# BUILT-RITE
# PSM SAFETY TRAINING
# for the
# PETROCHEMICAL INDUSTRY

**Process Safety Management**
**Recertification Training**

**8th Edition**

**Please Note:**

Annual PSM Recertification Training is for awareness and review purposes only. It does not take the place of classroom and/or hands-on training by contractors, owners and unions. Nor is it a substitute for field experience.

The Philadelphia Area Labor-Management Committee
www.palmnet.org



Eighth Edition
October 2018

# Process Safety Management Recertification Training

Welcome to BUILT-RITE's PSM Safety Training for the PetroChemical Industry. This training has been prepared to help you comply with OSHA and Delaware Valley PetroChemical Industry Process Safety Management Recertification Standards. This training program is not to be used to replace any required site-specific training. It is designed to be used to recertify annually after the original eight-hour BUILT-RITE training program. With approval, this recertification training can be applied to other OSHA acceptable safety training programs in order to achieve a PSM certification status. The entire booklet must be reviewed and should take between two and four hours.

# Table of Contents

# Section 1

# Process Safety Management of Highly Hazardous Chemicals 29 CFR 1910.119

## Introduction

PSM training came into being as a direct result of catastrophic explosions and release of toxins in the United States and Bhopal, India. This standard is intended to prevent or minimize the consequences of a catastrophic release of toxic, reactive, flammable or explosive Highly Hazardous Chemicals (HHC's) from a process. A process is any activity or any combination of activities including any use, storage, manufacturing, handling or on-site movement of HHC's. A process includes any vessels, interconnected or separate, which are located such that an HHC could be involved in a potential release.

## Contractors

This standard identifies responsibilities of worksite employers and contract employers with respect to contract employees involved in maintenance, repair, turnaround, shutdown, major renovation or specialty work on or near a covered process.

Contract employers are required to train their employees to safely perform their jobs and document that employees received and understood training. Beginning in 1992 when it was announced that OSHA would add this regulation covering The Process Safety Management of Highly Hazardous Chemicals (HHC's), a BUILT-RITE coalition of unions, owners and contractors set about to create a uniform, transferable PSM certification process for union contract workers in regional petrochemical plants. The result was a training manual for PSM that is now in common usage for over 20,000 union craft personnel in area refineries. This process requires an initial 8 to 10 hour training session followed by a test with 85% as a passing score. In order to remain eligible for PSM certification, a 2 to 4 hour refresher course including testing is required every year. The training manual provided to you, along with a written

test and passing grade of 85 or more, will qualify you for the PSM Recertification status.

The standard also requires that you know about potential hazards and the worksite employer's emergency action plan, assures that employees follow safety rules of the facility, and advises the work-site employer of the hazards the contract work itself poses. Work permits are required for all work or entry to worksites where the potential exists for a catastrophic release of HHC'S.

## General Work

Required to enter an operating unit.

## Confined Space

Required to enter any space that meets the confined-space definition Section 7.

## Hot Work

Hot work permits must be issued for hot work operations conducted on or near a covered process. More about permits will be discussed in Section 6.

## Incident Investigation

Requires employers to investigate as soon as possible incidents which did result or could reasonably have resulted in catastrophic release of covered chemicals. The standard calls for an investigative team, including at least one person knowledgeable in the process involved (a contract employee when the incident involved contract work) and others with knowledge and experience to investigate and analyze the incident and develop a report on the incident.

## Emergency Planning and Response

Requires employers to develop and implement an emergency action plan. This will be covered in detail at your site-specific training session.

# Section 2

# General Refinery Safety Rules

## Vehicle Safety Rules

- All motorized vehicles and equipment to be used in an operating unit require a hot work permit.
- Maximum speed limit on the jobsite is usually 15 mph, unless otherwise posted.
- Posted speed limits are to be strictly followed.
- Congested areas require reduced speed.
- When traveling in cars and pickup trucks, personnel must use seat belts at all times. Riding in the open bed of a pickup or other truck is not allowed.
- If the operator of a motor vehicle leaves the vehicle, he/she must turn off the engine, leave the key in the ignition, and leave the doors unlocked.

## Process Unit Boundaries

Process unit boundaries and procedures for entry and exit will be covered in detail at the site-specific training session. Unit operators must know who is on their units at all times and must be notified of such on each shift.

Process unit boundaries must be located and strictly adhered to. Sign in and sign out are required for all permits.

## Permits

Work permits are covered in detail in Section 6. In general the following are the types of work permits required. All employees must be shown and receive a permit before work begins.

- Hot Work
- Safe Work/General Work
- Confined Space Entry
- Vehicle Entry
- Non-Emergency Use of Firewater
- Excavation

## Personal Protective Equipment

Personal Protective Equipment will be covered in more detail in Section 5 of this lesson. In general the following is a list of PPE required.

- Safety Glasses with Side Shields
- Hardhats
- Flame Retardant Clothing (NOMEX)
- Work Boots
- Hearing Protection

## Drug and Alcohol Policy

Common Refinery drug and alcohol policies will be discussed in detail in Section 9. Drugs or Alcohol are not permitted on any refinery property including parking lots.

## Smoking

Allowed only in designated areas

## Horseplay and Unsafe Acts

Strictly forbidden

## Emergency Procedures and Plans

Emergency procedures are covered in Section 10 and in detail at your site-specific training session.

The following rules generally apply.

- If you hear an alarm, shut down work and evacuate to a designated meeting location.
- Contractors and facilities must have a written emergency procedures plan.
- First Aid and medical services must be provided.
- Exits must be identified.
- Fire prevention plan must be in writing.

## Facial Hair

Beards or sideburns that extend below the earlobe to the cheeks, or mustaches extending below the corners of the mouth will not be allowed. Hair that extends below the collar must be tucked under the hat or contained.

## Security

Since 9/11 security has become a very important issue. Refinery access is governed by the Marine Transportation Safety Act (MTSA). Contract employees are required to have a Transportation Worker Identification Credential (TWIC). Refinery entry PROCEDURES VARY at each location. Check with your dispatcher before reporting to any new assignments.

# Section 3

# Hazard Communication
# OSHA Standard 1910.1200

This standard establishes uniform requirements to make sure that the hazards of all chemicals used in U.S. workplaces are evaluated and that this hazard information is transmitted to affected employers and exposed employees.

Employers must develop, implement and maintain at the workplace a written comprehensive hazard communication program. If the workplace has multiple employers on site, such as a construction or turnaround site, the rule requires all these employers to ensure that information regarding hazards and protective measures be made available to the other employers on-site.

Chemical manufacturers and importers must develop a Safety Data Sheet (SDS), formerly known as a Material Safety Data Sheet (MSDS), for each hazardous chemical they produce or import and must provide the SDS automatically at the time of initial shipment of a hazardous chemical to a "downstream" distributor or user. Distributors must in turn also ensure that employers downstream of them are similarly provided with the SDS. Employees working near or exposed to any hazardous chemical have a Right to Know what the hazards are and a SDS must be made available to the employee or his or her representative. Understanding the SDS is a key element of this standard.

# Hazard Communication Safety Data Sheets

The Hazard Communication Standard (HCS) requires chemical manufacturers, distributors, and importers to provide Safety Data Sheets (SDSs) (formerly known as Material Safety Data Sheets or MSDSs) to communicate the hazards of hazardous chemical products. As of June 1, 2015, the HCS will require new SDSs to be in a uniform format, and include the section numbers, the headings, and associated information under the headings below:

**Section 1, Identification** includes product identifier; manufacturer or distributor name, address, phone number; emergency phone number; recommended use; restrictions on use.

**Section 2, Hazard(s) identification** includes all hazards regarding the chemical; required label elements.

**Section 3, Composition/information on ingredients** includes information on chemical ingredients; trade secret claims.

**Section 4, First aid measures** includes important symptoms/effects, acute, delayed; required treatment.

**Section 5, Firefighting measures** lists suitable extinguishing techniques, equipment; chemical hazards from fire.

**Section 6, Accidental release measures** lists emergency procedures; protective equipment; proper methods of containment and cleanup.

**Section 7, Handling and storage** lists precautions for safe handling and storage, including incompatibilities.

**Section 8, Exposure controls/personal protection** lists OSHA's Permissible Exposure Limits (PELs); Threshold Limit Values (TLVs); appropriate engineering controls; personal protective equipment (PPE).

**Section 9, Physical and chemical properties** lists the chemical's characteristics.

**Section 10, Stability and reactivity** lists chemical stability and possibility of hazardous reactions.

**Section 11, Toxicological information** includes routes of exposure; related symptoms, acute and chronic effects; numerical measures of toxicity.

Section 12, Ecological information*
Section 13, Disposal considerations*
Section 14, Transport information*
Section 15, Regulatory information*

**Section 16, Other information**, includes the date of preparation or last revision.

*Note: Since other Agencies regulate this information, OSHA will not be enforcing Sections 12 through 15 (29 CFR 1910.1200(g)(2)).

**Employers must ensure that SDSs are readily accessible to employees.**

## Safety Data Sheet

## Ethanol, Denatured, 95%

CAROLINA®
www.carolina.com

### Section 1 Product Description

| | |
|---|---|
| **Product Name:** | Ethanol, Denatured, 95% |
| **Recommended Use:** | Science education applications |
| **Synonyms:** | Alcohol, Ethyl alcohol |
| **Distributor:** | Carolina Biological Supply Company, 2700 York Road, Burlington, NC 27215-3398 |
| **Chemical Information:** | 800-227-1150 (8am-5pm (ET) M-F) |
| **Chemtrec:** | 800-424-9300 (Transportation Spill Response 24 hours) |

### Section 2 Hazard Identification

**Classification of the chemical in accordance with paragraph (d) of §1910.1200;**

**DANGER**

Highly flammable liquid and vapor. May cause damage to organs.

