provides protection against blows to the head. When worn with a liner, provides protection against the cold.

6. Construction safety boots:

a. Steel-toe and shank construction boots with chemically resistant soles protect the feet from heavy and sharp objects, and contact with chemicals.

7. Safety harnesses and lifelines:

a. Enable the individual to work in elevated areas or enter confined spaces to prevent falls and aid in rescue.

8. Hearing protection:

a. Provides protection against physiological damage and psychological effects.

9. Canvas work gloves:

a. Provide protection for the hands against abrasions and slivers.

10. High Visibility/Reflective Clothing (e.g., light weight workers Vests)

a. High Visibility/Reflective Clothing protects each worker by making them more visible during mob/demob, site preparation, and remedial operations, which will help to avoid incidences and accidents (e.g., personnel being struck by equipment, tools, vehicles, etc.) at the site.

8.0 SELECTION OF CHEMICALLY PROTECTIVE CLOTHING

1. Chemically-protective clothing (CPC) will be chosen in the following manner:

a. Determine what chemicals are present on the site.

b. CPC chosen must be resistant to permeation, degradation and penetration of the chemical(s).

- Permeation - Process by which a chemical dissolves in and/or moves through a protective clothing material on a molecular level.

- Degradation - The loss of or change in the fabric's chemical resistance or physical properties due to exposure to chemicals, use or ambient conditions (e.g., sunlight).
- Penetration - The movement of chemicals through zippers, stitched seams or imperfections (e.g., pinholes) in CPC.

c. c. Review manufacturer's permeation data to determine the performance characteristics of the material to the specific chemical.

d. d. Select CPC that protects against the greatest range of chemicals on the site and has the longest breakthrough time.

e. e. Discuss choice of CPC with the Health and Safety division prior to setting up the job.

9.0 DONNING AND DOFFING PROCEDURES

The following procedures will be used by Posillico employees and Posillico subcontractors for donning and doffing PPE at protection Levels B and C. Donning and doffing will be performed with the assistance of an individual(s) located in the Support Zone and Contamination Reduction Zone, respectively. This individual will help the worker tape up and adjust PPE for proper fit, as well as remove PPE after decontamination.

1. Donning PPE

a. Inspect the clothing and respirator before donning.

b. Unzip the suit.

c. Step into the legs of the suit, slipping the feet through the legs. Push arms through the sleeves.

d. Pull leg cuffs over the feet.

e. Put on chemical-resistant safety boots over the feet. Tape the leg cuff over the tops of the boots.

f. Pull over chemical-resistant boot covers and tape over the leg cuff.

g. If suit contains protective feet, wear chemical-resistant safety boots inside the suit with chemical-resistant boot covers over the suit and taped securely to the leg.

a. If wearing a SCBA, don the facepiece and adjust it to be secure, but comfortable. Do not connect the breathing hose. Open valve on the air tank.

b. If wearing a negative pressure respirator, pull hood over the head and perform positive and negative pressure facepiece seal test (procedures are written in the Posillico's Respiratory Protection Program).

c. Pull on chemical protective inner gloves.

d. Pull on chemical protective outer gloves and tape securely to the sleeve of the suit.

e. Securely tape the suit to protect all exposed skin around the neck area, and if wearing a full facepiece, tape around the edge of the hood-to-facepiece junction.

f. Put on hardhat, if needed, and tape securely on top of head so that the hard hat does not slide off.

2. Doffing PPE

a. Doffing of PPE will not take place until the individual has been properly decontaminated by a suitably attired assistant. Both the worker and assistant will make every effort to avoid any direct contact with the outside of the suit.

b. If the individual is wearing a SCBA, the hose connection to the diaphragm will be disconnected, leaving the facepiece on the wearer. The remainder of the unit will be removed and decontaminated before proceeding further.

c. If the individual is wearing a half-face or full-face negative pressure respirator, she/he will be instructed to leave it on until the doffing procedure is complete.

NOTE: Decontamination is to be performed in accordance with the Site-Specific Health and Safety Plan for the site.

10.0 DECONTAMINATION OF PPE

Whenever possible, disposable PPE will be used on-site. Disposable PPE includes the following:

- Chemical protective suits;
- Gloves; and
- Chemical protective boot covers.

After decontaminating the worker, PPE is disposed of on-site in labeled disposal containers. Complete procedures for the decontamination, cleaning, inspection, maintenance and storage of respiratory equipment is covered under Posillico's Respiratory Protection Program. All PPE must be cleaned and properly stored. If Posillico-owned PPE cannot be cleaned or disinfected or is damaged it will be replaced by Posillico.

11.0 INSPECTION OF PPE

PPE will be inspected prior to, during and after each use according to the procedure outlined below.

1. Prior to use (Reusable and Disposable PPE):

a. Through reviewing available literature, determine that the clothing material is correct for the task.

b. Visually inspect for:

- Imperfect seams;
- Non-uniform coatings;
- Tears or holes; and
- Malfunctioning closures.

c. Hold up to the light and check for pinholes (inflate gloves and check for leaks).

d. Flex and check for:

- Cracks; and
- Shelf deterioration.

e. If previously used, check for:

- Discoloration;
- Swelling;
- Stiffness and cracking; and
- Holes and tears.

2. During use (Reusable and Disposable PPE), check for:

a. Evidence of chemical attack.
b. Discoloration, swelling, stiffening, softening and/or cracking.
c. Tears.
d. Punctures.
e. Seam discontinuities.

Note: Report any sense of breakthrough to the Health and Safety Assessment Division. Medical monitoring may be necessary to determine the extent of exposure.

3. After use (Reusable PPE), check for:

a. Malfunctioning parts.
b. Evidence of chemical attack.
c. Punctures.
d. Tears.
e. Cracks.

Note: Posillico's Respirator Protection Program addresses complete inspection procedures and will be consulted for inspection of all respiratory equipment.

12.0 MAINTENANCE AND STORAGE OF PPE

PPE, other than respiratory equipment (covered under Posillico's Respiratory Protection Program), will be maintained and stored in accordance with the manufacturer's recommendations at a minimum to prevent damage due to exposure to dust, moisture, sunlight, chemicals, temperature extremes and sudden impact.

PPE will be stored in Field Operations Equipment bags. Before and after each use, the PPE will be inspected to determine whether or not it is still "field worthy". Any PPE found to be defective will be reported to the Health and Safety Assessment Division and either discarded or repaired, as appropriate. Under no circumstances will defective PPE be used in the field.

1. The Health and Safety Assessment Division will periodically inspect PPE issued for individual use.

    a. Unless the equipment can be repaired, any PPE found to be defective will be removed from service and discarded immediately.

    b. Repairable PPE will be tagged, returned to the Facility Manager and sent out for repair.

13.0 TRAINING

Posillico will provide the proper equipment to employees and train them on the proper use. At a minimum, each employee using PPE must know:

- When PPE is necessary
- What PPE is necessary and which PPE has been selected for each process the employee operates
- How to properly put on, take off, adjust and wear PPE
- The limitations of PPE
- How to determine if PPE is no longer effective or is damaged
- How to get replacement PPE
- How to properly care for, maintain, store and dispose of PPE

After employees have been trained, periodic assessment of the process/equipment will be conducted ensure that the PPE is adequate and training is appropriate.

Retraining employees will occur whenever:

- Changes in the workplace render the previous training obsolete
- Changes in the type of PPE render previous training obsolete
- Employer observed inadequacies in an employee's knowledge or use of assigned PPE indicates that an employee has not retained the necessary understanding or skill

Posillico verifies that each employee who is required to use PPE has received and understood the required training. Training is confirmed by written certification which included the employee name, the dates of training, and the certification subject.

14.0 EVALUATION OF PPE PROGRAM

Posillico's Personal Protection Equipment Program will be reviewed annually by the Health and Safety Assessment Division. Any program deficiencies that are identified by a Posillico employee will be reported to the Health and Safety Assessment Division, so that changes will be made immediately. All employees affected by the change(s) will be notified in writing.

Review of the PPE Program will include, but not be limited to, the following:

- Accident and illness experience on various job sites.
- Type and degree of exposure.
- Adequacy of equipment selection process.
- Degree of fulfillment of program objectives.
- Employee acceptance.
- Coordination with overall health and safety program elements.
- Recommendations for program improvements and modifications.
- Adequacy of program records.

15.0 EMPLOYEE OWNED EQUIPMENT

Posillico does not allow the use of employee-owned equipment on job sites.

APPENDIX G

MONITORING INSTRUMENTS: USE, CARE, AND CALIBRATION

MONITORING INSTRUMENTS: USE, CARE, AND CALIBRATION

1.0 INTRODUCTION

Prior to beginning any work at Posillico sites, a preliminary site evaluation must be conducted to identify the hazards or suspected hazards of the site. Through area and personal monitoring with direct-reading instruments and personal sampling pumps, hazardous conditions can be evaluated, and the proper level of protection chosen for the specific type of work activity. Monitoring equipment used by Posillico personnel includes the following: Oxygen/Combustible Gas Meters (CGM); Organic Vapor Analyzers (OVA); Photoionization Detectors (PID); Personal Sampling Pumps; and, Colorimetric Tubes. This program contains a description of each type of monitoring equipment; hazards for which it can be used to monitor; Applications; Care and Maintenance; Limitations; and, Calibration.

2.0 SCOPE

This program covers the use, application, care and maintenance, limitations and calibration of CGMs, OVAs, PIDs, Personal Sampling Pumps and Colorimetric Tubes used by Posillico employees in hazardous materials operations. Posillico employees engaged in activities involving hazardous materials includes the Hazardous Waste Division and the Air Division.

3.0 INSTRUMENTATION

1. Photoionization Detectors (PIDs)

Introduction

PIDs measure a variety of gases in many industrial, as well as hazardous material, operations. These analyzers employ the principle of photoionization, which is the absorption of ultraviolet light by molecules, for detection.

The sensor consists of a sealed ultraviolet light. The energy ionizes many trace species (particularly organics) but does not ionize the major components of air, such as O_2, N_2, CO, CO_2, or H_2O. A chamber adjacent to the ultraviolet source contains a pair of electrodes. When a positive potential is applied to one electrode, the field created drives any ions, which are formed by absorption of the UV light, to the collector electrode, where the current (proportional to the concentration) is measured.

To minimize absorption of various sample gases, the ion chamber is made up of an inert fluorocarbon material, located at the sampling point, and a rapid flow of sampling gas is maintained through the small ion chamber volume.

The analyzer will operate either from a rechargeable battery for up to 10 hours, or continuously from the AC battery charger.

The useful linear range of the instrument is from a fraction of a part per million to about 2000 PPM.. A Summary of relative FID responses can be found in Attachment B. Calibration logs are in Attachment A.

Theory

Posillico utilizes the MiniRAE meter or equivalent as its PID. The MiniRAE is a portable, non-specific vapor/gas detector. The MiniRAE employs the principle of photoionization to detect a variety of chemical compounds, both organic and inorganic.

The MiniRAE contains an ultraviolet light source within its sensor chamber. Ambient air is drawn into the chamber with the aid of a small fan or positive displacement pump. If the ionization potential (IP) of any contaminant present in the ambient air is equal to or lower than the energy of the UV light source, ionization will take place, causing a deflection in the meter.

Response time for the MiniRAE is approximately 90% at 3 seconds. The meter reading is expressed in parts per million (PPM) relative to the calibration gas. All readings must be stated as equivalent readings that depend on the calibration gas being used to calibrate the MiniRAE. The calibration gas used is Isobutylene. Formerly, benzene was used as the calibration gas, but due to its hazard it is no longer used. Isobutylene, used as an equivalent in place of benzene, allows the instrument to provide results in benzene equivalents.

A list of IPs for various gases is provided in the latest edition of the NIOSH Pocket Guide to Chemical Hazards.

Basic Operation of the MiniRAE

A sample of air is drawn through a chamber and an ultraviolet light causes certain contaminants present to be broken apart into positive and negative charged particles. These charged particles are passed between electrodes and converted into an electrical impulse displayed on the readout.

Field Applications/Limitations

a. The MiniRAE will only detect organic materials with an ionization potential less than 10.2eV.

b. It is a non-specific detection device, but provides continuous information on airborne concentrations.

c. It will not respond equally to all contaminants, and does not detect methane.

d. High humidity will cause the instrument to give lower readings than the actual airborne concentration.

e. Transfer of the instrument from a cold to a warm environment may cause condensation to form on the UV light source window, causing erroneous results.

f. The readout may also be affected by electrical power lines or power transformers.

g. Total concentrations are relative to the calibration gas used (isobutylene). Therefore, true concentrations cannot be identified. And, while the instrument scale reads 0-2000 ppm, response is linear (to isobutylene) from 0-600 ppm.

h. Wind speeds of greater than 3 mph may affect the pump and readings, depending on the position of the probe relative to wind direction.

Calibration Procedure

Calibration Checklist: MiniRAE; Span gas (HNu Manufactured); Regulator; Tygon tubing.

Cleaning and Calibration Checklist: Same materials as above; MiniRAE cleaning compound; Fine screwdrivers, flat and Phillips head; Sonnicator; Drying/Toaster oven.

Inventory Items: Battery; Lamp; ION chamber; O-Rings; Screws.

a. Obtain calibration gas, Isobutylene at Span 9.8 with 10.2 eV, manufactured by MiniRAE.

b. Connect the calibration gas to the end of the probe extension. Open the gas flow valve.

c. Turn the selection knob to the 0-200 range and observe the meter needle. The concentration should read the same as that listed on the cylinder. If not, the span should be adjusted until the meter reads accurately.

d. The above procedure can be used until the span reading is approximately 5. At this time, the meter needs to be cleaned and internally calibrated. See Step 5.

e. For cleaning and internal calibration:

- Disassemble the probe, carefully removing the lamp.
- Clean the lamp.
- Clean the ION chamber and probe extension.
- Remove the instrument from its housing to expose the calibration screw, located on the side of the instrument.
- Once the probe parts have cooled (assuming it has been used), assemble the probe and connect it to the instrument.
- Connect the calibration gas to the end of the probe extension and open the gas flow.
- Turn the selection knob to the 0-200 range and observe the needle. The concentration should read the same as the concentration listed on the cylinder. If not, then the calibration screw must be adjusted with a fine screwdriver.

Maintenance and Calibration Records

a. Protect the instrument from excessive abuse, such as moisture, shock, vibration, etc.

b. Maintenance and calibration records will be recorded in a logbook specific to the MiniRAE meter. See PID Calibration Log in Attachment A.

Troubleshooting

Below are some points that should be considered if the instrument is not running appropriately:

a. Check the battery condition. Recharge it if necessary.

b. If unstable readings are obtained, a faulty probe cable or electrical connection could be the problem. To check this, hold the probe normally and flex the cable firmly. Watch the meter needle for fluctuations as the cable is flexed. Individual wires in the readout can be checked in a similar way.

c. Check the coaxial connector on the amplifier board in the probe for any separation.

d. Determine whether or not the meter is being used in close proximity to AC power lines or power transformers. This can cause the instrument to read erroneously. To check for this interference, zero the instrument in an electrically quiet area in the standby position, and then move the instrument into the area in question. If AC pick-up is a problem in the area, then the meter will indicate the magnitude of the problem.

e. No response on any setting may mean that the meter movement is broken. Tip the instrument from side-to-side. The needle should move freely and return to zero.

f. No response may mean that the electrical connection to the meter is broken. Check all wires leading to the meter and clean the contacts of the quick-disconnects.

g. No response may mean that the battery is completely dead. Disconnect the battery and check the voltage with a volt-ohm meter. Also check the 2-amp fuse.

h. If the meter responds in the BATT CHK mode, but reads zero or near zero for all other modes, the power supply may be defective.

- Replace the power supply.
- Check the input signal connection, which may be broken in the probe or readout.
- Check the input connector on the printed circuit board inside the probe. It should be firmly pressed down.
- Check the components on the backside of the circuit board. All connections should be solid and no wires should touch any other object.
- Check all wires in the readout for solid connections.

i. When the instrument responds appropriately in the "BATT CHK" and "STANDBY" positions, but not in the measuring mode, check to see that the light source is on.

j. If the instrument responds correctly in all settings, but the signal is lower than expected:

- Check the span setting.
- Clean the window of the light source.
- Check the fan for proper insertion.

k. If the instrument response is slow and/or not reproducible, either the fan is operating improperly (check the fan voltage), or the instrument needs to be recalibrated.

l. A low battery indication comes on if the battery charge is low. It will also come on if the ionization voltage is too high.

2. Flame Ionization Detector

Introduction

The Flame Ionization Detector (FID) is a sensitive instrument designed to measure trace quantities of organic materials in air. It is essentially a flame ionization detector such as that utilized in laboratory gas chromatographs and has similar analytical capabilities. The FID is an almost universal detector for organic compounds with the sensitivity to measure in parts per million range in the presence of atmospheric moisture, nitrogen oxides, carbon monoxide and carbon dioxide.

The instrument has broad application since it has a chemically resistant air sampling system and can be readily calibrated to measure almost all organic vapors. Designed for use as a portable survey instrument, it can also be readily adapted to fixed remote monitoring or mobile installations. It is ideal for the determination of many organic air pollutants and for monitoring the air in potentially contaminated areas.

Theory

The FID analyzer is designed to detect and measure hazardous organic vapors and gases found in most industries. It has broad application since it has a chemically resistant sampling system and can be calibrated to almost all organic vapors. It can provide accurate indication of gas concentration. While designed as a lightweight portable instrument, it can be permanently installed to monitor a fixed point.

The instrument utilizes the principle of hydrogen flame ionization for detection and measurement of organic vapors. The instrument measures organic vapor concentration by producing a response to an unknown sample, which can be related to a gas of known composition to which the instrument has previously been calibrated. During normal survey mode operation, a continuous sample is drawn into the probe and transmitted to the detector chamber by an internal pumping system.

The sample stream is metered and passed through particle filters before reaching the detector chamber. Inside the detector chamber, the sample is exposed to a hydrogen flame which ionizes the organic vapors. When most organic vapors burn, they leave positively charged carbon-containing ions. An electric field drives the ions to a collecting electrode. As the positive ions are collected, a current corresponding to the collection rate is generated. This current is measured with a linear electrometer preamplifier which has an output signal proportional to the ionization current. A signal-conditioning amplifier is used to amplify the

signal from the pre-amp and to condition it for subsequent meter or external recorder display. The display is an integral part of the probe/readout assembly and has 270-degree scale deflection.

In general, the hydrogen flame ionization detector is more sensitive for hydrocarbons than any other class of organic compounds. The response of the FID varies from compound to compound, but gives repeatable results with all types of hydrocarbons, i.e. saturated hydrocarbons (alkanes), unsaturated hydrocarbons (alkenes and alkynes) and aromatic hydrocarbons.

Applications

a. Measurement of most toxic organic vapors present in industry for compliance with OSHA requirements.

b. Evaluation and monitoring applications in the air pollution field.

c. Source identification and measurement for fugitive emissions (leaks) as defined by the EPA.

d. Forensic science applications.

e. Controlling and monitoring atmospheres in manufacturing and packaging operations.

f. Leak detection related to volatile fuel handling equipment.

g. Monitoring the background level of organic vapors at hazardous waste sites.

h. Quality control procedures geared to leak checking, pressurized system checks, combustion efficiency checks, etc.

Limitations

a. The FID will not detect any inorganic compounds.

b. The FID will see methane, which is explosive, but relatively non-toxic in other than high concentrations. The user should determine if the contaminant involved is or is not methane.

c. DOT shipping regulations are strict for the FID when shipping pressurized oxygen.

d. A relative humidity greater than 95% will cause inaccurate and unstable responses.

e. A temperature of less than 40 deg. F will cause poor and slow response.

f. Actual contaminant concentrations are measured relative to the calibration gas used. Therefore, specific contaminants and their quantities cannot be easily identified.

Battery Charging

a. Plug charging connector into mating connector on battery cover and insert AC plug into 115V AC wall outlet.

b. Move the battery charger switch to the ON position. The lamp above the switch button should illuminate.

c. Battery charge condition is indicated by the meter on the front panel of the charger; meter will deflect to the left when charging. When fully charged, the pointer will be in line with "CHARGED" marker above the scale.

d. Approximately 1 hour of charging time is required for each hour of operation. However, an overnight charge is highly recommended. The charger can be left on indefinitely without damaging the battery. When finished, move the battery charger switch to "OFF" and disconnect from the SIDE PACK ASSEMBLY.

Calibration

The FID is capable of responding to nearly all organic compounds. At the time of manufacture, the analyzer is calibrated to mixtures of methane in air.

The instrument is calibrated by using a mixture of a specific vapor in air, with a known concentration. After the instrument is in operation and the normal background is zeroed, draw a sample of the calibration gas into the instrument. The GAS SELECT knob on the panel is then used to set the readout meter indication to correspond to the concentration of the calibration gas mixture.

The instrument has now been calibrated to the vapor mixture being used. After this adjustment, the setting on the DIGIDIAL should be recorded for that particular organic vapor compound. This exercise can be performed for a variety of compounds, thereby generating a library which can be used for future reference without need for additional calibration standards.

To read a particular compound, the GAS SELECT control is turned to the predetermined setting for the compound. Calibration on any one range automatically calibrates the other 2 ranges.

Startup Procedure

a. Connect the Probe/Readout Assembly to the Sidepack Assembly by attaching the sample line first, then connect electronic jack to the side pack.

b. Select the desired sample probe (close area sampler or telescoping probe) and connect the probe handle. Before tightening the knurled nut, check that the probe accessory is firmly seated against the flat seals in the probe handle and in the tip of the telescoping probe.

c. Move the instrument/BATT switch to the test position. The meter needle should move to a point beyond the white line, indicating that the integral battery has more than four (4) hours of operating life before recharging is necessary.

d. Move the instrument/BATT switch to the "ON" position and allow a five (5) minute warm-up.

e. Move PUMP switch to "ON" position, then place instrument panel in vertical position and check SAMPLE FLOW RATE indication. The normal range is 1.5 - 2.5 units. If less, check filters.

f. Perform a leak test. (See "Sampling Fixtures")

g. Activate audible alarm:

- Use the CALIBRATE ADJUST knob to set the meter needle to the level desired for activating the audible alarm. If this alarm level is other than zero, the CALIBRATE SWITCH must be set to the appropriate range.
- Turn the VOLUME knob fully clockwise.
- Using the ALARM LEVEL ADJUST knob, turn the knob until the audible alarm is activated.

h. Move the CALIBRATION SWITCH to X1 and adjust the meter reading to zero using the CALIBRATE ADJUST (zero knob).

i. Open the Hydrogen TANK VALVE one or two turns and observe the reading on the HYDROGEN TANK PRESSURE INDICATOR. Approximately 150 psi of pressure is required for each hour of operation.

j. Open the HYDROGEN SUPPLY VALVE one or two turns and observe the reading on the HYDROGEN SUPPLY PRESSURE INDICATOR. The reading should be between 8 and 12 psi.

k. After approximately 10 seconds, depress the IGNITER BUTTON until the hydrogen flame lights. The meter needle will travel upscale and begin to read "TOTAL ORGANIC VAPORS".

CAUTION: Do not depress the igniter for more than 6 seconds. If the flame does not ignite, wait <u>one minute</u> and try again.

l. Calibrate instrument (see "Calibration").

m. The instrument is ready for use.

NOTE: If the ambient background organic vapors are "zeroed out" using the CALIBRATE ADJUST KNOB, the meter may move off scale in the negative direction when the OVA is moved to a location with lower background levels. If the OVA are to be used in the 0-10 ppm range, it should be "zeroed" in an area with very low background.

Shut Down Procedure

a. Close the HYDROGEN SUPPLY VALVE.

b. Close the HYDROGEN TANK VALVE.

c. Move the INSTR switch and PUMP switch to OFF.

d. Instrument is now in the shut down configuration.

Operation Procedure

Set the CALIBRATE switch to the desired range. Survey the areas of interest while observing the meter and/or listening for the audible alarm indicator. For ease of operation, carry the SIDE PACK ASSEMBLY positioned on the side opposite the hand which holds the PROBE/READOUT ASSEMBLY. For broad surveys outdoors, the pick-up fixture should be positioned several feet above ground level. When making quantitative readings or pinpointing, the pick-up fixture should be positioned at the point of interest.

When organic vapors are detected, the meter pointer will move upscale. If the audible alarm is utilized, it will sound when the set point is exceeded. The frequency of the alarm will increase as the detection level increases.

If a flameout occurs, check that the pump is running, then press the igniter button. Under normal conditions, flameout results from sampling a gas mixture that is above the Lower Explosion Limit (LEL) which causes the hydrogen flame to extinguish. If this is the case, re-ignition is all that is required to resume monitoring. Another possible cause for flameout is restriction of the sample flow line which would not allow sufficient air into the chamber to support combustion. The normal cause for such restriction is a clogged particle filter.

It should be noted that the chamber exhaust port is on the bottom of the case and blocking this port with the hand will cause fluctuations and/or flameout.

Maintenance and Troubleshooting

IMPORTANT NOTE: This section describes a routine maintenance procedures for troubleshooting instrument malfunctions. Maintenance personnel should be thoroughly familiar with instrument operation before performing maintenance. All written portions of this section must be thoroughly understood relating to safety of operation, servicing and maintenance. There should be no potential ignition sources in the area when filling, emptying or purging the hydrogen system and the instrument should be turned off.

Replacement parts that are specified by Foxboro must be used for repair. No modifications are permitted. Disassembly of the instrument must take place in a non-hazardous atmosphere only.

Primary Filter Cleaning

This filter is located behind the sample inlet connector (fitting assembly) on the SIDE PACK ASSEMBLY and is removed for cleaning by using a 7/16" thin screwdriver to

unscrew the fitting assembly. The filter cup, "O" ring and loading spring will then come out. The porous stainless filter cup can be cleaned by blowing out. Reassemble in reverse order, ensuring that the "O" ring seal on the fitting assembly is intact.

Secondary Filter Cleaning

A particle filter is located in each pick-up fixture. One of these filters must be in the sample line whenever the instrument is in use. The OVA 128 uses a porous metal filter which can be replaced and cleaned.

Mixer/Burner Assembly Filter

A porous metal particle filter is incorporated in the Mixer/Burner Assembly, which screws into the Pre-Amp Assembly. This filter is used as the sample mixer and inlet flame arrestor in the chamber. The filter should not become contaminated under normal conditions but can be cleaned or the assembly replaced, if necessary.

Access to this filter or output surface does not require removing the instrument from the case. For access, remove the safety cover using a hex key wrench (supplied) then unscrew the exhaust port. The Filter Assembly can now be seen on the side of the chamber (Pre-Amp Assembly) and can be cleaned with a small wire brush.

Exhaust Flame Arrestor

A porous metal flame arrestor is located in the exhaust port of the detector chamber (Pre-Amp Assembly). It acts as a particle filter on the chamber output and restricts foreign matter from entering the chamber. This filter may be cleaned by removing the exhaust port. For access, see Mixer/Burner section above. Note that the filter is captive to the exhaust port.

Sampling Fixtures

Sampling fixtures should be periodically cleaned with an air hose and/or detergent solution to eliminate foreign particle matter.

The OVA is equipped with a flow gauge that provides a method to check for air leaks. Assemble the pick-up probe selected for use to the readout assembly and then position the side pack vertically so the flow gauge may be observed. Cover the end of the pick-up probe with your finger and observe that the ball in the flow gauge goes to the bottom, indicating no air flow (If the ball has a slight chatter while on the bottom, this is acceptable). Cover the center of the chamber exhaust port with your thumb and again observe the ball going to the bottom. Another simple check is to expose the pick-up probe to cigarette smoke or a light vapor (butane) and observe that the meter responds in approximately 2 seconds. It should be noted that the slow meter response might also indicate restriction in the air sampling.

Failure of the ball to go to the bottom when the inlet is blocked indicates a leak in the system between the probe and the pump inlet or the inlet check valve. To isolate the problem, remove the parts, one at a time, and again block off the air inlet. Remove the pick-up probes and cover the air inlet at the readout assembly. If the ball goes to the bottom, check that the "readout to probe" seal washer is in place and replace the probes, holding them back against

this seal while tightening the nut. Recheck, and if leakage is still present, it is probably in the probe (pick-up fixture), which should be repaired or replaced.

If leakage is indicated as being past the readout handle when the connection to the sidepack is tight, disconnect the sample line at the fitting on the sidepack and cover this inlet with your finger. If the flow gauge ball goes to the bottom, the problem should be a leak in the umbilical cord/readout assembly. which should be investigated and repaired. There is also the possibility of a leaking check valve in the pump which would not show up on this test. If the leakage is not found in the umbilical cord, it is most likely in the pump check valve. If the ball does not go to the bottom following these corrective actions, contact the manufacturer for further instructions, and do not use the instrument.

Using Empirical Data

Relative response data can be used to estimate the concentration of a vapor without need to recalibrate the analyzer. With the instrument calibrated to methane, obtain the concentration reading for a calibration sample of the test vapor. The response factor (**R**) in percent for that vapor is:

$$\mathbf{R} = \frac{\text{Actual Conc.}}{\text{Measured Conc.}}$$

To determine the concentration of an unknown sample of that vapor, multiply the measured concentration by **R.** See the alphabetical list of compounds and Relative Response values in Attachment B.

3. Colorimetric Indicator Tubes

Colorimetric indicator tubes are used to measure concentrations of specific gases and vapors, both organic and inorganic. When used appropriately, an indicator tube specific to a certain compound will produce a stain in the tube. The length of the stain (or color change) is proportional to the compound's concentration. Minimal operator training and expertise is required to operate this type of sampling instrument.

Limitations

Colorimetric indicator tubes are cross-sensitive, meaning that other compounds may trigger a similar response, which will give the user a false reading. The user must take this fact into account when he/she dealing with a situation containing unknowns.

Other limitations include individual interpretation concerning the length of the stain, the limited accuracy of the tube, and use in high humidity. The greatest sources of error occur in different interpretations that are obtained between individuals as to how far the stain has gone on the tube, and the tubes limited accuracy. Users must remember that the tubes are **25% accurate**. A simple calculation will tell the user the range in which the correct reading could possibly occur.

With this in mind, any discoloration on the tube should alert the user as to the appropriate protection required for the site. High humidity also affects the readings. Use in humid environments tends to clog the filtering medium, not allowing the gases or vapors to be drawn properly through the tube.

Maintenance and Calibration

Posillico utilizes the Draeger Model 31 Bellows-type pump for colorimetric tube sampling. General maintenance for this type of instrument includes: avoiding rough handling which may cause channeling; performing a leakage test before sampling each day (including documentation); calibrating the unit at least quarterly; providing an inventory of tubes, with expiration dates; and, appropriate storing.

Rough handling of this instrument may cause erroneous results due to channeling (leakage). Therefore, the unit must be handled carefully and not be stored outside of its protective carrying case when not in use.

It may be necessary to clean the rubber bung (tube holder) if a large number of tubes have been taken with the pump. A mild soap and water solution can be used.

Leak Test

Before each day's use, the user will perform a leak test on the instrument. This is a simple test and includes the following:

a. Squeeze the bellows of the pump and insert an unopened detector tube, attempting to draw 100 ml of air.

b. After a few minutes, examine the bellows for any expansion. Document the findings in the Site Monitoring Log Book. If the pump does not pass the leak test, it will be removed from service immediately and returned to the Facility Manager, to be sent out for repair.

Calibration Test

At least quarterly, the instrument will be calibrated for proper volume measurement. Equipment needed for the calibration test is: 100 ml burette and ring stand; stopwatch; soap solution; detector tube with both ends broken off; and, tygon tubing.

The calibration test is performed as follows:

a. Break both ends of a colorimetric tube and connect it in-line with the pump.

b. Connect the instrument directly to a bubble burette, and create a bubble inside the burette by touching the bottom of the burette to the soap solution.

c. Squeeze the bellows to exhaust all the air out of the unit.

d. Release the bellows and wait 5 minutes for the full volume of air to be drawn into the bellows. The bubble should stop between the 95 and 105 cc marks. Errors of 5% are permissible; if the error is greater than 5%, return the pump to the Facility Manager, to be sent out for repair.

Inventory and Storage Requirements

To inventory the tubes, check the expiration date marked on the storage container. No tubes will be allowed for use past the manufacturer's expiration date. A listing of tubes that are readily available will be maintained by the Health and Safety Coordinator. This list will contain the name of the tube and the expiration date of those available. The list will be updated monthly and provided to the Facility Manager and each Field Division. All colorimetric tubes will be stored in the refrigerator in the Chemical Storage Area. Refrigeration helps to maintain shelf life. Any tubes that have been previously opened and inadvertently stored in the refrigerator will not be used in the field. Colorimetric tubes are not reusable, and any reuse will result in erroneous results.

4. Personal Monitoring Pumps

Personal monitoring involves the collection of an air sample by a sampling device worn by the worker. The sampling device is worn as close as possible to the breathing zone of the individual so that the data collected closely approximates the concentration inhaled. Personal monitoring pumps are used when it is necessary to monitor the workers' exposure to air contaminants.

Personal monitoring pumps can be classified into three basic categories:

a. Low-Flow Pumps (0.5 - 500 ml/min);
b. High-Flow Pumps (500 - 4500 ml/min);
c. Dual Range Pumps.

Low-flow pumps are used for gas and vapor sampling. For example, the common flow rate for organic vapors is 200 ml/min.

High-flow pumps are used for particulate sampling as well as gas and vapor sampling. A common flow rate for fumes or dust sampling (i.e. zinc fume or asbestos) is 2 L/min.

Limitations

The major disadvantage in personal monitoring is the lag time between sampling and obtaining analysis results, which may take weeks, days or months if a remote laboratory is used. If a situation requires an immediate decision concerning worker safety, this can be a serious problem. Therefore, personal monitoring is rarely used for site characterization. Its main purpose is to assure effectiveness of work practice and engineering controls.

A second disadvantage is that multiple exposures may require the use of a variety of sampling media. Unfortunately, workers cannot carry multiple sampling media because of the added strain. Also, it is not usually possible to draw air through different sampling media using a single, portable battery operated pump. Several days may be required to measure the exposure of a specific individual to the variety of chemicals on site. Alternatively, if workers are in teams, a different monitoring device can be assigned to each team member.