**GHS Classification:**
Flammable Liquid Category 2, Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 2

**Other Safety Precautions:** IF exposed or if you feel unwell: Call a POISON CENTER or doctor/physician.

**Acute Toxicity Dermal Contains** 90.975 % of the mixture consists of ingredient(s) of unknown toxicity

### Section 3 Composition / Information on Ingredients

| Chemical Name | CAS # | % |
|---|---|---|
| Ethanol | 64-17-5 | 85.98 |
| Water | 7732-18-5 | 5 |
| 2-Propanol | 67-63-0 | 4.75 |
| Methanol | 67-56-1 | 4.28 |

### Section 4 First Aid Measures

**Emergency and First Aid Procedures**

| | |
|---|---|
| **Inhalation:** | In case of accident by inhalation: remove casualty to fresh air and keep at rest. |
| **Eyes:** | In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. |
| **Skin Contact:** | After contact with skin, wash immediately with plenty of water. |
| **Ingestion:** | If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label. |

### Section 5 Firefighting Procedures

| | |
|---|---|
| **Extinguishing Media:** | Use dry chemical, CO2 or appropriate foam. |
| **Fire Fighting Methods and Protection:** | Firefighters should wear full protective equipment and NIOSH approved self-contained breathing apparatus. |
| **Fire and/or Explosion Hazards:** | Vapors may travel back to ignition source. Closed Containers exposed to heat may explode. Extremely flammable. |
| **Hazardous Combustion Products:** | Carbon dioxide, Carbon monoxide |

### Section 6 Spill or Leak Procedures

| | |
|---|---|
| **Steps to Take in Case Material Is Released or Spilled:** | No health affects expected from the clean-up of this material if contact can be avoided. Follow personal protective equipment recommendations found in Section 8 of this MSDS Ve ntilate the contaminated area. |

# Safety Data Sheet

Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

## Section 7 Handling and Storage

**Handling:** Keep away from heat/sparks/open flames/hot surfaces. – No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting/…/ equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Do not breathe dust/fume/gas/mist/vapors/spray. Wash thoroughly after handling. Do no eat, drink or smoke when using this product. Wear protective gloves/protective clothing/eye protection/face protection.

**Storage:** Keep container tightly closed. Store in a well-ventilated place. Keep cool. Store locked up.

**Storage Code:** Red - Flammables. Store in approved flammable containers. Store away from oxidizing materials.

## Section 8 Protection Information

| | ACGIH | | OSHA PEL | |
|---|---|---|---|---|
| **Chemical Name** | **(TWA)** | **(STEL)** | **(TWA)** | **(STEL)** |
| Ethanol | N/A | 1000 ppm STEL | 1000 ppm TWA; 1900 mg/m3 TWA | N/A |
| 2-Propanol | 200 ppm TWA | 400 ppm STEL | 400 ppm TWA; 980 mg/m3 TWA | N/A |
| Methanol | 200 ppm TWA | 250 ppm STEL | 200 ppm TWA; 260 mg/m3 TWA | N/A |

**Control Parameters**

**Engineering Measures:** Local exhaust ventilation or other engineering controls are normally required when handling or using this product to avoid overexposure.

**Personal Protective Equipment (PPE):** Lab coat, apron, eye wash, safety shower.

**Respiratory Protection:** No respiratory protection required under normal conditions of use. Provide general room exhaust ventilation if symptoms of overexposure occur as explained Section 11. A respirator is not normally required.

**Respirator Type(s):** None required where adequate ventilation is provided. If airborne concentrations are above the applicable exposure limits, use NIOSH/MSHA approved respiratory protection.

**Eye Protection:** Wear chemical splash goggles when handling this product. Have an eye wash station available.

**Skin Protection:** Wear protective gloves. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work

**Gloves:** Nitrile

## Section 9 Physical Data

**Formula:** See Section 3
**Molecular Weight:** (Ethanol) 46.07
**Appearance:** Colorless Liquid
**Odor:** Moderate Alcohol Odor
**Odor Threshold:** No data available
**pH:** No data available
**Melting Point:** 114 C
**Boiling Point:** 79 C
**Flash Point:** 17 C
**Flammable Limits in Air:** (Ethanol) LEL: 3.3% UEL: 19%
**Vapor Pressure:** 57.3 hPa at 20°C
**Evaporation Rate (BuAc=1):** 3.3
**Vapor Density (Air=1):** 1.6
**Specific Gravity:** (Ethanol) 0.789 at 20 °C
**Solubility in Water:** Soluble
**Log Pow (calculated):** -0.32
**Autoignition Temperature:** 363 C
**Decomposition Temperature:** No data available
**Viscosity:** No data available
**Percent Volatile by Volume:** 95%

## Section 10 Reactivity Data

**Reactivity:** Not generally reactive under normal conditions.

**Chemical Stability:** Stable under normal conditions.

**Conditions to Avoid:** Temperatures above the high flash point of this combustible material in combination with sparks, open flames, or other sources of ignition.

**Incompatible Materials:** Organic Peroxides, Strong acids, Oxidizing materials, Water-reactive materials

**Hazardous Decomposition Products:** Carbon dioxide

**Hazardous Polymerization:** Will not occur

## Section 11 Toxicity Data

## Safety Data Sheet

**Routes of Entry** Inhalation and ingestion.
**Symptoms (Acute):** Respiratory Irritation, Dermitis, Central Nervous System Depression
**Delayed Effects:** Liver disorders

**Acute Toxicity:**

| Chemical Name | CAS Number | Oral LD50 | Dermal LD50 | Inhalation LC50 |
|---|---|---|---|---|
| Ethanol | 64-17-5 | Oral LD50 Rat 7060 mg/kg | | INHALATION LC50-4H Rat 124.7 MG/L |
| Water | 7732-18-5 | Not applicable | | |
| 2-Propanol | 67-63-0 | Oral LD50 Rat 4396 mg/kg | Dermal LD50 Rat 12800 mg/kg Dermal LD50 Rabbit 12870 mg/kg | INHALATION LC50-4H Rat 72.6 MG/L |
| Methanol | 67-56-1 | Oral LD50 Rat 5628 mg/kg | Dermal LD50 Rabbit 15800 mg/kg | INHALATION LC50-4H Rat 83.2 MG/L INHALATION LC50-4H Rat 64000 ppm |

**Carcinogenicity:**

| Chemical Name | CAS Number | IARC | NTP | OSHA |
|---|---|---|---|---|
| Ethanol | 64-17-5 | Listed | Listed | Listed |
| 2-Propanol | 67-63-0 | Listed | Not listed | Not listed |
| Methanol | 67-56-1 | Not listed | Not listed | Not listed |

**Chronic Effects:**
**Mutagenicity:** No evidence of a mutagenic effect.
**Teratogenicity:** No evidence of a teratogenic effect (birth defect).
**Sensitization:** No evidence of a sensitization effect.
**Reproductive:** No evidence of negative reproductive effects.
**Target Organ Effects:**
**Acute:** Central Nervous System, Eyes
**Chronic:** Eyes

## Section 12 Ecological Data

**Overview:** Slight ecological hazard. In high concentrations, this product may be dangerous to plants and/or wildlife.
**Mobility:** This material is expected to have moderate mobility in soil. It absorbs to most soil types.
**Persistence:** Biodegradation is expected to be a major fate process for this material.
**Bioaccumulation:** Bioconcentration is not expected to occur.
**Degradability:** Biodegrades quickly.
**Other Adverse Effects:** No data

| Chemical Name | CAS Number | Eco Toxicity |
|---|---|---|
| Ethanol | 64-17-5 | 96 HR LC50 PIMEPHALES PROMELAS > 100 MG/L [STATIC] |
| Water | 7732-18-5 | No data available |
| 2-Propanol | 67-63-0 | 96 HR LC50 LEPOMIS MACROCHIRUS > 1400000 µG/L |
| Methanol | 67-56-1 | 96 HR LC50 PIMEPHALES PROMELAS 11130 MG/L [STATIC]<br>48 HR EC50 DAPHNIA MAGNA 2 MG/L [STATIC]<br>24 HR EC50 DAPHNIA MAGNA 10800 MG/L<br>48 HR LC50 DAPHNIA MAGNA 9268 - 14221 MG/L<br>48 HR EC50 DAPHNIA MAGNA 13299 MG/L<br>72 HR EC50 DESMODESMUS SUBSPICATUS > 1000 MG/L<br>96 HR EC50 DESMODESMUS SUBSPICATUS > 1000 MG/L |

## Section 13 Disposal Information

**Disposal Methods:** Dispose in accordance with all applicable Federal, State and Local regulations. Always contact a permitted waste disposer (TSD) to assure compliance.
**Waste Disposal Code(s):** If discarded, this product is considered a RCRA ignitable waste, D001.

# Safety Data Sheet

## Section 14 Transport Information

**Ground - DOT Proper Shipping Name:**
UN1170
Ethanol Solutions
Class 3
P.G. II

**Air - IATA Proper Shipping Name:**
UN1170
Ethanol Solutions
Class 3
P.G. II

## Section 15 Regulatory Information

**TSCA Status:** All components in this product are on the TSCA Inventory.

| Chemical Name | CAS Number | § 313 Name | § 304 RQ | CERCLA RQ | § 302 TPQ | CAA 112(2) TQ |
|---|---|---|---|---|---|---|
| Ethanol | 64-17-5 | No | No | No | No | No |
| 2-Propanol | 67-63-0 | Isopropyl alcohol | No | No | No | No |
| Methanol | 67-56-1 | No | No | No | No | No |

**California Prop 65:** WARNING: This product contains a chemical known to the state of California to cause cancer and birth defects or other reproductive harm.

## Section 16 Additional Information

**Revised: 04/01/2013** **Replaces: 03/19/2013** **Printed: 06-21-2013**

The information provided in this (Material) Safety Data Sheet represents a compilation of data drawn directly from various sources available to us. Carolina Biological Supply makes no representation or guarantee as to the suitability of this information to a particular application of the substance covered in the (Material) Safety Data Sheet.

**Glossary**

| | | | |
|---|---|---|---|
| ACGIH | American Conference of Governmental Industrial Hygienists | NTP | National Toxicology Program |
| CAS | Chemical Abstract Service Number | OSHA | Occupational Safety and Health Administration |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act | PEL | Permissible Exposure Limit |
| DOT | U.S. Department of Transportation | ppm | Parts per million |
| IARC | International Agency for Research on Cancer | RCRA | Resource Conservation and Recovery Act |
| N/A | Not Available | SARA | Superfund Amendments and Reauthorization Act |
| | | TLV | Threshold Limit Value |
| | | TSCA | Toxic Substances Control Act |
| | | IDLH | Immediately dangerous to life and health |

# Hazard Communication Standard Labels

OSHA has updated the requirements for labeling of hazardous chemicals under its Hazard Communication Standard (HCS). As of June 1, 2015, all labels will be required to have pictograms, a signal word, hazard and precautionary statements, the product identifier, and supplier identification. A sample revised HCS label, identifying the required label elements, is shown below. Supplemental information can also be provided on the label as needed.

**SAMPLE LABEL**

**CODE**_____
**Product Name**_____
} **Product Identifier**

**Company Name**_____
Street Address_____
City_____ State_____
Postal Code_____Country_____
Emergency Phone Number_____
} **Supplier Identification**

**Hazard Pictograms**

**Signal Word**
**Danger**

Keep container tightly closed. Store in a cool, well-ventilated place that is locked.
Keep away from heat/sparks/open flame. No smoking.
Only use non-sparking tools.
Use explosion-proof electrical equipment.
Take precautionary measures against static discharge.
Ground and bond container and receiving equipment.
Do not breathe vapors.
Wear protective gloves.
Do not eat, drink or smoke when using this product.
Wash hands thoroughly after handling.
Dispose of in accordance with local, regional, national, international regulations as specified.

**In Case of Fire:** use dry chemical (BC) or Carbon Dioxide ($CO_2$) fire extinguisher to extinguish.

**First Aid**
If exposed call Poison Center.
If on skin (or hair): Take off immediately any contaminated clothing. Rinse skin with water.

} **Precautionary Statements**

**Highly flammable liquid and vapor.**
**May cause liver and kidney damage.**
} **Hazard Statements**

**Supplemental Information**

**Directions for Use**

_____
_____
_____

Fill weight:_____ Lot Number:_____
Gross weight:_____ Fill Date:_____
Expiration Date:_____

## HCS Pictograms and Hazards:

| **Health Hazard**  | **Flame**  | **Exclamation Mark**  |
|---|---|---|
| • Carcinogen<br>• Mutagenicity<br>• Reproductive Toxicity<br>• Respiratory Sensitizer<br>• Target Organ Toxicity<br>• Aspiration Toxicity | • Flammables<br>• Pyrophorics<br>• Self-Heating<br>• Emits Flammable Gas<br>• Self-Reactives<br>• Organic Peroxides | • Irritant (skin and eye)<br>• Skin Sensitizer<br>• Acute Toxicity (harmful)<br>• Narcotic Effects<br>• Respiratory Tract Irritant<br>• Hazardous to Ozone Layer (Non Mandatory) |
| **Gas Cylinder**  | **Corrosion**  | **Exploding Bomb**  |
| • Gases under Pressure | • Skin Corrosion/ burns<br>• Eye Damage<br>• Corrosive to Metals | • Explosives<br>• Self-Reactives<br>• Organic Peroxides |
| **Flame over Circle**  | **Environment (Non Mandatory)**  | **Skull and Crossbones**  |
| • Oxidizers | • Aquatic Toxicity | • Acute Toxicity (fatal or toxic) |

# Section 3B

# Asbestos Awareness

Asbestos is a naturally occurring mineral that is mined and used in over 3000 products.

## Examples of Asbestos containing materials

- Gaskets
- Automobile brakes
- Roofing materials
- Transite pipe and panels
- Floor tiles and mastics
- Thermal system insulation including Pre-formed sections
- Block, trowel and spray on applications

The primary purpose for using asbestos is as a binder or as an insulator. OSHA, the EPA and individual States regulate the use of asbestos containing materials in the U.S. All Asbestos containing material, which by definition is any material that contains one percent (1%) asbestos or more by weight, is placed in one of three categories.

1. Category I Non Friable
   Roofing, flooring, packing gaskets
2. Category II Non Friable
   All other non friable materials (Transite Pipe and Sheets)
3. Category III Friable (Regulated Asbestos Containing Materials)

**Also included as Category III Friable Asbestos Containing Materials**

- Category I Non Friable ACM's that have become friable or altered, sanded, cut or ground
- Category II Non Friable ACM's that have become friable or have a high possibility of becoming friable during demolition or renovation

Some Asbestos Containing Materials are produced in what is known as "Closed Cell Matrix."

### Examples of "Closed Cell Matrix"

Vinyl Asbestos Floor Tiles

These materials are generally not easily made friable and therefore are not broken down into small particles that float into the breathing zone and are inhaled.

Other products such as Thermal Systems Insulations (TSIs), by nature of their construction, are easily made friable and therefore are inherently more dangerous to handle.

Under OSHA regulations all Thermal Systems Insulation in buildings or facilities constructed prior to 1980 must be identified either through specific identifiers such as color coding or gold MICA Chips or be examined by a qualifying bulk sample that is examined at a certified laboratory before it can be removed or disturbed.

If the material is not identified, you must presume that the material is an ACM until it is proven to be a non-asbestos containing material.

## *OSHA Regulations 1926.1101 (b) Definitions*

Greatest danger of contact with ACMs is the long-term health effects.

- Some of the diseases associated with Asbestos Exposure are:
- Asbestosis—A scarring of the lungs
- Lung Cancer
- Mesothelioma—cancer of the lining of the lung or stomach
- Gastro Intestinal Cancer

Asbestosis and Mesothelioma are known as Marker Diseases. Only Asbestos can cause these diseases.

Asbestosis and Lung Cancer are dose related. The greater your exposure, the greater your chance of developing one of these diseases.

Mesothelioma is not dose related. Very little exposure is necessary to develop this disease.

## Smoking and Asbestos

- A person who smokes has a 22 times greater chance of developing lung cancer than someone who does not smoke.
- A person who works with Asbestos has a 5 times greater chance of developing lung cancer than someone who does not work with Asbestos.
- If you smoke and work with Asbestos, you have an 80 times greater chance of developing lung cancer than someone who dose not smoke and does not work with Asbestos. This is known as the Synergistic Effect.

The combined effect of smoking and working with Asbestos is so deadly that your Physician is required to give self-help information on quitting when a smoker takes part in a physical exam.

The latency period, the period between initial exposure and the time that you exhibit symptoms of asbestos-related disease could range from

10 to 40 years.

Once you have contracted an Asbestos related disease, it becomes progressive; it never gets better, it only gets worse.

If you are interested in additional Asbestos related information, the OSHA regulations that pertain to Asbestos are:

- 1910.1001 – General Industry
- 1926.1001 – Contract Construction

Although these rules vary slightly in their application, they are both to protect the worker on the job site from Asbestos exposure.

The location of the OSHA office nearest you can be found in the blue pages of your local telephone directory or on the Internet at **www.OSHA.gov**.

# You Have a Right to a Safe and Healthful Workplace.

# IT'S THE LAW!

- You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
- You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in the inspection.
- You can file a complaint with OSHA within 30 days of discrimination by your employer for making safety and health complaints or for exercising your rights under the *OSH Act*.
- You have a right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violation.
- Your employer must correct workplace hazards by the date indicated on the citation and must certify that these hazards have been reduced or eliminated.
- You have the right to copies of your medical records or records of your exposure to toxic and harmful substances or conditions.
- Your employer must post this notice in your workplace.

The *Occupational Safety and Health Act of 1970 (OSH Act)*, P.L. 91-596, assures safe and healthful working conditions for working men and women throughout the Nation. The Occupational Safety and Health Administration, in the U.S. Department of Labor, has the primary responsibility for administering the *OSH Act*. The rights listed here may vary depending on the particular circumstances. To file a complaint, report an emergency, or seek OSHA advice, assistance, or products, call 1-800-321-OSHA or your nearest OSHA office: • Atlanta (404) 562-2300 • Boston (617) 565-9860 • Chicago (312) 353-2220 • Dallas (214) 767-4731 • Denver (303) 844-1600 • Kansas City (816) 426-5861 • New York (212) 337-2378 • Philadelphia (215) 861-4900 • San Francisco (415) 975-4310 • Seattle (206) 553-5930. Teletypewriter (TTY) number is 1-877-889-5627. To file a complaint online or obtain more information on OSHA federal and state programs, visit OSHA's website at **www.osha.gov**. If your workplace is in a state operating under an OSHA-approved plan, your employer must post the required state equivalent of this poster.

## 1-800-321-OSHA
## www.osha.gov

**U.S. Department of Labor** • **Occupational Safety and Health Administration** • **OSHA 3165**

☆ U.S. GOVERNMENT PRINTING OFFICE: 2000–467–940

# Section 3C

# Silica Awareness

## Introduction

About 2.3 million workers are exposed to respirable crystalline silica in their workplaces, including 2 million construction workers who drill, cut, crush, or grind silica-containing materials such as concrete and stone, and 300,000 workers in general industry operations such as brick manufacturing, foundries, and hydraulic fracturing, also known as fracking. Responsible employers have been protecting workers from harmful exposure to respirable crystalline silica for years, using widely-available equipment that controls dust with water or a vacuum system.

## Key Provisions of Final Rule – 29 CFR 19261153:

- Reduces the permissible exposure limit (PEL) for respirable crystalline silica to 50 micrograms per cubic meter of air, averaged over an 8-hour shift.
- Requires employers to: use engineering controls (such as water or ventilation) to limit worker exposure to the PEL; provide respirators when engineering controls cannot adequately limit exposure; limit worker access to high exposure areas; develop a written exposure control plan, offer medical exams to highly exposed workers, and train workers on silica risks and how to limit exposures.
- Provides medical exams to monitor highly exposed workers and gives them information about their lung health.

## What is crystalline silica?

Crystalline silica is a common mineral found in many naturally occurring materials and used in many industrial products and at construction sites. Materials like sand, concrete, stone and mortar contain crystalline silica. Crystalline silica is also used to make products such as glass, pottery, ceramics, bricks, concrete and artificial stone. Industrial sand used

in certain operations, such as foundry work and hydraulic fracturing (fracking), is also a source of crystalline silica exposure. Amorphous silica, such as silica gel, is not crystalline silica.

## What does the standard require?

The standard requires employers to limit worker exposures to respirable crystalline silica and to take other steps to protect workers.

The standard provides flexible alternatives, especially useful for small employers. Employers can either use a control method laid out in Table 1 of the construction standard; or they can measure workers' exposure to silica and independently decide which dust controls work best to limit exposures to the PEL in their workplaces. (See Table 1 on page 23.)

Regardless of which exposure control method is used, all construction employers covered by the standard are required to:

- Establish and implement a **written exposure control plan** that identifies tasks that involve exposure and methods used to protect workers, including procedures to restrict access to work areas where high exposures may occur.
- Designate a **competent** person to implement the written exposure control plan.
- Restrict **housekeeping** practices that expose workers to silica where feasible alternatives are available.
- Offer **medical exams**—including chest X-rays and lung function tests—every three years for workers who are required by the standard to wear a respirator for 30 or more days per year.
- **Train workers** on work operations that result in silica exposure and ways to limit exposure.
- **Keep records** of workers' silica exposure and medical exams.

## When are employers required to comply with the standard?

Construction employers must comply with all requirements of the

standard by June 23, 2017, except requirements for laboratory evaluation of exposure samples, which begin on June 23, 2018.

## What is Table 1: "Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica"?

- Table 1 is a flexible compliance option that effectively protects workers from silica exposures. It identifies 18 common construction tasks that generate high exposures to respirable crystalline silica and for each task, specifies engineering controls, work practices, and respiratory protection that effectively protect workers.
- Employers who fully and properly implement the engineering controls, work practices, and respiratory protection specified for a task on Table 1 are not required to measure respirable crystalline silica exposures to verify that levels are at or below the PEL for workers engaged in the Table 1 task.

## Employers who do not use the control methods found in Table 1 must:

- Measure the amount of silica that workers are exposed to if it may be at or above an **action level of 25 µg/m3** (micrograms of silica per cubic meter of air), averaged over an eight-hour day.
- Protect workers from respirable crystalline silica exposures above the **permissible exposure limit of 50 µg/m3**, averaged over an eight-hour day.
- Use **dust controls** to protect workers from silica exposures above the PEL.
- Provide **respirators** to workers when dust controls cannot limit exposures to the PEL.