Calibration

The following procedure will be used for calibration with a primary calibration source for all personal monitoring pumps used by Posillico. It has been taken from OSHA Instruction CPL 2-2.20B, Appendix 1-C, Manual Bubble Meter Technique.

Electronic bubble meters are also used as primary calibration sources. These meters have a digital read-out and the ability to give a printed copy for documentation of the pump flow rate. Posillico uses a Spectrex Model BFM-4000 for this purpose.

NOTE:
When calibrating with a bubble meter (either manual or electronic), the use of adapters can cause moderate to severe pressure drop in the sampling train, which will affect the calibration result. If adapters are used for sampling, then they should be used when calibrating.

a. Connect the collection device, tubing, pump and calibration apparatus (see figure 4.1).

b. Conduct a visual inspection on all tygon tubing connections.

c. Wet the inside of a one-liter burette with a soap solution.

d. Turn on the pump and adjust the pump rotameter to the appropriate flow rate setting.

e. Momentarily submerge the opening of the burette in order to catch a film of soap.

f. Draw 2 or 3 bubbles up to the burette in order to insure that the bubbles will complete their run.

g. Visually capture a single bubble and time the bubble from 0 - 1000 ml for high flow pumps or 0 - 100 ml for low flow pumps.

h. The timing accuracy must be within 1 second of the time corresponding to the desired flow rate.

i. If the time is not within the range of accuracy, adjust the flow rate and repeat steps g and h until the correct flow rate is achieved.

j. While the pump is running, mark the pump or record on the air sampling worksheet the position of the center of the float in the pump rotameter as a reference.

k. Repeat bubble timing for 3 times. Calculate the average time given by these measurements.

l. Calculate the flow rate as follows:
(NOTE: 1L = 1000 ml)

$$\frac{\text{Measured Volume (L)}}{\text{Average Seconds}} \times \frac{\text{60 Seconds}}{\text{1 Min}} = \text{L/min}$$

For Example:

$$\frac{\text{1 L}}{\text{38 sec}} \times \frac{\text{60 Sec}}{\text{min}} = \text{1.6 L/min (round to m)}$$
2 digits)

Repeat the procedures for all pumps to be used for all calibrations involving the same sampling method.

Different contaminants have different sampling protocols, which may result in different calibration protocol. Contact the Posillico Certified Industrial Hygienist or Health and Safety Coordinator for chemical-specific calibration protocols.

Checklist for Using Personal Monitoring Pumps

a. Look at measurement method in NIOSH Pocket Guide to Chemical Hazards (Latest edition).

b. Calibrate with a primary calibration source, as described in the calibration procedures.

c. Record information of air sampling worksheet and calibration logbook.

d. Make sure battery is fully charged. Air pumps have NiCd battery, which creates a memory. Care needs to be used so as to not recharge a battery that has been used for only a few hours. Recharge a battery only if it has been used for at least 8 hours. There are chargers which will completely discharge a battery before recharging; or, the pumps can be left running until the battery is rundown completely and then recharged to eliminate this memory, also.

e. Check sample requirement sheet or NIOSH method to see the minimum time/volume for the sample. An 8-hour sample period would allow for the best measure, giving an 8-hour TWA exposure.

5. Combination Oxygen and Combustible Gas Meter

Combination meters measure the concentration of combustible gas or vapor present in an area, as well as the oxygen content. The concentration is reported as a percent, with 1% equal to 10,000 ppm. Although it is an easy instrument to operate, its effective use requires that the operator understand the operating principles and procedures behind the instrument. Certain atmospheres may cause erroneous readings or damage to the instrument. Typically, the instrument can be used as long as the battery lasts, or for the recommended interval between calibrations.

Maintenance

Maintenance of combination meters is fairly simple. Batteries must be recharged at the end of a continuous day's use. Occasionally, the rechargeable battery must be replaced. Most batteries last for approximately 2 years of continued use. Also, oxygen and combustible gas sensors will need to be replaced periodically. These sensors last approximately 6 months with continued use. Sensors that can no longer be calibrated within the manufacturers' acceptable range indicate the need for replacement.

If, after an attempted calibration, the instrument cannot be calibrated due to problems other than the need for battery or sensor replacement, the problem must be reported to the Facility Manager immediately, so that the instrument can be sent out for repair.

Detection Method

The instrument contains 2 analyzers: 1 for combustible gases and vapors; and 1 for oxygen content. The combustible gas analyzer contains a battery operated electrical circuit called a Wheatstone Bridge. Basically, the Wheatstone Bridge is a filament, usually made of platinum, that is exposed to the air in the instrument. When heated by a burning combustible gas or vapor, the increase in heat over the filament is measured as electrical resistance. Another part of the bridge contains similar filaments, but it has been sealed. They are heated in the same fashion, but not directly in the air stream. Thus, this filament is not capable of causing combustion of the gas or vapor, because it is sealed. The net effect of the change in resistance to the electrical current flow in the air stream is due only to the presence of a combustible gas. These changes in electrical current are registered as "percent LEL" (Lower Explosion Limit) on the instrument.

The oxygen analyzer senses oxygen concentration by a galvanic cell. The cell contains 1 gold and 1 lead electrode, and is encapsulated in inert plastic. Oxygen diffusing through the plastic initiates a redox reaction, which generates a small electrical current that is proportional to the oxygen partial pressure. The instrument contains a temperature-compensated electronic circuit that converts the electrical current to a proportional voltage. This voltage is displayed on the instrument as the concentration of oxygen.

Limitations

The combination meter contains some inherent limitations. Knowledge of these limitations will help the user make an educated decision regarding the accuracy of the instrument.

Accuracy of the instrument depends, in part, on the difference between the calibration and sampling temperatures. Differences in temperature may cause a lack of sensitivity in the instrument when brought from a warm to a cold environment.

Another aspect of sensitivity of the instrument is a function of the differences in the chemical and physical properties between the calibration gas (pentane) and the gas being sampled. The chemical and physical properties of the calibration gas are slightly different from those being sampled, so all gases being sampled are compared to the combustion of pentane. In order to get a true reading of the LEL, the gas that is present must also be used as the calibration gas.

The filament can be damaged by certain compounds such as silicones, halides, tetraethyl lead, and oxygen enriched atmospheres. Each manufacturer's instrument handbook should contain a listing of compounds that should not be sampled with this instrument, or serious damage could result.

Under oxygen deficient atmospheres, the oxygen analyzer must be read first. Otherwise, the CGM analyzer may not provide a valid reading and give the user a false sense of security.

ATTACHEMENT A

PID AND FID CALIBRATION LOGS

POSILLICO ENVIRONMENTAL, INC.

PID CALIBRATION LOG

IMPORTANT: Instruments that do not pass calibration will not be used in the field. Contact the Facility Manager IMMEDIATELY for the instrument to be sent out for repair.

Model #:_____ Serial #:_____

Date	Calibrated By	Repair Necessary (Y or N)	Initials
Span	Reading	Reading	Setting

POSILLICO ENVIRONMENTAL, INC.

MICRIOFID CALIBRATION LOG

IMPORTANT: Instruments that do not pass calibration will not be used in the field. Contact the Facility Manager IMMEDIATELY for the instrument to be sent out for repair.

Model #:_____ Serial #:_____

Date	Calibrated By	Repair Necessary (Y or N)	Initials

ATTACHMENT B

FID RELATIVE RESPONSE VALUES FOR VARIOUS COMPOUNDS

COMPOUND	RELATIVE RESPONSE
Acetone	60
Acetonitrile	70
Acrylonitrile	70
Allyl Alcohol	30
Allyl Chloride	50
Benzene	150
2-Bromo-2-Chloro-1,1,1-Trifluoroethane (Halothane)	45
Bromoethane	75
1-Bromopropane	75
2-Butane	60
N-Butanol	50
2-Butanol	65
N-Butyl Acetate	80
N-Butyl Acrylate	60
2-Butyl Acrylate	70
N-Butyl Formate	50
2-Butyl Formate	60
N-Butyl Methacrylate	60
2-Butyl Methacrylate	80
Carbon Tetrachloride	10
Chlorobenzene	200
Chlorodifluoromethane (FREON)	40
Chloroform	65
1-Chloropropane	75
2-Chloropropane	90
2-Dichloro-1,1,2-Trifluoroethyl-Difluoromethyl Ether (Ethrane)	150
Cumene	100
Cyclohexane	85
Cyclohexanone	100
N-Decane	75
o-Dichlorobenzene	50
Dichlorodifluoromethane (FREON 12)	15
1,1-Dichloroethane	80
1,2-Dichloroethane	80
trans-1,2-Dichloroethylene	50
Dichlorofluoromethane (FREON 21)	70
Dichloromethane	100

COMPOUND	RELATIVE RESPONSE
1,2-Dichloropropane	90
1,3-Dichloropropane	80
1,2-Dichloro-1,2,2-Tetrafluorethane (FREON 114)	110
Diethyl Ether	50
Diethyl Ketone	80
p-Dioxane	30
Ethane	80
Ethanethiol	30
Ethanol	25
Ethyl Acetate	65
Ethyl Acrylate	40
Ethyl Benzene	100
Ethyl Butyrate	70
Ethyl Formate	40
Ethyl Methacrylate	70
Ethyl Propionate	65
Ethylene Dibromide	50
Ethylene Dichloride	60
Ethylene Oxide	70
Fluorotrichloromethane (FREON 11)	10
Heptane	75
Hexane	70
Isoprene	50
Methane	100
Methyl alcohol	12
Methyl Acetate	41
Methyl Acrylate	40
Methyl Cyclohexane	100
Methyl Cyclopentane	80
Methyl Ethyl Ketone	80
Methyl Isobutyl Ketone	80
Methyl Methacrylate	50
Methyl Propyl Ketone	70
Nitromethane	35
1-Nitropropane	60
2-Nitropropane	70
Nonane	90
Octane	80

COMPOUND	RELATIVE RESPONSE
Pentane	65
Pentanol	40
Propane	80
N-Propanol	40
2-Propanol	65
N-Propyl Acetate	75
N-Propyl Ether	65
N-Propyl Formate	50
Pyridine	128
Styrene	85
1,1,1,2-Tetrachloroethane	100
1,1,2,2-Tetrachloroethane	100
Tetrachloroethylene	70
Tetrahydrofuran	40
Toluene	110
1,1,1 Trichloroethane	105
1,1,2-Trichloroethane	85
Trichloroethylene	70
Trichlorotrifluoroethane (FREON 113)	80
Triethylamine	70
Vinyl Acetate	50
Vinylidene Chloride	40
m-Xylene	111
o-Xylene	116
p-Xylene	116

APPENDIX H

GENERAL HEALTH AND SAFETY WORK RULES

GENERAL HEALTH AND SAFETY WORK RULES

1. All site personnel must attend each day's Daily Briefing.
2. All site personnel shall wear the personal protective equipment specified by the HASP(s). This includes hard hats and safety glasses, which must be worn at all times in active work areas.
3. Facial hair (beards, long sideburns or mustaches) which may interfere with a satisfactory fit of a respirator mask is not allowed on any person who may be required to wear a respirator.
4. All personnel must sign the site log and the exclusion zone log when used at the site.
5. Personnel must follow proper decontamination procedures including, if required, showering at the end of the work shift.
6. Eating, drinking, chewing tobacco or gum, smoking and any other practice that may increase the possibility of hand-to-mouth contact is prohibited in the exclusion zone or the contamination reduction zone. (Exceptions may be permitted by the Site Manager to allow fluid intake during heat stress conditions.)
7. All lighters, matches, cigarettes and other forms of tobacco are prohibited in the Exclusion Zone.
8. All signs and demarcations shall be followed. Such signs and demarcation shall not be removed, except as authorized by the Site Manager.
9. No one shall enter a permit-required confined space without a permit. Confined space entry permits shall be implemented as issued.
10. All personnel must follow Hot Work Permits as issued.
11. All personnel must use the Site personnel System in the Exclusion Zone.
12. All personnel must follow the work-rest regimens and other practices required by the heat stress program.
13. All personnel must follow lockout/tagout procedures when working on equipment involving moving parts or hazardous energy sources.
14. No person shall operate equipment unless trained and authorized.
15. No one may enter an excavation greater than four feet deep unless authorized by the Competent Person. Excavations must be sloped or shored properly. Safe means of access and egress from excavations must be maintained.
16. Ladders and scaffolds shall be solidly constructed, in good working condition, and inspected prior to use. No one may use defective ladders or scaffolds.
17. Fall protection or fall arrest systems must be in place when working at elevations greater than six feet for temporary working surfaces and four feet for fixed platforms.
18. The Supervisor must select safety belts, harnesses and lanyards. The user must inspect the equipment prior to use. Only properly functioning personal fall protection equipment shall be used. Personal fall protection that has been shock loaded must be discarded.
19. Hand and portable power tools must be inspected prior to use. Defective tools and equipment shall not be used.

20. Ground fault interrupters shall be used for cord and plug equipment used outdoors or in damp locations. Electrical cords shall be kept out walkways and puddles unless protected and rated for the service.
21. Improper use, mishandling, or tampering with health and safety equipment and samples is prohibited.
22. Horseplay of any kind is prohibited.
23. Possession or use of alcoholic beverages, controlled substances, or firearms on any site is strictly forbidden.
24. All incidents, no matter how minor, must be reported immediately to the Site Manager/PM.
25. All personnel shall be familiar with the Site Emergency Response Plan.

APPENDIX I

CONTROL OF HAZARDOUS ENERGY PROGRAM "LOCK OUT/TAG OUT"

CONTROL OF HAZARDOUS ENERGY PROGRAM: "LOCK OUT/TAG OUT"

1.0 INTRODUCTION

The Lock Out/Tag Out Standard, 29 CFR 1910.147, is believed to prevent about 120 deaths and 60,000 injuries per year, according to OSHA officials. Although this standard is aimed at the industrial community, in environmental engineering applications, it is very important that employees understand and implement these procedures when working with and around energized equipment. Posillico employees will identify, locate and control these energy sources, as necessary.

2.0 PURPOSE

To establish procedures for locking out and/or tagging to isolate and disable equipment to prevent accidental startup or release of stored energy, and possible injury to employees.

3.0 SCOPE

This procedure applies to all field/facility operations that require all operative energy sources, including line breaking, in the work area to be shut down, locked out and tagged, so that workers may safely perform their job. Employees and subcontractors performing work on Posillico projects will be required to comply with these requirements if their employer does not have a comparable lock out/tag out program already in place.

4.0 PROCEDURE

1. The authorized employee will evaluate the scope of work and all equipment, machines or industrial processes in the area that require the use of stored energy. Energized equipment that may cause a safety hazard will be shut down to eliminate the potential for injury.

2. Prior to beginning the work, the authorized employee will be sure that appropriate lock out/tag out equipment is available to isolate the energy source.

3. The authorized employee will ensure that all affected employees have been advised of the following topics:

    a. Scope of Work.

    b. Energy sources.

    c. Energy isolation devices.

    d. Lock out devices.

    e. Tags.

    f. Test procedures.

    g. Authorized personnel. Those individuals charged with the responsibility for deenergizing and reenergizing energy sources).

4. The safety meeting will be documented and placed in the job folder for future reference. All employees will sign the Lockout Worksheet prior to starting the work. See Attachment A for a copy of the Lockout Worksheet.

5. All energized equipment will be shut down before **Posillico Environmental** personnel or its contractors/subcontractors begin work on site. Shut down will take place in the following manner:

   a. The authorized employee will inform the client's representative of the need to shut down the equipment.

   b. The authorized employee, with assistance from the client's representative, will locate all power sources on the process or equipment.

   c. All power sources will be shut down and verified as such by the authorized employee.

   d. When possible, a lockout device will be applied by both parties to isolate each source.

   e. Any necessary testing of equipment will be conducted to ensure that the process or equipment is free of energy.

   f. The authorized employee will attempt to operate the machine to be sure that it remains inoperative. All activation controls will be returned to the "off" position after testing.

   g. The authorized employee will apply a tag that bears the following warning, "DANGER - EQUIPMENT LOCKOUT" along with the authorized employee's name, the date, and the time of the lockout.

   h. The authorized employee will complete the Lockout Worksheet.

   i. Equipment may now be released for work by the authorized employee. No release will be given until all required inspections and testing are performed.

6. Residual energy, i.e. pneumatic/hydraulic power, spring compression, and residual electrical energy in transformers are examples of residual energy that, when unsuspected, may present a greater hazard to the employee. These sources of energy will be identified, located and controlled in the following manner:

   a. Residual electrical energy can be controlled through grounding.

   b. Pneumatic/hydraulic line pressure can be released, allowing the weight to come to a rest.

   c. Spring tensions can be relieved.

   d. Product lines will be double blocked (panned) and bled to prevent product from being released.

   e. A lockout device and tag will be applied and secured by the authorized employee for the duration of the job to prevent residual energy from reaccumulating and creating a hazard to employees.

f. The lockout/tagout will be documented by the authorized employee on the Lockout Worksheet.

7. After all work is completed, the authorized employee will perform the following:

   a. The authorized employee will inform everyone that the job is complete.

   b. The Lockout Worksheet will be reviewed by the authorized employee with all employees to make sure that all employees are accounted for before re-energizing the equipment.

   c. The authorized employee will be sure that all tools, debris or other material that could be placed into motion are removed before the equipment or process is re-energized. All employees will be instructed to stay clear of movable parts of the equipment or process.

   d. All residual energy controls will be removed by the authorized employee, as well as all energy isolation lockouts and tags.

   e. In the presence of the client's representative, energy will be restored to the equipment or process.

   f. All lockout equipment removal will be documented on the Lockout Worksheet by the authorized employee. The Lockout Sheet will be placed in the job file at the end of the shift.

8. All employees must be accounted for before re-energizing equipment. When employees that have worked on the job are absent from the final inspection before re-energizing the equipment, the authorized employee will initiate the following:

   a. The lockout sheet will be checked to account for all employees.

   b. The authorized employee will obtain a Lockout/Tagout Absent Employee form (See Attachment B).

   c. The authorized employee will appoint employees to look for the individual, paying special attention to high hazard areas where physical harm could result from the start-up of the equipment or process.

   d. After a complete search of the equipment or process, and it has been determined by the authorized employee that the employee is not present, all outlying areas surrounding the site will be searched.

   e. The area surrounding the site will be guarded to prevent the absent employee from inadvertently entering a hazardous situation.

   f. The equipment or process will be cleared for re-energization only by the authorized employee once all of the above conditions are met.

g. A copy of the completed Absent Employee form will be posted conspicuously in the work area, and not removed until the employee has been located. The client's representative will be notified of the situation so that the absent employee does not endanger himself/herself by entering an energized process or equipment.

9. When appropriate, employees and subcontractors working under Posillico direction will be informed of their responsibilities, under the Lockout/Tagout Standard, to provide protection against hazardous energy.

   a. When necessary within the scope of work, contractors and subcontractors without such a program, at the discretion of Posillico, will be disqualified from bidding on these projects.

   b. Contractors and subcontractors with such a program will submit their program to the Health and Safety Division for review. The contractor or subcontractor program must be comparable or stricter than Posillico's program.

      - Programs found to be insufficient in some areas will be returned, with the requested changes to be made before the program is acceptable for implementation.

      - The copy of the program will be returned to the contractor or subcontractor, and will not be duplicated by Posillico or any of its employees.

10. All affected employees will be given training in these procedures prior to performing any lockout/tagout work. This training will be documented and maintained in the employees' training file with the Health and Safety Division.

11. This procedure will be reviewed annually by the Health and Safety Division to ensure that it is relevant to Posillico operations.

DEFINITIONS

Affected Employee: An employee whose job requires operation/use of equipment or machines on which servicing or maintenance is being performed under lockout or tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed. All Posillico personnel or subcontractors working in these circumstances are "affected employees".

Authorized Employee: A person who locks out or implements a tagout system procedure on machines or equipment in connection with the servicing or maintenance on that machine or equipment. An authorized person and an affected employee may be the same person when the affected employee's duties also include performing a lock out or tag out on a machine or equipment.

Capable of being Locked Out: An energy isolating device will be considered to be capable of being locked out either if it designed with a hasp or other attachment or integral part to which, or through which, a lock can be affixed, or if it has a locking mechanism built into it. Other energy isolating devices will also be considered to be capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.

Energized: Connected to an energy source or containing residual or stored energy.

Energy Isolating Device: A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: a manually operated electrical circuit breaker; a disconnect switch; a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors, and, in addition, no pole can be operated independently; a slide gate; a slip blind; a line valve; a block; and, any similar device used to block or isolate energy. The term does not include a push button, selector switch, and other control circuit type devices.

Energy Source: Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

Lockout: The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

Lockout Device: A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment.

Tagout: The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

Tagout Device: A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

ATTACHEMENT A

LOCKOUT WORKSHEET

LOCKOUT WORKSHEET

Job Location: _____ Project Manager: _____

Date: _____ Time: _____ a.m./p.m.

Description of Lockout to be Performed: _____

Energy Source(s): _

Pre-Work Safety Meeting Minutes: _____

Lockout Hardware Used: _____

Energy Restoration (Check each as you Progress):	Time Completed
___ All personnel accounted for and in the clear.	_____
___ Point(s) of operation free of tools and debris.	_____
___ Points of operation restraints removed.	_____
___ Lockout hardware removed.	_____
___ Personnel clear of points of operation.	_____
___ Energy restored.	_____
___ Equipment operation verified, client's rep on site.	_____
___ Lockout terminated.	_____

Employees' Signatures: _____

ATTACHMENT B

LOCKOUT/TAGOUT ABSENT EMPLOYEE FORM

LOCKOUT/TAGOUT ABSENT EMPLOYEE FORM

NOTICE

Upon completion of work performed under lockout/tagout conditions, the following employee(s) listed below could not be located or accounted for:

_____

_____

_____

All attempts have been made to locate this employee at the jobsite. It has been verified that this employee is not in the vicinity of the hazardous energy source and will not be affected by the startup of equipment which was under lockout conditions.

_____ _____

Signature of Authorized Employee Date

APPENDIX J

CONFINED SPACE/HOT WORK PERMITTING PROCEDURE

CONFINED SPACE/HOT WORK PERMITTING PROCEDURE

1.0 Introduction

Welding, cutting, brazing and other hot work operations are a necessary part of the industrial world, both in manufacturing and construction. Too often, the people who hire, use, or supervise the use of these processes don't understand the hazards behind them, which can result in loss of life, property, or both, by fire and explosion.

Any material that is combustible or flammable is susceptible to ignition by heat-producing activity. Common materials such as floors, partitions, roofs, wooden members, paper, textiles, plastics, chemicals, flammable liquids and gases, and grass or brush are very likely to become involved in fire during hot work operations if adequate precautions are not taken.

To be more site specific, Coal Tar Waste, although weathered, is ignitable. During Hot Work operations the proper precautions will be taken, such as covering the material with a Fire Blanket to prevent ignition.

Hot work is any work that requires the use of tools/equipment that have the potential to produce temperatures which could reasonably be expected to ignite flammable/combustible material or atmospheres in the vicinity of the work area. These tools/equipment have the capability of producing sparks, open flames, heat, or an electrical arc during use. Hot work is not limited to just welding, cutting and brazing, but also grinding, sawing (metal to metal) and chipping operations.

Confined spaces are spaces that can be bodily entered but are not meant for human occupancy. Confined space hazards exist if the potential for hazardous or explosive atmospheres and/or oxygen deficient hazards exist. Other hazards that could exist include mechanical sources and falls. Two types of confined spaces exist: permit required and non-permit required.

2.0 Purpose

To provide Posillico employees and subcontractors, who oversee or perform hot work and confined space entry on projects, with a standard permitting and safety procedure to prevent injury or loss of life and property. To be used as a reference in instances where hot work/confined space entry is performed and as a permit procedure in instances where one is not available.

3.0 Scope

This procedure will apply to all Posillico employees and subcontractors who oversee or perform hot work on projects utilizing welding, cutting, brazing, grinding, chipping, portable heaters, and other potential heat-producing equipment for field/facility activities. This procedure is also to be followed for all confined space entry situations. This procedure will apply to all contractors or subcontractors working under Posillico that do not have an adequate Permitting Procedure in place with the company in which they are currently employed. All Posillico employees involved with confined space entry will be properly trained for the role and duties performed. Training will consist of hands-on training with Posillico's confined space entry equipment including harnesses, retrieval equipment, air-line respirators and monitoring equipment. Certification that the training was satisfactorily complete will be provided and documentation maintained.

4.0 Procedure

1. Hazard Identification

   a. The Project Manager will identify all work that requires tools, equipment, or operations that may produce sparks or temperatures that are sufficient to ignite flammable/combustible materials or atmospheres.

   b. The Project Manager will determine if a confined space entry is required and determine if the entry requires a permit. Any situation that has the potential to produce hazardous atmospheres or deplete oxygen will require a permit.

   c. This information will be included in the Site Specific Health and Safety Plan to be reviewed with the Health and Safety Division prior to starting the project.

   d. The Project Manager will determine if the work can be performed without the use of hot work, i.e. alternative method to reduce the hazard.

   e. The Project Manager should consult the Health and Safety Division if the Project Manager has questions on hazard determination. The Project Manager will act as the Entry Supervisor.

   f. The Safety Director will review entry with the Project Manager and review this program at least annually to make sure the Program is effective and enforced. Copies of completed permits will be retained for at least one year.

   g. The permit program will be reviewed to determine if it is adequate for the projects conducted. Incident reports will be reviewed, employee issues raised and entries reviewed. The permit program will be evaluated to determine if all hazards were adequately identified and evaluated. Additional protective equipment will be purchased, if necessary, for future entries if the review process shows that all hazards were not properly controlled. This review will be part of annual confined space training.

2. Area Preparation

   a. The following preparation for the work area will be made once it is determined that hot work is necessary:

      - All flammable/combustible materials will be relocated at least 35 feet away from the work area.

      - All combustible materials that cannot be reasonably removed from the area will be covered with a fire blanket.

      - An appropriate fully charged fire extinguisher and/or charged fire hose will be available at the work area before, during and 1/2 hour after hot work procedures have ended.

- All safety equipment will be on-site and functional.

- The confined space entry area will be appropriately marked and barricaded to prevent impact from external hazards and vehicles. Ground level entries will be ringed with a toe board to prevent objects from inadvertently being dropped into the space.

3. Pre-Work Safety Meeting

   a. The Project Manager will assure that a pre-work safety meeting has been provided to the crew prior to any hot work/confined space entry being performed. Individuals involved with confined space entry will be identified as the authorized entrant(s), attendant and the entry supervisor. Additional individuals may be designated to conduct monitoring for multiple entries. This meeting will include, but not be limited to:

      - Permitting conditions (environmental conditions, type of work to be performed). This would include reviewing the results of the initial monitoring of the test results, ventilation requirements, potential hazards and continuous testing procedures.

      - Personnel authorized to sign-off on the permit. All personnel involved with the confined space entry must sign the permit and acknowledge the hazards expected to be encountered.

      - Location of the permit. (Must be conspicuously posted.)

      - Type of monitoring required. Employees involved with the entry may request additional monitoring or increasing monitoring frequency at any time.

      - Designation of attendant and discussion of duties.

      - Return completed permit to Project Manager or client when work is complete and project has concluded.

   b. During the pre-work safety meeting the authorized entrants will be identified and the entry procedure reviewed. The attendant will be specified and the monitoring and communication procedures reviewed. The entry will be reviewed with the designated entry supervisor before entry. The attendant will be responsible for conducting the air monitoring during the entry and providing results to the entrants and entry supervisor. The designated positions will be posted on the entry permit.

c. The entry supervisor will be responsible for meeting with the client prior to entry to identify if other contractors or client personnel will be working in close proximity to the confined space entry. The entry supervisor will coordinate entry activities in order to make sure the other work does not impact the entry or endanger entry personnel. The entry supervisor will attend scheduled project meetings with the client and other contractor representatives in order to properly coordinate the entry with other projects.

d. Initial air-monitoring results will be reviewed with the entry supervisor and the authorized entrants prior to entry. Air-monitoring procedures and alarm levels will also be reviewed. Ventilation of the space will be initiated before entry and periodic monitoring conducted prior to entry to verify the ventilation is adequate. Monitoring will be performed throughout entry by the attendant and entrants will wear dosimeters with alarms to conduct monitoring during the entry.

e. The Project Manager will meet with the client to arrange for adequate rescue services from the client, if available, or from outside rescue operations. The Project Manager will discuss rescue procedures with representatives of the rescue operation and allow the rescue team to examine the area, practice the rescue and decline to act as the rescue team if they feel they are not adequately staffed or equipped. The entry cannot be conducted until adequate rescue services are provided.

f. The Project Manager will meet with the client to discuss other projects or contractors that could interfere with Posillico's confined space work. Posillico will coordinate the entry to have minimal impact on other contractors in the area and to make sure Posillico personnel are not endangered by other contractors work.

4. Permit Completion

The Confined Space Work Permit (see Attachment A) will be completed by the Project Manager prior to beginning work each day. The permit will not be considered valid until all personnel involved with the entry have reviewed and signed the entry permit. The entry supervisor will review each permit at the completion of the entry to determine if monitoring and safety procedures are adequate for this project. The permit will be modified if appropriate. The permit will be conspicuously posted at the site of the work.

5. Attendant

A designated Attendant will be present to observe the hot work/confined space operation. The Attendant will maintain contact with personnel and conduct air monitoring. The Attendant will oversee safety retrieval systems and initiate the alarm if rescue is necessary. The Attendant will not perform entry rescue or enter the confined space unless relieved of duty by another authorized Attendant and is equipped with maximum respirator protection. The Attendant will monitor only one confined space entry at one time.

6. Entrant

Entrants will be identified on the permit and instructed on the purpose for the entry of the confined space. Entrants are responsible for adhering to the permit requirements and communicating with the Attendant. Once work tasks are completed the Entrant is responsible for removing equipment, sampling devices and exiting the confined space safely.

7. Atmospheric Monitoring

a. When cutting, grinding, heating or welding surfaces coated with epoxy finishes or paint, or when cutting certain metals with a welding torch, toxic fumes or vapors can be emitted in the process. In these instances, monitoring may be required under the OSHA Standard. Therefore, it is the responsibility of the Project Manager to notify the Health and Safety Coordinator of these coatings and have them sampled (if unknown) to determine what type of monitoring will be required.

b. Occasionally, a "liner" will be adhered to the inside of a metal duct or tank. When hot work will be performed on such material, the liner will be removed at least 4 inches to each side of the cut to prevent toxic vapors from being emitted, or fire from occurring.

c. After moving all flammable materials out of the work area, the area will be monitored with a Combustible Gas Meter immediately before hot work takes place. LEL readings at or above 5% will necessitate that the area be ventilated before hot work operations begin. **Hot work should not proceed if readings of five percent or below cannot be achieved.**

d. All area monitoring must be performed a minimum of once every 10 minutes when the hot work area is located in a low lying area down slope from a storage area containing flammable and/or combustible liquids.

e. Hot work performed in confined spaces requires that contaminant specific air monitoring be performed. Contact the Health and Safety Division to determine the type of air monitoring required for the contaminant.

f. Hot work performed on containers that previously contained flammable liquids (i.e. underground storage tanks) will not be performed until the Health and Safety Division has been contacted and has approved the work to be performed. Posillico's Site Specific Health and Safety Plan for Flammable and Combustible Underground Storage Tank Removals contains detailed procedures for cleaning, inerting and cutting these types of containers.

g. Entrants and the attendant will continuously evaluate the permit-required space to determine if additional monitoring or more frequent monitoring is necessary. The permit may be revoked or modified accordingly. All entrants will leave the space if unsafe conditions are observed or measured. The permit will be invalidated and reviewed with the supervisor before re-entry is allowed. Additional monitoring will be performed at the request of employees or attendants.

8. Prohibitive Circumstances

   a. Hot work will be prohibited if any of the following conditions exist:

      - Oxygen levels greater than 21%.
      - LEL greater than 5%.
      - Organic vapor concentration greater than Permissible Exposure Limits depending on contaminant (ventilation may reduce this hazard).
      - Confined space entry will not be permitted if oxygen levels are below 19.5% or if the LEL is >10%. Individual hazardous constituents will be monitored and appropriate levels of respiratory protection will be issued.

9. Conditions of Permit Validity

   a. A permit is not valid unless all necessary inspections and air monitoring (if required) have been performed and all required signatures appear on the permit.

   b. Work permits will be judged as valid for the following time durations:

      - Shift or significant change in personnel.
      - Duration of the hot work.
      - When atmospheric changes dictate ceasing the operation, abate the hazard and reinspect the work area before completing another permit.

   c. Permits are valid up to one day and new permits must be completed each day or whenever the permit conditions change.

   d. The local Fire Department or client emergency services will be contacted prior to entry into confined spaces. They will be notified of the reason for entry and be requested to be available for rescue and administrating first aid. If emergency rescue cannot be provided within three minutes Posillico will not conduct the entry. The permit program will be reviewed to determine if it is adequate for the projects conducted. Incident reports will be reviewed, employee issues raised and entries reviewed. The permit program will be evaluated to determine if all hazards were adequately identified and evaluated. Additional protective equipment will be purchased, if necessary, for future entries if the review process shows that all hazards were not properly controlled. This review will be part of annual confined space training.

   e. Posillico will coordinate the entry with client and/or other contractors present at the job site. Work will be evaluated to determine the impact by non-Posillico staff on the work being conducted.

   f. If conditions change and Posillico employees are at risk the permit will be considered invalid.

g. The permit will be canceled once the project is complete or conditions change that warrant leaving the site. A new permit will be issued for future entries once a permit has been canceled.

10. Training and Program Review

All workers involved with confined space entry will receive training relative to their role on the project. Since Posillico conducts confined space entry infrequently, training will be conducted prior to each project in order to refresh Posillico employees on the use of the equipment, monitoring procedures and the confined space entry program. The program will be reviewed annually or when new equipment is acquired. All completed permits will be reviewed and critiqued at the completion of each entry. The entrants and attendants will be interviewed after entry to determine if there were significant problems or concerns.