**List of Table 1 Entries**

- Stationary masonry saws
- Handheld power saws
- Handheld power saws for fiber cement board
- Walk-behind saws
- Drivable saws
- Rig-mounted core saws or drills
- Handheld and stand-mounted drills
- Dowel drilling rigs for concrete
- Vehicle-mounted drilling rigs for rock and concrete
- Jackhammers and handheld powered chipping tools
- Handheld grinders for mortar removal (tuckpointing)
- Handheld grinders for other than mortar removal
- Walk-behind milling machines and floor grinders
- Small drivable milling machines
- Large drivable milling machines
- Crushing machines
- Heavy equipment and utility vehicles to abrade or fracture silica materials
- Heavy equipment and utility vehicles for grading and excavating

Below is an example of an entry on table 1 that includes requirements for respiratory protection. If an employer with employees using handheld power saws fully and properly implements the controls specified in the second column, no respiratory protection would be required for employees engaged in that task outdoors for four hours or less.

If employees use handheld power saws outdoors for more than four hours per shift, or indoors for any length of time, a respirator with an assigned protection factor of 10 would be required.

**Example of Table 1 Entry**

| Equipment/ Task | Engineering and Work Practice Control Methods | Required Respiratory Protection and Minimun APF | |
|---|---|---|---|
| | | ≤ 4 hr/shift | > 4 hr/shift |
| Handheld power saws (any blade diameter) | Use saw equipped with integrated water delivery system that continuously feeds water to the blade.<br>Operate and maintain tool in accordance with manufacturers' instruction to minimize dust<br>• When used outdoors<br>• When used indoors or in an enclosed area | None<br>APF 10 | APF 10<br>APF 10 |

# Section 4

# Occupational Safety and Health Act Information

This section will provide general information concerning the Occupational Health and Safety Act and employees' individual rights and responsibilities under OSHA.

- Access to medical and exposure records
- Reporting of all safety concerns to the Shop Steward, Foreman, Safety Engineer, Business Agent or Management and in an Imminent Danger situation to OSHA
- Employer Safety Training
- Employers and Host Employers Site-Specific PSM Employee Training
- Responsibility of Employees

Read the OSHA poster at the jobsite, comply with all applicable OSHA Standards, follow all employer safety and health rules and regulations, wear or use prescribed protective equipment required at the worksite, report injuries to employer and cooperate with OSHA compliance officer conducting an inspection.

Section 11(c) of the OSHA act:
An employee who believes that he or she has been discriminated against by an employer in violation of a federal statute may, within 30 days of the occurrence, file or have another person file on their behalf a complaint alleging such discrimination. A special 11(c) provision vigorously enforces this standard.

OSHA is now emphasizing a common sense approach to the language used in the standards and enforcement procedures.

## OSHA Inspections

1. Opening Conference
2. Walk Around Inspection
3. Closing Conference

Any citations that are issued must be posted at the work site. The goal of the agency is the abatement of workplace hazards.

OSHA
Philadelphia Area Office
U.S. Customs House Room 242
2nd and Chestnut Streets
Philadelphia, PA 19106

Duty Officer
8:15 AM to 4:45 PM
Monday thru Friday

215-597-4955
215-597-1956 (fax)

**www.OSHA.gov**

# Section 4B

# Construction "Focus Four" Hazards

Construction is one of the most dangerous industries. Each year approximately 4,000 employees lose their lives to work related accidents. Approximately 800 or 20 percent of the total in all industries each year occur in the construction industry. Over half of the fatalities in construction are attributed to four types of hazards: fall hazards, electrical hazards, struck by hazards, and caught in or between hazards. Controlling these "Focus Four" hazards could save over 500 lives each year in America.

## Fall Hazards

Fall hazards are by far the leading cause of fatalities. The recognition and prevention of fall hazards have been emphasized by OSHA for many years. In recent years the agency has promoted a National Safety Stand-down to prevent falls in construction. All employees who might be exposed to falls in construction must receive training in recognizing the hazards of falling and in the procedures to minimize these hazards. The best fall hazards prevention methods are engineering controls such as standard guardrails installed at edges and guardrails or covers protecting floor openings. Personal fall arrest systems are also effective when they are properly installed and maintained, however in an arrested fall an employee may still receive serious or life threatening injuries. Preventing falls in construction could save approximately 350 lives each year in America.

## Electrical Hazards

Electrical hazards are widely recognized in all industries. Fatalities occur each year from both exposures to high voltage power lines and electrical wiring and associated equipment. Ladders, scaffolds and new structures elevate employees closer to power transmission equipment and the extensive use of highly conductive metal tools and materials also increases the risk of exposure.

Electrical power transmission lines are not insulated. Coverings on

the lines are to protect the lines from weather or abrasion. Conductive materials can become energized without ever contacting power transmission lines. The minimum safe distance from these lines is ten feet. Power transmission equipment needs to be identified, moved, de-energized or effectively protected prior to working in these areas.

The need for temporary electrical installations, which are exposed to the elements and wear and tear in tough construction environments, makes the exposure to electrical hazards more prevalent in the construction industry. Damaged wiring and extension cords need to be removed from service when they are identified. Protective measures include: ensuring the proper grounding of equipment; using Ground Fault Circuit Interruption (GFCIs); checking fuses and circuit breakers; guarding live parts; proper use of extension cords; participation in training, and inspecting tools and equipment before use. Preventing electrocutions in construction could save approximately 75 lives each year.

## Struck by Hazards

Struck by hazards are presented by any falling, swinging, rolling, flying or moving material or equipment. Trucks and heavy equipment are on almost every construction worksite. The size and function of these vehicles provide operators with restricted views and blind-spots. Every construction site needs to segregate areas for equipment operation and truck traffic. These areas should be well maintained and marked with barricades. High visibility clothing should be worn on all construction sites.

All aspects of construction require materials handling. All personnel involved in rigging operations should be properly trained, and all equipment should be inspected before each use. Areas beneath hoisted loads need to be kept clear of workers that may or may not be involved in moving the loads. All materials need to be stacked, blocked or secured in some manner to prevent any unexpected shifting. Pneumatic tools, nail guns and grinders can all produce flying objects. The operators of these tools need to be trained and conscious of all the workers around them during their use and operation. Preventing struck-by hazards in construction could save approximately 75 lives each year.

## Caught-in or Between Hazards

Caught-in or between hazards are presented by objects coming together

causing crushing injuries. Common caught-in or between hazards on construction sites include trench wall cave-ins, pinned-in or between heavy equipment and wall/object or another piece of equipment, and getting caught-in or pulled into machinery by rolling/turning/running parts. Preventing these hazards can be accomplished by following excavation shoring procedures, machine guarding, and Lock Out/Tag Out procedures. Use adequate shoring before entering trenches. Provide guards or covers to moving machine parts that can come in contact with workers. Ensure walls/structures are braced during construction. Ensure any equipment or material that employees may have to work beneath, such as excavator buckets and dump truck bodies, is adequately supported by jacks and cribbing. Although the total number of these types of accidents has decreased, they generally result in a fatality and contribute to the "Focus Four" accounting for over half of all construction industry fatalities.

**"Situational Awareness"** is the first line of defense against Focus Four Hazards.

**Refocus on Safety to Avoid Focus Four Dangers**

- Discuss job hazards when completing JHA (Job Hazard Analysis) and while completing each task.
- On a daily basis, construction team members need to understand and recognize the tasks that are being performed that present the potential for hazards.
- Good communication is essential with and among team members.
- Continued self-assessment regarding scope of work and the tasks being performed is critical to **"Situational Awareness"** and to recognizing at-risk behavior and the danger of injury.
- **"I Own Safety"**. Employee Intervention is the Key.
- **Remember** remaining silent when you see an unsafe behavior or unsafe act is giving permission to be unsafe. Each person's actions are critical.

A **"2 Minute Drill"** like the one below can be used to further emphasize job safety.

CAUTION CAUTION CAUTION CAUTION CAUTION CAUTION

## 2 Minute Drill @ the Jobsite

### General Requirements

- Am I on the correct unit/facade?
- Are all required permits in place?
- Have I received and signed the JHA?
- Are all crew members wearing proper PPE?
- Does 100% tie-off rule apply?
- Do all crew members have the proper training for the conditions (e.g. Confined Space)?
- Do I have the correct tools and are they in good working order?

### Hazard Assessment

- Body Positioning
- Pinch Points
- Falling Objects/Suspended Loads
- Electrical Flash/Chemical Spills
- Lifting Angles
- Impact From Other Trades

### Environment

- Adequate ventilation & lighting
- Slip & trip hazards/housekeeping
- Sharp, hot, wet or cold surfaces
- Obstructions - pipes, beams, etc.
- Adequate ingress/egress

### Fundamental Behaviors

- Am I prepared to OWN SAFETY for myself and my team members?
- Remind crew of their authority to STOP WORK and correct unsafe behaviors and conditions.
- Do I need to OR have I changed the job plans? If so STOP WORK and rebrief.
- Any loosened or dismantled components must be tightened or removed before leaving the area.
- Employ the 20-20 Rule!

CAUTION CAUTION CAUTION CAUTION CAUTION CAUTION

# SECTION 4C

# Recordkeeping and Reporting Occupational Injuries and Illnesses

## This requirement applies to the following:

- Companies with 250 or more employees that currently are required to keep OSHA injury and illness records. These companies must electronically submit information from:

  - OSHA Form 300 - "Log of Work-Related Injuries and Illnesses"

  - OSHA Form 300A - "Summary of Work-Related Injuries and Illnesses"

  - OSHA Form 301 - "Injury and Illness Incident Report"

- Companies with 20-249 employees that are classified in certain industries, like construction, with historically high rates of occupational injuries and illnesses. Companies must submit information from OSHA Form 300 A electronically.

- The electronic reporting requirements are based on the size of the company.

- OSHA injury and illness records are maintained by the company.

- The employer will need to determine the company's peak employment during the calendar year.

- Each individual employed by the company at any time during the calendar year counts as one employee, including full-time, part-time, seasonal and temporary workers.

- Companies in the construction industry with 20-249 employees must submit Injury and Illness Summary Form 300A data to OSHA electronically

See the chart below to find out when these requirements take effect.

| Submission Year | Establishments with 250 or more employees | Establishments with 20-249 employees | Submission Deadline |
|---|---|---|---|
| **2017** | **Form 300A** | **Form 300A** | **July 1, 2017** |
| **2018** | **Form 300A, 300, 301** | **Form 300A** | **July 1, 2018** |

# Section 5

# Personal Protective Equipment

A review of proper safety equipment required by various plant rules and OSHA regulations.

The proper, basic PPE required by the OSHA standards and the refineries in which we work.

- Safety Glasses with Side Shields
- Hardhats
- Flame Retardant Clothing (Nomex)
- Sturdy Work Boots
- Hearing Protection

## Eye and Face Protection

OSHA requires eye and face protection equipment where there is a reasonable probability of preventable injury. Protectors must meet the following minimum requirements.

- Provide adequate protection against particular hazards for which they are designed.
- Be reasonably comfortable when worn under designated conditions.
- Fit snugly without interfering with the movements or vision of the wearer.
- Be durable.
- Be capable of disinfecting.
- Be easily cleaned.
- Be kept clean and in good repair.

One of the key elements for safety glasses is proper labeling, look for the ANSI-Z 87 label.

## Head Protection

Hard hats must do two things—resist penetrations and the shock of the blow. Protective hats are also used to protect against electrical shock.

## Torso Protection

Many hazards can threaten the torso; heat, splashes from hot metals, liquids, chemicals, impact, cuts, acid, radiation and flash fires. A variety of protective clothing is available from vests to full body suits. The proper protection required will be listed on your work permit.

## Foot and Leg Protection

For protection of feet and legs, workers should use leg and shin guards, foot guards, safety shoes and leggings. Check your work permit for proper equipment required.

## Respiratory Protection

Respiratory protection is required in many instances when working in refineries or chemical plants and other hazardous locations. A medical exam, a fit test and training are required for each make and type of respirator to be used.

Respiratory protection requirements are outlined in 29 CFR 1910.134 as well as in job-specific OSHA standards. Again check your work permit for detailed instructions. Facial hair requirements are common throughout the PSM covered work areas.

Respirator types will vary depending upon conditions and usage.

- 1/2 Face Air Purifying Respirators (A.P.R.)
- Full Face A.P.R.
- Airline Supplied Respirators
- Self-Contained Breathing Apparatus (S.C.B.A.)

Each type of respirator has advantages and limitations which will influence its use.

Employers are responsible for establishing an effective Respiratory Protection Program. You as the employee are responsible for wearing the respirator and complying with the program. Different hazards require different respirators.

## Program Evaluation

The effectiveness of a company's respiratory program should be evaluated at least annually, with written operating procedures modified as necessary.

## Work Area Surveillance

Changes in operating procedures, temperature, air movement, humidity and work practices can influence the concentration of substances in the work area atmosphere. These factors necessitate periodic monitoring of the air contaminate concentration. Testing should continue to insure that none of the exposure has risen above the minimum protective capacity of the respirator being used.

## Hearing Protection

Exposure to high noise levels can cause an irreversible hearing loss or impairment. There is no known cure for noise-induced hearing loss, so the prevention of excessive noise exposure is the only way to avoid hearing damage. Specifically designed protection is required, dependent upon the noise encountered. Check your work permit for detailed instructions.

- OSHA requires employers to institute a hearing conservation program for workers exposed to a noise level above established levels. (85-db-action limit)
- The first priority is to implement engineering controls to reduce noise levels.
- To provide hearing protection when unable to reduce noise levels beneath the required limit.
- Annual training.
- Also audiometric testing when required.

**Remember noise levels during a turnaround project are often higher than normal plant operations.**

# Section 6

# Work Permits

## Types of Work Permits

- Safe Work/General Work = Permission to work
- Hot Work = Cutting, Burning, Welding, Grinding, Etc.
- Confined Space = Permission to enter only
- Excavation/Digging
- Non-Emergency Use of Firewater
- Vehicle Entry Permit

## Safe Work Permits

- Although the procedure for starting a job may vary between sites, contractors cannot perform any work at a host facility without a work permit.
- Work permits are required to be renewed daily and at the beginning of each shift.
- Contractors must familiarize themselves with the permit requirements, properly prepare the job and maintain permit conditions.
- The date, time and location of the work permit are correct.
- The location of the emergency shower and eyewash, telephone, alarm box, exits and evacuation routes have been identified.
- The appropriate signature is on the permit.
- All work permits are void if a site emergency occurs and must be reissued before work can begin.

## Hot Work Permits

- A hot work permit is needed for any activity with the potential to produce an open flame or act as an ignition source.

This includes but is not limited to:

- Brazing, Cutting, Grinding, Soldering, Welding, Sandblasting, Electric Power Tools, Stress Relieving and use of Engine Driven Equipment.

You will need to verify the following:

- The date, time and location of the hot work permit are correct.
- Make sure all hot work equipment is in good repair.
- Ensure available sprinklers and fire extinguishers are in service.
- A trained fire watch must be provided in the area during and after the work is completed.
- The fire watch must maintain a suitable fire extinguisher or hose as outlined on the hot work permit.
- Establish a 360 degree safe work zone approximately 30 to 35 feet around the work area.
- Ensure the atmosphere is explosive free.
- Remove other flammable and combustible materials from the area.
- Ensure all wall and floor openings are covered.
- Ensure the appropriate signatures are on the hot work permit.

## Non-Emergency Use of Firewater

- The use of firewater for non-emergency use is strictly forbidden. Permitting varies between plant locations. Check at your site-specific training.

## Vehicle Entry Permits

- Security changes have been updated since 9/11. Check at your site-specific training session.

## Confined-Space Permit

- Hundreds of confined spaces are present in the refinery.
- Examples include towers, tanks, vessels, heaters, electrical manholes, sewers, tank cars, rail cars, floating roof tanks and excavations over 4 feet deep.
- All confined spaces are considered permit required and require an authorized confined-space entry permit before making any entry.
- Confined-Space Entry Permits will be covered in more detail in Section 7 of this course.

## Excavation and Digging Permit

- A digging permit is required before opening any type of trench or digging any hole.
- The site needs to be observed for potential hazards, and the location of utilities and services needs to be marked.
- If the excavation is more than 4 feet deep, it is a confined space.
- The atmosphere must be tested initially and the excavation must be monitored regularly.
- Exit requirements are limited by the size and shape of the dig, however a means of exit must be located within 25 feet of every worker.
- The contractor conducting the excavation must comply with OSHA regulations on excavation and trenching including the requirements for shoring and sloping.

***OSHA Excavation Std. Subpart "P" 1926.650***

## You must verify the following

- The date, time and location indicated on the permit are correct.
- The appropriate signatures are on the permit.

# Section 7

# Confined Space Safety

## Introduction

Many workplaces contain spaces that are considered to be confined because their configurations hinder the activities of any employee who must enter into, work in, and exit from them. Confinement itself may pose entrapment hazards, and work in confined spaces may keep employees closer to hazards such as an asphyxiating atmosphere, than they would otherwise be.

A confined space has: 1) limited or restricted means of entry or exit, 2) is large enough for an employee to enter and perform assigned work, and 3) is not designed for continuous occupancy by the employee. These spaces may include, but are not limited to, underground vaults, tanks, storage bins, pits and diked areas, vessels and silos.

A permit-required confined space is one that meets the definition of a confined space above and has one or more of these characteristics:

1. Contains or has the potential to contain a hazardous atmosphere, including but not limited to one that is Immediately Dangerous to Life or Health. (IDLH)

2. Contains a material that has the potential for engulfing an entrant.

3. Has an internal configuration that might cause an entrant to be trapped or asphyxiated by inward converging walls or by a floor that slopes downward and tapers to a smaller cross section.

4. Contains any other recognized serious safety or health hazard.

5. Airborne Dust.

# *Requirements of Permit Required Confined Spaces – 1910.146*

## General

In general, employers must evaluate the work place to determine if spaces are permit-required confined spaces. If there are permit-required spaces in the workplace, the employer must inform employees of the existence, location, and danger posed by the spaces. This can be accomplished by posting danger signs or by another equally effective means. The following language would satisfy the requirements for such a sign.


If employees are not to enter and work in permit spaces, employers must take effective measures to prevent their employees from entering the permit space.

If employees are to enter permit spaces, the employer must develop a written permit space program that shall be made available to employees or their representatives.

The internal atmosphere of the space must be tested first for

1. Oxygen content
2. Flammable gases and vapors
3. Potential toxic air contaminants

## Permit System

A permit, signed by the entry supervisor and verifying that pre-entry preparations have been completed and that the space is safe to enter, must be posted at entrances or otherwise be made available to entrants before they enter a permit space.

The duration of entry permits must not exceed the time required to complete an assignment. Also the entry supervisor must terminate entry and cancel permits when an assignment is completed or when new conditions exist. New conditions must be noted on the cancelled permit and used in revising the permit space program.

## Entry Permits

Entry permits must include the following information:

1. Test results.
2. Tester's initials or signature.
3. Name and signature of supervisor who authorizes entry.
4. Name of permit space to be entered, authorized entrants, eligible attendants and individuals authorized to be entry supervisors.
5. Purpose of the entry and known space hazards.
6. Measures to be taken to isolate permit spaces and to eliminate or control space hazards, i.e., locking out or tagging of equipment and procedures for purging, making inert, ventilating and flushing permit spaces.
7. Name and telephone number of rescue and emergency services.
8. Date and authorized duration of entry.
9. Acceptable entry conditions.
10. Communication procedures and equipment to maintain contact during entry.
11. Additional permits, such as for hot work, that have been issued to authorize work in permit space.
12. Special equipment and procedures, including personal protective equipment and alarm systems.
13. Any other information needed to ensure employee safety.

## Training and Education

Before initial work assignment begins, the employer must provide proper training for all workers who are required to work in permit spaces

(Site-Specific Training). Upon completing this training, employers must ensure that employees have acquired the understanding, knowledge and skills necessary for the safe performance of their duties.

## Authorized Entrants' Duties

1. Know space hazards, including information on the mode of exposure (e.g; inhalation or dermal absorption), signs or symptoms, and consequences of the exposure.

2. Use appropriate personal protective equipment properly (e.g., face and eye protection, other forms of barrier protection such as gloves and aprons).

3. As necessary, maintain communication (i.e., telephone, radio, visual observation) with attendants to enable the attendant to monitor the entrant's status as well as to alert the entrant to evacuate.

4. Exit from permit spaces as soon as possible when ordered by an authorized person, when the entrant recognizes the warning signs and symptoms of exposure exist, when a prohibited condition exists, or when an automatic alarm is activated.

5. Alert the attendant when a prohibited condition exists or when warning signs or symptoms of exposure exist.

## Emergency Service

The standard requires the employer to ensure that rescue service personnel are provided with and trained in the proper use of personal protective and rescue equipment including respirators, trained to perform assigned rescue duties, and have authorized entrants' training.

## Attendants' Duties

1. Remain outside permit space during entry operations unless relieved by another authorized attendant.

2. Perform no entry rescues unless specified by employer's rescue procedure. **Never Self Rescue.**

3. Know existing and potential hazards, including information on the mode of exposure, signs or symptoms, consequences of the exposure and their physiological effects.