5.0 Definitions

Fire Blanket: Blanket made of fire-resistant material, such as NOMEX or KEVLAR (**not asbestos**), or treated wool, which can be used to cover combustible materials to prevent their ignition from sparks, flames or heat during hot work.

Attendant: Person who observes the confined space activities/hot work to ensure that ignition of the surrounding material does not occur. The Attendant will be equipped with a fully charged, suitable fire extinguisher and/or charged fire hose at the work area at the time of the hot work. The Attendant will not be assigned to any other duties.

Confined Space: Confined spaces are spaces that can be bodily entered but are not meant for human occupancy.

Entrant: Person who is trained and authorized to enter a confined space. Entrants are required to review air-monitoring data prior to entry into a PRCS and understand the hazards.

ATTACHMENT A

CONFINED SPACE PERMIT

Posillioc Environmental, Inc.
Confined Space Entry Permit

Location of Confined Space _____ Date/tim _____
Purpose of entry _____ Duration _____

Authorized by _____ Expires on _____
Attendant _____
Authorized Entrants _____

Measures for isolating & Equipment	YES	NO	Measures for isolating & Equipment	YES	NO
LOTO			Protective clothing		
Lines capped			Communications equipment		
Purging			Hot work permit needed		
Ventilation			Other PPE		
Secure area			Special conditions		
Harness and retrieval system					
Fire extinguishers					
Air line system					
SCBAs					
Other Respirators					

Atmospheric Monitoring

Tests to be Taken	yes	no	Acceptable entry Conditions	Test # Date: Time:	1	2	3	4	5	6	7	8	9	10
Oxygen			19.5-23.5%											
LEL			<10%											
CO			<25 ppm											
H_2S			<5 ppm											
Other														

Individual conducting test: _____
Supervisor authorizing entry _____

- Instruments used:

Instrument(s) name	Type	Serial #

Standby persons: _____
Emergency and rescue contact: _____

Entry supervisor approval to conduct entry _____ Date/time _____

APPENDIX K

INCIDENT REPORTING

INCIDENT REPORT

1.0 Accident and Incident Reporting

It is important that all accidents and incidents that result in injury, illness, or medical treatment be reported immediately. Supervisors are required to complete the Supervisor's Report of Accident included in this section. It is Posillico's responsibility to investigate each incident, file appropriate paperwork and conduct a follow-up analysis of each incident.

2.0 Reporting Phone Numbers

Safety and Health Director:	Selso Salazar Cell: (516) 315-0379
Human Resources Director:	Frank Franzini Office: (631) 390-5708

3.0 First Aid and Medical Treatment

Posillico Environmental, Inc. provides a First Aid Kit on each site and in each Company vehicle. It is there for use in the treatment of minor scratches, burns, headaches, nausea, etc. Each employee should verify the location of the nearest first aid kit and should make use of it whenever needed. Each kit is fully stocked and restocked monthly by an outside vendor. The kit includes bandages, over the counter medications, disinfecting supplies and topical ointments. The user of each kit is responsible for contacting the vendor to replace items used or submitting the kit to Posillico for replacement. Kits are to be inventoried by the Project Manager before being sent in the field. Only completely stocked kits are to be brought into the field. The kits are maintained in a weatherproof container and in accordance with ANSI Standard Z308.1-1998. The first aid supplies in each kit are included in Attachment A.

Any work related injury or illnesses that requires professional medical assistance should be reported immediately. Failure to promptly notify of a work related injury could make the claim questionable and subject to stricter review. The nearest medical center or hospital will be identified for each project. The phone number and location for this center will be determined before commencing field activities and be included in the Health and Safety Plan. The phone numbers will be posted by Health and Safety Director or the Project Manager and available to all employees in order to provide prompt response to all injuries. The Project Manager will contact the nearest medical facility to determine the facility's capabilities and verify that the facility is willing to provide emergency medical services.

4.0 First Aid

Each Posillico project will have at least one certified CPR/first aid trained person on site at all times. All Project Managers and anyone acting as the on-site Health and Safety Officer must be current in First Aid/CPR. First aid training sponsored by the American Red Cross is acceptable and must be renewed every three years. CPR training must be renewed annually. Other first aid training will be reviewed to see if it is comparable to the Red Cross training.

1. Minor First Aid Treatment

First aid kits are stored in each company vehicle. If an injury is sustained or results in minor first aid treatment:

a. Inform your supervisor.
b. Administer first aid treatment to the injury or wound.
c. If a first aid kit is used, indicate usage on the accident investigation report.
d. Access to a first aid kit is not intended to be a substitute for medical attention.
e. Provide details for the completion of the accident investigation report.

2. Non-Emergency Medical Treatment

For non-emergency work-related injuries requiring professional medical assistance, management must first authorize treatment. If you sustain an injury requiring treatment other than first aid:

a. Inform your supervisor.

b. Proceed to the posted medical facility. Your supervisor will assist with transportation, if necessary.

c. Provide details for the completion of the accident investigation report.

3. Emergency Medical Treatment

If you sustain a severe injury requiring emergency treatment:

a. Call for help and seek assistance from a co-worker.

b. Use the emergency telephone numbers and instructions posted next to the telephone in your work area to request assistance and transportation to the local hospital emergency room.

c. Provide details for the completion of the accident investigation report.

d. The Project Manager will identify an ER provider for each long-term project for emergency medical services. The phone number will be posted at each job site.

4. First Aid Training

Each employee will receive training and instructions from his or her supervisor on our first aid procedures.

5. Wounds

a. Minor - Cuts, lacerations, abrasions, or punctures

- Wash the wound using soap and water; rinse it well.
- Cover the wound using clean dressing.

b. Major - Large, deep and bleeding

- Stop the bleeding by pressing directly on the wound, using a bandage or cloth.
- Keep pressure on the wound until medical help arrives.

6. Broken Bones

   a. Do not move the victim unless it is absolutely necessary.

   b. If the victim must be moved, "splint" the injured area. Use a board, cardboard, or rolled newspaper as a splint.

7. Burns

   a. Thermal (Heat)

      - Rinse the burned area, without scrubbing it, and immerse it in cold water; do not use ice water.

      - Blot dry the area and cover it using sterile gauze or a clean cloth.

   b. Chemical

      - Flush the exposed area with cool water immediately for 15 to 20 minutes. Posillico will ensure that suitable facilities will be provided within the work area.

8. Eye Injury

   a. Small particles

      - Do not rub your eyes.

      - Use the corner of a soft clean cloth to draw particles out, or hold the eyelids open and flush the eyes continuously with water.

   b. Large or stuck particles

      - If a particle is stuck in the eye, do not attempt to remove it.
      - Cover both eyes with bandage.

   c. Chemical

      - Immediately irrigate the eyes and under the eyelids, with water, for 30 minutes. Posillico will ensure that suitable facilities will be provided within the work area.

9. Neck And Spine Injury

If the victim appears to have injured his or her neck or spine, or is unable to move his or her arm or leg, do not attempt to move the victim unless it is absolutely necessary.

10. Heat Exhaustion

a. Loosen the victim's tight clothing.
b. Give the victim "sips" of cool water.
c. Make the victim lie down in a cooler place with the feet raised.

5.0 Workers' Compensation

Every state has a Workers' Compensation Law to provide benefits to employees for lost wages and medical bills resulting from a work related injury or illness. You are covered under Workers' Compensation. You may request Workers' Compensation benefits from your supervisor. Qualification for benefits is determined by the state, not Posillico Environmental, Inc. Employees are responsible for keeping appointments, following doctors' instructions on and off the job, maintaining good communication with your supervisor, and to fully cooperate with all instructions given.

Workers' Compensation provides wages at a lower pay scale than what you may earn by working.

1. Employee Safety Rights

Employees have several important rights concerning safety, which are protected by federal, state and local laws that you should be aware of. They are:

a. The right to a safe work-place free from recognized hazards.

b. The right to request information on safety and health hazards in the workplace, precautions that may be taken, and procedures to be followed if an employee is injured or exposed to toxic substances.

c. The right to know about the hazards associated with the chemicals you work with, and the safety procedures.

d. The right to question any instruction which may violate a safety rule, which puts someone in unnecessary danger of serious injury.

e. The right of freedom from retaliation for demanding safety rights.

2. Safety Responsibilities

Employees also have some important responsibilities concerning safety. These are:

a. The responsibility of reporting all injuries and illnesses to your supervisor, no matter how small.

b. The responsibility of always following the safety rules for every task performed.

c. The responsibility of reporting any hazards seen.

d. The responsibility of helping co-workers recognize unsafe actions or conditions.

e. The responsibility of asking about the safety rules.

3. Employee Safety Rules

It is impossible to list or include all safety rules for all the possible tasks. But the following rules have been prepared to help the employee avoid hazards, which may cause injury while doing some of the more common tasks. Failure to follow safety rules and /or safe practices will result in disciplinary action, up to and including termination.

6.0 General Safety Rules

a. Read and follow the safety notices and other information that is posted.

b. Observe and follow all safety instructions, signs, and operation procedures.

c. Help your fellow employee when they ask for assistance or when needed for their safety.

d. Never participate in "horseplay". Horseplay that results in injury is often not covered by Workers' Compensation.

e. Clean up spills immediately.

f. Report all unsafe conditions, hazards, or equipment immediately. Make sure other people are warned of the problem so that they may avoid it.

g. Wear personal protective equipment as required to reduce injury potential. Use gloves, safety glasses, back support belts, etc., as necessary.

h. Never stand on chairs, furniture, or anything other than an approved ladder or step stool.

i. Never use intoxicating beverages or controlled drugs before or during work. Prescription medication should only be used at work with your Doctor's approval.

1. Fire Safety

a. Report all fire hazards to your supervisor immediately.

b. Fire fighting equipment shall be used only for fire fighting purposes.

c. Smoking is not permitted at any time in the areas where "No Smoking" signs are posted.

d. Do not block off access to fire fighting equipment.

e. Keep doors, aisles, fire escapes and stairways completely unobstructed at all times.

f. In the case of a fire, your first consideration must be the safety of all persons, then attention should be directed to the protection of property.

g. Change clothes immediately if they are soaked with oil, gasoline, paint thinner or any other flammable liquid.

h. Know how to report a fire and how to turn on a fire alarm.

i. Know the location of all fire extinguishers, and how to use them.

j. Know the fire exits to be used in an emergency.

7.0 Hand Tool Safety

a. Wear protective equipment necessary for the job you are performing. Discuss any required safety equipment with your supervisor as changes occur.

b. Defective tools must not be used.

c. Do not carry sharp hand tools in clothing.

d. Check all wiring on electric hand tools for proper insulation and 3-prong plug grounding.

e. **Hammers:** Use eye protection at all times!

f. **Screwdrivers:** Use the right size and type of screwdriver for the job. Do not use a screwdriver as a chisel.

g. **Wrenches:** In using any wrench, it is better to pull than to push. If you have to push, use your open palm. Use the proper wrench for the job.

h. **Handsaws:** Saws that are sharp and rust free are less likely to bind or jump. Insure the object being cut is secured tightly to a flat surface.

8.0 Protective Equipment

a. Approved eye protection (safety glasses with side shields, goggles, etc.) must be worn at all times when assigned any certain job classifications. It is important to check with your supervisor to assure compliance.

b. Moccasins and shoes with open toes or high heels are not permitted.

c. Wear protective clothing and equipment as required by your job classification to protect against hazards at hand. These include, but are not limited to, hard hats, steel-toed shoes, gloves, fall safety harnesses, earplugs, etc.

9.0 Material Handling Safety Rules

a. When lifting, lift properly. Keep the back straight, stand close to the load, and use your leg muscles to do the lifting, keeping the load close to the body. Never twist your upper body while carrying a load.

b. When lifting heavy objects, utilize a two-wheeled dolly, or, ask for assistance from another employee.

c. Inspect the object you are going to lift for sharp corners, nails, black widow spiders, or other things that may cause injury.

d. Use gloves when handling rough or sharp materials.

10.0 Housekeeping

a. Do not place materials in aisles, stairways, or any designated path of travel.

b. Stack material at a safe height so that material will not fall if bumped. Insure heavy loads have proper support, and make sure there is no overhanging or irregular stacking of material.

c. Place all trash or scrap in places provided. Clean up all spills immediately.

d. Report worn or broken flooring, stair treads, handrails, furniture, or other office equipment.

e. Smoking is permitted only in designated areas. Use ashtrays for disposing of butts. Do not throw butts on the floor.

Employee's Report of Injury Form

Instructions: Your employees may use this form to report all work related injuries, illnesses, or "near miss" events (which could have caused an injury or illness) – *no matter how minor.* This helps you to identify and correct hazards before they cause serious injuries. This form should be completed by employees as soon as possible and given to a supervisor for further action.

I am reporting a work related: ❑ Injury ❑ Illness ❑ Near miss	
Your Name:	
Job title:	
Supervisor:	
Have you told your supervisor about this injury/near miss? ❑ Yes ❑ No	
Date of injury/near miss:	Time of injury/near miss:
Names of witnesses (if any):	
Where, exactly, did it happen?	
What were you doing at the time?	
Describe step by step what led up to the injury/near miss. (continue on the back if necessary):	
What could have been done to prevent this injury/near miss?	
What parts of your body were injured? If a near miss, how could you have been hurt?	
Did you see a doctor about this injury/illness? ❑ Yes ❑ No	
If yes, whom did you see?	Doctor's phone number:
Date:	Time:
Has this part of your body been injured before? ❑ Yes ❑ No	
If yes, when?	Employer:
Your signature (optional):	Date:

Incident Investigation Report Form

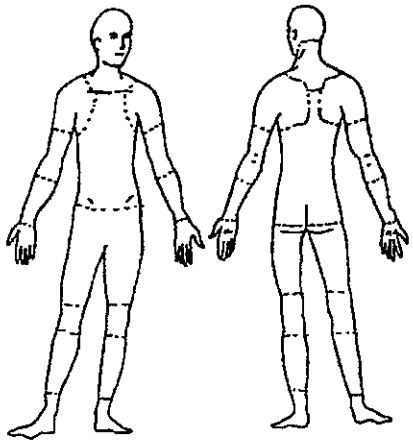
Instructions: Complete this form as soon as possible after an incident that results in serious injury or illness. (Optional: Use to investigate a minor injury or near miss that *could have resulted in a serious injury or illness.*)

This is a report of a: ❑ Near Miss ❑ First Aid Only ❑ Dr. Visit Only ❑ Lost Time ❑ Death	
Date of incident:	This report is made by: ❑ Employee ❑ Supervisor ❑ Team ❑ Final Report

Step 1: Injured employee (complete this part for each injured employee)

Name:	Sex: ❑ Male ❑ Female	Date of Birth::
Craft or Trade:	Job title at time of incident:	

Part of body affected: (shade all that apply)



Nature of injury: (most serious one)

- ❑ Abrasion, scrapes
- ❑ Amputation
- ❑ Broken bone
- ❑ Bruise
- ❑ Burn (heat)
- ❑ Burn (chemical)
- ❑ Concussion (to the head)
- ❑ Crushing Injury
- ❑ Cut, laceration, puncture
- ❑ Hernia
- ❑ Illness
- ❑ Sprain, strain
- ❑ Damage to a body system:
- ❑ Other _____

This employee works:

- ❑ Regular full time
- ❑ Regular part time
- ❑ Seasonal
- ❑ Temporary

Months with this employer

Months doing this job:

(e.g.: nervous, respiratory, or circulatory systems)

Step 2: Describe the incident

Exact location of the incident:	Exact time:

What part of employee's workday? ❑ Entering or leaving work ❑ Doing normal work activities ❑ During meal period ❑ During break ❑ Working overtime ❑ Other

Names of witnesses (if any):

Number of attachments:	Written witness statements:	Photographs:	Maps / drawings:

What personal protective equipment was being used (if any)?

Describe, step-by-step the events that led up to the injury. Include names of any machines, parts, objects, tools, materials and other important details.

Description continued on attached sheets: ❑

Step 3: Why did the incident happen?

Unsafe workplace conditions: (Check all that apply)
- ❑ Inadequate guard
- ❑ Unguarded hazard
- ❑ Safety device is defective
- ❑ Tool or equipment defective
- ❑ Workstation layout is hazardous
- ❑ Unsafe lighting
- ❑ Unsafe ventilation
- ❑ Lack of needed personal protective equipment
- ❑ Lack of appropriate equipment / tools
- ❑ Unsafe clothing
- ❑ No training or insufficient training
- ❑ Other: _____

Unsafe acts by people: (Check all that apply)
- ❑ Operating without permission
- ❑ Operating at unsafe speed
- ❑ Servicing equipment that has power to it
- ❑ Making a safety device inoperative
- ❑ Using defective equipment
- ❑ Using equipment in an unapproved way
- ❑ Unsafe lifting by hand
- ❑ Taking an unsafe position or posture
- ❑ Distraction, teasing, horseplay
- ❑ Failure to wear personal protective equipment
- ❑ Failure to use the available equipment / tools
- ❑ Other: _____

Why did the unsafe conditions exist?

Why did the unsafe acts occur?

Is there a reward (such as "the job can be done more quickly", or "the product is less likely to be damaged") that may have encouraged the unsafe conditions or acts? ❑ Yes ❑ No
If yes, describe:

Were the unsafe acts or conditions reported prior to the incident? ❑ Yes ❑ No

Have there been similar incidents or near misses prior to this one? ❑ Yes ❑ No

Step 4: How can future incidents be prevented?

What changes do you suggest to prevent this injury/near miss from happening again?

❑ Stop this activity ❑ Guard the hazard ❑ Train the employee(s) ❑ Train the supervisor(s)

❑ Redesign task steps ❑ Redesign work station ❑ Write a new policy/rule ❑ Enforce existing policy

❑ Routinely inspect for the hazard ❑ Personal Protective Equipment ❑ Other: _____

What should be (or has been) done to carry out the suggestion(s) checked above?

Description continued on attached sheets: ❑

Step 5: Who completed and reviewed this form? (Please Print)

Written by: Department:	Title: Date:
Names of investigation team members:	
Reviewed by:	Title: Date:

ATTACHMENT A

FIRST AID KITS

FIRST AID KITS

Each first aid kit is in a weather proof container, accessible, and contains but is not limited to the following elements:

Item	Amount
Ear Plugs	2 pair
Band-aids	2 boxes
Sterile pads	5 2"x2"
Oval eye pads	2
Tylenol	10
Burn cream	1 tube
Tweezers	1 each
Scissors	1 each
Triangular bandage	1
Antiseptic wipes	1 box
Ammonia inhalants	1 box
Flexible gauze	1 roll
First aid guide	
Latex gloves	2 pair

APPENDIX L

SAFE OPERATION OF CRANES, DERRICKS, AND HOISTING EQUIPMENT

Subpart N — Cranes, Derricks, Hoists, Elevators, and Conveyors

§1926.550 Cranes and derricks.

(a) *General requirements.* (1) The employer shall comply with the manufacturer's specifications and limitations applicable to the operation of any and all cranes and derricks. Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a qualified engineer competent in this field and such determinations will be appropriately documented and recorded. Attachments used with cranes shall not exceed the capacity, rating, or scope recommended by the manufacturer.

(2) Rated load capacities, and recommended operating speeds, special hazard warnings, or instruction, shall be conspicuously posted on all equipment. Instructions or warnings shall be visible to the operator while he is at his control station.

(3) (Reserved)

(4) Hand signals to crane and derrick operators shall be those prescribed by the applicable ANSI standard for the type of crane in use. An illustration of the signals shall be posted at the job site.

(5) The employer shall designate a competent person who shall inspect all machinery and equipment prior to each use, and during use, to make sure it is in safe operating condition. Any deficiencies shall be repaired, or defective parts replaced, before continued use.

(6) A thorough, annual inspection of the hoisting machinery shall be made by a competent person, or by a government or private agency recognized by the U.S. Department of Labor. The employer shall maintain a record of the dates and results of inspections for each hoisting machine and piece of equipment.

(7) Wire rope shall be taken out of service when any of the following conditions exist:

(i) In running ropes, six randomly distributed broken wires in one lay or three broken wires in one strand in one lay;

(ii) Wear of one-third the original diameter of outside individual wires. Kinking, crushing, bird caging, or any other damage resulting in distortion of the rope structure;

(iii) Evidence of any heat damage from any cause;

(iv) Reductions from nominal diameter of more than one-sixty-fourth inch for diameters up to and including five-sixteenths inch, one-thirty-second inch for diameters three-eighths inch to and including one-half inch, three-sixty-fourths inch for diameters nine-sixteenths inch to and including three-fourths inch, one-sixteenth inch for diameters seven-eighths inch to $1\frac{1}{8}$ inches inclusive, three-thirty-seconds inch for diameters $1\frac{1}{4}$ to $1\frac{1}{2}$ inches inclusive;

(v) In standing ropes, more than two broken wires in one lay in sections beyond end connections or more than one broken wire at an end connection.

(vi) Wire rope safety factors shall be in accordance with American National Standards Institute B 30.5-1968 or SAE J959-1966.

(8) Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating, rotating, or other moving parts or equipment shall be guarded if such parts are exposed to contact by employees, or otherwise create a hazard.

Guarding shall meet the requirements of the American National Standards Institute B 15.1-1958 Rev., Safety Code for Mechanical Power Transmission Apparatus.

(9) Accessible areas within the swing radius of the rear of the rotating superstructure of the crane, either permanently or temporarily mounted, shall be barricaded in such a manner as to prevent an employee from being struck or crushed by the crane.

(10) All exhaust pipes shall be guarded or insulated in areas where contact by employees is possible in the performance of normal duties.

(11) Whenever internal combustion engine powered equipment exhausts in enclosed spaces, tests shall be made and recorded to see that employees are not exposed to unsafe concentrations of toxic gases or oxygen deficient atmospheres.

(12) All windows in cabs shall be of safety glass, or equivalent, that introduces no visible distortion that will interfere with the safe operation of the machine.

(13) (i) Where necessary for rigging or service requirements, a ladder, or steps, shall be provided to give access to a cab roof.

(ii) Guardrails, handholds, and steps shall be provided on cranes for easy access to the car and cab, conforming to American National Standards Institute B30.5.

(iii) Platforms and walkways shall have anti-skid surfaces.

(14) Fuel tank filler pipe shall be located in such a position, or protected in such manner, as to not allow spill or overflow to run onto the engine, exhaust, or electrical equipment of any machine being fueled.

(i) An accessible fire extinguisher of 5BC rating, or higher, shall be available at all operator stations or cabs of equipment.

(ii) All fuels shall be transported, stored, and handled to meet the rules of Subpart F of this part. When fuel is transported by vehicles on public highways, Department of Transportation rules contained in 49 CFR Parts 177 and 393 concerning such vehicular transportation are considered applicable.

(15) Except where electrical distribution and transmission lines have been deenergized and visibly grounded at point of work or where insulating barriers, not a part of or an attachment to the equipment or machinery, have been erected to prevent physical contact with the lines, equipment or machines shall be operated proximate to power lines only in accordance with the following:

(i) For lines rated 50 kV. or below, minimum clearance between the lines and any part of the crane or load shall be 10 feet;

(ii) For lines rated over 50 kV., minimum clearance between the lines and any part of the crane or load shall be 10 feet plus 0.4 inch for each 1 kV. over 50 kV., or twice the length of the line insulator, but never less than 10 feet;

(iii) In transit with no load and boom lowered, the equipment clearance shall be a minimum of 4 feet for voltages less than 50 kV., and 10 feet for voltages over 50 kV., up to and including 345 kV., and 16 feet for voltages up to and including 750 kV.

(iv) A person shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means;

(v) Cage-type boom guards, insulating links, or proximity warning devices may be used on cranes, but the use of such devices shall not alter the requirements of any other regulation of this part even if such device is required by law or regulation;

(vi) Any overhead wire shall be considered to be an energized line unless and until the person owning such line or the electrical utility authorities indicate that it is not an energized line and it has been visibly grounded;

(vii) Prior to work near transmitter towers where an electrical charge can be induced in the equipment or materials being handled, the transmitter shall be de-energized or tests shall be made to determine if electrical charge is induced on the crane. The following precautions shall be taken when necessary to dissipate induced voltages:

(a) The equipment shall be provided with an electrical ground directly to the upper rotating structure supporting the boom; and

(b) Ground jumper cables shall be attached to materials being handled by boom equipment when electrical charge is induced while working near energized transmitters. Crews shall be provided with nonconductive poles having large alligator clips or other similar protection to attach the ground cable to the load.

(c) Combustible and flammable materials shall be removed from the immediate area prior to operations.

(16) No modifications or additions which affect the capacity or safe operation of the equipment shall be made by the employer without the manufacturer's written approval. If such modifications or changes are made, the capacity, operation, and maintenance instruction plates, tags, or decals, shall be changed accordingly. In no case shall the original safety factor of the equipment be reduced.

(17) The employer shall comply with Power Crane and Shovel Association Mobile Hydraulic Crane Standard No. 2.

(18) Sideboom cranes mounted on wheel or crawler tractors shall meet the requirements of SAE J743a-1964.

(19) All employees shall be kept clear of loads about to be lifted and of suspended loads.

(b) *Crawler, locomotive, and truck cranes.* (1) All jibs shall have positive stops to prevent their movement of more than 5° above the straight line of the jib and boom on conventional type crane booms. The use of cable type belly slings does not constitute compliance with this rule.

(2) All crawler, truck, or locomotive cranes in use shall meet the applicable requirements for design, inspection, construction, testing, maintenance and operation as prescribed in the ANSI B30.5-1968, Safety Code for Crawler, Locomotive and Truck Cranes. However, the written, dated, and signed inspection reports and records of the monthly inspection of critical items prescribed in section 5-2.1.5 of the ANSI B30.5-1968 standard are not required. Instead, the employer shall prepare a certification record which includes the date the crane items were inspected; the signature of the person who inspected the crane items; and a serial number, or other identifier, for the crane inspected. The most recent certification record shall be maintained on file until a new one is prepared.

(c) *Hammerhead tower cranes.* (1) Adequate clearance shall be maintained between moving and rotating structures of the crane and fixed objects to allow the passage of employees without harm.

EDITOR'S NOTE: Effective February 6, 1995 paragraph (c)(2) of 1926.550 below is revised to read:

(2) Each employee required to perform duties on the horizontal boom of hammerhead tower cranes shall be protected against falling by guardrails or by a personal fall arrest system in conformance with subpart M of this part.

(2) Employees required to perform duties on the horizontal boom of hammerhead tower cranes shall be protected against falling by guardrails or by safety belts and lanyards attached to lifelines in conformance with Subpart E of this part.

(3) Buffers shall be provided at both ends of travel of the trolley.

(4) Cranes mounted on rail tracks shall be equipped with limit switches limiting the travel of the crane on the track and stops or buffers at each end of the tracks.

(5) All hammerhead tower cranes in use shall meet the applicable requirements for design, construction, installation, testing, maintenance, inspection, and operation as prescribed by the manufacturer.

(d) *Overhead and gantry cranes.* (1) The rated load of the crane shall be plainly marked on each side of the crane, and if the crane has more than one hoisting unit, each hoist shall have its rated load marked on it or its load block, and this marking shall be clearly legible from the ground or floor.

(2) Bridge trucks shall be equipped with sweeps which extend below the top of the rail and project in front of the truck wheels.

(3) Except for floor-operated cranes, a gong or other effective audible warning signal shall be provided for each crane equipped with a power traveling mechanism.

(4) All overhead and gantry cranes in use shall meet the applicable requirements for design, construction, installation, testing, maintenance, inspection, and operation as prescribed in the ANSI B30.2.0-1967, Safety Code for Overhead and Gantry Cranes.

(e) *Derricks.* All derricks in use shall meet the applicable requirements for design, construction, installation, inspection, testing, maintenance, and operation as prescribed in American National Standards Institute B30.6-1969, Safety Code for Derricks.

(f) *Floating cranes and derricks*—(1) *Mobile cranes mounted on barges.* (i) When a mobile crane is mounted on a barge, the rated load of the crane shall not exceed the original capacity specified by the manufacturer.

(ii) A load rating chart, with clearly legible letters and figures, shall be provided with each crane, and securely fixed at a location easily visible to the operator.

(iii) When load ratings are reduced to stay within the limits for list of the barge with a crane mounted on it, a new load rating chart shall be provided.

(iv) Mobile cranes on barges shall be positively secured.

(2) *Permanently mounted floating cranes and derricks.* (i) When cranes and derricks are permanently installed on a barge, the capacity and limitations of use shall be based on competent design criteria.

(ii) A load rating chart with clearly legible letters and figures shall be provided and securely fixed at a location easily visible to the operator.

(iii) Floating cranes and floating derricks in use shall meet the applicable requirements for design, construction, installation,

testing, maintenance, and operation as prescribed by the manufacturer.

(3) *Protection of employees working on barges.* The employer shall comply with the applicable requirements for protection of employees working onboard marine vessels specified in §1926.605.

(g) *Crane or derrick suspended personnel platforms*—(1) *Scope, application and definitions*—(i) *Scope and application.* This standard applies to the design, construction, testing, use and maintenance of personnel platforms, and the hoisting of personnel platforms on the load lines of cranes or derricks..

(ii) *Definitions.* For the purposes of this paragraph (g), the following definitions apply:

(A) *Failure* means load refusal, breakage, or separation of components.

(B) *Hoist* (or hoisting) means all crane or derrick functions such as lowering, lifting, swinging, booming in and out or up and down, or suspending a personnel platform.

(C) *Load refusal* means the point where the ultimate strength is exceeded.

(D) *Maximum intended load* means the total load of all employees, tools, materials, and other loads reasonably anticipated to be applies to a personnel platform or personnel platform component at any one time.

(E) *Runway* means a firm, level surface designed, prepared and designated as a path of travel for the weight and configuration of the crane being used to lift and travel with the crane suspended platform. An existing surface may be used as long as it meets these criteria.

(2) *General requirements.* The use of a crane or derrick to hoist employees on a personnel platform is prohibited, except when the erection, use, and dismantling of conventional means of reaching the worksite, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform or scaffold, would be more hazardous or is not possible because of structural design or worksite conditions.

(3) *Cranes and derricks*—(i) *Operational criteria.* (A) Hoisting of the personnel platform shall be performed in a slow, controlled, cautious manner with no sudden movements of the crane or derrick, or the platform.

(B) Load lines shall be capable of supporting, without failure, at least seven times the maximum intended load, except that where rotation resistant rope is used, the lines shall be capable of supporting without failure, at least ten times the maximum intended load. The required design factor is achieved by taking the current safety factor of 3.5 (required under §1926.550(b)(2) and applying the 50 percent derating of the crane capacity which is required by §1926.550(g)(3)(i)(F).

(C) Load and boom hoist drum brakes, swing brakes, and locking devices such as pawls or dogs shall be engaged when the occupied personnel platform is in a stationary working position.

(D) The crane shall be uniformly level within one percent of level grade and located on firm footing. Cranes equipped with outriggers shall have them all fully deployed following manufacturer's specifications, insofar as applicable, when hoisting employees.

(E) The total weight of the loaded personnel platform and related rigging shall not exceed 50 percent of the rated capacity for the radius and configuration of the crane or derrick.

(F) The use of machines having live booms (booms in which lowering is controlled by a brake without aid from other

devices which slow the lowering speeds) is prohibited.

(ii) *Instruments and components.* (A) Cranes and derricks with variable angle booms shall be equipped with a boom angle indicator, readily visible to the operator.

(B) Cranes with telescoping booms shall be equipped with a device to indicate clearly to the operator, at all times, the boom's extended length or an accurate determination of the load radius to be used during the lift shall be made prior to hoisting personnel.

(C) A positive acting device shall be used which prevents contact between the load block or overhaul ball and the boom tip (anti-two-blocking device), or a system shall be used which deactivates the hoisting action before damage occurs in the event of a two-blocking situation (two-block damage prevention feature).

(D) The load line hoist drum shall have a system or device on the power train, other than the load hoist brake, which regulates the lowering rate of speed of the hoist mechanism (controlled load lowering.) Free fall is prohibited.

(4) *Personnel Platforms.*—(i) *Design criteria.* (A) The personnel platform and suspension system shall be designed by a qualified engineer or a qualified person competent in structural design.

(B) The suspension system shall be designed to minimize tipping of the platform due to movement of employees occupying the platform.

EDITOR'S NOTE: Effective February 6, 1995 paragraph (g)(4)(i)(C) of 1926.550 below is revised to read:

(C) The personnel platform itself, except the guardrail system and personal fall arrest system anchorages, shall be capable of supporting, without failure, its own weight and at least five times the maximum intended load. Criteria for guardrail systems and personal fall arrest system anchorages are contained in subpart M of this Part.

(C) The personnel platform itself, except the guardrail system and body belt/harness anchorages, shall be capable of supporting, without failure, its own weight and at least five times the maximum intended load. Criteria for guardrail systems and body belt/harness anchorages are contained in other Subparts, E and M, respectively of this part.

(ii) *Platform specifications.* (A) Each personnel platform shall be equipped with a guardrail system which meets the requirements of Subpart M, and shall be enclosed at least from the toeboard to mid-rail with either solid construction or expanded metal having openings no greater than ½ inch (1.27 cm).

(B) A grab rail shall be installed inside the entire perimeter of the personnel platform.

(C) Access gates, if installed, shall not swing outward during hoisting.

(D) Access gates, including sliding or folding gates, shall be equipped with a restraining device to prevent accidental opening.

(E) Headroom shall be provided which allows employees to stand upright in the platform.

(F) In addition to the use of hard hats, employees shall be protected by overhead protection on the personnel platform when employees are exposed to falling objects.

(G) All rough edges exposed to contact by employees shall be surfaced or smoothed in order to prevent injury to employees from punctures or lacerations.

(H) All welding of the personnel platform and its components shall be performed by a qualified welder familiar with the weld

grades, types and material specified in the platform design.

(I) The personnel platform shall be conspicuously posted with a plate or other permanent marking which indicates the weight of the platform, and its rated load capacity or maximum intended load.

(iii) *Personnel platform loading.* (A) The personnel platform shall not be loaded in excess of its rated load capacity. When a personnel platform does not have a rated load capacity then the personnel platform shall not be loaded in excess of its maximum intended load.

(B) The number of employees occupying the personnel platform shall not exceed the number required for the work being performed.

(C) Personnel platforms shall be used only for employees, their tools and the ma-

terials necessary to do their work, and shall not be used to hoist only materials or tools when not hoisting personnel.

(D) Materials and tools for use during a personnel lift shall be secured to prevent displacement.

(E) Materials and tools for use during a personnel lift shall be evenly distributed within the confines of the platform while the platform is suspended.

(iv) *Rigging.* (A) When a wire rope bridle is used to connect the personnel platform to the load line, each bridle leg shall be connected to a master link or shackle in such a manner to ensure that the load is evenly divided among the bridle legs.

(B) Hooks on overhaul ball assemblies, lower load blocks, or other attachment assemblies shall be of a type that can be closed and locked, eliminating the hook throat opening. Alternatively, an alloy anchor type shackle with a bolt, nut and retaining pin may be used.

(C) Wire rope, shackles, rings, master links, and other rigging hardware must be capable of supporting, without failure, at least five times the maximum intended load applied or transmitted to that component. Where rotation resistant rope is used, the slings shall be capable of supporting without failure at least ten times the maximum intended load.

(D) All eyes in wire rope slings shall be fabricated with thimbles.

(E) Bridles and associated rigging for attaching the personnel platform to the hoist line shall be used only for the platform and the necessary employees, their tools and the materials necessary to do their work and shall not be used for any other purpose when not hoisting personnel.

(5) *Trial lift, inspections and proof testing.* (i) A trial lift with the unoccupied personnel platform loaded at least to the anticipated liftweight shall be made from ground level, or any other location where employees will enter the platform to each location at which the personnel platform is to be hoisted and positioned. This trial lift shall be performed immediately prior to placing personnel on the platform. The operator shall determine that all systems, controls and safety devices are activated and functioning properly; that no interferences exist; and that all configurations necessary to reach those work locations will allow the operator to remain under the 50 percent limit of the hoist's rated capacity. Materials and tools to be used during the actual lift can be loaded in the platform, as provided in paragraphs (g)(4)(iii)(D), and (E) of this section for the trial lift. A single trial lift may be performed at one time for all locations that are to be reached from a single set up position.

(ii) The trial lift shall be repeated prior to hoisting employees whenever the crane or derrick is moved and set up in a new location or returned to a previously used location. Additionally, the trial lift shall be repeated when the lift route is changed unless the operator determines that the route change is not significant (i.e. the route change would not affect the safety of hoisted employees.)

(iii) After the trial lift, and just prior to hoisting personnel, the platform shall be hoisted a few inches and inspected to ensure that it is secure and properly balanced. Employees shall not be hoisted unless the following conditions are determined to exist:

(A) Hoist ropes shall be free of kinks;

(B) Multiple part lines shall not be twisted around each other;

(C) The primary attachment shall be centered over the platform; and

(D) The hoisting system shall be inspected if the load rope is slack to ensure all ropes are properly stated on drums and sheaves.

(iv) A visual inspection of the crane or derrick, rigging, personnel platform, and the crane or derrick base support or ground shall be conducted by a competent person immediately after the trial lift to determine whether the testing has exposed any defect or produced any adverse effect upon any component or structure.

(v) Any defects found during inspections which create a safety hazard shall be corrected before hoisting personnel.

(vi) At each job site, prior to hoisting employees on the personnel platform, and after any repair or modification, the platform and rigging shall be proof tested to 125 percent of the platform's rated capacity by holding it in a suspended position for five minutes with the test load evenly distributed on the platform (this may be done concurrently with the trial lift). After proof testing, a competent person shall inspect the platform and rigging. Any deficiencies found shall be corrected and another proof test shall be conducted. Personnel hoisting shall not be conducted until the proof testing requirements are satisfied.

(6) *Work practices.* (i) Employees shall keep all parts of the body inside the platform during raising, lowering, and positioning. This provision does not apply to an occupant of the platform performing the duties of a signal person.

(ii) Before employees exit or enter a hoisted personnel platform that is not landed, the platform shall be secured to the structure where the work is to be performed, unless securing to the structure creates an unsafe situation.

(iii) Tag lines shall be used unless their use creates an unsafe condition.

(iv) The crane or derrick operator shall remain at the controls at all times when the crane engine is running and the platform is occupied.

(v) Hoisting of employees shall be promptly discontinued upon indication of any dangerous weather conditions or other impending danger.

(vi) Employees being hoisted shall remain in continuous sight of and in direct communication with the operator or signal person. In those situations where direct visual contact with the operator is not possible, and the use of a signal person would create a greater hazard for the person, direct communication alone such as by radio may be used.

(vii) Except over water, employees occupying the personnel platform shall use a body belt/harness system with lanyard appropriately attached to the lower load block or overhaul ball, or to a structural member within the personnel platform capable of supporting a fall impact for employees using the anchorage. When working over water the requirements of §1926.106 shall apply.

(viii) No lifts shall be made on another of the crane's or derrick's loadlines while personnel are suspended on a platform.

(7) *Traveling.* (i) Hoisting of employees while the crane is traveling is prohibited, except for portal, tower and locomotive cranes, or where the employer demonstrates that there is no less hazardous way to perform the work.

(ii) Under any circumstances where a crane would travel while hoisting personnel, the employer shall implement the following procedures to safeguard employees:

(A) Crane travel shall be restricted to a fixed track or runway;

(B) Travel shall be limited to the load radius of the boom used during the lift; and

(C) The boom must be parallel to the direction of travel.

(D) A complete trial run shall be performed to test the route of travel before employees are allowed to occupy the platform. This trial run can be performed at the same time as the trial lift required by paragraph (g)(5)(i) of this section which tests the route of the lift.

(E) If travel is done with a rubber tired-carrier, the condition and air pressure of the tires shall be checked. The chart capacity for lifts on rubber shall be used for application of the 50 percent reduction of rated capacity. Notwithstanding paragraph (g)(5)(i)(E) of this section, outriggers may be partially retracted as necessary for travel.

(8) *Pre-lift meeting.* (i) A meeting attended by the crane or derrick operator, signal person(s) (if necessary for the lift), employee(s) to be lifted, and the person responsible for the task to be performed shall be held to review the appropriate requirements of paragraph (g) of this section and the procedures to be followed.

(ii) This meeting shall be held prior to the trial lift at each new work location, and shall be repeated for any employees newly assigned to the operation.

§1926.551 Helicopters.

(a) *Helicopter regulations.* Helicopter cranes shall be expected to comply with any applicable regulations of the Federal Aviation Administration.

(b) *Briefing.* Prior to each day's operation a briefing shall be conducted. This briefing shall set forth the plan of operation for the pilot and ground personnel.

(c) *Slings and tag lines.* Load shall be properly slung. Tag lines shall be of a length that will not permit their being drawn up into rotors. Pressed sleeve, swedged eyes, or equivalent means shall be used for all freely suspended loads to prevent hand splices from spinning open or cable clamps from loosening.

(d) *Cargo hooks.* All electrically operated cargo hooks shall have the electrical activating device so designed and installed as to prevent inadvertent operation. In addition, these cargo hooks shall be equipped with an emergency mechanical control for releasing the load. The hooks shall be tested prior to each day's operation to determine that the release functions properly, both electrically and mechanically.

(e) *Personal protective equipment.* (1) Personal protective equipment for employees receiving the load shall consist of complete eye protection and hard hats secured by chinstraps.

(2) Loose-fitting clothing likely to flap in the downwash, and thus be snagged on hoist line, shall not be worn.

(f) *Loose gear and objects.* Every practical precaution shall be taken to provide for the protection of the employees from flying objects in the rotor downwash. All loose gear within 100 feet of the place of lifting the load, depositing the load, and all other areas susceptible to rotor downwash shall be secured or removed.

(g) *Housekeeping.* Good housekeeping shall be maintained in all helicopter loading and unloading areas.

(h) *Operator responsibility.* The helicopter operator shall be responsible for size, weight, and manner in which loads are connected to the helicopter. If, for any reason, the helicopter operator believes

the lift cannot be made safely, the lift shall not be made.

(i) *Hooking and unhooking loads.* When employees are required to perform work under hovering craft, a safe means of access shall be provided for employees to reach the hoist line hook and engage or disengage cargo slings. Employees shall not perform work under hovering craft except when necessary to hook or unhook loads.

(j) *Static charge.* Static charge on the suspended load shall be dissipated with a grounding device before ground personnel touch the suspended load, or protective rubber gloves shall be worn by all ground personnel touching the suspended load.

(k) *Weight limitation.* The weight of an external load shall not exceed the manufacturer's rating.

(l) *Ground lines.* Hoist wires or other gear, except for pulling lines or conductors that are allowed to "pay out" from a container or roll off a reel, shall not be attached to any fixed ground structure, or allowed to foul on any fixed structure.

(m) *Visibility.* When visibility is reduced by dust or other conditions, ground personnel shall exercise special caution to keep clear of main and stabilizing rotors. Precautions shall also be taken by the employer to eliminate as far as practical reduced visibility.

(n) *Signal systems.* Signal systems between aircrew and ground personnel shall be understood and checked in advance of hoisting the load. This applies to either radio or hand signal systems. Hand signals shall be as shown in Figure N-1.

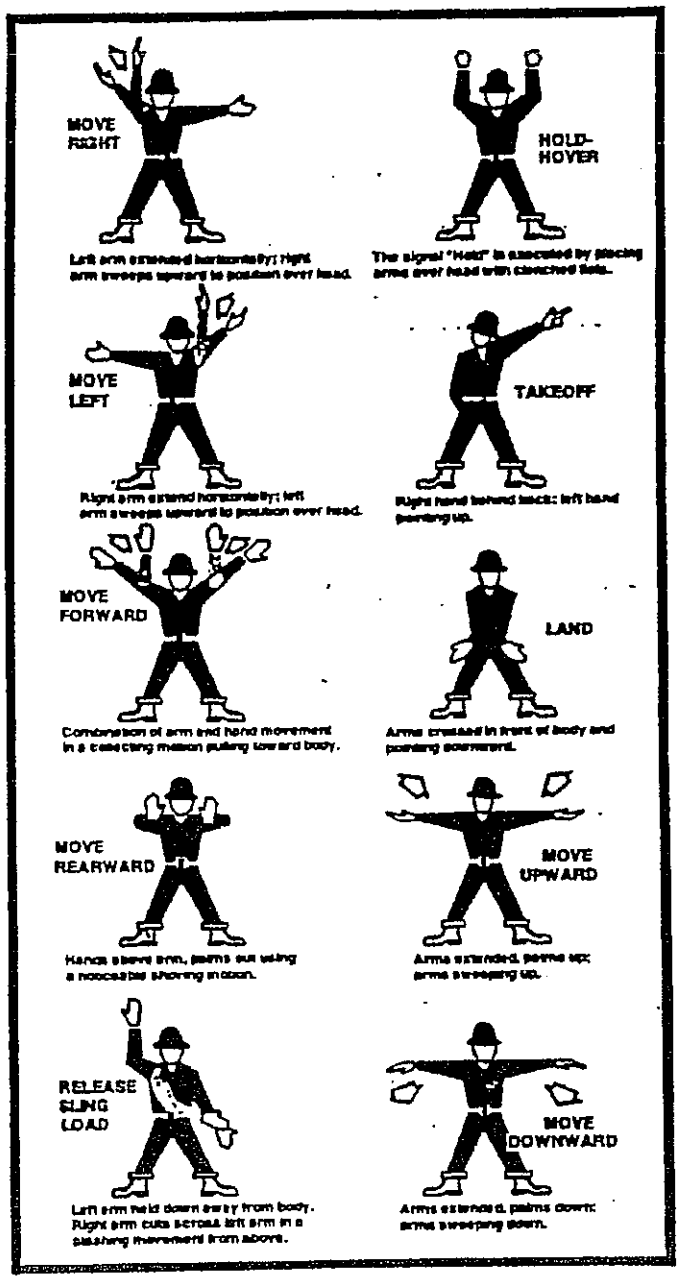


FIGURE N-1 HELICOPTER HAND SIGNAL

(o) *Approach distance.* No unauthorized person shall be allowed to approach within 50 feet of the helicopter when the rotor blades are turning.

(p) *Approaching helicopter.* Whenever approaching or leaving a helicopter with blades rotating, all employees shall remain in full view of the pilot and keep in a crouched position. Employees shall avoid the area from the cockpit or cabin rearward unless authorized by the helicopter operator to work there.

(q) *Personnel.* Sufficient ground personnel shall be provided when required for safe helicopter loading and unloading operations.

(r) *Communications.* There shall be constant reliable communication between the pilot, and a designated employee of the ground crew who acts as a signalman during the period of loading and unloading. This signalman shall be distinctly recognizable from other ground personnel.

(s) *Fires.* Open fires shall not be permitted in an area that could result in such fires be spread by the rotor downwash.

§1926.552 Material hoists, personnel hoists, and elevators.

(a) *General requirements.* (1) The employer shall comply with the manufacturer's specifications and limitations applicable to the operation of all hoists and elevators. Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a professional engineer competent in the field.

(2) Rated load capacities, recommended operating speeds, and special hazard warnings or instructions shall be posted on cars and platforms.

(3) Wire rope shall be removed from service when any of the following conditions exists:

(i) In hoisting ropes, six randomly distributed broken wires in one rope lay or three broken wires in one strand in one rope lay;

(ii) Abrasion, scrubbing, flattening, or peening, causing loss of more than one-third of the original diameter of the outside wires;

(iii) Evidence of any heat damage resulting from a torch or any damage caused by contact with electrical wires;

(iv) Reduction from nominal diameter of more than three sixty-fourths inch for diameters up to and including three-fourths inch; one-sixteenth inch for diameters seven-eights to 1 1/8 inches; and three thirty-seconds inch for diameters 1 1/4 to 1 1/2 inches.

(4) Hoisting ropes shall be installed in accordance with the wire rope manufacturers' recommendations.

(5) The installation of live booms on hoists is prohibited.

(6) The use of endless belt-type manlifts on construction shall be prohibited.

(b) *Material hoists.* (1) (i) Operating rules shall be established and posted at the operator's station of the hoist. Such rules shall include signal system and allowable line speed for various loads. Rules and notices shall be posted on the car frame or crosshead in a conspicuous location, including the statement "No Riders Allowed."

(ii) No person shall be allowed to ride on material hoists except for the purposes of inspection and maintenance.

(2) All entrances of the hoistways shall be protected by substantial gates or bars which shall guard the full width of the land-

ing entrance. All hoistway entrance bars and gates shall be painted with diagonal contrasting colors, such as black and yellow stripes.

(i) Bars shall be not less than 2- by 4-inch wooden bars or the equivalent, located 2 feet from the hoistway line. Bars shall be located not less than 36 inches nor more than 42 inches above the floor.

(ii) Gates or bars protecting the entrances to hoistways shall be equipped with a latching device.

(3) Overhead protective covering of 2-inch planking, ¾-inch plywood, or other solid material of equivalent strength, shall be provided on the top of every material hoist cage or platform.

(4) The operator's station of a hoisting machine shall be provided with overhead protection equivalent to tight planking not less than 2 inches thick. The support for the overhead protection shall be of equal strength.

(5) Hoist towers may be used with or without an enclosure on all sides. However, whichever alternative is chosen, the following applicable conditions shall be met:

(i) When a hoist tower is enclosed, it shall be enclosed on all sides for its entire height with a screen enclosure of ½-inch mesh, No. 18 U.S. gauge wire or equivalent, except for landing access.

(ii) When a hoist tower is not enclosed, the hoist platform or car shall be totally enclosed (caged) on all sides for the full height between the floor and the overhead protective covering with ½-inch mesh of No. 14 U.S. gauge wire or equivalent. The hoist platform enclosure shall include the required gates for loading and unloading. A 6-foot high enclosure shall be provided on the unused sides of the hoist tower at ground level.

(6) Car arresting devices shall be installed to function in case of rope failure.

(7) All material hoist towers shall be designed by a licensed professional engineer.

(8) All material hoists shall conform to the requirements of ANSI A10.5-1969, Safety Requirements for Material Hoists.

(c) *Personnel hoists.* (1) Hoist towers outside the structure shall be enclosed for the full height on the side or sides used for entrance and exit to the structure. At the lowest landing, the enclosure on the sides not used for exit or entrance to the structure shall be enclosed to a height of at least 10 feet. Other sides of the tower adjacent to floors or scaffold platforms shall be enclosed to a height of 10 feet above the level of such floors or scaffolds.

(2) Towers inside of structures shall be enclosed on all four sides throughout the full height.

(3) Towers shall be anchored to the structure at intervals not exceeding 25 feet. In addition to tie-ins, a series of guys shall be installed. Where tie-ins are not practical the tower shall be anchored by means of guys made of wire rope at least one-half inch in diameter, securely fastened to anchorage to ensure stability.

(4) Hoistway doors or gates shall be not less than 6 feet 6 inches high and shall be provided with mechanical locks which cannot be operated from the landing side, and shall be accessible only to persons on the car.

(5) Cars shall be permanently enclosed on all sides and the top, except sides used for entrance and exit which have car gates or doors.

(6) A door or gate shall be provided at each entrance to the car which shall protect the full width and height of the car entrance opening.

(7) Overhead protective covering of 2-inch planking, ¾-inch plywood or other solid material or equivalent strength shall be provided on the top of every personnel hoist.

(8) Doors or gates shall be provided with electric contacts which do not allow movement of the hoist when door or gate is open.

(9) Safeties shall be capable of stopping and holding the car and rated load when traveling at governor tripping speed.

(10) Cars shall be provided with a capacity and data plate secured in a conspicuous place on the car or crosshead.

(11) Internal combustion engines shall not be permitted for direct drive.

(12) Normal and final terminal stopping devices shall be provided.

(13) An emergency stop switch shall be provided in the car and marked "Stop."

(14) Ropes: (i) The minimum number of hoisting ropes used shall be three for traction hoists and two for drum-type hoists.

(ii) The minimum diameter of hoisting and counterweight wire ropes shall be ½-inch.

(iii) Safety factors:

MINIMUM FACTORS OF SAFETY FOR SUSPENSION WIRE ROPES

Rope speed in feet per minute	Minimum factor of safety
50	7.60
75	7.75
100	7.95
125	8.10
150	8.25
175	8.40
200	8.60
225	8.75
250	8.90
300	9.20
350	9.50
400	9.75
450	10.00
500	10.25
550	10.45
600	10.70

(15) Following assembly and erection of hoists, and before being put in service, an inspection and test of all functions and safety devices shall be made under the supervision of a competent person. A similar inspection and test is required following major alteration of an existing installation. All hoists shall be inspected and tested at not more than 3-month intervals. The employer shall prepare a certification record which includes the date the inspection and test of all functions and safety devices was performed; the signature of the person who performed the inspection and test; and a serial number, or other identifier, for the hoist that was inspected and tested. The most recent certification record shall be maintained on file.

(iii) A means whereby remotely operated hoists stop when any control is ineffective.

4) All base-mounted drum hoists in use shall meet the applicable requirements for design, construction, installation, testing, inspection, maintenance, and operations, as prescribed by the manufacturer.

(b) *Specific requirements.* (Reserved)

§1926.554 Overhead hoists.

(a) *General requirements.* (1) The safe working load of the overhead hoist, as determined by the manufacturer, shall be indicated on the hoist, and this safe working load shall not be exceeded.

(2) The supporting structure to which the hoist is attached shall have a safe working load equal to that of the hoist.

(3) The support shall be arranged so as to provide for free movement of the hoist and shall not restrict the hoist from lining itself up with the load.

4) The hoist shall be installed only in locations that will permit the operator to stand clear of the load at all times.

(5) Air hoists shall be connected to an air supply of sufficient capacity and pressure to safely operate the hoist. All air hoses supplying air shall be positively connected to prevent their becoming disconnected during use.

(6) All overhead hoists in use shall meet the applicable requirements for construction, design, installation, testing, inspection, maintenance, and operation, as prescribed by the manufacturer.

(b) *Specific requirements.* (Reserved)

§1926.555 Conveyors.

(a) *General requirements.* (1) Means for stopping the motor or engine shall be provided at the operator's station. Conveyor systems shall be equipped with an audible warning signal to be sounded immediately before starting up the conveyor.

(2) If the operator's station is at a remote point, similar provisions for stopping the motor or engine shall be provided at the motor or engine location.

(3) Emergency stop switches shall be arranged so that the conveyor cannot be started again until the actuating stop switch has been reset to running or "on" position.

(4) Screw conveyors shall be guarded to prevent employee contact with turning flights.

(5) Where a conveyor passes over work areas, aisles, or thoroughfares, suitable guards shall be provided to protect employees required to work below the conveyors.

(6) All crossovers, aisles, and passageways shall be conspicuously marked by suitable signs, as required by Subpart G of this part.

(7) Conveyors shall be locked out or otherwise rendered inoperable, and tagged out with a "Do Not Operate" tag during repairs and when operation is hazardous to employees performing maintenance work.

(8) All conveyors in use shall meet the applicable requirements for design, construction, inspection, testing, maintenance, and operation, as prescribed in the ANSI B20.1-1957, Safety Code for Conveyors, Cableways, and Related Equipment.

(16) All personnel hoists used by employees shall be constructed of materials and components which meet the specifications for materials, construction, safety devices, assembly, and structural integrity as stated in the American National Standard A10.4-1963, Safety Requirements for Workmen's Hoists. The requirements of this paragraph (c)(16) do not apply to cantilever type personnel hoists.

(17)(i) Personnel hoists used in bridge tower construction shall be approved by a registered professional engineer and erected under the supervision of a qualified engineer competent in this field.

(ii) When a hoist tower is not enclosed, the hoist platform or car shall be totally enclosed (caged) on all sides for the full height between the floor and the overhead protective covering with $^3/_4$-inch mesh of No. 14 U.S. gauge wire or equivalent. The hoist platform enclosure shall include the required gates for loading and unloading.

(iii) These hoists shall be inspected and maintained on a weekly basis. Whenever the hoisting equipment is exposed to winds exceeding 35 miles per hour it shall be inspected and put in operable condition before reuse.

(iv) Wire rope shall be taken out of service when any of the following conditions exist:

(a) In running ropes, six randomly distributed broken wires in one lay or three broken wires in one strand in one lay;

(b) Wear of one-third the original diameter of outside individual wires. Kinking, crushing, bird caging, or any other damage resulting in distortion of the rope structure;

(c) Evidence of any heat damage from any cause;

(d) Reductions from nominal diameter of more than three-sixty-fourths inch for diameters to and including three-fourths inch, one-sixteenth inch for diameters seven-eights inch to $1^1/_8$ inches inclusive, three-thirty-seconds inch for diameters $1^1/_4$ to $1^1/_2$ inches inclusive;

(e) In standing ropes, more than two broken wires in one lay in sections beyond end connections or more than one broken wire at an end connection.

(d) Permanent elevators under the care and custody of the employer and used by employees for work covered by this Act shall comply with the requirements of American National Standards Institute A17.1-1965 with addenda A17.1a-1967, A17.1b-1968, A17.1c-1969, A17.1d-1970, and inspected in accordance with A17.2-1960 with addenda A17.2a-1965, A17.2b-1967.

§1926.553 Base-mounted drum hoists.

(a) *General requirements.* (1) Exposed moving parts such as gears, projecting screws, setscrews, chain, cables, chain sprockets, and reciprocating or rotating parts, which constitute a hazard, shall be guarded.

(2) All controls used during the normal operation cycle shall be located within easy reach of the operator's station.

(3) Electric motor operated hoists shall be provided with:

(i) A device to disconnect all motors from the line upon power failure and not permit any motor to be restarted until the controller handle is brought to the "off" position;

(ii) Where applicable, an overspeed preventive device;

§1926.556 Aerial lifts.

(a) *General requirements.* (1) Unless otherwise provided in this section, aerial lifts acquired for use on or after the effective date of this section shall be designed and constructed in conformance with the applicable requirements of the American National Standards for "Vehicle Mounted Elevating and Rotating Work Platforms," ANSI A92.2-1969, including appendix. Aerial lifts acquired before the effective date of this section, which do not meet the requirements of ANSI A92.2-1969, may not be used after January 1, 1976, unless they shall have been modified so as to conform with the applicable design and construction requirements of ANSI A92.2-1969. Aerial lifts include the following types of vehicle-mounted aerial devices used to elevate personnel to job-sites above ground: (i) Extensible boom platforms; (ii) aerial ladders; (iii) articulating boom platforms; (iv) vertical towers; and (v) a combination of any of the above. Aerial equipment may be made of metal, wood, fiberglass reinforced plastic (FRP), or other material; may be powered or manually operated; and are deemed to be aerial lifts whether or not they are capable of rotating about a substantially vertical axis.

(2) Aerial lifts may be "field modified" for uses other than those intended by the manufacturer provided the modification has been certified in writing by the manufacturer or by any other equivalent entity, such as a nationally recognized testing laboratory, to be in conformity with all applicable provisions of ANSI A92.2-1969 and this section and to be at least as safe as the equipment was before modification.

(b) *Specific requirements*—(1) Ladder trucks and tower trucks. Aerial ladders shall be secured in the lower traveling position by the locking device on top of the truck cab, and the manually operated device at the base of the ladder before the truck is moved for highway travel.

(2) *Extensible and articulating boom platforms.* (i) Lift controls shall be tested each day prior to use to determine that such controls are in safe working condition.

(ii) Only authorized persons shall operate an aerial lift.

(iii) Belting off to an adjacent pole, structure, or equipment while working from an aerial lift shall not be permitted.

(iv) Employees shall always stand firmly on the floor of the basket, and shall not sit or climb on the edge of the basket or use planks, ladders, or other devices for a work position.

(v) A body belt shall be worn and a lanyard attached to the boom or basket when working from an aerial lift.

(vi) Boom and basket load limits specified by the manufacturer shall not be exceeded.

(vii) The brakes shall be set and when outriggers are used, they shall be positioned on pads or a solid surface. Wheel chocks shall be installed before using an aerial lift on an incline, provided they can be safely installed.

(viii) An aerial lift truck shall not be moved when the boom is elevated in a working position with men in the basket, except for equipment which is specifically designed for this type of operation in accordance with the provisions of paragraphs (a)(1) and (2) of this section.

(ix) Articulating boom and extensible boom platforms, primarily designed as personnel carriers, shall have both platform (upper) and lower controls. Upper controls shall be in or beside the platform within easy reach of the operator. Lower controls shall provide for overriding the upper con-

trols. Controls shall be plainly marked as to their function. Lower level controls shall not be operated unless permission has been obtained from the employee in the lift, except in case of emergency.

(x) Climbers shall not be worn while performing work from an aerial lift.

(xi) The insulated portion of an aerial lift shall not be altered in any manner that might reduce its insulating value.

(xii) Before moving an aerial lift for travel, the boom(s) shall be inspected to see that it is properly cradled and outriggers are in stowed position except as provided in paragraph (b)(2)(viii) of this section.

(3) *Electrical tests.* All electrical tests shall conform to the requirements of ANSI A92.2-1969 section 5. However equivalent d.c. voltage tests may be used in lieu of the a.c. voltage specified in A92.2-1969; d.c. voltage tests which are approved by the equipment manufacturer or equivalent entity shall be considered an equivalent test for the purpose of this paragraph (b)(3).

(4) *Bursting safety factor.* The provisions of the American National Standards Institute standard ANSI A92.2-1969, section 4.9 Bursting Safety Factor shall apply to all critical hydraulic and pneumatic components. Critical components are those in which a failure would result in a free fall or free rotation of the boom. All noncritical components shall have a bursting safety factor of at least 2 to 1.

(5) *Welding standards.* All welding shall conform to the following standards as applicable:

(i) Standard Qualification Procedure, AWS B3.0-41.

(ii) Recommended Practices for Automotive Welding Design, AWS D8.4-61.

(iii) Standard Qualification of Welding Procedures and Welders for Piping and Tubing, AWS D10.9-69.

(iv) Specifications for Welding Highway and Railway Bridges, AWS D2.0-69.

SAFETY MEETING

WORKING AROUND CRANES

week's safety topic is working around cranes. Cranes are found on most construction sites. The general actor and various subcontractors use them to move materials and equipment. Your employer may have one on job. There are some very important things that you need to know about cranes to prevent accidents from rring when you are working near them.

stay clear of the swing zone of the crane. The swing zone is located around the crane's superstructure and ses the operator's cab, the engine and the counterweight. Most crane operators will mark this area off with a ing line running from the outriggers back to the frame of the crane. Keep out of this area so you don't get crushed.

ware of electrical hazards. Watch out for these during transport, set up and operation of the crane. A crane boom comes in contact with a power line will provide a direct circuit to ground. If you are ever near a crane that does act a power line call the correct electric utility immediately. Do not approach the crane; if you get too close, the ricity may arc and electrocute you. Try to keep the operator calm and in the cab until the power is turned off. sure you follow the manufacturer's recommendations and OSHA standards when working around power lines.

n doing maintenance, never reach into boom sections. Do not wear loose fitting clothing when working on the ment and always have a fire extinguisher handy. Never start or operate any crane until all personnel are clear.

e making a lift, be sure you have sufficient clearance between the load and the boom, and adequate head room een the load and whatever rigging is required to make the lift. Every crane must be equipped with a load chart has clearly legible letters and figures. Make sure you read and understand the load chart before making any lift. ave questions about the chart or the weight that is going to be lifted ask your supervisor. A qualified signal should be used whenever the load cannot be clearly seen by the operator. Don't hitch a ride on the chassis of a ---t never ride on a load.

Mobile cranes are becoming larger, more expensive, and more sophisticated all the time. Keep a sharp lookout when working around them.

' REMINDERS

Topics For Your Project _____

_____

_____

e Safety Recommendations _____

_____

d M.S.D.S. # _____ Subject: _____

Attended By

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

Signature _____

These instructions do not supersede local, state or federal regulations.

POSILLICO-SCALAMANDRE JOINT VENTURE

SAFETY MEETING

TIPS FOR OPERATORS

I are the one responsible for operating a piece of equipment, here are some safety tips:

Operators wear hard hats at all times and use seat belts when provided.
Always get on and off by the three point method.
Clean the windshield at the start of each shift.
Check the fluid levels, also brakes, horn and side view mirrors.
Test your turn signals, head lights and back-up alarm.
Check your fire extinguisher and inspect tires and wipers.
Make sure other workers are clear before you start your equipment.
Keep workers outside of the swing radius.
Never carry co-workers unless the rig is designed for passengers.
Never let anyone ride the headache ball.
Don't overload your rig - follow the manufacturer's capacity ratings.
Watch out for overhead power lines and keep away from them.
Secure dump bodies before working under them.
Crib up blades and release stored pressure.
Keep your hands away from sprockets and gears.
Be familiar with locations and operation of override controls.
Secure your load before traveling and observe all road signs.
If you travel on a public roadway with an off the road vehicle, proper escort is required.
Always keep your attention on the direction of travel and don't speed.
Shut off engines before fueling and never smoke while refueling.
Shut off all power controls before making adjustments.
Remove rings, watches and jewelry before performing maintenance.
Caution when checking hot pressurized engine coolant systems.
Keep oil, grease and water wiped from standing surfaces and hand holds.

REMINDERS STOP & CALL YOUR SUPERVISOR IF THE RIG DOESN'T FEEL RIGHT.
YOUR PIECE OF EQUIPMENT RESPONDS TO YOUR MOVEMENTS, MAKE SURE THEY'RE SAFE ONES.

Topics For Your Project _____

_____

_____

Safety Recommendations _____

_____

_____

M.S.D.S. # _____ Subject _____

Attended By

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

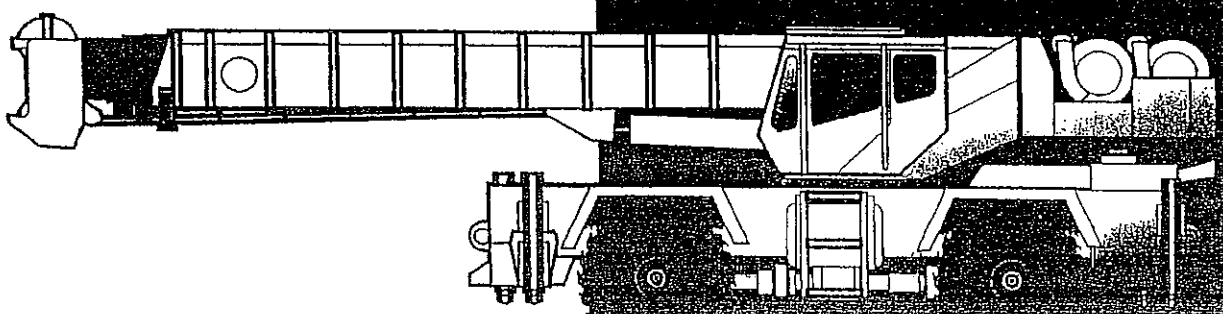
Name _____

These instructions do not supersede local, state or federal regulations

GROVE®
CRANE
A GROVE WORLDWIDE COMPANY

1995
81920

RT635C



Rough Terrain Hydraulic Crane


34 - 105 ft.
(10.4 - 32.0 m)


5,787 lbs.
(2624 kg)


Stationary


360°

26.5 x 25 - 26PR Tires

75% Domestic (Pounds)

(Feet)	34	40	50	*58	60	70	80	90	100
10	37,600	35,650							
12	31,450	31,200							
15	21,550	21,200	20,600						
20	12,950	12,650	12,200	11,800	11,950				
25	8,510	8,250	7,800	7,460	7,690	8,760	8,920		
30		5,470	5,080	4,780	4,920	5,530	6,130	6,510	
35			3,230	2,970	3,100	3,680	4,250	4,570	4,900
40			1,890	1,670	1,790	2,340	2,900	3,160	3,460
45						1,340	1,760	1,760	1,760

*58 ft. boom length is with inner-mid extended and outer-mid & fly retracted.