4. Keep an accurate account of those workers entering the permit-required space.

5. Maintain communications with the entrants.

6. Ensure that unauthorized persons stay away from the permitted space or exit immediately as they have entered the permit space. Inform authorized entrants and the entry supervisor of entry by an unauthorized person.

7. Order evacuation of the permit space when a prohibited condition exists, when a worker shows signs of physiological effects of hazardous exposure, when an emergency outside the confined space exists and when the attendant cannot effectively and safely perform required duties.

8. Summon rescue and other services during an emergency.

9. Perform no other duties that interfere with the attendant's primary duties.

## Written Program

Among other things, the OSHA standard requires the employer's program to:

- Identify and evaluate permit space hazards before allowing an employee entry.

- Test conditions in the permit space before entry operations and monitor the space during entry.

- Perform in the following sequence appropriate testing for atmospheric hazards: oxygen, combustible gases or vapors, and toxic gases or vapors.

- Implement necessary measures to prevent unauthorized entry.

- Establish and implement the means, procedures and practices,

such as specifying acceptable entry conditions, isolating the permit space, providing barriers, verifying acceptable entry conditions, purging, making inert, flushing or ventilation of the permit space to eliminate or control hazards necessary for safe permit-space entry operations.

- Identify employee job duties.
- Provide, maintain, and require, at no cost to the employee, the use of personal protective equipment and any other equipment necessary for safe entry (e.g., testing, monitoring, ventilating, communications, lighting equipment, and barriers and ladders).
- Ensure that at least one attendant is stationed outside the permit space for the duration of entry operations.
- Coordinate entry operations when employees of more than one employer are to be working in the permit-required space.
- Implement appropriate procedures for summoning rescue and emergency services.
- Establish in writing and implement a system for the preparation, issuance and cancellation of entry permits.
- Review established entry operations and annually revise the permit space entry program.

When an attendant is required to monitor multiple spaces, implement the procedures to be followed during an emergency in one or more of the permit-required spaces being monitored.

# Section 8

# Control of Hazardous Energy (Lock out / Tag Out) 29 CFR 1910.147

Workers performing service or maintenance on machinery and equipment are exposed to injuries from unexpected energization, startup of machinery or equipment, or release of stored energy in the equipment.

The Lockout/Tagout standard requires the adoption and implementation of practices and procedures to shut down equipment, isolate it from its energy sources, and prevent the release of potentially hazardous energy while maintenance or service activities are being preformed. The purpose of this standard is to prevent injuries during service and maintenance operations.

- Whenever contractors and other outside personnel perform tasks covered by the Lockout/Tagout standard, they must adhere to all the standard's requirements.
- The contractor or outside employer and the on-site employer must inform each other of their respective energy control responsibilities.
- The on-site employer must ensure that his/her employees understand and comply with the restrictions and prohibitions of the outside employer's energy control program.

Refineries at other locations may have different LOTO procedures.


You will receive more detailed instructions from your contractor regarding any applicable LOTO standards that apply, prior to performing any work.

Remember all your previous lessons. All work in the Philadelphia Area Refineries requires a work permit. When directed to perform any Lockout/Tagout procedures, make sure your supervisor has the proper work permits, and you are at the right location.

# Section 9

# Drug and Alcohol Policies

Each employee must understand that all PSM and CUDAP covered facilities will require Pre-Employment Drug and Alcohol screening. Any violation of the drug and alcohol policies will result in immediate expulsion from the plant.

A refusal to test is treated as if it is a positive drug test result. The person will be denied access to any CUDAP site until he or she completes the Allied Trades Assistance Program's Addiction Awareness Program with a negative drug screen.

These policies have been negotiated and approved by the Philadelphia Building Trades Council and their Affiliated Unions.

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Testing is administered through BUILT-RITE's Coalition for Uniform Drug and Alcohol Program (CUDAP).

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When screening for alcohol and other prohibited substances first became a condition of employment in the construction industry, most construction workers felt they were being reduced to the status of a container and would be judged on how many milligrams of a prohibited substance they had in their body, rather than their job performance. This mode of thought has certainly changed. We must always remember drug and alcohol screenings are just one of the components that insure a safe work environment.

- The medical review officer will report the results of an alcohol or drug screen to the person who has failed the screen and the third party administrator (CUDAP).
- The Department of Health and Human Services (DHHS) establishes drug testing substances and sensitivities. All of the testing labs must be Substance Abuse and Mental Health Services Administration (SAMSHA) approved.

PSM covered facilities will require testing for:

- Pre-Employment
- Post Accident
- Reasonable Suspicion
- Return to Duty
- Lottery

Rehabilitation will be offered one time only. The person who failed the drug or alcohol screen must contact the Allied Trades Assistance Program at **215-677-8820** for an assessment and be referred to the proper modality of treatment recommended by a Certified Addiction Counselor. Completion of the treatment plan and a clear screening can attain a return-to-duty status and must be presented to the employer and the CUDAP administrator.

## Introduction to CUDAP

CUDAP is the Coalition for Uniform Drug and Alcohol Policy. CUDAP is a Built-Rite program sponsored by Plant Owners and Contractors of the Greater Philadelphia Area and by The Philadelphia Building and Construction Trades Council and its member Unions. The need for this program was identified by the number of repetitive drug tests being done on Building Trades personnel at petrochemical facilities in the Philadelphia area. To cut down on this repetitive testing, local Refineries and Fossil Plants agreed to recognize CUDAP'S testing, provided random (lottery) testing was being conducted on a scheduled basis. Drug and Alcohol test records are stored in a secure database maintained by Built-Rite.

The CUDAP program provides a cost effective and efficiently administered uniform drug and alcohol testing program. CUDAP participants benefit by:

- Fewer and less frequent drug and alcohol tests.
- All workers are tested at all locations using the same rigorous standards and procedures.
- Transfer between CUDAP work sites.

- Workers testing positive are encouraged to contact **The Philadelphia Building Trades Council's Allied Trades Assistance Program's substance abuse professionals.**

## CUDAP Drug and Alcohol Policy Summary

**Prohibited Conduct:**

- Sale or distribution of drugs and or alcohol.
- The use of alcoholic beverages or the possession of any unopened alcoholic beverages while on CUDAP company premises or while on duty.
- The use, possession, concealment or purchase of drugs while on a CUDAP company premises or while on duty.
- The on-duty impairment of any employee due to the use of drugs or alcoholic beverages, or an impermissible level of drugs or alcohol in the system of any employee while on duty.
- Off-premises involvement with drugs or alcohol that has or may have an adverse impact on a CUDAP company.
- The use of prescription or over-the-counter medication while on premises where the medication may interfere with safe job performance.

**Violations:**

If an individual possesses or conceals drugs or alcohol on the premises of a CUDAP company, the individual will be removed from the premises and precluded from performing any subsequent work for any company of the coalition.

The program allows for the one time rehiring of an employee who tests positive, completes a prescribed program sponsored by the Philadelphia Building and Construction Trades Councils Allied Trades Assistance Program, passes a return to work drug and alcohol test, and undergoes a program of accelerated random testing.

# Section 10

# Fire and Safety Plans

## Types of Emergencies

- Fires/Explosions
- Leaks/Spills
- Gas or Vapor Releases
- Injuries

Contractor personnel normally do not respond to emergencies. They should report any emergency, hazardous or dangerous condition to their foreman/plant personnel or call the posted emergency in-plant telephone number.

Contractor and Host employers are required to have a written emergency action plan. The plan should be simple and easy to understand and will be explained to you in detail at the jobsite or at the site-specific training session.

Emergencies should be reported by using the in-plant telephone to the in-plant emergency department. The telephone number will be given to you at your site-specific training and posted throughout the jobsite.

It is important to know the in-plant telephone number, your location, type of emergency and nature of the injuries sustained. Do not hang up until the person you are speaking with tells you it is OK.

## First Aid and Medical Services

Minor injuries will be treated at the jobsite. It is important to report all injuries no matter how minor. If a more serious injury occurs, call the emergency in-plant telephone number.

## Fire Safety

Three things are required to ignite a fire.

- Fuel
- Oxygen
- Ignition Source

NOMEX type coveralls will be supplied and are required to be worn at all area refineries.

Contractor supervisors have received special training and will explain to you all work procedures, rules and safety practices necessary at each job location.

The contractor will supply inspected and approved fire extinguishers.

Normally—A B C—Type extinguishers are supplied.

Class "A"—Paper, Wood, Cardboard, Plastic and Rags are the most common. (Remember the word Ash.)

Class "B"—Flammable/Combustible Liquids. (Remember the word Bottle.)

Class "C"—Combustible Electrical Fires. (Remember the word Current.)

Class "D"—Metal fires not normally seen in refineries.

The use of fire extinguishers and fire hoses requires specialized fire training. DO NOT ATTEMPT TO EXTINGUISH A FIRE UNLESS YOU HAVE BEEN TRAINED. The contractor at the jobsite or at the site-specific training session will train fire watches in the use of fire hoses and fire extinguishers.

# Section 11

# Excavations

Each year an estimated 100 deaths and over 1,000 workers are injured in the United States as a result of excavation accidents.

## Objective of this Section

- Provide an understanding of the dangers of excavations and the OSHA regulations applicable to excavations.

**DID YOU KNOW?**
THE FATALITY RATE FOR EXCAVATION WORK IS 112% HIGHER THAN THE RATE FOR GENERAL CONSTRUCTION

## *OSHA Regulations – CFR 1926 Subpart P (1926.650 – 652)*

## Key Definitions

- Competent Person—OSHA describes a competent person as one who is capable of identifying existing and predictable hazards on the work site. He or she must have the authority to take prompt action to eliminate the hazard. The competent person's duties will vary depending on the type of work being done. The contractor will assign a competent person at each worksite.

- Excavation—Any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

- Protective System—means a method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of an adjacent structure. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

- Trench—means a narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench is not greater than 15 feet.

## Planning for Safe Excavation Work

- One call/utility mark out.
- Notify all parties involved (utilities, businesses, other contractors, etc.).
- Competent person must be assigned.
- Red cement/warning lines indicate electrical cables/lines.
- If unmarked lines/cables exposed, stop work immediately.
- Surface Encumbrances – Removed, supported to safeguard employees.
- Identify sloping/benching/shoring/shielding requirements.
- Identify proper access into and out of excavation.
- Hazardous atmospheres.
- Vehicular traffic – Vests.
- Stability of surrounding structures.
- Emergency Rescue Equipment.
- Loose loads not permitted above or in trench.
- Warning systems near edge of excavation.
- Water accumulation.
- Loose rock/soil.
- Daily or at every shift change, inspections by a Competent Person.
- Permits – Check permits for any conditions that may require special attention.
- When nearing estimated utility locations, locate exactly by safe and acceptable means (hand dig).