A6-829-011675


34 - 105 ft.
(10.4 - 32.0 m)


5,787 lbs.
(2624 kg)


Pick & Carry
Up to 2.5 MPH
Centered over Front

26.5 x 25 - 26PR Tires

75% Domestic (Pounds)

(Feet)	34	40	50	*58	60	70	80	90	100
10	49,200	49,200							
12	42,950	42,950							
15	35,850	35,800	29,300	29,300	29,300				
20	24,350	24,200	23,950	23,750	23,650				
25	16,350	16,150	15,850	15,600	15,700	16,050	16,400	16,900	
30		11,400	11,150	10,900	11,000	11,400	11,800	12,250	12,700
35			8,060	7,880	7,980	8,400	8,810	9,210	9,600
40			5,890	5,740	5,840	6,270	6,710	7,070	7,430
45				4,150	4,250	4,700	5,150	5,490	5,820
50				2,920	3,030	3,490	3,950	4,270	4,580
55						2,580	3,000	3,300	3,600
60						1,840	2,220	2,510	2,790
65							1,580	1,850	2,130
70							1,040	1,300	1,570
75									1,090

*58 ft. boom length is with inner-mid extended and outer-mid & fly retracted.

A6-829-011676

THIS CHART IS ONLY A GUIDE AND SHOULD NOT BE USED TO OPERATE THE CRANE. The individual crane's load chart, operating instructions and other instructional plates must be read and understood prior to operating the crane.

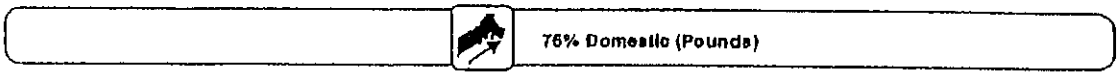

34 - 105 ft.
(10.4 - 32.0 m)


5,787 lbs.
(2624 kg)


Pick & Carry
Up to 2.5 MPH


Centered
Over Front

23.5R25 Tires



(Feet)	34	40	50	*58	60	70	80	90	100
10	38,150	38,150							
12	33,350	33,350							
15	27,800	27,700							
20	21,450	21,250	20,900	20,650	20,650				
25	15,900	16,600	15,950	14,600	14,800				
30		11,150	9,070	10,250	10,400	11,200	11,950		
35			7,760	7,440	7,590	8,260	8,920	9,300	9,820
40			5,720	5,450	5,580	6,190	6,800	7,140	7,450
45				3,970	4,100	4,660	5,220	5,530	5,840
50				2,840	2,510	3,480	3,990	4,300	4,600
55						2,550	3,010	3,320	3,620
60						1,800	2,220	2,520	2,820
65							1,550	1,860	2,150
70							1,000	1,300	1,580
75									1,100

*58 ft. boom length is with inner-mid extended and outer-mid & fly retracted.

A6-829-011624

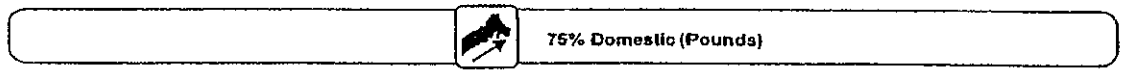

34 - 105 ft.
(10.4 - 32.0 m)


5,787 lbs.
(2624 kg)


Stationary


Defined Arc
Over Front

26.5 x 25 - 26PR Tires



(Feet)	34	40	50	*58	60	70	80	90	100
10	38,650	35,550							
12	36,000	33,250							
15	32,300	30,050	23,350						
20	24,350	24,200	22,400	20,250	17,500				
25	16,350	16,150	15,850	15,600	15,700	16,050	13,050		
30		11,400	11,150	10,900	11,000	11,400	11,800	8,020	
35			8,060	7,880	7,980	8,400	8,810	8,020	8,420
40			5,690	5,740	5,840	6,270	6,710	7,070	7,430
45				4,150	4,250	4,700	5,150	5,490	5,820
50				2,920	3,030	3,490	3,950	4,270	4,580
55						2,580	3,000	3,300	3,600
60						1,840	2,220	2,510	2,790
65							1,580	1,850	2,130
70							1,040	1,300	1,570
75									1,090

*58 ft. boom length is with inner-mid extended and outer-mid & fly retracted.

A6-829-011674


34 - 105 ft.
(10.4 - 32.0 m)


5,787 lbs.
(2624 kg)


Stationary


Defined Arc
Over Front

23.5R25 Tires


75% Domestic (Pounds)

(Feet)	34	40	50	*58	60	70	80	90	100
10	36,650	34,600							
12	32,550	30,650	27,450	24,400	24,400				
15	27,400	25,900	21,100	21,100	21,100				
20	21,100	20,050	18,300	16,900	16,900	16,400	14,450		
25	15,900	16,600	14,650	13,650	13,650	13,650	13,000	11,250	
30		11,150	9,070	10,250	10,400	11,200	11,200	10,150	8,090
35			7,760	7,440	7,590	8,260	8,920	8,920	7,370
40			5,720	5,450	5,580	6,190	6,600	7,140	6,660
45				3,970	4,100	4,660	5,220	5,630	5,840
50				2,840	2,950	3,480	3,990	4,300	4,600
55						2,550	3,010	3,320	3,620
60						1,800	2,220	2,520	2,820
65							1,550	1,860	2,150
70							1,000	1,300	1,580
75									1,100

*58 ft. boom length is with inner-mid extended and outer-mid & fly retracted.

A6-829-011622


34 - 105 ft.
(10.4 - 32.0 m)


5,787 lbs.
(2624 kg)


Stationary


360°

23.5R25 Tires


75% Domestic (Pounds)

(Feet)	34	40	50	*58	60	70	80	90	100
10	31,700	31,200							
12	26,800	26,250	25,200	24,400	24,400				
15	19,650	19,400	19,050	18,700	18,700				
20	11,850	11,600	11,250	11,100	11,150	11,950			
25	7,770	7,560	7,210	6,820	7,090	7,780	8,480	8,810	
30		4,980	4,400	4,110	4,420	5,210	5,820	6,170	6,170
35			2,580	2,160	2,360	3,420	3,690	4,230	4,230
40						1,900	2,100	2,760	2,760
45								1,600	1,600

*58 ft. boom length is with inner-mid extended and outer-mid & fly retracted.

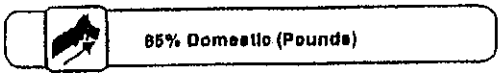
A6-829-011623

29 -51 ft.
(8.8 -15.5 m)

5,787 lbs.
(2624 kg)

100%

360°



(Feet)	29 ft. LENGTH 0° OFFSET	30°OFFSET	51 ft. LENGTH 0° OFFSET	30°OFFSET
30	9,000			
35	8,600		*5,065	
40	8,250	*5,000	4,900	
45	7,500	4,800	4,700	
50	6,850	4,600	4,400	
55	6,250	4,400	4,000	*2,800
60	5,600	4,350	3,800	2,700
65	5,000	4,300	3,700	2,600
70	4,450	4,250	3,500	2,500
75	4,000	4,200	3,400	2,400
80	3,550	3,600	3,300	2,350
85	3,150	3,300	3,100	2,300
90	2,800	2,860	2,900	2,250
95	2,360	2,360	2,700	2,200
100	1,910	1,910	2,350	2,150
105	1,510	1,510	2,050	2,150
110	1,150	1,150	1,900	2,040
115			1,660	1,680
120			1,360	1,360
125			1,060	1,060

A6-829-011361B

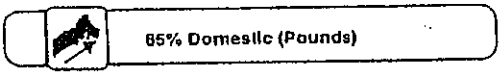
*This capacity is based upon maximum boom angle.

29 -51 ft.
(8.8 -15.5 m)

5,787 lbs.
(2624 kg)

50%

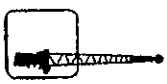
360°



(Feet)	29 ft. LENGTH 0° OFFSET	30°OFFSET	51 ft. LENGTH 0° OFFSET	30°OFFSET
30	9,000			
35	8,600		*5,065	
40	8,250	*5,000	4,900	
45	7,090	4,800	4,700	
50	5,740	4,600	4,400	
55	4,630	4,400	4,000	*2,800
60	3,710	3,710	3,800	2,700
65	2,930	2,930	3,700	2,600
70	2,260	2,260	3,050	2,500
75	1,690	1,690	2,490	2,400
80	1,180	1,180	1,990	1,990
85			1,550	1,550
90			1,160	1,160

A6-829-012057A

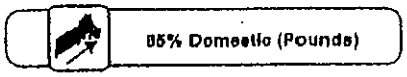
*This capacity is based upon maximum boom angle.


29 ft.
(8.8 m)


5,787 lbs.
(2624 kg)


100%


360°



(Feet)	0° OFFSET	30° OFFBET
30	9,360	
35	8,960	
40	8,610	*5,360
45	7,860	5,160
50	7,210	4,960
55	6,610	4,750
60	6,060	4,710
65	5,360	4,660
70	4,610	4,610
75	4,360	4,660
80	3,910	4,160
85	3,510	3,660
90	3,160	3,260
95	2,860	2,860
100	2,430	2,430
105	2,020	2,020
110	1,670	1,670

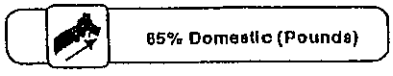
A6-829-011544


29 ft.
(8.8 m)


5,787 lbs.
(2624 kg)


50%


360°



(Feet)	0° OFFSET	30° OFFSET
30	9,360	
35	8,960	
40	8,610	*5,360
45	7,700	5,160
50	6,340	4,960
55	5,240	4,750
60	4,320	4,320
65	3,540	3,540
70	2,880	2,880
75	2,300	2,300
80	1,800	1,800
85	1,360	1,360

A6-829-012409A


34 -105 ft.
(10.4 - 32.0 m)


5,787 lbs.
(2624 kg)


50%


360°

65% Domestic (Pounds)

(Feet)	34	40	50	*58	60	70	80	90	100	105
10	70,000	66,900	58,850	44,600	29,300					
12	64,350	64,000	55,000	44,600	29,300	29,300				
15	64,050	63,550	48,000	41,500	29,300	29,300				
20	35,000	33,350	30,850	29,350	29,250	28,900	28,400	27,000		
25	23,150	22,700	21,500	20,450	20,500	20,550	20,450	20,250	18,550	@15,950
30		16,000	15,500	15,050	15,150	15,350	15,450	15,400	15,350	15,250
35			11,400	11,050	11,200	11,350	12,000	12,100	12,100	12,100
40			8,590	8,310	8,450	9,050	9,540	9,680	9,750	9,770
45				6,290	6,420	6,990	7,550	7,820	7,930	7,970
50				4,740	4,870	5,410	5,960	6,330	6,490	6,540
55						4,210	4,700	5,050	5,330	5,390
60						3,240	3,680	4,010	4,340	4,430
65							2,850	3,160	3,470	3,620
70							2,140	2,440	2,750	2,900
75								1,840	2,130	2,270
80								1,330	1,600	1,730
									1,140	1,270

*58 ft. boom length is with inner-mid extended and outer-mid & fly retracted.
@Capacity also applicable at maximum boom angle.

A6-829-012055A


34 -105 ft.
(10.4 - 32.0 m)


5,787 lbs.
(2624 kg)


0%


360°

76% Domestic (Pounds)

(Feet)	34	40	50	*58	60	70	80	90	100	105
10	47,200	44,100	39,900	37,150	29,300					
12	36,100	33,900	30,900	28,950	28,800	28,000				
15	24,700	24,250	22,450	21,100	21,100	20,850				
20	15,050	14,650	14,200	13,050	13,200	13,750	13,750	13,650		
25	10,050	9,660	8,950	8,400	8,530	9,120	9,720	9,780	9,760	9,740
30		6,270	5,880	5,570	5,690	6,230	6,780	7,170	7,240	7,260
35			3,930	3,660	3,790	4,300	4,800	5,190	5,410	5,460
40			2,540	2,320	2,430	2,910	3,390	3,740	4,030	4,090
45				1,300	1,400	1,860	2,320	2,650	2,950	3,020
50						1,050	1,500	1,800	2,080	2,160
55								1,120	1,370	1,450

*58 ft. boom length is with inner-mid extended and outer-mid & fly retracted.

A6-829-012056


34 -105 ft.
(10.4 - 32.0 m)


5,787 lbs.
(2624 kg)


100%


360°


85% Domestic (Pounds)

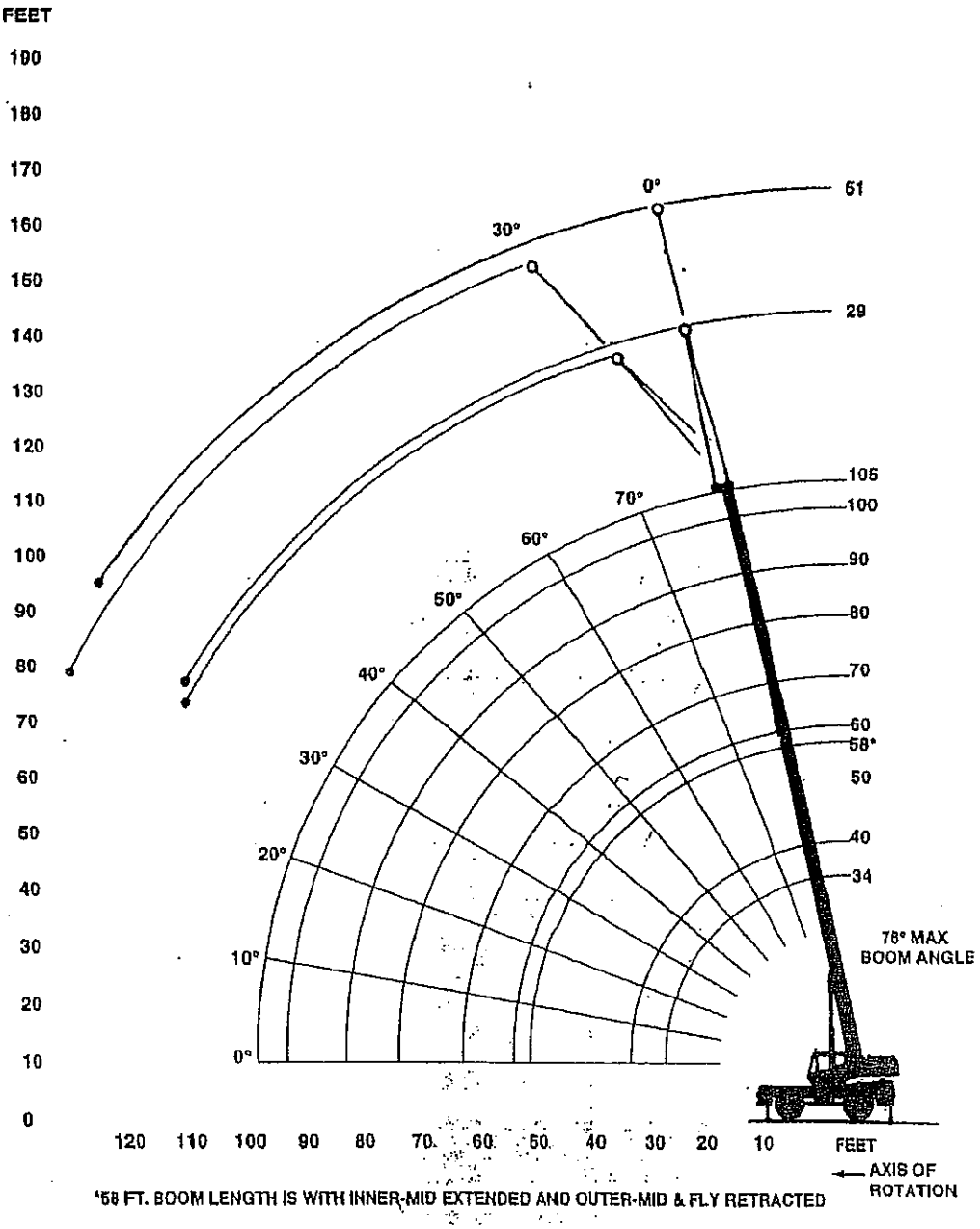
(Feet)	34	40	50	*58	60	70	80	90	100	105
10	70,000	66,900	59,850	44,600	29,300					
12	66,050	64,100	55,000	44,600	29,300	29,300				
15	59,150	57,650	48,000	41,500	29,300	29,300				
20	45,900	45,450	38,500	35,900	29,300	29,300	29,300	27,000		
25	35,550	35,250	32,400	30,500	29,300	27,950	26,350	23,250	18,550	@ 15,850
30		27,150	26,500	25,550	25,300	24,000	22,950	20,300	16,500	15,850
35			19,550	19,150	19,350	20,250	20,000	17,950	14,600	14,350
40			15,000	14,650	14,850	15,650	16,450	16,000	13,400	12,850
45				11,500	11,650	12,400	13,100	13,460	12,500	11,550
50				9,160	9,330	10,000	10,650	10,950	11,300	10,400
55						8,170	8,770	9,080	9,390	9,450
60						6,710	7,250	7,560	7,870	8,020
65							6,020	6,320	6,630	6,790
70							4,990	5,300	5,610	5,760
75								4,450	4,750	4,890
80								3,740	4,020	4,150
85									3,390	3,510
90									2,830	2,950
95										2,460

*58 ft. boom length is with inner-mid extended and outer-mid & fly retracted.
@ Capacity also applicable at maximum boom angle.

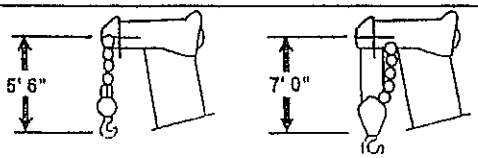
A5-829-011360A

THIS CHART IS ONLY LEGIBLE AND CORRECT WHEN PRINTED TO CREATE THE ORIGINAL SIZE

Working Range

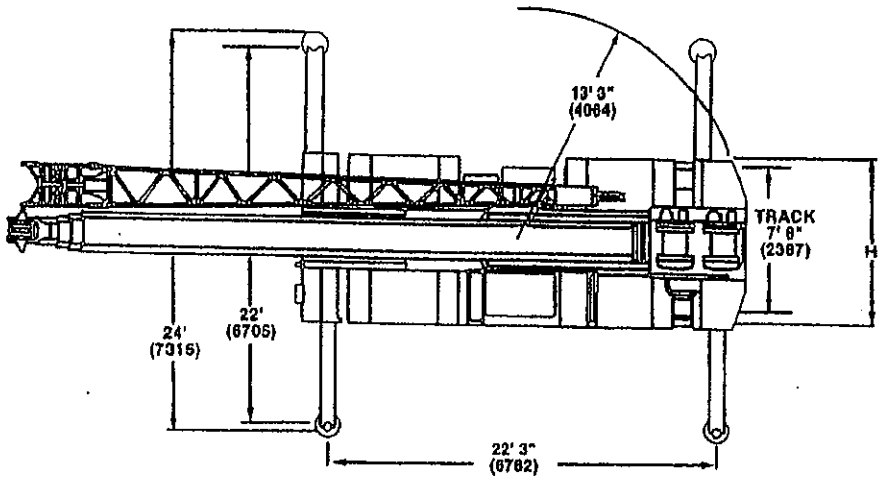


*58 FT. BOOM LENGTH IS WITH INNER-MID EXTENDED AND OUTER-MID & FLY RETRACTED

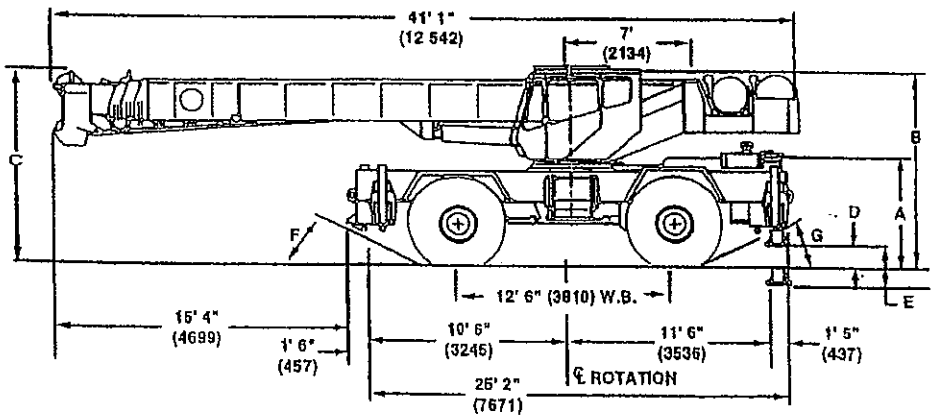


DIMENSIONS ARE FOR LARGEST GROVE FURNISHED HOOK BLOCK AND HEADACHE BALL, WITH ANTI-TWO BLOCK ACTIVATED.

Dimensions



	Tire Size	
	23.5 x 25	26.5 x 25
A	5' 4" (1631)	5' 5" (1661)
B	12' 1" (3687)	12' 2" (3715)
C	10' 11" (3323)	11' 0" (3353)
D	1' 9-3/4" (553)	1' 4-1/4" (413)
E	21" (533)	25" (635)
F	24-1/2"	20"
G	22"	19"
H	9' 10" (2997)	10' 9" (3277)



Turning Radius . . . . . 20' (6096 mm) (23.5 Tires)

Front Axle Load . . . . . 32,258 lbs. (14 632 kg)

Rear Axle Load . . . . . 30,893 lbs. (14 013 kg)

Gross Vehicle Weight . . . . . 63,151 lbs. (28 645 kg)

Rated Lifting Capacities

IMPORTANT NOTES:

WARNING: THIS CHART IS ONLY A GUIDE. **The notes below are for illustration only and should not be relied upon to operate the crane. The individual crane's load chart, operating instructions and other instruction plates must be read and understood prior to operating the crane.**

1. All rated loads have been tested to and meet minimum requirements of SAE J1063 OCT90 - Cantilevered Boom Crane Structures - Method of Test, and do not exceed 85% of the tipping load on outriggers fully extended and 50% extended, and 75% of the tipping load on outriggers 0% extended (fully retracted) and on rubber, as determined by SAE J765 OCT90 Crane Stability Test Code.

2. Capacities given do not include the weight of hookblocks, slings, auxiliary lifting equipment and load handling devices. Their weights must be added to the load to be lifted. When more than minimum required reeving is used, the additional rope weight shall be considered part of the load.

3. Defined Arc ±6° on either side of longitudinal centerline of machine.

4. Capacities appearing above the bold line are based on structural strength and tipping should not be relied upon as a capacity limitation.

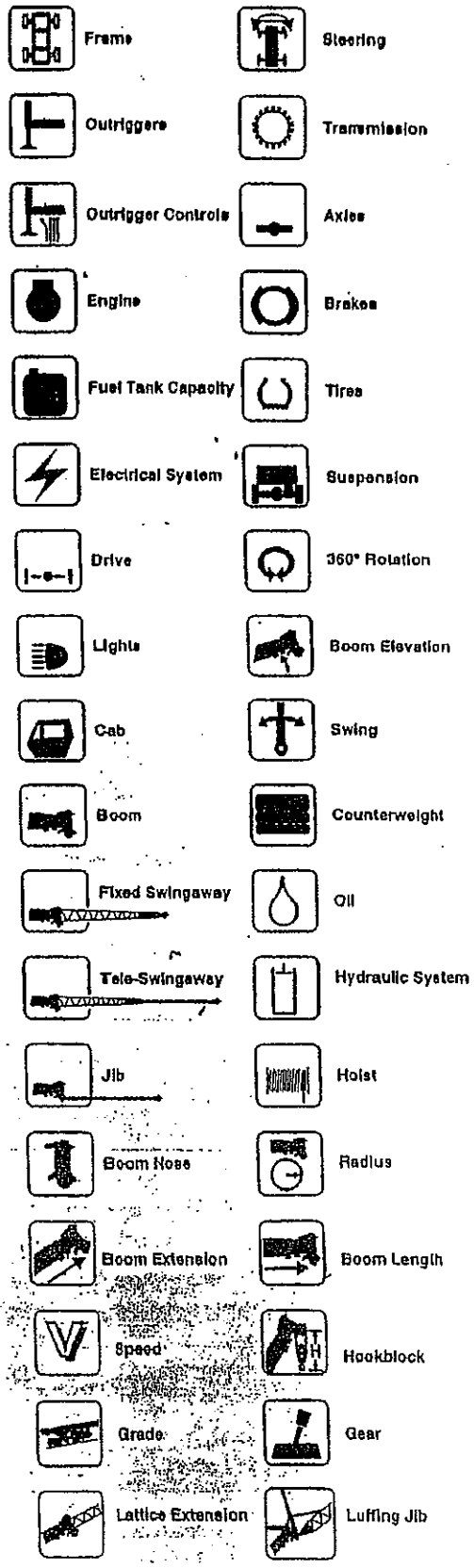
5. All capacities are for crane on firm, level surface. It may be necessary to have structural supports under the outrigger floats or tires to spread the load to a larger bearing surface.

6. When either boom length or radius or both are between values listed, the smallest load shown at either the next larger radius or boom length shall be used.

7. Tires shall be inflated to the recommended pressure before lifting on rubber.

8. For outrigger operation, ALL outriggers shall be properly extended with tires raised free of ground before raising the boom or lifting loads.

Symbols Glossary



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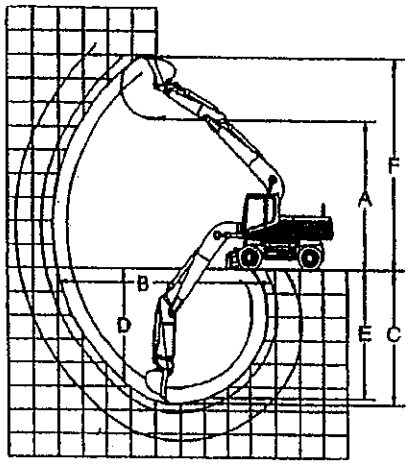


'8 and

- General purpose bucket

KEY:

- **A** Maximum loading height of bucket with teeth
- **B** Maximum reach at ground level
- **C** Maximum digging depth
- **D** Maximum vertical wall
- **E** Maximum depth of cut for 2.44 m (8'0") level bottom (straight clean up)
- **F** Maximum height, to bucket teeth at highest arc

M312

Stick	1.6 m	5'3"	2 m	6'6"	2.3 m	7'5"	2.6 m	8'5"	3 m	9'9"
	m	ft	m	ft	m	ft	m	ft	m	ft
A	5.64	18'5"	5.86	19'2"	6.03	19'8"	6.19	20'3"	6.20	20'3"
B	7.62	25'0"	8.01	26'3"	8.30	27'2"	8.59	28'2"	8.90	29'2"
C	4.42	14'5"	4.82	15'8"	5.12	16'8"	5.42	17'6"	5.82	19'1"
D	2.39	7'0"	3.75	12'3"	4.03	13'2"	4.30	14'1"	4.39	14'4"
E	4.10	13'5"	4.57	15'0"	4.89	16'0"	5.21	17'1"	5.63	18'5"
F	7.68	25'5"	8.21	26'9"	8.38	27'5"	8.55	28'1"	8.52	28'0"

Stick	
A	
B	
C	
D	
E	
F	

M315

Stick	1.7 m	5'7"	2.1 m	6'9"	2.4 m	7'9"	2.6 m	8'5"	3.1 m	10'1"
	m	ft	m	ft	m	ft	m	ft	m	ft
A	5.94	19'6"	6.16	20'3"	6.33	20'9"	6.44	21'1"	6.59	21'7"
B	7.95	26'1"	8.34	27'4"	8.63	28'4"	8.82	28'9"	9.26	30'5"
C	4.65	15'3"	5.05	16'7"	5.35	17'7"	5.55	18'2"	6.05	19'10"
D	2.51	8'0"	4.00	13'1"	4.27	14'0"	4.48	14'8"	4.76	15'7"
E	4.37	14'4"	4.81	15'9"	5.13	16'10"	5.34	17'6"	5.87	19'3"
F	6.18	26'10"	8.52	27'11"	8.69	28'6"	8.80	28'10"	8.93	29'4"

Stick	
Bucket	1
A	
B	
C	
D	
E	
F	

M315 • 4-Point Outriggers Down • 1100 mm (3'7") Bucket • One-Piece Boom

Stick		3 m 10'0" Front	3 m 10'0" Side	4.5 m 15'0" Front	4.5 m 15'0" Side	6 m 20'0" Front	6 m 20'0" Side	7.5 m 25'0" Front	7.5 m 25'0" Side	At Max. Reach Front	At Max. Reach Side
1700 mm 5'10"	kg	—	—	6700*	6400	4800*	4100	—	—	2600*	2600*
	lb			14,770*	14,110	10,580*	9040			6730*	6730*
2100 mm 6'11"	kg	—	—	6700*	6500	4800*	4100	—	—	1700*	1700*
	lb			14,770*	14,330	10,580*	9040			3740*	3740*
2400 mm 7'10"	kg	2500*	2500*	6700*	6500	4800*	4100	2900*	2900*	1500*	1500*
	lb	5510*	5510*	14,770*	14,330	10,580*	9040	6390*	6390*	3300*	3300*
2600 mm 8'6"	kg	2700*	2700*	6700*	6500	4800*	4100	3300*	2900*	1300*	1300*
	lb	5950*	5950*	14,770*	14,330	10,580*	9040	7270*	6390*	2860*	2860*

M315 • Free On Wheels • 1100 mm (3'7") Bucket • One-Piece Boom

Stick		3 m 10'0" Front	3 m 10'0" Side	4.5 m 15'0" Front	4.5 m 15'0" Side	6 m 20'0" Front	6 m 20'0" Side	7.5 m 25'0" Front	7.5 m 25'0" Side	At Max. Reach Front	At Max. Reach Side
1700 mm 5'10"	kg	—	—	4700	2600	3100	1700	—	—	2000	1100
	lb			10,360	5730	6830	3740			4410	2420
2100 mm 6'11"	kg	—	—	4800	2700	3100	1700	—	—	1700*	1000
	lb			10,580	5950	6830	3740			3740*	2200
2400 mm 7'10"	kg	2500*	2500*	4800	2700	3100	1700	2200	1200	1500*	1000
	lb	5510*	5510*	10,580	5950	6830	3740	4850	2640	3300*	2200
2600 mm 8'6"	kg	2700*	2700*	4800	2700	3100	1700	2200	1200	1300*	900
	lb	5950*	5950*	10,580	5950	6830	3740	4850	2640	2860*	1980

M315 • 4-Point Outriggers Down • 1100 mm (3'7") Bucket • VA Boom

Stick		3 m 10'0" Front	3 m 10'0" Side	4.5 m 15'0" Front	4.5 m 15'0" Side	6 m 20'0" Front	6 m 20'0" Side	7.5 m 25'0" Front	7.5 m 25'0" Side	At Max. Reach Front	At Max. Reach Side
1700 mm 5'10"	kg	9500*	9500*	6600*	6600*	4700*	4300	—	—	2400*	2400*
	lb	20,940*	20,940*	14,550*	14,550*	10,360*	9430			5290*	5290*
2100 mm 6'11"	kg	8900*	8900*	6600*	6500	4700*	4300	3000*	2900	1600*	1600*
	lb	19,620*	19,620*	14,550*	14,330	10,360*	9480	6610*	6390	3520*	3520*
2400 mm 7'10"	kg	8300*	8300*	6500*	6500*	4700*	4300	3000*	2900	1400*	1400*
	lb	18,300*	18,300*	14,330*	14,330	10,360*	9480	6610*	6390	3080*	3080*
2600 mm 8'6"	kg	8500*	8500*	6500*	6500*	4600*	4200	3000*	2900	1300*	1300*
	lb	18,740*	18,740*	14,330*	14,330*	10,140*	9260	6610*	6390	2860*	2860*

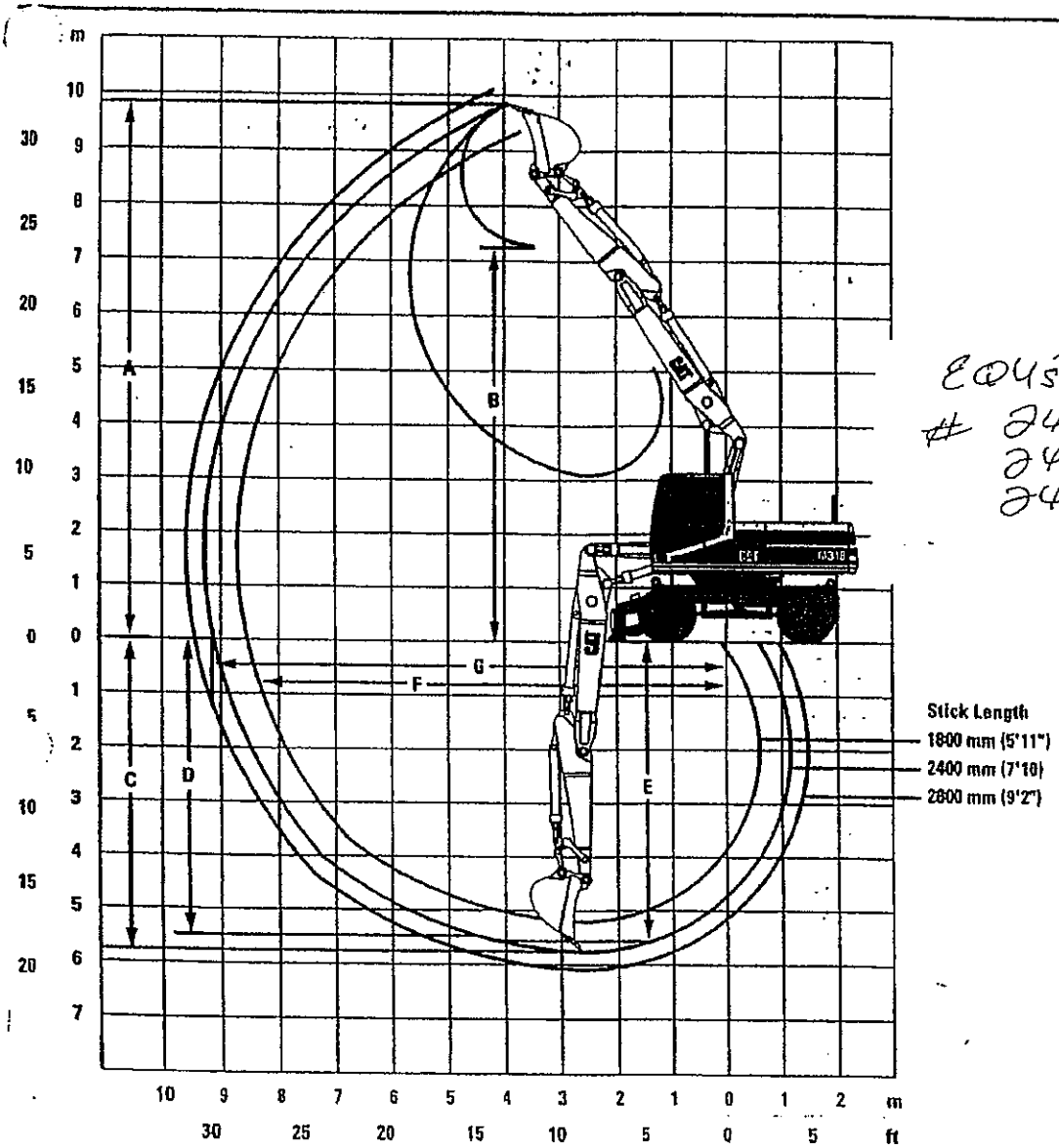
M315 • Free On Wheel • 1100 mm (3'7") Bucket • VA Boom

Stick		3 m 10'0" Front	3 m 10'0" Side	4.5 m 15'0" Front	4.5 m 15'0" Side	6 m 20'0" Front	6 m 20'0" Side	7.5 m 25'0" Front	7.5 m 25'0" Side	At Max. Reach Front	At Max. Reach Side
1700 mm 5'10"	kg	9500*	6800	5200	3200	3200	1800	—	—	1900	1000
	lb	20,940*	12,780	11,460	7050	7050	3960			4180	2200
2100 mm 6'11"	kg	8900*	5900	5200	3200	3300	2000	2200	1200	1600*	1000
	lb	19,620*	13,000	11,460	7050	7270	4410	4850	2640	3520*	2200
2400 mm 7'10"	kg	8300*	6000	5200	3200	3400	2000	2200	1200	1400*	900
	lb	18,300*	13,230	11,460	7050	7490	4410	4850	2640	3080*	1980
2600 mm 8'6"	kg	8500*	5800	5200	3300	3400	2000	2200	1200	1300*	900
	lb	18,740*	12,780	11,460	7270	7490	4410	4850	2640	2860*	1980

*Load limited by hydraulic capacity rather than tipping.