For more information on excavation, go to the OSHA website at **www.osha.gov.**

# Section 12

# Fall Protection
# 29 CFR 1926.500 to 503

Almost all worksites have unprotected sides and edges, wall openings, or floor holes at some point during construction or maintenance activities. If these sides and openings are not protected at your worksite, injuries from falls may result, ranging from sprains and concussions to death.

## How do I avoid these hazards?

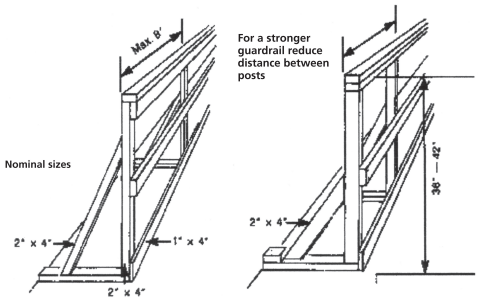
Use at least one of the following whenever employees are exposed to a fall of 6 feet or more above a lower level:

- Guardrail Systems
- Safety Net Systems
- Fall Arrest Systems


Also be sure to:

- Cover or guard floor holes as soon as they are created.
- For existing structures, survey the site before working and continually audit as work continues.

In general, it is better to use fall **prevention** systems, such as guardrails, than fall protection systems, such as safety nets or fall arrest devices, because they provide more positive safety means.



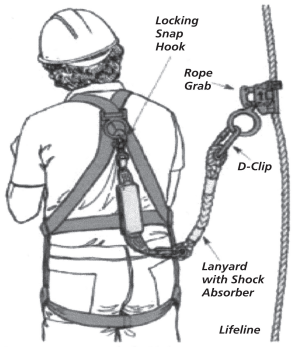
This lesson will review:

## Personal Fall Arrest Systems

A personal fall arrest system is one of the options of protection that OSHA requires for workers on construction or maintenance activities that are exposed to vertical drops of 6 feet or more.

A "Qualified Person" with supervisory authority must design personal fall arrest systems. "Qualified" means one who, by possession of a recognized degree, certificate, or professional standing or who by extensive knowledge, training and experience, has successfully demonstrated his or her ability to solve or resolve problems related to the subject matter, the work or the project.

Employers must provide for inspection of systems before each use, promptly rescue workers in the event of a fall, or assure that they are able to rescue themselves. Systems and components must be removed from service immediately after a fall impact until inspected by a competent person and deemed undamaged and ready for service. Fall arrest systems shall not be attached to guardrail systems or hoists.




Since January 1, 1998 body belts are no longer permitted for use in a personal fall arrest system. An approved full-body harness (as illustrated) is now required.

The standard requires that the approved full-body harness and its components be used only for employee fall protection.

Vertical lifelines and lanyards (as illustrated) must have a minimum breaking strength of 5000 pounds and prohibit more than one employee being attached to any one lifeline.

Lifelines shall be protected from cuts and abrasions and be inspected before each use.

In addition to this training, OSHA standard 29 CFR-1926.503 requires that the employer provide a training program for each employee who

might be exposed to fall hazards. As there are a variety of systems in use, the employer shall assure that a “Competent Person” has trained each employee in the use of the Personal Fall Arrest System to be used.

For more information on Personal Fall Arrest Systems, go to the OSHA website at: **www.osha.gov.**

# Section 13

# Stairways and Ladders
# OSHA Subpart X
# 29 CFR1926.1050-1060

## General Requirements

- Stairway/ladder needed when elevation changes by 19” or more.
- No temporary spiral stairs allowed.
- When 25 or more workers are required at an elevation location, two ladders or a double-cleated ladder are required.
- Stairway/Ladder access must be kept clear.
- Employers must provide safe ladders/stairways before any work begins at elevated locations.
- Ladders shall not be tied or fastened together unless they are specifically designed that way.
- When two or more portable ladders are used to access an elevation, they must have an offset platform between them.
- Stair platform at door/gate landings must have a minimum of 20” clearance from the open door to edge of platform.
- Pan stairs/landings must be secure and have temporary or permanent fill before using solid material, edge-to-edge.
- All parts of stairways must be free of obstructions and projections.
- Slippery conditions must be eliminated before use (ice, snow, grease, oil, etc.).
- Stair rails must be between 36”- 37” above the stair tread, and wall-mounted hand rails must be between 30”- 37”.
- Rail must begin at a horizontal or topmost stair.
- Rail end must not cause a projection hazard.
- Rail must be smooth surfaced to prevent injury.
- Rail must be adequate as a handhold (2x4 or less).
- Hand rail must be minimum of 3” from wall.

## General Rules – Ladders

- Remember the 4 to 1 rule.
- Ladders should be tied near the top and project at least 3 feet above the platform.

## *General Information on the Safe Use of Scaffolding OSHA 1926.450(L)*

All users of scaffolding must provide a competent person who will inspect scaffolding daily, and whenever conditions change, such as with modification to scaffold, severe weather, etc.

OSHA's definition of a competent person is one who is capable of identifying existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous or dangerous to employees and who has the authority to take prompt corrective measures to eliminate them. The competent person must have had specific training in and be knowledgeable about scaffolding.

If the plant has a scaffold tagging system, do check the tag before each use/shift and the scaffold to assure it is safe and the tag has been updated. If any scaffold appears damaged, don't use the scaffold until it has been inspected and okayed by the competent person.

## Scaffolding "Do" and "Don't" list

- Do check all scaffold tags before using scaffold.
- Do check footing to make sure it's secure. Scaffolding is to be built on a firm foundation; use base plates under all legs.
- Do make sure all casters are locked before climbing mobile scaffold.
- Do use built-in or attached ladders with uniform rungs, 12"-16" apart.
- Do ensure a standard guardrail system (top rail, mid rail, and toeboard) is installed on all scaffold over 6' high.
- Do fully plank the working level(s) of a scaffold.
- Do remember the 1/60 rule.

- Don't use until checked by the competent person.
- Don't use bricks, cinder blocks or loose objects.
- Don't allow free-standing mobile scaffold to exceed four times its base width.
- Don't access scaffolding by climbing cross braces.
- Don't allow riders when moving mobile scaffold (Tools may only be left on the scaffold if they are secured.)
- Don't jump on scaffolds.
- Don't climb on scaffold ends.
- Don't overload the work platform with materials.
- Don't remove planks or support members, or alter the scaffold in any way without proper approval.
- Don't tie off to scaffold.
- Don't dismantle or alter scaffold unless you are a qualified person who is employed by the scaffold builder/erector and designated to do so by the **competent** person/foreman.

## Tube and Coupler Type Scaffolds

- Swivel clamps to be used for non-load bearing only.
- Right angle clamps to be used for load bearing, top and mid rails and right angle applications.


**Sign "A" (Re: Uncompleted Scaffold)**


**Sign "B" (Re: Alteration & Unauthorized Use)**

The word "WARNING" is printed in reverse white lettering on an orange background. The balance of the lettering is black on white. On Sign "B", the lessee's name can be inserted on the blank line with either painted lettering for permanent use or with a grease-type paint which can be removed with acrylic paint thinner without damaging the sign.

The signs are constructed of .060 high-impact polystyrene material, 12" x 18" in size with 1/8" holes punched at each rounded corner. The signs are twice the thickness of those used in 1974, thus providing greater durability. The punched holes at each corner provide an easy means for tying the sign to the scaffold. On built-up scaffolds, signs should be posted wherever access is likely to occur. They can also be used on aerial lifts, suspended scaffolds and rolling towers.

# Section 14

# Cranes and Derricks in Construction CFR 1926 Subpart CC

## Operator Qualification and Certification

### 1926.1427

Any person engaged in a construction activity who is operating a crane must meet the criteria for minimum expertise described in the applicable section in Subpart CC. Exceptions apply for (side booms, derricks, and equipment with a rated capacity of 2,000 pounds or less) but operators must still meet the criteria for minimum expertise in the applicable Subpart CC.

With respect to certification from an accredited testing organization, an operator must be certified for the type and capacity of crane he or she is to operate. This certification is portable.

When a state or local government requires a crane operator license, the crane operator must be licensed accordingly to meet OSHA requirements. This type of licensure is only valid within the issuing jurisdiction.

## Signals

### 1926.1419 to 1926.1422

General requirements

A signal person must be provided in each of the following situations:

(1) The point of operation, meaning the load travel or the area near or at load placement, is not in full view of the operator.

(2) When the equipment is traveling, the view in the direction of travel is obstructed.

(3) Due to site specific safety concerns, either the operator or the person handling the load determines that it is necessary.

(4) Where encroachment / electrocution precautions are required under Option (2) or Option (3) of 1926.1408 (Power line safety-equipment operations).

(5) If any part of the equipment while traveling under or near power lines with no load gets closer than 20 feet. (See 1926.1411 on page 66.)

## Signal Person Qualifications

### 1926.1428

The employer of the signal person must ensure that each signal person meets the Qualification Requirements (paragraph (c) of this section) prior to giving any signals.

(c) Qualification Requirements
Each signal person must:

(1) Know and understand the type of signals used. If hand signals are used, the signal person must know and understand the ***Standard Method*** for hand signals.
(2) Be competent in the application of the type of signals used.
(3) Have a basic understanding of equipment operation and limitations, including the crane dynamics involved in swinging and stopping loads and boom deflection from hoisting loads.
(4) Know and understand the relevant requirements of 1926.1419 through 1926.1422 and 1926.1428.
(5) Demonstrate that he/she meets the requirements in paragraphs (1) through (4) of this section through an oral or written test, and through a practical test.

**Types of Signals**
Signals to operators must be by hand, voice, audible, or new signals. When using hand signals, the ***Standard Method*** must be used (see Appendix A of Subpart CC)

Signals other than the Standard Method may be used where the new

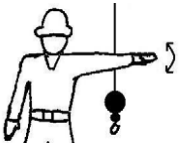
signals comply with a national consensus standard that provides at least equally effective communication.

Hand signals have their limitations. They should not be used when distance or visibility prevents accurate communication with the crane or hoist operator. Consider the use of radio or other electronic transmission of voice signals.

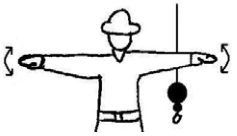
Note: The operator's reception of signals must be by a hands-free system

Hand signal charts must be either posted on the equipment or conspicuously posted in the vicinity of the hoisting operations.

## Hand Signal Chart

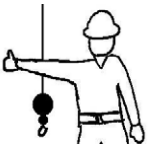


**STOP –** With arm extended horizontally to the side, palm down, arm is swung back and forth.

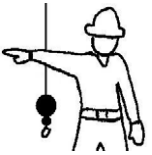


**EMERGENCY STOP** – With both arms extended horizontally to the side, palms down, arms are swung back and forth.

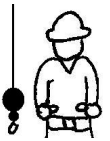
**HOIST –** With upper arm extended to the side, forearm and index finger pointing straight up, hand and finger make small circles.