Working Ranges

With VA boom



Stick	1800 mm (5'11")	2400 mm (7'10")	2800 mm (9'2")
Bucket	0.90 m³ (1.18 yd³)	0.80 m³ (1.05 yd³)	0.70 m³ (.92 yd³)
A Maximum cutting height	9380 mm (30'9")	9840 mm (32'3")	10 020 mm (32'10")
B Maximum loading height	6780 mm (22'3")	7180 mm (23'7")	7380 mm (24'3")
C Maximum digging depth	5200 mm (17'7")	5790 mm (19'0")	6180 mm (20'3")
D Maximum vertical wall digging depth	3170 mm (10'5")	4430 mm (14'6")	4730 mm (15'6")
E Maximum depth of cut, for 2440 mm (8') level bottom	5080 mm (16'8")	5690 mm (18'8")	6150 mm (20'2")
Maximum reach	8630 mm (28'4")	9190 mm (30'2")	9530 mm (31'3")
Maximum reach at ground level	8430 mm (27'8")	9000 mm (29'6")	9350 mm (30'8")
Digging forces:			
Stick	108 kN (24,300 lb)	83 kN (18,675 lb)	75 kN (16,875 lb)
Bucket	122 kN (27,450 lb)	114 kN (25,650 lb)	114 kN (25,650 lb)

M318 Lift Capacities

All weights are in pounds (multiply by 1,000).

Hydraulically Adjustable Boom

Max. 5.25 m (17'3")
Stick
2.4 m (7'10")
Bucket
0.8 m³ (1.05 yd³)

VA Boom lift capacities vary with the degree of VA Boom extension. The lift capacities shown are minimums.

Undercarriage configuration	10'0"			15'0"			20'0"			25'0"						Max
20'0"																
Rear dozer up							*5.4		5.2							
Rear dozer down								*5.4	*5.4							
Rear stab down								*5.4	*5.4							
2 sets stab down							*5.4		*5.4							
Dozer and stab down							*5.4		*5.4							
15'0"																
Rear dozer up				*7.4		*7.4	*4.6		*4.6							
Rear dozer down					*7.4	*7.4		*4.6	*4.6							
Rear stab down					*7.4	*7.4		*4.6	*4.6							
2 sets stab down				*7.4		*7.4	*4.6		*4.6							
Dozer and stab down				*7.4		*7.4	*4.6		*4.6							
10'0"																
Rear dozer up	*11.8		*11.8	*6.8		*6.8	*4.6		*4.6	*5.0		3.0	*3.2		2.4	
Rear dozer down		*11.8	*11.8		*6.8	*6.8		*4.6	*4.6		*5.0	3.8		*3.2	3.0	
Rear stab down		*11.8	*11.8		*6.8	*6.8		*4.6	*4.6		*5.0	4.8		*3.2	*3.2	28.7'
2 sets stab down	*11.8		*11.8	*6.8		*6.8	*4.6		*4.6	*5.0		*5.0	*3.2		*3.2	
Dozer and stab down	*11.8		*11.8	*6.8		*6.8	*4.6		*4.6	*5.0		*5.0	*3.2		*3.2	
5'0"																
Rear dozer up	*12.2		*12.2	*7.0		*7.0	*5.8		4.4	5.8		3.0	*3.4		2.2	
Rear dozer down		*12.2	*12.2		*7.0	*7.0		*5.8	6.2		*6.8	3.4		*3.4	2.6	
Rear stab down		*12.2	*12.2		*7.0	*7.0		*5.8	*5.8		*6.8	4.6		*3.4	*3.4	29.5'
2 sets stab down	*12.2		*12.2	*7.0		*7.0	*5.8		*5.8	*6.8		*6.8	*3.4		*3.4	
Dozer and stab down	*12.2		*12.2	*7.0		*7.0	*5.8		*5.8	*6.8		5.8	*3.4		*3.4	
Ground 0'0"																
Rear dozer up	*9.4		*9.4	*9.0		6.4	*7.8		4.2	5.6		2.8	*3.6		2.2	
Rear dozer down		*9.4	*9.4		*9.0	7.6		*7.8	5.0		*7.4	3.4		*3.6	2.6	
Rear stab down		*9.4	*9.4		*9.0	*9.0		*7.8	6.4		*7.4	4.4		*3.6	3.4	29.2'
2 sets stab down	*9.4		*9.4	*9.0		*9.0	*7.8		*7.8	*7.4		7.0	*3.6		*3.6	
Dozer and stab down	*9.4		*9.4	*9.0		*9.0	*7.8		*7.8	*7.4		5.8	*3.6		*3.6	
-5'0"																
Rear dozer up	*15.8		11.8	12.6		8.2	8.0		4.0				*4.0		2.2	
Rear dozer down		*15.8	14.2		*14.2	7.4		*11.6	4.8					*4.0	2.6	
Rear stab down		*15.8	*15.8		*14.2	9.8		11.0	6.2					*4.0	3.6	27.9'
2 sets stab down	*15.8		*15.8	*14.2		*14.2	*11.6		9.8				*4.0		*4.0	
Dozer and stab down	*15.8		*15.8	*14.2		12.2	*11.6		7.8				*4.0		*4.0	
-10'0"																
Rear dozer up	*22.2		12.2	12.8		6.4	8.2		4.2				*4.8		2.8	
Rear dozer down		*22.2	14.8		*15.0	7.6		*10.2	5.0					*4.8	3.4	
Rear stab down		*22.2	19.6		*15.0	9.8		*11.0	6.4					*4.8	4.4	25.5'
2 sets stab down	*22.2		*22.2	*15.0		*15.0	*10.2		*10.2				*4.8		*4.8	
Dozer and stab down	*22.2		*22.2	*15.0		12.4	*10.2		8.0				*4.8		*4.8	
-15'0"																
Rear dozer up	*21.6		13.6													
Rear dozer down		*21.6	16.2													
Rear stab down		*21.6	21.2													
2 sets stab down	*21.6		*21.6													
Dozer and stab down	*21.6		*21.6													

Hydraulically Adjustable (VA) Boom

Max. 5.25 m (17'3")
Stick
2.8 m (9'2")
Bucket
0.7 m³ (.92 yd³)

VA Boom lift capacities vary with the degree of VA Boom extension. The lift capacities shown are minimums.

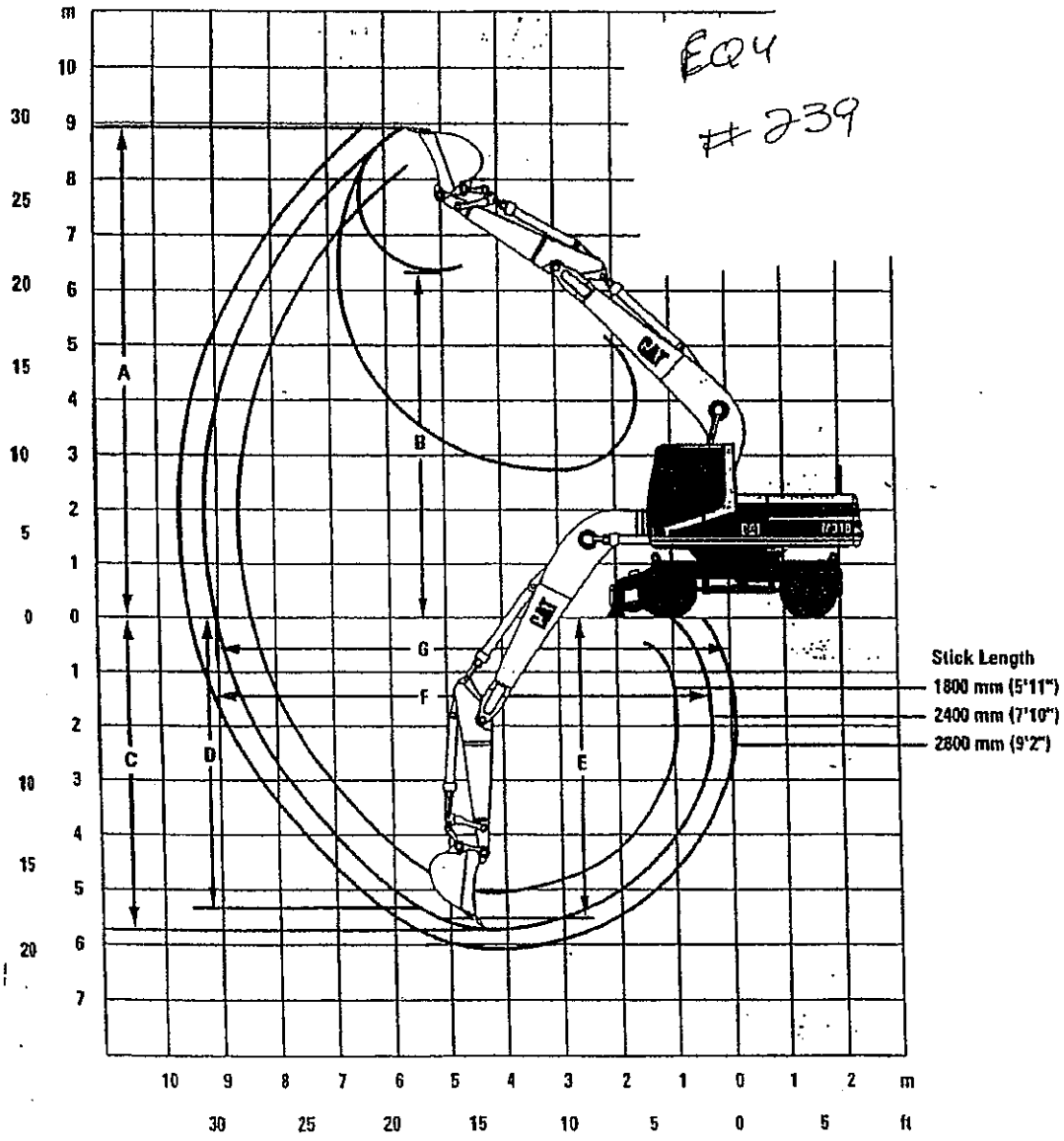
Undercarriage configuration	10'0"			15'0"			20'0"			25'0"						Max
20'0"																
Rear dozer up							*4.6		*4.6							
Rear dozer down								*4.6	*4.6							
Rear stab down								*4.6	*4.6							
2 sets stab down							*4.6		*4.6							
Dozer and stab down							*4.6		*4.6							
15'0"																
Rear dozer up				*7.8		*7.8	*5.0		*5.0	*5.2		3.2				
Rear dozer down					*7.8	*7.8		*5.0	*5.0		*5.2	3.8				
Rear stab down					*7.8	*7.8		*5.0	*5.0		*5.2	5.0				
2 sets stab down				*7.8		*7.8	*5.0		*5.0	*5.2		*5.2				
Dozer and stab down				*7.8		*7.8	*5.0		*5.0	*5.2		*5.2				
10'0"																
Rear dozer up	*11.8		*11.8	*7.0		*7.0	*5.0		5.0	*5.4		3.2	*2.8		2.2	
Rear dozer down		*11.8	*11.8		*7.0	*7.0		*5.0	*5.0		*5.4	3.8		*2.8	2.8	
Rear stab down		*11.8	*11.8		*7.0	*7.0		*5.0	*5.0		*5.4	4.8		*2.8	*2.8	29.6'
2 sets stab down	*11.8		*11.8	*7.0		*7.0	*5.0		*5.0	*5.4		*5.4	*2.8		*2.8	
Dozer and stab down	*11.8		*11.8	*7.0		*7.0	*5.0		*5.0	*5.4		*5.4	*2.8		*2.8	
5'0"																
Rear dozer up	*13.8		13.6	*7.8		*7.0	*5.0		4.6	*4.8		3.0	*2.8		2.0	
Rear dozer down		*13.8	*13.8		*7.0	*7.0		*5.0	*5.0		*4.8	3.6		*2.8	2.4	
Rear stab down		*13.8	*13.8		*7.0	*7.0		*5.0	*5.0		*4.8	4.6		*2.8	*2.8	30.6'
2 sets stab down	*13.8		*13.8	*7.0		*7.0	*5.0		*5.0	*4.8		*4.8	*2.8		*2.8	
Dozer and stab down	*13.8		*13.8	*7.0		*7.0	*5.0		*5.0	*4.8		*4.8	*2.8		*2.8	
Ground 0'0"																
Rear dozer up	*9.0		*9.0	*7.6		6.6	*7.4		4.2	*5.4		2.8	*3.0		2.0	
Rear dozer down		*9.0	*9.0		*7.6	7.6		*7.4	5.0		*5.4	3.4		*3.0	2.4	
Rear stab down		*9.0	*9.0		*7.6	7.6		*7.4	6.2		*5.4	4.4		*3.0	*3.0	30.3'
2 sets stab down	*9.0		*9.0	*7.6		7.6	*7.4		*7.4	*5.4		*5.4	*3.0		*3.0	
Dozer and stab down	*9.0		*9.0	*7.6		*7.6	*7.4		*7.4	*5.4		*5.4	*3.0		*3.0	
-5'0"																
Rear dozer up	*15.6		11.8	12.6		6.2	*7.2		4.0	5.6		2.8	*3.4		2.2	
Rear dozer down		*15.6	14.2		*12.8	7.4		*7.2	4.8		*7.6	3.4		*3.4	2.6	
Rear stab down		*15.6	*15.6		*12.8	9.8		*7.2	6.2		*7.6	4.4		*3.4	*3.4	29.1'
2 sets stab down	*15.6		*15.6	*12.6		*12.8	*7.2		*7.2	*7.6		7.0	*3.4		*3.4	
Dozer and stab down	*15.6		*15.6	*12.6		12.2	*7.2		*7.2	*7.6		5.6	*3.4		*3.4	
-10'0"																
Rear dozer up	*23.4		12.0	12.8		6.4	8.0		4.0				*4.2		2.6	
Rear dozer down		*23.4	14.6		*15.6	7.6		*11.0	4.8					*4.2	3.0	
Rear stab down		*23.4	19.4		*15.6	9.8		*11.0	6.2					*4.2	4.0	26.8'
2 sets stab down	*23.4		*23.4	*15.6		*15.6	*11.0		9.8				*4.2		*4.2	
Dozer and stab down	*23.4		*23.4	*15.6		12.4	*11.0		7.8				*4.2		*4.2	
-15'0"																
Rear dozer up	*22.2		13.2	*13.0		6.8										
Rear dozer down		*22.2	15.6		*13.0	8.0										
Rear stab down		*22.2	20.6		*13.0	10.4										
2 sets stab down	*22.2		*22.2	*13.0		*13.0										
Dozer and stab down	*22.2		*22.2	*13.0		13.0										

Load Point Height | Load Radius Over Front | Load Radius Over Rear | Load Radius Over Side | Load at Maximum Reach

Working Ranges

With One-piece boom

EQ4
#239



Stick	1800 mm (5'11")	2400 mm (7'10")	2800 mm (9'2")
Bucket	0.90 m³ (1.18 yd³)	0.80 m³ (1.05 yd³)	0.70 m³ (.92 yd³)
A Maximum cutting height	8530 mm (28'0")	8890 mm(29'2")	8950 mm (29'4")
B Maximum loading height	6080 mm (19'11")	6330 mm (20'9")	6420 mm (21'8")
C Maximum digging depth	5090 mm (16'8")	5690 mm (18'8")	6090 mm (20'0")
D Maximum vertical wall digging depth	2930 mm (9'7")	4360 mm (14'4")	4560 mm (15'0")
Maximum depth of cut, for 2440 mm (8') level bottom	4820 mm (15'10")	5470 mm (17'11")	5890 mm (19'4")
Maximum reach	8690 mm (28'6")	9230 mm (30'3")	9560 mm (31'4")
G Maximum reach at ground level	8490 mm (27'10")	9040 mm (29'8")	9380 mm (30'9")
Digging forces:			
Stick	108 kN (24,300 lb)	83 kN (18,675 lb)	75 kN (16,875 lb)
Bucket	122 kN (27,450 lb)	114 kN (25,650 lb)	114 kN (25,650 lb)

M318 Lift Capacities

All weights are in pounds (multiply by 1,000).

One-piece Boom

5.25 m (17'5")

Stick

2.8 m (9'2")

Bucket

0.7 m³ (.92 yd³)

	Undercarriage configuration	10'0"			15'0"			20'0"			25'0"						
																	Max
15'0"	Rear dozer up							*7.8		6.2	6.2		3.2				
	Rear dozer down								*7.8	6.0		*6.8	3.8				
	Rear stab down								*7.8	*7.8		*6.8	8.0				
	2 sets stab down							*7.8		*7.8	*6.8		*6.8				
	Dozer and stab down							*7.8		*7.8	*6.8		8.0				
10'0"	Rear dozer up	*19.0		14.8	*11.8		8.0	9.0		4.6	6.0		3.2	*3.2		2.2	
	Rear dozer down		*19.0	17.4		*11.8	9.2		*9.2	5.6		*8.0	3.8		*3.2	2.8	
	Rear stab down		*19.0	*19.0		*11.8	*11.8		*9.2	6.8		*8.0	8.0		*3.2	*3.2	29.9'
	2 sets stab down	*19.0		*19.0	*11.8		*11.8	*9.2		*9.2	*8.0		7.4	*3.2		*3.2	
	Dozer and stab down	*19.0		*19.0	*11.8		*11.8	*9.2		8.8	*8.0		6.0	*3.2		*3.2	
5'0"	Rear dozer up				13.4		7.0	8.4		4.0	5.8		3.0	*3.2		2.0	
	Rear dozer down					*14.8	8.2		*10.8	5.2		*8.8	3.6		*3.2	2.4	
	Rear stab down					*14.8	13.0		*10.8	9.4		*8.8	5.8		*3.2	*3.2	30.7'
	2 sets stab down				*14.8		*14.8	*10.6		10.2	*8.8		7.2	*3.2		*3.2	
	Dozer and stab down				*14.8		13.0	*10.6		9.4	*8.8		5.8	*3.2		*3.2	
Ground 0'0"	Rear dozer up	*8.6		*8.6	12.8		6.6	8.2		4.2	5.8		2.8	*3.4		2.0	
	Rear dozer down		*8.6	*8.6		*16.4	7.6		*11.6	5.0		8.6	3.4		*3.4	2.4	
	Rear stab down		*8.6	*8.6		*16.4	12.4		*11.6	8.0		*9.0	5.6		*3.4	*3.4	30.5'
	2 sets stab down	*8.6		*8.6	*16.4		15.8	*11.6		10.0	*9.0		7.0	*3.4		*3.4	
	Dozer and stab down	*8.6		*8.6	*16.4		12.4	*11.6		8.0	*9.0		5.6	*3.4		*3.4	
-5'0"	Rear dozer up	*15.2		12.0	12.6		6.4	8.0		4.0	5.6		2.8	*4.0		2.2	
	Rear dozer down		*15.2	14.4		*16.6	7.6		*11.8	4.8		8.6	3.4		*4.0	2.6	
	Rear stab down		*15.2	*15.2		*16.6	12.2		*11.8	7.8		*8.8	5.6		*4.0	*4.0	29.2'
	2 sets stab down	*15.2		*15.2	*16.6		15.6	*11.8		9.8	*8.8		7.0	*4.0		*4.0	
	Dozer and stab down	*15.2		*15.2	*16.6		12.2	*11.8		7.8	*8.8		5.6	*4.0		*4.0	
-10'0"	Rear dozer up	*22.6		12.2	12.6		6.4	8.0		4.2				*4.8		2.6	
	Rear dozer down		*22.6	14.8		*15.2	7.6		*10.8	4.8					*4.8	3.0	
	Rear stab down		*22.6	*22.6		*15.2	12.4		*10.8	7.8					*4.8	*4.8	26.8'
	2 sets stab down	*22.6		*22.6	*15.2		*15.2	*10.8		9.8				*4.8		*4.8	
	Dozer and stab down	*22.6		*22.6	*15.2		12.4	*10.8		7.8				*4.8		*4.8	
-15'0"	Rear dozer up	*16.8		13.0	*11.4		6.8										
	Rear dozer down		*16.8	15.4		*11.4	8.0										
	Rear stab down		*16.8	*16.8		*11.4	*11.4										
	2 sets stab down	*16.8		*16.8	*11.4		*11.4										
	Dozer and stab down	*16.8		*16.8	*11.4		*11.4										

Hydraulically Adjustable (VA) Boom

Max. 5.25 m (17'3")

Stick

1.8 m (5' 11")

Bucket

0.9 m³ (1.18 yd³)

VA Boom lift capacities vary with the degree of VA Boom extension. The lift capacities shown are minimums.

	Undercarriage configuration	10'0"			15'0"			20'0"			25'0"						
																	Max
20'0"	Rear dozer up				*7.2		*7.2	*8.4		4.8							
	Rear dozer down					*7.2	*7.2		*8.4	5.6							
	Rear stab down					*7.2	*7.2		*8.4	7.2							
	2 sets stab down				*7.2		*7.2	*8.4		*8.4							
	Dozer and stab down				*7.2		*7.2	*8.4		*8.4							
15'0"	Rear dozer up				*7.6		*7.6	*6.6		5.0							
	Rear dozer down					*7.6	*7.6		*6.6	5.8							
	Rear stab down					*7.6	*7.6		*6.6	*6.6							
	2 sets stab down				*7.6		*7.6	*6.6		*6.6							
	Dozer and stab down				*7.6		*7.6	*6.6		*6.6							
10'0"	Rear dozer up				*7.2		*7.2	*6.8		4.6				5.4		2.8	
	Rear dozer down					*7.2	*7.2		*6.8	5.4					*6.0	3.2	
	Rear stab down					*7.2	*7.2		*6.8	*6.8					*6.0	4.2	26.8'
	2 sets stab down				*7.2		*7.2	*6.8		*6.8				*6.0		*6.0	
	Dozer and stab down				*7.2		*7.2	*6.8		*6.8				*6.0		5.2	
5'0"	Rear dozer up	*12.0		*12.0	*7.4		6.8	8.4		4.2				5.0		2.4	
	Rear dozer down		*12.0	*12.0		*7.4	*7.4		*8.4	5.0					*6.0	2.8	
	Rear stab down		*12.0	*12.0		*7.4	*7.4		*8.4	6.6					*6.0	3.8	27.6'
	2 sets stab down	*12.0		*12.0	*7.4		*7.4	*8.4		*8.4				*8.0		6.0	
	Dozer and stab down	*12.0		*12.0	*7.4		*7.4	*8.4		8.2				*8.0		4.8	
Ground 0'0"	Rear dozer up	*18.2		13.0	*11.2		6.2	*8.0		4.0				5.0		2.4	
	Rear dozer down		*18.2	15.4		*11.2	7.4		*10.8	4.8					*8.4	2.8	
	Rear stab down		*18.2	*18.2		*11.2	9.8		*10.8	6.2					*8.4	3.8	27.4'
	2 sets stab down	*18.2		*18.2	*11.2		*11.2	*10.8		9.8				*6.4		6.0	
	Dozer and stab down	*18.2		*18.2	*11.2		*11.2	*10.8		*7.8				*6.4		4.8	
-5'0"	Rear dozer up	*15.8		12.0	12.6		6.2	8.0		4.0				5.4		2.6	
	Rear dozer down		*15.8	14.4		*16.0	7.4		*11.4	4.8					*7.0	3.2	
	Rear stab down		*15.8	*15.8		*16.0	9.6		11.0	6.2					*7.0	4.2	25.9'
	2 sets stab down	*15.8		*15.8	*16.0		15.6	*11.4		9.8				*7.0		6.6	
	Dozer and stab down	*15.8		*15.8	*16.0		12.2	*11.4		7.8				*7.0		5.2	
-10'0"	Rear dozer up	*22.0		12.6	13.0		6.6							6.6		3.2	
	Rear dozer down		*22.0	15.2		*13.8	7.8								*7.0	4.0	
	Rear stab down		*22.0	20.0		*13.8	10.0								*7.0	5.0	23.2'
	2 sets stab down	*22.0		*22.0	*13.8		*13.8							*7.0		*7.0	
	Dozer and stab down	*22.0		*22.0	*13.8		12.6							*7.0		6.4	

Load Point Height | Load Radius Over Front | Load Radius Over Rear | Load Radius Over Side | Load at Maximum Reach

*Limited by hydraulic rather than tipping load.

E04

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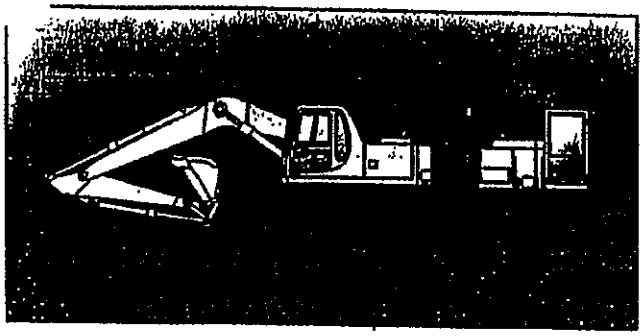
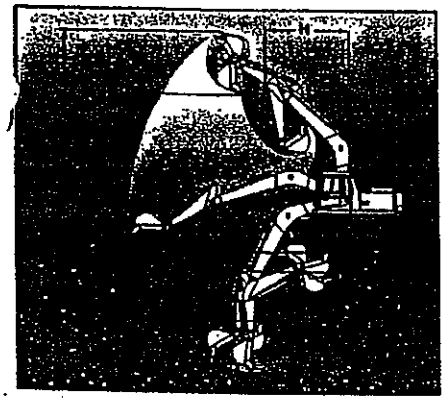
DIMENSIONS

	Arm		
A	Overall length		
B	Length on ground (transport)		
C	Overall height (to top of boom)		
D	Overall width		
E	Overall height (to top of cab)		
F	Ground clearance, counterweight	1030 mm	3'5"
G	Minimum ground clearance	442 mm	1'5"
H	Tail swing radius	2433 mm	7'11"
I	Length of track on ground	3260 mm	10'8"
J	Track length	4066 mm	13'4"
K	Track gauge	1990 mm	6'6"
L	Width of crawler	2590 mm	8'6"
M	Shoe width	600 mm	2'0"
N	Grouser height	25 mm	1.0"
O	Machine cab height	1986 mm	6'6"
P	Upper structure width	2442 mm	8'1"
Q	Distance, swing center to rear end	2417 mm	7'11"

nm	7'5"	2810 mm	9'7"	2900 mm	9'6"
nm	28'1"	8560 mm	28'1"	8670 mm	28'2"
nm	15'10"	4750 mm	15'7"	4555 mm	14'11"
nm	9'9"	2965 mm	9'9"	3055 mm	10'0"



WORKING RANGE AND BUCKET/ARM COMBINATION



	Arm	1850 mm	6'1"	2250 mm	7'5"	2810 mm	9'7"	2900 mm	9'6"
A	Max. digging height	8775 mm	28'9"	8840 mm	29'0"	8900 mm	29'2"	9055 mm	29'8"
B	Max. dumping height	6130 mm	20'1"	6230 mm	20'5"	6320 mm	20'9"	6470 mm	21'3"
C	Max. digging depth	5200 mm	17'1"	5610 mm	18'5"	5960 mm	19'7"	6250 mm	20'6"
D	Max. vertical wall digging depth	4506 mm	14'9"	5036 mm	16'6"	5890 mm	18'6"	5743 mm	18'10"
E	Max. digging depth of cut for 8' level	4950 mm	16'3"	5375 mm	17'6"	5740 mm	18'10"	6050 mm	19'10"
F	Max. digging reach	8355 mm	27'5"	8676 mm	28'6"	8960 mm	29'5"	9230 mm	30'3"
G	Max. digging reach at ground	8180 mm	26'10"	8510 mm	27'11"	8800 mm	28'10"	9075 mm	29'9"
H	Min. swing radius	3380 mm	11'3"	3060 mm	10'1"	3000 mm	9'10"	3010 mm	9'11"
Bucket digging force*		12540 kg 27,646 lb		12540 kg 27,646 lb		12540 kg 27,646 lb		12540 kg 27,646 lb	
Arm crowd force*		12126 kg 26,733 lb		9700 kg 21,385 lb		8393 kg 18,503 lb		7521 kg 16,581 lb	

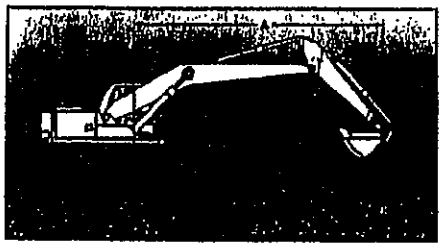
*at power max

BACKHOE BUCKET AND ARM COMBINATION

Bucket	Capacity		Width Outside Lip		Weight		Number of Teeth	Arm 1.85 m 6'1"	Arm 2.26 m 7'5"	Arm 2.61 m 8'7"	Arm 2.9 m 9'6"
Esco Standard Plate	0.38 m³	0.50 yd³	610 mm	24"	442 kg	975 lb	4	○	○	○	○
	0.57 m³	0.75 yd³	762 mm	30"	456 kg	1,006 lb	4	○	○	○	○
	0.67 m³	0.88 yd³	914 mm	36"	510 kg	1,125 lb	5	○	○	○	○
	0.86 m³	1.12 yd³	1067 mm	42"	557 kg	1,227 lb	6	○	○	○	□
Esco Heavy-duty Plate	0.38 m³	0.50 yd³	610 mm	24"	519 kg	1,138 lb	4	○	○	○	○
	0.57 m³	0.75 yd³	762 mm	30"	566 kg	1,225 lb	4	○	○	○	○
	0.67 m³	0.88 yd³	914 mm	36"	634 kg	1,398 lb	5	○	□	○	X
	0.86 m³	1.12 yd³	1067 mm	42"	699 kg	1,541 lb	6	□	□	▲	X

○—Used with weights up to 3,040 lb/yd³ □—Used with weights up to 2,520 lb/yd³ ▲—Used with weights up to 2,020 lb/yd³ X— Not useable

LIFTING CAPACITY



Equipment:
- Boom: 5150 mm 16'11"
- Bucket: 0.38 m³ 0.50 yd³
- Shoes: 600 mm 24"
- Lifting mode

A: Reach from swing center
B: Bucket hook height
C: Lifting capacity
Cf: Rating over front
Cs: Rating over side
⊖: Rating at maximum reach

Arm: 2610 mm 8'7" — Unit: kg lb

A / B	1.5 m 5'		3.0 m 10'		4.5 m 15'		6.0 m 20'		7.6 m 25'		⊖ Maximum	
	Cf	Cs	Cf	Cs	Cf	Cs	Cf	Cs	Cf	Cs	Cf	Cs
6.0 m 20'							*3150 *6,900	2900 6,400			*1700 *3,700	*1700 *3,700
4.5 m 15'							*3700 *8,200	2850 6,300			*1650 *3,700	*1650 *3,700
3.0 m 10'			*7750 *17,100	*7750 *17,100	*5300 *11,700	4400 9,700	*4250 *9,400	2700 6,000	*3100 *6,800	1750 3,900	*1700 *3,800	1600 3,500
1.5 m 5'			*6750 *14,800	*6750 *14,800	*6460 *14,200	3900 8,600	4450 9,900	2500 5,500	3050 6,700	1700 3,700	*1900 *4,200	1500 3,300
0.0 m 0'			*6400 *14,100	*6400 *14,100	6900 15,200	3700 8,100	4300 9,500	2350 5,200	3000 6,600	1600 3,600	*2200 *4,800	1500 3,300
−1.5 m −5'	*5050 *11,200	*5050 *11,200	*9100 *20,000	6800 15,100	6750 14,900	3550 7,900	4250 9,400	2300 5,100			*2750 *6,000	1650 3,700
−3.0 m −10'	*8300 *18,300	*8300 *18,300	*9950 *22,000	6950 15,400	6800 15,000	3550 7,900	4250 9,400	2300 5,100			3850 8,500	2100 4,600
−4.5 m −15'			*7300 *16,100	*7300 *16,100	*4900 *10,800	3600 8,000					*4150 *9,200	3300 7,300

Ratings are based on SAE Standard No. J1097. Rated loads do not exceed 87% of hydraulic lift capacity or 75% of tipping load.
*Load is limited by hydraulic capacity rather than tipping.

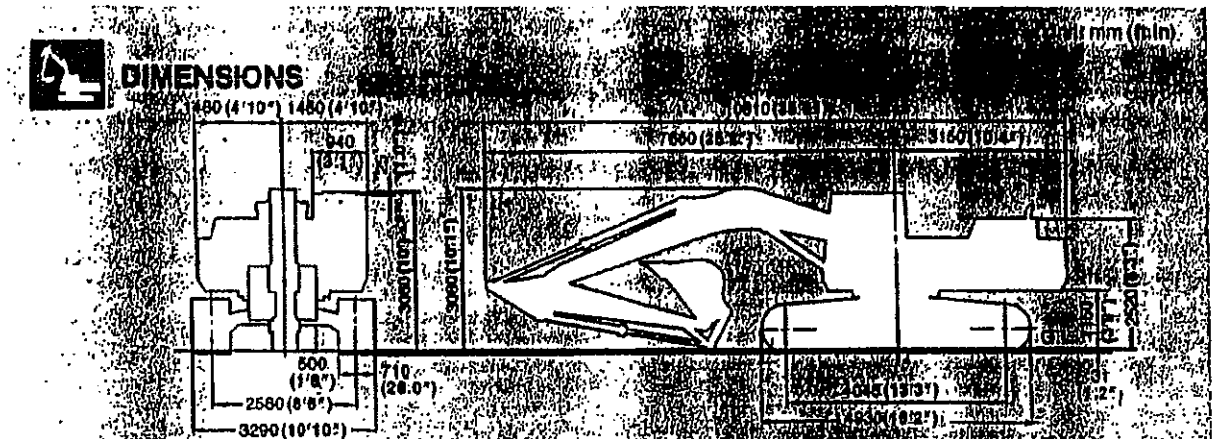
Arm: 2910 mm 9'6" — Unit: kg lb

A / B	1.5 m 5'		3.0 m 10'		4.5 m 15'		6.0 m 20'		7.6 m 25'		⊖ Maximum	
	Cf	Cs	Cf	Cs	Cf	Cs	Cf	Cs	Cf	Cs	Cf	Cs
6.0 m 20'							*3050 *6,800	2950 6,600			*1500 *3,300	*1500 *3,300
4.5 m 15'							*3550 *7,800	2900 6,400	*2200 *4,800	1850 4,100	*1450 3,200	*1450 *3,200
3.0 m 10'			*7150 *15,800	*7150 *15,800	*5000 *11,000	4450 9,900	*4050 *9,000	2750 6,000	3200 7,000	1800 4,000	*1500 *3,300	1500 3,300
1.5 m 5'			*8750 *19,300	7500 16,500	*6300 *13,900	4050 8,900	4500 9,900	2650 5,800	3100 6,800	1700 3,800	*1650 *3,700	1400 3,100
0.0 m 0'			*6750 *14,900	*6750 *14,900	6900 15,300	3700 8,200	4300 9,500	2400 5,300	3000 6,600	1650 3,600	*1900 *4,200	1400 3,100
−1.5 m −5'	*4750 *10,500	*4750 *10,500	*8750 *19,300	6750 14,900	6750 14,900	3550 7,800	4200 9,300	2300 5,100	2950 6,500	1600 3,500	*2350 *5,200	1550 3,400
−3.0 m −10'	*7600 *16,800	*7600 *16,800	*10350 *22,800	6900 15,200	6800 14,900	3550 7,900	4250 9,400	2300 5,100			*3250 *7,200	1900 4,200
−4.5 m −15'			*8000 *17,600	7200 15,800	*5350 *11,800	3650 8,100					*4100 *9,000	2850 6,300

Ratings are based on SAE Standard No. J1097. Rated loads do not exceed 87% of hydraulic lift capacity or 75% of tipping load.
*Load is limited by hydraulic capacity rather than tipping.

PC 300-3 KOM

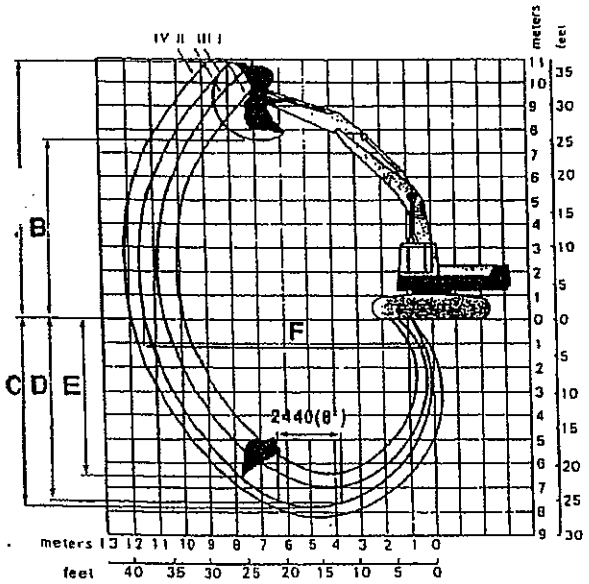
DIMENSIONS



With 6470 mm (21'3") one-piece boom, 3130 mm (10'3") arm, SAE heaped 1.3 m³ (1.7 yd³) backhoe bucket.

WORKING RANGE

EQ4 #234



	Arm Length		'4")
A	Max. digging height		")
B	Max. dumping height		")
C	Max. digging depth		")
D	Max. vertical wall digging depth		11")
E	Max. digging depth of cut for 2440 mm (8') level bottom	6.16 m (20'3")	6.55 m (21'6")
F	Max. digging reach at ground level	9.96 m (32'8")	10.55 m (34'7")
	Bucket digging force	17200 kg (37,920 lb)	17200 kg (37,920 lb)
	Arm crowd force	17400 kg (38,360 lb)	15200 kg (33,510 lb)

	Arm Length	3130 mm (10'3")	IV. 4020 mm (13'2")
A	Max. digging height	10.15 m (33'4")	10.54 m (34'7")
B	Max. dumping height	7.10 m (23'4")	7.46 m (24'6")
C	Max. digging depth	7.32 m (24')	8.20 m (26'11")
D	Max. vertical wall digging depth	6.22 m (20'5")	7.16 m (23'6")
E	Max. digging depth of cut for 2440 mm (8') level bottom	6.16 m (20'3")	6.07 m (26'6")
F	Max. digging reach at ground level	10.96 m (35'11")	11.80 m (39'1")
	Bucket digging force	17200 kg (37,920 lb)	17200 kg (37,920 lb)
	Arm crowd force	13000 kg (28,660 lb)	11000 kg (24,250 lb)

BACKHOE BUCKETS

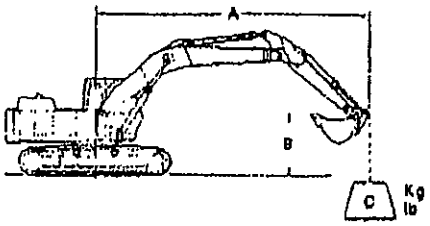
Bucket Type	General Purpose	Light Duty*	Narrow Bucket
SAE, PCSA heaped struck	1.3 m³ (1.7 yd³) 1.0 m³ (1.3 yd³)	1.5 m³ (2.0 yd³) 1.1 m³ (1.4 yd³)	1.1 m³ (1.4 yd³) .8 m³ (1.0 yd³)
Number of bucket teeth	5	6	4
Bucket width with side cutters without side cutters	1453 mm (4'9") 1290 mm (4'3")	1605 mm (5'3") 1473 mm (4'10")	1236 mm (4') 1105 mm (3'7")
Bucket weight with side cutters (with teeth) without side cutters	859 kg (1,894 lb) 809 kg (1,783 lb)	1039 kg (2,291 lb) 995 kg (2,194 lb)	859 kg (1,894 lb) 815 kg (1,797 lb)

*Use with 2200 mm (7'3"), 2550 mm (8'4") and 3130 mm (10'3") arm only.

PC300LC-5

...ed with 700 mm (28") shoes and ...au 1.20 m³ (1.60 yd³) Mid-Heavy ...bucket with side cutters and teeth.

HYDRAULIC EXCAVATOR
Lifting Capacity



A — Reach from swing centerline
B — Bucket hook height
C — Lifting capacities
— Rating over front
— Rating over side or 360 degrees
— Rating at maximum reach

A / B		3.0m/10'		4.6m/15'		6.1m/20'		7.6m/25'		9.1m/30'			
Arm 2200mm 7'3"													
7.6m	Kg											*6300	6300
25'	lb											13,850	13,850
6.1m	Kg					*6600	*6600	*5150	5200			*6050	4800
20'	lb					15,050	15,050	13,450	11,450			13,350	10,650
4.6m	Kg			*9900	*9900	*7600	7400	*6450	6100			*6000	4100
15'	lb			21,850	21,850	16,750	16,350	14,150	11,150			13,150	8,950
3.0m	Kg			*12100	10550	*8650	6950	*6900	4850			*6900	3700
10'	lb			26,650	23,150	19,050	15,250	15,250	10,650			13,750	8,050
1.5m	Kg			*13200	9750	*9350	6500	*7300	4650			6050	3550
5'	lb			29,050	21,450	20,650	14,250	16,050	10,250			13,300	7,850
0m	Kg			*13100	9550	*9600	6250	*7400	4300			6100	3650
0'	lb			28,850	20,950	21,150	13,750	16,300	9,450			13,450	8,050
−1.5m	Kg	*10150	*10150	*12300	9450	*9250	6200	*7100	4450			*6300	4000
−5'	lb	22,350	22,350	27,050	21,050	20,450	13,650	15,650	9,750			13,850	8,750
−3.0m	Kg	*13650	*13650	*10700	9750	*8200	6300					*5250	4800
−10'	lb	30,050	30,050	23,650	21,450	18,050	13,850					13,750	10,550
−4.6m	Kg			*7700	*7700							*5700	*5700
−15'	lb			16,950	16,950							12,550	12,550
Arm 2550mm 8'4"													
7.6m	Kg											*4950	*4950
25'	lb											10,900	10,900
6.1m	Kg							*5800	5250			*4800	4300
20'	lb							12,850	11,550			10,550	9,450
4.6m	Kg					*7250	*7250	*6150	5100			*4850	3700
15'	lb					15,950	15,950	13,550	11,250			10,650	8,150
3.0m	Kg			*11550	10750	*9550	6950	*8700	4850	*6700	3100	*5100	3050
10'	lb			25,450	23,650	18,350	15,350	14,750	10,650	12,650	7,650	11,150	7,350
1.5m	Kg			*12950	9900	*9650	6400	*7150	4600	5800	3400	*5550	3250
5'	lb			28,550	21,850	19,850	14,150	15,650	10,150	12,750	7,450	12,250	7,150
0m	Kg			*13200	9550	*9550	6250	*7950	4450	5700	3300	5700	3300
0'	lb			28,650	21,050	20,950	13,750	16,150	9,850	12,550	7,250	12,550	7,250
−1.5m	Kg	*9100	*9100	*12650	9500	*9350	6150	*7150	4400			*5850	3600
−5'	lb	20,150	20,150	27,750	20,950	20,550	13,550	15,750	9,650			12,850	7,950
−3.0m	Kg	*15000	*13090	*11300	9650	*8450	6200	*6200	4450			*5890	4250
−10'	lb	33,050	33,050	24,650	21,250	18,650	13,650	13,750	9,850			12,950	9,350
−4.6m	Kg	*11050	*11050	*8300	*8500	*6200	6200					*5400	*5400
−15'	lb	24,250	24,250	18,150	18,750	13,650	13,650					11,850	11,850

NOTES

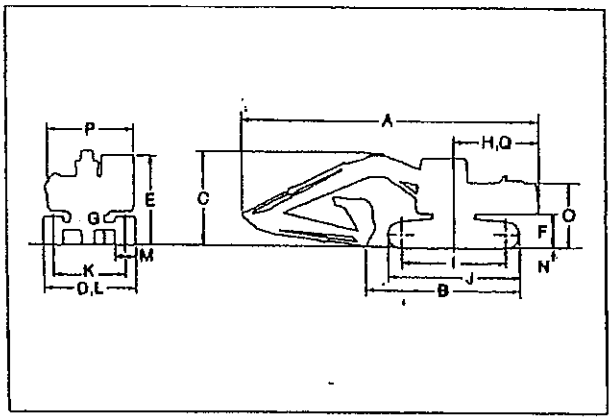
1. Lifting capacities shown do not exceed 75% of minimum tipping loads of 87% of hydraulic capacities. Capacities marked with an asterisk (*) are limited by hydraulic capacities.
2. Lifting capacities shown should not be exceeded. Weight of all lifting accessories must be considered part of the load.
3. Lifting capacities assume the machine is standing level on a firm, uniform supporting surface. The user must make allowances for unfavorable job conditions such as soft or uneven ground or sudden stopping of loads.
4. The least stable position is over the side.
5. The operator should be fully acquainted with the Komatsu Operation Manual before operating the machine.
6. Capacities apply only to the machine as originally manufactured and normally equipped by Komatsu.
7. Ratings are based on SAE Standard No. J1097.

KOMATSU
KOMATSU MARKETING DIVISION

DIMENSIONS

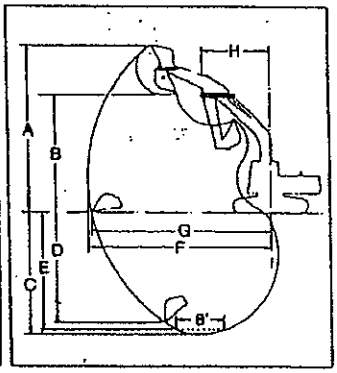
	2.2 m (7'3") arm	2.2 m (8'4") arm	3.185 m (10'5") arm	4.02 m (13'2") arm
ength	10950 mm (35'11")	10855 mm (35'7")	10810 mm (35'6")	10840 mm (35'7")
Length on ground (transport)	7728 mm (25'4")	6850 mm (22'6")	5405 mm (17'9")	5390 mm (17'8")
Overal height (to top of boom)	3370 mm (11'3")	3425 mm (11'3")	3200 mm (10'6")	3650 mm (12')

Overall width	3280 mm (10'10")
Overall height (to top of cab)	3060 mm (10')
Ground clearance, counterweight	1180 mm (3'10")
Min. ground clearance	498 mm (1'8")
Tail swing radius	3225 mm (10'7")
Length of track on ground	3946 mm (12'11")
Track length	4855 mm (15'11")
Track gauge	2590 mm (8'6")
Width of crawler	3290 mm (10'10")
Shoe width	700 mm (28")
Grouser height	31 mm (1.2")
Machine cab height	2495 mm (8'2")
Machine cab width	2960 mm (9'9")
Distance, swing center to rear end	3150 mm (10'4")



WORKING RANGE

	2.2 m (7'3") arm	2.55 m (8'4") arm	3.185 m (10'5") arm	4.02 m (13'2") arm
Max. digging height	9580 mm (31'5")	9965 mm (32'8")	10210 mm (33'6")	10550 mm (34'7")
mping	6595 mm (21'8")	6895 mm (22'7")	7110 mm (23'4")	7490 mm (24'7")
ging depth	6355 mm (20'10")	6705 mm (22')	7380 mm (24'3")	8180 mm (26'10")
ertical wall digging depth	5120 mm (16'10")	5880 mm (19'4")	6480 mm (21'3")	7260 mm (23'11")
Max. digging depth of cut for 8' level	6130 mm (20'1")	6520 mm (21'6")	7180 mm (23'7")	8045 mm (26'5")
Max. digging reach	10155 mm (33'4")	10550 mm (34'7")	11100 mm (36'5")	11900 mm (39'1")
Max. digging reach at ground level	9950 mm (32'8")	10355 mm (34')	10920 mm (35'10")	11730 mm (38'6")
Min. swing radius	4330 mm (14'2")	4345 mm (14'3")	4260 mm (14')	4260 mm (14'1")
et digging force	18800 kg (41,450 lb/184 kN)	18800 kg (41,450 lb/184 kN)	18800 kg (41,450 lb/184 kN)	18800 kg (41,450 lb/184 kN)
crowd force	19100 kg (42,110 lb/187 kN)	16700 kg (36,820 lb/164 kN)	14100 kg (31,080 lb/138 kN)	12100 kg (26,680 lb/119 kN)



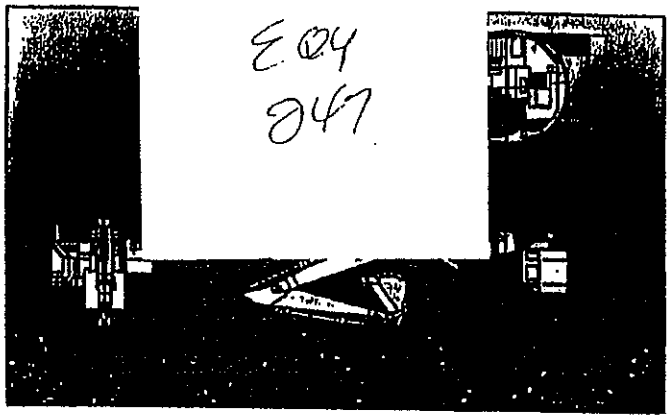
BUCKETS

TYPE	Capacity m³ (yd³) SAE, PCSA heaped	Width mm (in) Outside Lip	Width mm (in) With side cutters (Komatsu) With wear shrouds (ESCO)	Weight Kg (lb)	No. of Teeth	ARMS 2.2 m (7'3")	2.55 m (8'4")	3.185 m (10'5")	4.02 m (13'2")
OMATSU Heavy Duty	0.86 (1.13)	710 (28)	815 (32)	930 (2,118)	4	○	○	○	○
	1.06 (1.38)	840 (33)	940 (37)	1040 (2,368)	4	○	○	○	○
	1.25 (1.63)	965 (38)	1145 (45)	1145 (2,600)	5	○	○	○	○
ESCO STDP	0.96 (1.25)	760 (30)	815 (32)	955 (2,105)	4	○	○	○	○
	1.15 (1.50)	915 (36)	965 (38)	1030 (2,275)	4	○	○	○	○
	1.44 (1.88)	1065 (42)	1120 (44)	1150 (2,531)	5	○	○	○	□
	1.62 (2.12)	1220 (48)	1270 (50)	1225 (2,705)	5	○	○	□	X
	1.91 (2.50)	1370 (54)	1420 (56)	1350 (2,975)	6	○	□	Δ	X
	0.96 (1.25)	760 (30)	815 (32)	1165 (2,563)	4	○	○	○	○
	1.15 (1.50)	915 (36)	965 (38)	1250 (2,753)	4	○	○	○	○
	1.44 (1.88)	1065 (42)	1120 (44)	1375 (3,034)	5	○	○	○	Δ
	1.62 (2.12)	1220 (48)	1270 (50)	1485 (3,269)	5	○	○	□	X
	1.91 (2.50)	1370 (54)	1420 (56)	1610 (3,550)	6	○	□	Δ	X
ESCO HDC	0.76 (1.00)	710 (28)	785 (31)	945 (2,082)	4	○	○	○	○
	0.96 (1.25)	840 (33)	915 (36)	1155 (2,544)	4	○	○	○	○
	1.06 (1.38)	990 (39)	1065 (42)	1210 (2,670)	4	○	○	○	○
	1.44 (1.88)	1145 (45)	1220 (48)	1515 (3,345)	5	○	○	□	X

○ - Can be used with a material weight up to 3,040 lb/yd³ Δ - Can be used with a material weight up to 2,020 lb/yd³

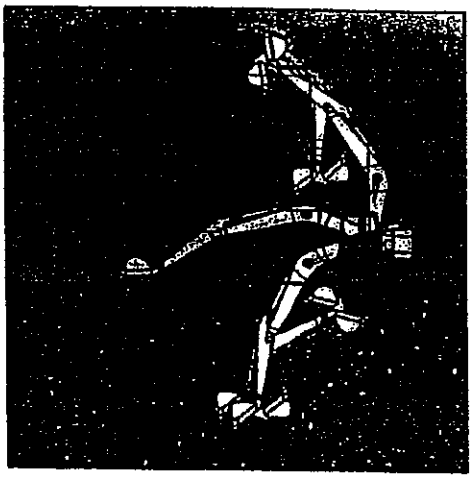
DIMENSIONS

	Arm	2400 mm	7'10"	2900 mm	9'6"
A	Overall length	8690 mm	29'2"	9890 mm	29'2"
B	Overall width	3080 mm	10'1"		
C	Overall height (to top of cab)	2965 mm	9'9"		
D	Ground clearance, counterweight	1050 mm	3'5"		
E	Minimum ground clearance	440 mm	1'5"		
F	Tail swing radius	1680 mm	5'6"		
G	Length of track on ground	3640 mm	11'11"		
H	Track length	4460 mm	14'7"		
I	Track gauge	2380 mm	7'10"		
J	Width of crawler	3080 mm	10'1"		
K	Shoe width	700 mm	27.6"		
L	Grouser height	26 mm	1"		
M	Machine cab height	2280 mm	7'6"		
N	Upper structure width	2995 mm	9'10"		
O	Distance, swing center to rear end	2225 mm	7'3"		
	Implement offset from swing center	182 mm	7.2"		

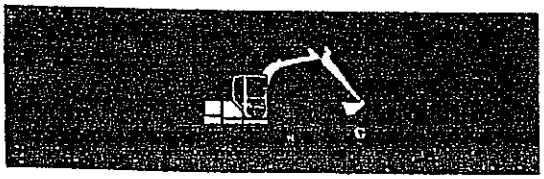


WORKING RANGE AND BUCKET/ARM COMBINATION

	Arm	2400 mm	7'10"	2900 mm	9'6"
A	Maximum digging height	10185 mm	33'5"	10640 mm	34'11"
B	Maximum dumping height	7270 mm	23'10"	7720 mm	25'4"
C	Maximum digging depth	6445 mm	21'2"	6810 mm	22'4"
D	Maximum vertical wall digging depth	5511 mm	18'1"	5910 mm	19'5"
	Maximum digging depth of cut for 8' level	6230 mm	20'5"	6590 mm	21'7"
F	Maximum digging reach	9375 mm	30'9"	9850 mm	32'4"
G	Maximum digging reach at ground	9185 mm	30'2"	9670 mm	31'9"
H	Minimum swing radius	2795 mm	9'2"	2380 mm	7'10"
I	Maximum height at minimum swing radius	8265 mm	27'1"	8210 mm	26'11"
	Bucket digging force	12800 kg	28,219 lb	12800 kg	28,219 lb
	Arm crowd force	11100 kg	24,471 lb	9300 kg	20,503 lb



LIFTING CAPACITY



Equipment:
- Boom: 5700 mm 18'8"
- Bucket: 0.80 m³ 1.05 yd³
- Shoes: 700 mm 28"

Blade is off ground

A: Reach from swing center
B: Bucket hook height
C: Lifting capacity
Cf: Rating over front
Cs: Rating over side
⊖: Rating at maximum reach

Arm: 2400 mm 7'10" — Unit: kg lb

B \ A	3.0 m 10'		4.5 m 15'		6.1 m 20'		7.6 m 25'		⊖ Maximum	
	Cf	Cs	Cf	Cs	Cf	Cs	Cf	Cs	Cf	Cs
9.1 m 30'									*4400 *9,700	*4400 *9,700
6.1 m 20'			*5300 *11,700	*5300 *11,700	*4900 *10,800	4400 9,700			*3400 *7,500	3400 7,500
3.0 m 10'			*7800 *17,200	6450 14,300	*5960 *13,100	4100 9,000	4850 10,700	2800 6,200	*3650 *8,100	2500 5,500
0.0 m 0'	*6200 *13,600	*6200 *13,600	*9300 *20,500	5750 12,700	6660 14,600	3750 8,300	4700 10,300	2650 5,900	4350 9,600	2450 5,400
−3.0 m −10'	*10350 *22,800	*10350 *22,800	*7600 *16,800	5750 12,700	*5600 *12,100	3750 8,300			*4900 *10,800	3400 7,500

* Load is limited by hydraulic capacity rather than tipping. Ratings are based on SAE Standard No. J1097. Rated loads do not exceed 87% of

Equipment:
- Boom: 5700 mm 18'8"
- Bucket: 0.80 m³ 1.05 yd³
- Shoes: 700 mm 28"

Blade is off ground

A: Reach from swing center
B: Bucket hook height
C: Lifting capacity
Cf: Rating over front
Cs: Rating over side
⊖: Rating at maximum reach

Arm: 2900 mm 9'6" — Unit: kg lb

B \ A	3.0 m 10'		4.5 m 15'		6.1 m 20'		7.6 m 25'		⊖ Maximum	
	Cf	Cs	Cf	Cs	Cf	Cs	Cf	Cs	Cf	Cs
3.0 m 10'	*11200 *24,700	*11200 *24,700	*7200 *15,900	*6700 *14,800	5600 12,400	4200 9,300	4750 10,500	2900 6,400	*2250 *5,000	*2250 *5,000
0.0 m 0'	*6700 *14,800	*6700 *14,800	9250 20,400	5900 13,000	6700 14,800	3800 8,400	4700 10,400	2700 5,900	2900 6,400	2200 4,900
-3.0 m -10'	*11450 *25,200	*11450 *25,200	*8100 *17,900	5800 12,700	6900 13,000	3700 8,200			*4600 *10,200	2950 6,500

* Load is limited by hydraulic capacity rather than tipping. Ratings are based on SAE Standard No. J1097. Rated loads do not exceed 87% of hydraulic lift capacity or 75% of tipping load.

STANDARD EQUIPMENT

- Air cleaner, double element with auto dust evacuation
- Air conditioner/heater
- Alternator, 50 A
- Batteries, 110 Ah/2 x 12 V
- Boom holding valve
- Cab which includes: antenna, AM/FM radio, floormat, intermittent wiper and washer, large ceiling hatch, pull-up front window, openable rear window, rearview mirror, removable lower windshield, sliding seat with 3" seat belt, tinted safety glass
- Cooling fan, mixed flow with fan guard
- Corrosion resister
- Counterweight, 6200 kg 13,667 lb
- Dustproof net for radiator and oil cooler
- Instrument panel
- Light, one front
- Pump/engine room partition cover
- Shoes, 700 mm 28", triple grouser
- Starting motor, 5.5 kW
- Travel alarm
- Turbocharger exhaust manifold cover
- Vandalism protection provision tabs

OPTIONAL EQUIPMENT

- Arm
  —2400 mm 7'10"
  —2900 mm 9'6"
  —2900 mm 9'6" with piping
- Blade assembly
- Hydraulic control unit
  —1 additional actuator
  —2 additional actuators
  —3 additional actuators
- Shoes, triple grouser
  —600 mm 24"
  —800 mm 31.5"
- Shoes, rubber shoe
  —600 mm 24"
- Track guiding guards

SOLD ONLY WITH BUCKET

- Lug bushing
- Play adjustment mechanism

BACKHOE BUCKET AND ARM COMBINATION

Bucket	Capacity		Width Outside Lip		Weight		Teeth	Arm 2.4 m 7'10"	Arm 2.9 m 9'6"
Esco Standard Plate	0.62 m³	0.81 yd³	610 mm	24"	510 kg	1,124 lb	4	○	○
	0.72 m³	0.94 yd³	762 mm	30"	581 kg	1,281 lb	4	○	○
	1.00 m³	1.31 yd³	914 mm	36"	637 kg	1,404 lb	5	○	○
	1.25 m³	1.64 yd³	1067 mm	42"	706 kg	1,556 lb	5	□	Y
	1.53 m³	2.00 yd³	1219 mm	48"	750 kg	1,653 lb	5	Y	X
Esco Heavy-duty Plate	0.62 m³	0.81 yd³	610 mm	24"	494 kg	1,089 lb	4	○	○
	0.72 m³	0.94 yd³	762 mm	30"	546 kg	1,204 lb	4	○	○
	1.00 m³	1.31 yd³	914 mm	36"	615 kg	1,356 lb	5	○	○
	1.25 m³	1.64 yd³	1067 mm	42"	667 kg	1,470 lb	5	Y	X
	1.53 m³	2.00 yd³	1219 mm	48"	694 kg	1,530 lb	5	Y	X

○ – Used with weights up to 3,040 lb/yd³ □ – Used with weights up to 2,520 lb/yd³ Y – Used with weights up to 2,020 lb/yd³ X – Not useable

AESS500-02

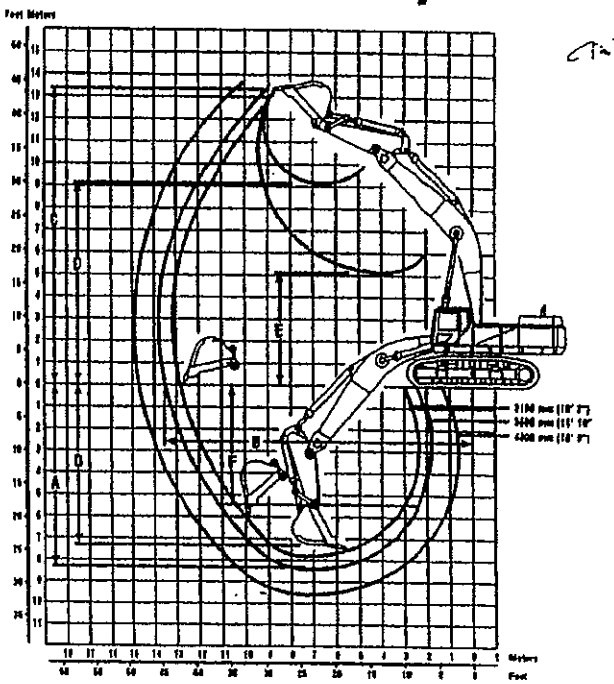
4/00 (EV-1)

KOMATSU®
Komatsu America International Company
440 N. Fairway Dr., Vernon Hills, IL 60061

350/350 L

350 Reach Excavator Working Ranges

EQ4
#240



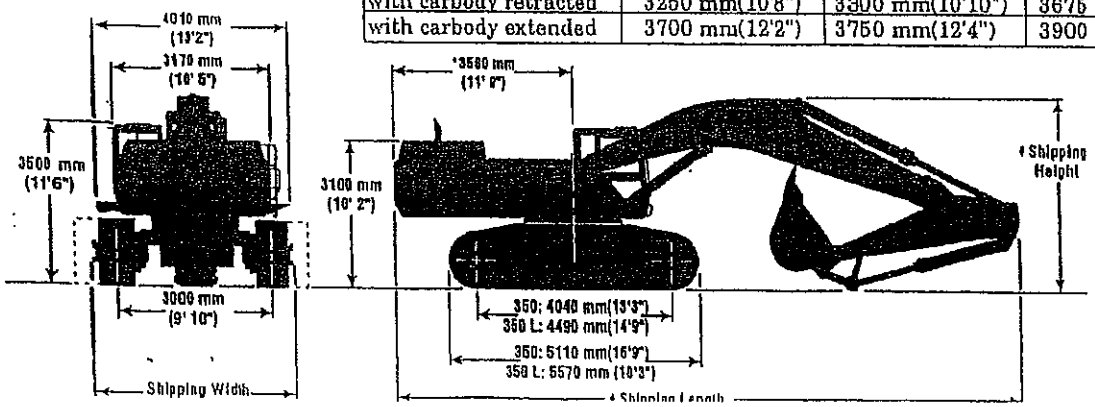
Stick	R4.8F 4800 mm(15'9")	R3.6F 3600 mm(11'10")	R3.1F 3100 mm(10'2")
Bucket	**2.0 m³(2.63 yd³) T**	**2.3 m³(3.0 yd³) T**	**2.2 m³(2.88 yd³) EX**
A Maximum digging depth	9.61 m(31'6")	8.41 m(27'7")	7.81 m(25'8")
B Maximum reach at ground level	13.49 m(44'3")	12.37 m(40'7")	11.81 m(38'9")
C Maximum cutting height	12.12 m(39'9")	11.67 m(38'3")	11.38 m(37'4")
D Maximum loading height	8.41 m(27'7")	7.95 m(26'1")	7.85 m(25'9")
E Minimum loading height	1.66 m(5'6")	2.86 m(9'5")	3.46 m(11'4")
F Maximum digging depth at 2440 mm (8') level bottom	9.50 m(31'2")	8.27 m(27'2")	7.69 m(25'3")
G Maximum vertical wall digging depth	7.96 m(26'2")	6.88 m(22'7")	6.27 m(20'7")
Bucket forces	22 100 kg(48,700 lb)	22 100 kg(48,700 lb)	23 280 kg(51 300 lb)
Stick forces	14 990 kg(33,000 lb)	17 640 kg(38,800 lb)	20 490 kg(45,100 lb)

Dimensions (approximate)

Stick	R4.8FH 4800 mm(15'9")	R3.6F 3600 mm(11'10")	R3.1F 3100 mm(10'2")
Shipping height	4570 mm(15'0")	3750 mm(12'4") 3175 mm(10'5") ■	3930 mm(12'11")
Shipping length	12 190 mm(40'0")	12 200 mm(40'0")	12 270 mm(40'3")

■ With stick and bucket pins removed

Shipping Width	700 mm(28")	750 mm(30")	900 mm(36")
with carbody retracted	3250 mm(10'8")	3300 mm(10'10")	3675 mm(12'1")
with carbody extended	3700 mm(12'2")	3750 mm(12'4")	3900 mm(12'10")



SPECIFICATIONS

Capacities

350 L EXCAVATOR with Counterweight Removal Device, with Heavy Lift Activated
BOOM — Reach 7200 mm/23'8" **BUCKET** — 1.7 m³/2,25 yd³ Trenching
STICK — R4.8F 4800 mm/16'9" **SHOE** — 900 mm/36" Triple Grouser

		1.5 m/5.0 ft		3.0 m/10.0 ft		4.5 m/15.0 ft		6.0 m/20.0 ft		7.5 m/25.0 ft		9.0 m/30.0 ft		10.5 m/35.0 ft		12.0 m/40.0 ft				
																				m ft
10.5 m 35.0 ft	kg lb																	*2750	*2750	10.48
9.0 m 30.0 ft	kg lb																	*2550 *5600	*2550 *5600	11.60 37.75
7.5 m 25.0 ft	kg lb											*13,550	*13,550	*4700 *9350	*4700 *9350			*2450 *5400	*2450 *5400	12.38 40.44
6.0 m 20.0 ft	kg lb											*6650 *14,550	*6650 *14,550	*5950 *12,300	6850 *12,300			*2450 *5400	*2450 *5400	12.69 42.22
4.5 m 15.0 ft	kg lb									*8200 *17,800	*8200 *17,800	*7400 *16,100	*7400 *16,100	*6900 *14,850	5700 12,200			*2550 *5550	*2550 *5550	13.16 43.21
3.0 m 10.0 ft	kg lb					*16 500 *35,300	*16 500 *35,300	*11 950 *25,750	*11 950 *25,750	*9650 *20,900	*9650 *20,900	*8300 *16,000	7350 15,750	*7450 *16,150	5500 11,750	*3750	*3750	*2700 *5650	*2700 *5650	13.26 43.49
1.5 m 5.0 ft	kg lb					*20 650 *44,400	*20 650 *44,400	*14 900 *30,650	13 500 29,050	*11 100 *23,950	9500 20,350	*9200 *19,900	7000 15,000	*7950 *17,900	5300 11,350	*3950	*3950	*2900 *6400	*2900 *6400	13.13 43.07
Ground Line	kg lb			*6300 *14,300	*6300 *14,300	*17 600 *40,900	*17 600 *40,900	*16 000 *34,550	12 750 27,350	*12 200 *26,400	9000 19,350	*9900 *21,450	6700 14,350	*8400 *18,150	5150 10,950			*3250 *7150	*3250 *7150	12.79 41.95
-1.5 m -5.0 ft	kg lb			*9500 *21,450	*9500 *21,450	*18 850 *43,250	*18 850 41,800	*16 900 *36,550	12 300 26,400	*12 900 *27,900	8700 18,650	*10 400 *22,450	6500 13,900	8450 18,150	5000 10,750			*3750 *8250	*3750 *8250	12.21 40.03
-3.0 m -10.0 ft	kg lb			*13 600 *30,650	*13 600 *30,650	*23 050 *50,600	19 400 41,550	*17 000 *36,700	12 100 26,000	*13 050 *28,200	8550 18,300	*10 400 *22,400	6400 13,750	*8300 *14,600	5000 10,700			*4500 *10,000	4500 9900	11.37 37.21
-4.5 m -15.0 ft	kg lb			*18 750 *42,450	*18 750 *42,450	*21 900 *47,300	19 600 42,000	*16 200 *34,950	12 150 26,100	*12 600 *26,850	8550 18,400	*9750 *20,800	6450 13,850	*8250	11,000			*5800 *12,950	5500 12,300	10.19 33.19
-6.0 m 0 ft	kg lb			*25 850 *58,400	*25 850 *58,400	*19 100 *40,900	*19 100 *40,900	*14 250 *30,500	12 400 26,750	*10 600 *22,900	8750 18,900	*21,500	14,200					*6450 *11,850	*5450 *11,850	8.48 27.36
-7.5 m -25.0 ft	kg lb			*57,000	*57,000	*14 100 *29,400	*14 100 *29,400	*10 250 *20,900	*10 250 *20,900	*23,800	19,300							*8400 *18,350	*8400 *18,350	6.73 21.46

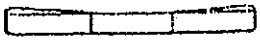
350 L EXCAVATOR with Counterweight Removal Device, with Heavy Lift Activated
BOOM — Reach 7200 mm/23'8" **BUCKET** — 2,2 m³/2.88 yd³ Excavation
STICK — R3.6F 3600 mm/11'10" **SHOE** — 900 mm/36" Triple grouser

		1.5 m/5.0 ft		3.0 m/10.0 ft		4.5 m/15.0 ft		6.0 m/20.0 ft		7.5 m/25.0 ft		9.0 m/30.0 ft		10.5 m/35.0 ft				
																		m ft
9.0 m 30.0 ft	kg lb															*3300 *7350	*3300 *7350	10.28 33.37
7.5 m 25.0 ft	kg lb											*7350 *14,950	*7350 *14,950			*3200 *7050	*3200 *7050	11.17 36.46
6.0 m 20.0 ft	kg lb									*8600 *18,650	*8600 *18,650	*7950 *17,350	7700 16,400			*3200 *7050	*3200 *7050	11.75 38.46
4.5 m 15.0 ft	kg lb					*15 800 *34,750	*15 800 *34,750	*11 600 *25,400	*11 800 *25,400	*9800 *21,150	*9800 *21,150	*8600 *18,700	7450 15,950	*6350 *11,150	6500 *11,150	*3300 *7250	*3300 *7250	12.07 39.56
3.0 m 10.0 ft	kg lb					*20 400 *43,700	*20 400 *43,700	*14 150 *30,400	13 900 29,950	*11 100 *23,950	9750 20,950	*9350 *20,300	7200 15,400	*8100 *15,350	5400 11,500	*3500 *7650	*3500 *7650	12.15 39.87
1.5 m 5.0 ft	kg lb					*13 450 *32,050	*13 450 *32,050	*16 000 *34,500	13 100 28,150	*12 250 *26,600	9300 19,950	*10 050 *21,800	6900 14,800	*8650 *16,850	5250 11,250	*3800 *8350	*3800 *8350	12.01 39.40
Ground Line	kg lb					*14 800 *34,350	*14 800 *34,350	*17 050 *36,900	12 650 27,000	*13 050 *28,200	8950 19,200	*10 550 *22,800	6700 14,350	*8100 *13,700	5150 11,050	*4250 *9350	*4250 *9350	11.62 38.13
-1.5 m -5.0 ft	kg lb			*10 450 *23,550	*10 450 *23,550	*19 600 *44,950	*19 600 42,150	*17 300 *37,400	12 350 26,550	*13 300 *28,750	8750 18,800	*10 650 *22,950	6600 14,150			*4950 *10,900	4850 10,650	10.98 35.98
-3.0 m -10.0 ft	kg lb			*16 650 *37,400	*16 650 *37,400	*22 250 *48,150	19 850 42,550	*16 650 *36,000	12 350 26,550	*12 900 *27,800	8750 18,800	*10 100 *21,600	6600 14,200			*6050 *13,450	5750 12,700	10.01 32.72
-4.5 m -15.0 ft	kg lb			*24 250 *55,000	*24 250 *55,000	*19 750 *42,550	*19 750 *42,550	*15 000 *32,250	*12 600 27,050	*11 500 *24,450	8900 19,200					*5900 *12,650	*5900 *12,650	8.59 27.91
-6.0 m -20.0 ft	kg lb			*20 550 *45,300	*20 550 *45,300	*15 450 *32,750	*15 450 *32,750	*11 550 *24,200	*11 550 *24,200							*9200 *20,150	*9200 *20,150	6.91 22.27

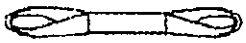
*Limited by hydraulic capacity rather than tipping load. The above loads are in compliance with SAE hydraulic excavator lift capacity rating

REPUBLIC CRANE & HOIST CORP.
484 RUTGERS ROAD
N. BABYLON, NY 11703
(516)587-3344 FAX(516)587-3345

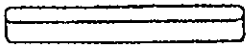
WEBMASTER® 1600 EYE & EYE AND ENDLESS SLINGS



Type 3



Type 4



Type 5

EYE & EYE (FLAT OR TWISTED EYE)

	Code	Rated Capacities in Lbs.		
		Vertical	Choker	V. Basket
One Ply	EE1-801	1,600	1,250	3,200
	EE1-802	3,200	2,500	6,400
	EE1-803	4,800	3,800	9,600
	EE1-804	6,400	5,000	12,800
	EE1-805	8,000	6,400	16,000
	EE1-806	9,600	7,700	19,200
	EE1-808	12,800	10,200	25,600
	EE1-810	16,000	12,800	32,000
	EE1-812	19,200	15,400	38,400
Two Ply	EE2-801	3,200	2,500	6,400
	EE2-802	6,400	5,000	12,800
	EE2-803	8,600	6,900	17,200
	EE2-804	11,500	9,200	23,000
	EE2-805	13,600	10,900	27,200
	EE2-806	16,300	13,000	32,600
	EE2-808	19,200	15,400	38,400
	EE2-810	22,400	17,900	44,800
	EE2-812	26,900	21,500	53,800
Three Ply	EE3-801	4,100	3,300	8,200
	EE3-802	8,300	6,600	16,600
	EE3-803	12,500	10,000	25,000
	EE3-804	16,000	12,800	32,000
	EE3-805	19,200	15,400	38,400
	EE3-806	23,000	18,400	46,000
	EE3-808	30,700	24,500	61,400
	EE3-810	36,800	29,400	73,600
	EE3-812	44,000	35,200	88,000
Four Ply	EE4-801	5,000	4,000	10,000
	EE4-802	10,000	8,000	20,000
	EE4-803	14,900	11,900	29,800
	EE4-804	19,800	15,800	39,600
	EE4-805	24,800	19,800	49,600
	EE4-806	29,800	23,800	59,600
	EE4-808	39,700	31,700	79,400
	EE4-810	49,600	39,600	99,200
	EE4-812	59,500	47,600	119,000

ENDLESS SLINGS (MOST VERSATILE WEB SLING)

Code	Rated Capacities in Lbs.		
	Vertical	Choker	V. Basket
EN1-801	3,200	2,500	6,400
EN1-802	6,400	5,000	12,800
EN1-803	8,600	6,900	17,200
EN1-804	11,500	9,200	23,000
EN1-805	13,600	10,900	27,200
EN1-806	16,300	13,000	32,600
EN1-808	19,200	15,400	38,400
EN1-810	22,400	17,900	44,800
EN1-812	26,900	21,500	53,800
EN2-801	6,200	4,900	12,400
EN2-802	12,200	9,800	24,400
EN2-803	16,300	13,000	32,600
EN2-804	20,700	16,500	41,400
EN2-805	24,500	19,600	49,000
EN2-806	28,600	23,000	57,200
EN2-808	30,700	24,500	61,400
EN2-810	33,600	26,800	67,200
EN2-812	37,600	30,000	75,200
EN3-801	8,000	6,400	16,000
EN3-802	16,000	12,800	32,000
EN3-803	21,500	17,200	43,000
EN3-804	28,700	23,000	57,400
EN3-805	34,000	27,200	68,000
EN3-806	40,700	32,500	81,400
EN3-808	46,000	36,800	92,000
EN3-810	51,500	41,200	103,000
EN3-812	59,200	47,300	118,400
EN4-801	10,000	8,000	20,000
EN4-802	19,800	15,800	39,600
EN4-803	26,700	21,300	53,400
EN4-804	35,600	28,400	71,200
EN4-805	42,200	33,700	84,400
EN4-806	50,500	40,400	101,000
EN4-808	57,800	46,000	115,200
EN4-810	67,200	53,700	134,400
EN4-812	80,700	64,500	161,400

Minimum length for three and four ply slings is five feet.

EYE LENGTH

Applies To All Slings

Sling Width	Plies of Webbing			
	1	2	3	4
1"	8-1/2"	8-1/2"	10"	10"
2"	10"	10"	12"	12"
3"	11"	11"	14"	14"
4"	12"	12"	16"	16"
5"	14"	14"	18"	18"
6"	16"	16"	18"	18"
8"	20"	20"	24"	24"
10"	24"	24"	24"	24"

TUFLEX—AN ALTERNATIVE

For three and four ply slings wider than 6 inches, Tuflex® roundslings should be seriously considered because of increased flexability, ease of use and lower cost. See Lift-All Catalog TRS-89.

TAPERING

As a standard practice, the eyes, or bearing points, of Types 3 and 4 slings are tapered to accommodate a crane hook on slings that are 3" and wider. Untapered eyes available upon request. Type 5 (Endless) slings are *Not* tapered unless specified on order

Rope Size Inches	Min. Sling Feet/ Inches	Loop Size Inches	Straight Pull	Choker Hitch	Basket Hitch	2 Leg Bridle			3 Leg Bridle			4 Leg Bridle		
														
			Rated Capacity	Rated Capacity	Rated Capacity	15°	30°	45°	15°	30°	45°	15°	30°	45°
1/4	1-6	2 x 4	.65	.48	1.3	1.3	1.1	.92	1.9	1.7	1.4	2.5	2.3	1.8
5/16	1-6	2½ x 5	1.0	.74	2.0	1.9	1.7	1.4	2.9	2.6	2.1	3.9	3.5	2.8
3/8	2	3 x 6	1.4	1.1	2.8	2.7	2.4	2.0	4.1	3.6	3.0	5.4	4.8	4.0
7/16	2	3½ x 7	1.9	1.4	3.8	3.7	3.3	2.7	5.5	4.9	4.0	7.3	6.6	5.4
1/2	2-6	4 x 8	2.5	1.9	5.0	4.8	4.3	3.5	7.2	6.5	5.3	9.7	8.7	7.1
9/16	3	4½ x 9	3.2	2.4	6.4	6.2	5.5	4.5	9.3	8.3	6.8	12	11	(9)
5/8	3	5 x 10	3.9	2.9	7.8	7.5	6.8	5.5	11	10	8.3	15	14	11
3/4	3-6	6 x 12	5.6	4.1	11	11	9.7	7.9	16	15	12	22	19	16
7/8	4	7 x 14	7.6	5.6	15	15	13	11	22	20	16	29	26	21
1	4-6	8 x 16	9.8	7.2	20	19	17	14	28	25	21	38	34	28
1-1/8	5	9 x 18	12	9.1	24	23	21	17	35	31	25	46	42	34
1-1/4	5-6	10 x 20	15	11	30	29	26	21	43	38	32	58	52	42
1-3/8	6	11 x 22	18	13	36	35	31	25	52	47	38	70	62	51
1-1/2	7	12 x 24	21	16	42	41	36	30	61	55	45	81	73	59
1-3/4	8	14 x 28	28	21	56	54	48	40	81	73	59	108	97	79
2	9	16 x 32	36	28	72	70	62	51	104	94	76	139	125	102
2-1/4	10	18 x 36	44	35	88	85	76	62	128	114	93	170	152	124
2-1/2	11	20 x 40	54	42	108	104	94	76	156	140	115	209	187	153

All dimensions are in inches and capacities in tons (2000 lbs.)

APPENDIX M

FIRE AND EXPLOSION SAFETY PRECAUTIONS

1. Fire Protection and Extinguisher Training

A. Objectives

This course has been developed to heighten awareness of incipient fire fighting inside the structure, should the situation arise. This course will outline the different types of fire fighting methods and equipment to be used. The employee should be after this training able to apply good fire prevention techniques, recognize a developing fire situation, and be able to respond appropriately to that event.

B. Topics

- What is an "Incipient" fire?
- What conditions must exist to start and maintain a fire?
- What are the different types of fire extinguisher types and their uses?
- Demonstrate the proper use of a fire extinguisher.
- What Signals and Communications are to be used in the event of an emergency?
- When should we evacuate?
- Other Extinguishing methods.
- Fire Prevention

C. Incipient Fires - **Definition**

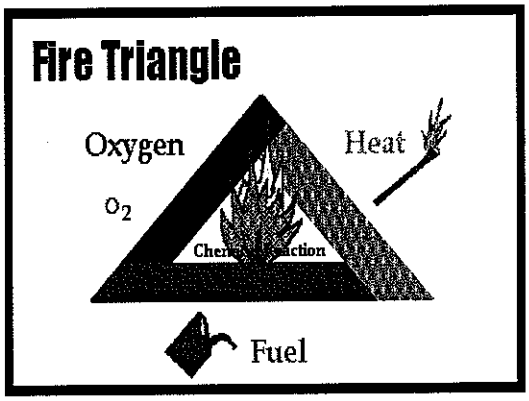
Incipient Fires are small fires that can be quickly extinguished with portable fire extinguishers. These fires require negligible coordination between individuals and can be easily extinguished without use of specialized equipment.

D. Conditions for Fire - **The Fire Triangle**

In order to understand how fire extinguishers work, you first need to know a little bit about fire.

Four things must be present at the same time in order to produce fire:

- Enough **oxygen** to sustain combustion,
- Enough **heat** to raise the material to its ignition temperature,
- Some sort of **fuel** or combustible material, and
- The **chemical, exothermic reaction** that is fire.



Oxygen, heat, and fuel are frequently referred to as the "fire triangle." Add in the fourth element, the chemical reaction, and you actually have a fire "tetrahedron." The important thing to remember is:

Take any of these four things away, and you will not have a fire, OR **the fire will be extinguished. Essentially, fire extinguishers put out fire by taking away one or more elements of the fire triangle/tetrahedron.**

E. Types of fire Extinguishers

There are basically four different types or classes of fire extinguishers, each of which extinguishes specific types of fire. Newer fire extinguishers use a picture/labeling system to designate which types of fires they are to be used on. Older fire extinguishers are labeled with colored geometrical shapes with letter designations. Both of these types of labels are shown below with the description of the different classes of extinguishers.

Additionally, Class A and Class B fire extinguishers have a numerical rating which is based on tests conducted by Underwriter's Laboratories that are designed to determine the extinguishing potential for each size and type of extinguisher.

Fire Extinguisher Ratings

Class A Extinguishers will put out fires in ordinary combustibles, such as wood and paper. The numerical rating for this class of fire extinguisher refers to the amount of water the fire extinguisher holds and the amount of fire it will extinguish.

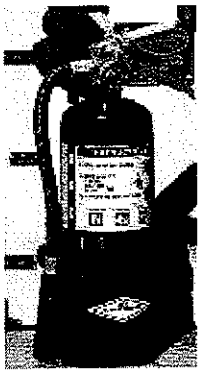
Class B Extinguishers should be used on fires involving flammable liquids, such as grease, gasoline, oil, etc. The numerical rating for this class of fire extinguisher states the approximate number of square feet of a flammable liquid fire that a non-expert person can expect to extinguish.

Class C Extinguishers are suitable for use on electrically energized fires. This class of fire extinguishers does not have a numerical rating. The presence of the letter "C" indicates that the extinguishing agent is non-conductive.

Class D Extinguishers are designed for use on flammable metals and are often specific for the type of metal in question. There is no picture designator for Class D extinguishers. These extinguishers generally have no rating nor are they given a multi-purpose rating for use on other types of fires.

D

Combustible Metals



Dry Chemical extinguishers are usually rated for multiple purpose use. They contain an extinguishing agent and use a compressed, non-flammable gas as a propellant.

Halon extinguishers contain a gas that interrupts the chemical reaction that takes place when fuels burn. These types of extinguishers are often used to protect valuable electrical equipment since them leave no residue to clean up. Halon extinguishers have a limited range, usually 4 to 6 feet. The initial application of Halon should be made at the base of the fire, even after the flames have been extinguished.

Water These extinguishers contain water and compressed gas and should only be used on Class A (ordinary combustibles) fires.

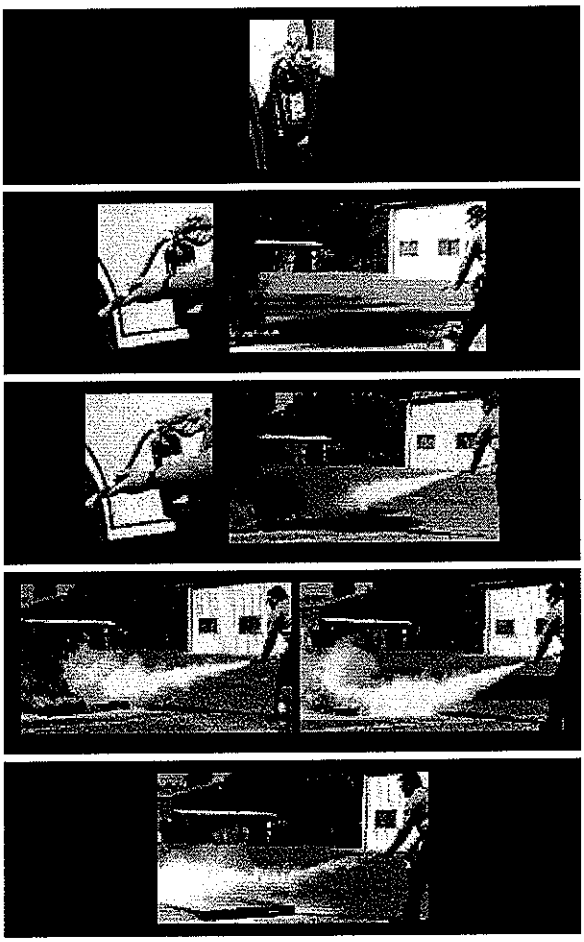
Carbon Dioxide (CO_2) extinguishers are most effective on Class B and C (liquids and electrical) fires. Since the gas disperses quickly, these extinguishers are only effective from 3 to 8 feet. The carbon dioxide is stored as a compressed liquid in the extinguisher; as it expands, it cools the surrounding air. The cooling will often cause ice to form around the "horn" where the gas is expelled from the extinguisher. Since the fire could re-ignite, continue to apply the agent even after the fire appears to be out.

F. Fire Extinguisher Use

How to Use a Fire Extinguisher

Even though extinguishers come in a number of shapes and sizes, they all operate in a similar manner. Here's an easy acronym for fire extinguisher use:

P A S S -- **P**ull, **A**im, **S**queeze, and **S**weep



Pull the pin at the top of the extinguisher that keeps the handle from being accidentally pressed.

Aim the nozzle toward the base of the fire.

Stand approximately 8 feet away from the fire and **squeeze** the handle to discharge the extinguisher. If you release the handle, the discharge will stop.

Sweep the nozzle back and forth at the base of the fire. After the fire appears to be out, watch it carefully since it may re-ignite!

G. Important Rules to Remember

1. Most fires start small. Except for explosions, fires can usually be brought under control if they are attacked correctly with the right type and size of extinguisher within the first two minutes.

2. A fire extinguisher should be "listed and labeled" by an independent testing laboratory. The higher the rating number on an A or B extinguisher, the more fire it can put out. Be careful - high-rated units are heavier models. Make certain you can hold and operate the model you are buying.

3. A portable fire extinguisher can save lives and property by putting out a small fire or containing it until the fire department arrives. Before attempting to fight a small fire, be sure everyone is out of the building. It is important to have someone notify Site Management quickly to report the fire. If the fire starts to spread or threatens your escape path, get out immediately.

4. The operator must know how to use the extinguisher, quickly without taking time to read directions during an emergency. Remember that the extinguishers need care and must be recharged after every use.

5. If You Fight a Fire, Remember the Word:

PASS

Pull...Aim...Squeeze...Sweep

Pull - Pull the pin. Some extinguishers require releasing a lock latch, pressing a puncture lever or other motion.
Aim - Aim low, pointing the extinguisher nozzle (0r it's horn or hose at the base of the fire.
Squeeze - Squeeze the handle. This releases the extinguishing agent.
Sweep- Sweep from side to side at the base of the fire until it appears out. Watch the fire area in case fire breaks out again and repeat use of extinguisher if necessary.

6. Most portable extinguishers work according to these directions. But some do not. An example of that would be a D class fire extinguisher. Class D fire extinguishers work on a smothering method where the fire suppressant it aim directly at the fire source until completely covered. Read and follow the directions on your extinguisher. If you have the slightest doubt about whether or not to fight a fire - DON'T! Get out and close the door behind you.
Learn how and when to use a fire extinguisher before an emergency, inspect extinguishers monthly, and always keep your fire extinguishers fully charged.

When not to fight a fire...
When fire is blocking your only exit.
If the fire is too spreading too quickly.
If visibility is effected to where safe egress is compromised
If the structure itself is on fire
Atmosphere in enclosure becomes IDLH
Explosive reaction is eminent or ongoing
If the type or size of the extinguisher is wrong.
If the fire is too large.

If you don't know how to use your fire extinguisher.
If any of the above conditions exist, leave immediately.

H. Other Extinguishing Methods

a. **Encapsulate with Soils-** When using soils to extinguish a fire you are essentially starving it of oxygen. This method is quick, easy and very effective especially when a piece of earth moving equipment is readily available. As effective as this method is, one must recognized some limitations and possible problems with this method.
   i. Air reactive materials can be quickly extinguished by this method for the most part, but one must be aware that the fire hazard still exists once the material is unearthed or exposed to oxygen.
   ii. Some materials react with water so moist soils may either contribute to the reactive process or allow the material to continue to react under the soils.
   iii. Know where you are getting your soils. Throwing soils potentially contaminated with flammables, combustibles, or non-compatible chemicals may increase the reaction

b. Remote Foam Applicators- The use of remote foam applicators enable the fire to be put out by means of opening a valve from outside the effected area which activates the unit and sends foam through its pre-positioned application nozzles. This has the distinct advantage of keeping personnel away from the source of the fire and also aids in vapor suppression in the event you are dealing with a volatile liquid.
   i. This method also is very easy to use but has its limitation;
      1. Most foam applications are good for A-B fires. Metal fires and water reactive materials will not be effected and may even increase reactive activity
      2. Preplanning of the positioning of the application nozzles is imperative so that proper coverage is made once unit is activated
      3. Foams eventually break down and reapplication may be necessary

I. Fire Prevention

- Good housekeeping in the work area
- Check communication systems between tent crew prior to operations
- Fire extinguishers and fire arrest systems checked prior to operations for serviceability
- Ground spotters in place where they can observe excavation face during intrusive activities
- Fire arrest systems placed in the immediate work area where ground spotters have unobstructed access to them (within 10ft).
- Keep area of operations small and contained limiting fuel for a fire
- Containerize, Segregate, and Store materials according to their established hazard classification
- Keep all areas accessible to quick response team should a fire begin to develop
- Two fire watch personnel should be stationed in the enclosure for 30 minutes after the completion of intrusive activities to monitor the area.

J. Drum Handling Procedure

a. The objective of this section is to be able to recognize a situation when drum handling procedures are to be put in place in addition to established work practices not otherwise specified by the Health and Safety Plan.

b. **Definition**

i. An **intact container** is defined as being able to hold 75% of its contents. In addition to this, containers shall also be considered intact if the container itself has not been breeched in a way so that the outside environment can contact the containerized material. Containers that do not meet these criteria are defined as contaminated debris.

c. Drum handling personnel shall follow these safety precautions while performing their tasks

- Inspect PPE/ Communication Gear prior to entering the enclosure
- Know your emergency evacuation plan
- Always have a clear evacuation route
- Always know your exit locations
- Know the location of emergency shower
- Never enter an unsafe excavation
- Never approach an anomaly until cleared by the RT/CT
- Limit handling of drum as much as possible
- Stand clear of drums being raised for over packing
- Watch finger pinch points
- Practice good airline management
- Replace damaged PPE immediately (i.e. torn gloves, suits)
- Use absorbent pads to wipe of any chemical contact with PPE as soon as possible

K. Excavation and Over packing Operations

a. Excavation Operations will proceed by carefully removing 6"-12" lifts to lessen the chance of breeching or unnecessarily disturbing a buried container. Ground spotters will be in place to observe the excavation face and to notify the operator if an anomaly has been unearthed. Once an anomaly has been identified a visual inspection of the item will be made prior to approaching.

b. Anomalies that have these characteristics will not be approached;

i. Bulging
ii. Smoking
iii. Hissing
iv. Reacting
v. Intact gas cylinders

c. Appropriate incipient fire fighting measures shall be applied in a small fire event if applicable. Ideally, the excavator will cover with soils and non-essential crews shall back away to the Primary Assembly Point to re evaluate the situation.

d. Once it has been determined by visual inspection that it is safe to approach the anomaly (i.e. proper sloping of excavation & no characteristics exhibited by anomaly as stated above) a SSO, RT, and CT shall simultaneously scan the area as they approach the item. The SSO, RT and CT shall determine whether it is safe for the drum handling crew to approach and over pack the intact container if needed. Intact containers shall be over packed prior to removal from the excavation. Breached or fragmented containers that do not meet the definition of an intact container may be wrapped or over packed depending upon amount of leakage, potential leakage, or nature of contents in the container before being removed from the excavation. The ultimate

determination as to in what manner a non-intact container is to be packed for disposal will be that of the Operations Manager or Supervisor.

e. Over packing
    i. Once the anomaly has been identified and scanned, over packing of the item shall be conducted in the following manner if applicable:

- Expose the anomaly by carefully removing dirt from around it by hand. This should only be accomplished if it has been determined safe to do so.
- Position 110gallon over pack near the anomaly on a level surface so that it will not tip once container is over packed.
- Position the drum retrieval device firmly around the drum. A drum strap for example should be cinched about 18" from the top of the drum.
- The drum shall be lifted by the excavator and placed into the 110gallon over pack. Personnel shall stand clear of the drum until it has been placed directly over the over pack drum. The use of guide sticks or tag line may be employed.
- Once the item is over packed the lid shall be secured
- The over pack shall then be lifted out of the excavation by the retrieval device and staged for identification and sampling
- Sampling of the intact container shall be performed in the designated sample area
- Remote opening and/or use of non-sparking tools shall be used to access an intact container
- All drum staging areas shall be located so that they do not impede emergency egress from the structure

L. Emergency Contingency Plan

Objective

This section is designed to outline the emergency procedures established for operations in Tent #2.

Topics

- Definition of an emergency condition
- Identification of Emergency Exits
- Emergency Evacuation Shut Down Signals and Procedures
- Recognition and Reaction to an Emergency Condition
- Emergency Rescue

Definition

An **emergency condition** can be defined as a detrimental event that may disrupt enclosure operations and adversely affected the health and safety of onsite personnel.

Emergency Access and Egress

Prior to any activities in Enclosure, emergency access and egress points must be established and maintained. Criteria for such points are as follows:

- Emergency egress door must be marked with a self- illuminating exit sign that is clearly visible
- Illuminating arrows shall be placed in the enclosure in a manner that directs personnel within the enclosure to the emergency exits
- Operations shall be conducted in a manner as not to obstruct a direct path to the emergency exits if at all possible
- Emergency decontamination stations shall be established outside of the emergency exits in a manner to which quick and effective decontamination of personnel can be conducted
- Maps showing emergency exit, emergency air horns, and fire extinguisher locations shall be located inside and out of the structure for quick reference

- Adequate work lighting will be maintained. If lighting fails, work will stop and workers will move to the airlock until lighting is reestablished.

- **Recognition and Reaction to an Emergency Condition**

Emergency conditions in the structure can be divided in two categories for which we will review.

Injury/Accident

Fire/Chemical Reaction

Injury/ Accident

An injury/accident emergency shall be handled as follows:

- An injury shall be reported to all enclosure personnel either by radio or by two consecutive blasts with the air horn
- All operations inside the enclosure will immediately cease
- Evaluation of the incident shall be conducted by personnel in the immediate area to access if a rescue is needed and if a rescue can be safely accomplished before proceeding with any rescue activity
- The Enclosure Operations Supervisor, Health and Safety Officer or designee will notify the Incident Commander of the situation. Information regarding your name, location, and the nature of the injury, how many personnel involved, and current actions being taken should be given. Outside Emergency Medical Assistance will be summoned at that time if requested
- If the nature of the injury is such where the effected person can be assisted back to the emergency exit under his/her own power, enclosure personnel will escort the person to the exit to waiting decon personnel for decontamination and further assistance.
- If the injured requires extraction from the enclosure by means of a rescue crew and a rescue can been safely accomplished, the pre-assembled crew will enter the structure, place the victim in the Skid Sled and remove back to the exit for decontamination or packaging. Enclosure personnel shall assist the Rescue Team as much as possible during this operation.

Fire/Chemical Reaction

A Fire/Chemical Reaction emergency shall be handled as follows:

- Ground spotters positioned to observe the excavation face shall notify the excavator operator of developing fire or chemical reaction
- All other operations in the enclosure will stop and non-essential personnel, who will also be monitoring the radio, shall leave the area (i.e. loading and sampling personnel).
- Soils designated for fire suppression shall be applied by the excavator to quickly extinguish the fire or cover the reacting material. This shall be the preferred method if possible. The use of a hand held fire extinguisher can be used by ground personnel as necessary.
- If the fire is quickly put out the team will regroup with Supervisory personnel at the CRZ and assess the situation prior to further excavation.
- In the event where a fire is beyond the incipient stage or violent chemical reaction is occurring, one long air horn blast shall be the sounded by the Enclosure Operations Supervisor, Site Safety Officer or designee at which time all personnel will evacuate the structure through its pre determined egress points, proceed through the decontamination station, and meet at the Primary Assembly Area located within the airlock enclosure.
- The Secondary Assembly Area (guard shack west of airlock enclosure) will be used in the event that it is not safe to assemble in the Primary Assembly Area
- The Airlock Supervisor will be responsible for making a head count of personnel using his entry/exit log
- Notification for outside assistance shall be made by the Incident Commander
- All personnel shall remain in the assembly area until further directed by the Enclosure Operations Supervisor, Site Safety Officer, or designee.
- Emergency access roads to the enclosure must be unobstructed in the event outside assistance is needed

Emergency Rescue Personnel

Two emergency rescue personnel will be staged in the Support Area on standby and ready to enter. They shall be suited in the same Level of chemical gear (or higher) as enclosure personnel. Both Rescue personnel shall be wearing SCBAs for increased mobility. The Rescue team shall be notified by the Enclosure Operations Supervisor, Site Safety Officer, or designee by radio that they are required in the Enclosure for a rescue. At that time they will be quickly briefed on the situation. Rescue personnel shall enter the Enclosure with the Skid Sled to extract injured personnel as outlined in the Injury/Accident Emergency plan