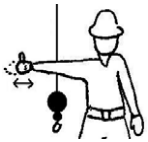
**RAISE BOOM –** With arm extended horizontally to the side, thumb points up with other fingers closed.



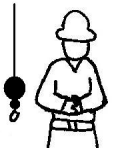
**SWING –** With arm extended horizontally, index finger points in direction that boom is to swing.



**RETRACT TELESCOPING BOOM –** With hands to the front at waist level, thumbs point at each other with other fingers closed.



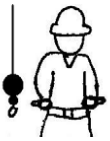
**RAISE THE BOOM AND LOWER THE LOAD –** With arm extended horizontally to the side and thumb pointing up, fingers open and close while load movement is desired.



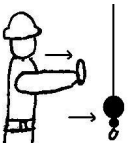
**DOG EVERYTHING –** Hands held together at waist level.

**LOWER –** With arm and index finger pointing down, hand and finger make small circles.

**LOWER BOOM –** With arm extended horizontally to the side, thumb points down with other fingers closed.

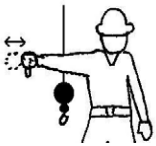


**EXTEND TELESCOPING BOOM –** With hands to the front at waist level, thumbs point outward with other fingers closed.



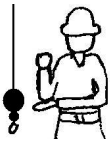
**TRAVEL/TOWER TRAVEL** – With all fingers pointing up, arm is extended horizontally out and back to make a pushing motion in the direction of travel.

## Hand Signal Chart (continued)



**LOWER THE BOOM AND RAISE THE LOAD –** With arm extended horizontally to the side and thumb pointing down, fingers open and close while load movement is desired.

**MOVE SLOWLY –** A hand is placed in front of the hand that is giving the action signal.

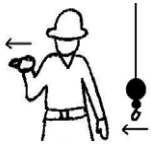


**USE AUXILIARY HOIST** (whipline) **–** With arm bent at elbow and forearm vertical, elbow is tapped with other hand. Then regular signal is used to indicate desired action.

**CRAWLER CRANE TRAVEL, BOTH TRACKS –** Rotate fists around each other in front of body; direction of rotation away from body indicates travel forward; rotation towards body indicates travel backward.

**USE MAIN HOIST –** A hand taps on top of the head. Then regular signal is given to indicate desired action.

**CRAWLER CRANE TRAVEL, ONE TRACK –** Indicate track to be locked by raising fist on that side. Rotate other fist in front of body in direction that other track is to travel.



**TROLLEY TRAVEL** – With palm up, fingers closed and thumb pointing in direction of motion, hand is jerked horizontally in direction trolley is to travel.

## Signal Work (Best) Practices

### Suitability

The signals used (hand, voice, audible, or new) and means of transmitting the signals to the operator (such as direct line of sight, video, radio, etc.), must be appropriate for the site conditions.

### During Operations Requiring Signals

The ability to transmit signals between the operator and signal person must be maintained. If that ability is interrupted at any time, the operator must safely stop operations requiring signals until reestablished, and a proper signal is given and understood.

If the operator becomes aware of a safety problem and needs to communicate with the signal person, the operator must safely stop operations. Operations must not resume until the operator and signal person agree that the problem has been resolved.

Only one person may give signals to a crane or derrick operator at a time, unless anyone else who becomes aware of a safety problem gives a stop or emergency stop signal. If so, it must be obeyed immediately.

All directions given to the operator from the signal person must be given from the operator's perspective.

Each voice signal must contain the following three elements:

Function (such as hoist, boom, etc.)

Direction; distance and/or speed

Function; stop command

The operator, signal person and lift director (if there is one) must be able to effectively communicate in the language used.

## Rigging Equipment For Material Handling

## 1926.251

(a) General

(1) Rigging Equipment for material handling shall be inspected prior to use on each shift and as necessary during its use to ensure that it is safe. Defective rigging equipment shall be removed from service.

(5) Scope. This section applies to slings used in conjunction with other material handling equipment for the movement of material by hoisting, in employments covered by this part. The types of slings covered are those made from alloy steel chain, wire rope, metal mesh, natural or synthetic fiber rope (conventional three strand construction), and synthetic web (nylon, polyester and polypropylene).

(6) Inspections. Each day before being used, the sling and all fastenings and attachments shall be inspected for damage or defects by a **competent person** designated by the employer. Additional inspections shall be performed during sling use, where service conditions warrant. Damaged or defective slings shall be immediately removed from service.

**Safe Rigging Practices**

Safe Rigging practices must ensure that control of the load is maintained at all times. There are several factors the rigger must consider before lifting the load.

* Inspect the slings and rigging hardware to ensure they are in good working order.
* Know the weight of the load to be lifted.
* Know the lifting capacity of all the rigging equipment including the crane or hoisting device.
* Use the correct type of sling hitch to maintain load control.
* Understand how sling angle affects lifting capacity of a bridle assembly.
* Ensure the sling or lifting device captures the center of gravity of the load.

* Be aware of any overhead obstructions or power lines.
* Route the lift so that no personnel are working under the load except those hooking up or landing the load.

## Assembly/ Disassembly - General Requirements

## 1926.1404

When rigging is used for assembly/disassembly, the employer must ensure that:

(1) The rigging work is done by both a **competent** and a **qualified rigger**.

**Synthetic Slings**

The employer must follow manufacture procedures when using synthetic slings during assembly and disassembly rigging.

A synthetic sling must be protected from abrasive, sharp or acute edges, and configurations that might reduce the sling's rated capacity.

## 1926.1402 Ground Conditions

(1) "Ground conditions" mean the ability of the ground to support the equipment (including slope, compaction, and firmness).

(2) "Supporting materials" means blocking, mats, cribbing, marsh buggies (in marshes / wetlands), or similar supporting materials or devices.

(b) The equipment must not be assembled or used unless ground conditions are firm, drained, and graded to a sufficient extent so that, in conjunction (if necessary) with the use of supporting materials, the equipment manufacturer's specifications for adequate support and degree of level of the equipment are met. The requirement for the ground to be drained does not apply to marshes / wetlands.

(c) The controlling entity must:

(1) Ensure that ground preparations necessary to meet the requirements in paragraph (b) of this section are provided.

(2) Inform the user of the equipment and the operator of the location of hazards beneath the equipment set-up area such as voids, tanks, utilities, if those hazards are identified in documents (such as drawings, as-built drawings, and soil analyses) that are in the possession of the controlling entity (whether at the site or off-site) or the hazards are otherwise known to that controlling entity.

(d) If there is no controlling entity for the project, the requirement in paragraph (c) (1) of this section must be met by the employer who has authority at the site to make or arrange for ground preparations needed to meet paragraph (b) of this section.

(e) If the A/D director or the operator determines that ground conditions do not meet the requirements in paragraph (b) of this section, that person's employer must have a discussion with the controlling entity regarding the ground preparations that are needed so that, with the suitable supporting materials / devices (if necessary), the requirements in paragraph (b) of this section can be met.

(f) This section does not apply to cranes designed for use on railroad tracks when used on railroad tracks that are part of the general railroad system of transportation that is regulated pursuant to the Federal Railroad Administration under 49CFR part 213 and that comply with applicable Federal Railroad Administration requirements.

## Keeping Clear of the Load

## 1926.1425

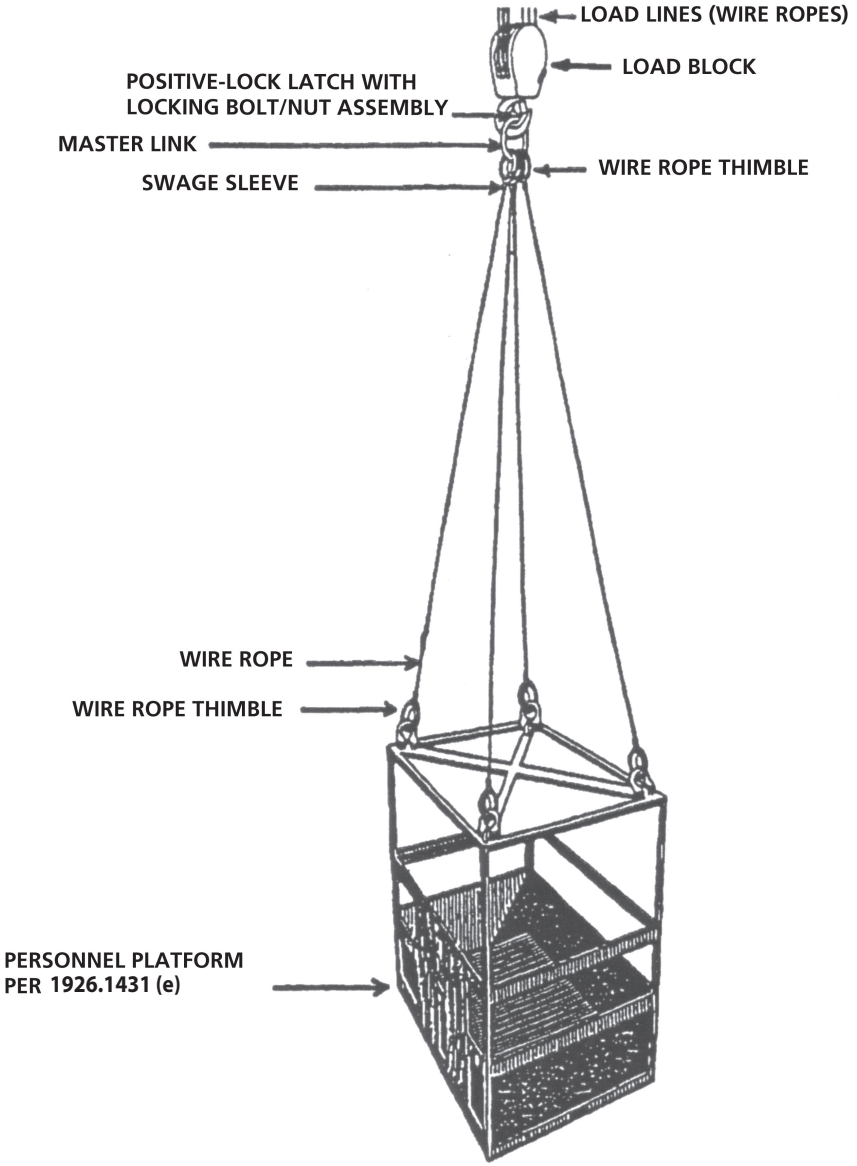
(c) When employees are engaged in hooking, unhooking, or guiding the load, or in the initial connection of a load to a component or structure and are within the fall zone, all of the following criteria must be met:

(1) The materials being hoisted must be rigged to prevent unintentional displacement.

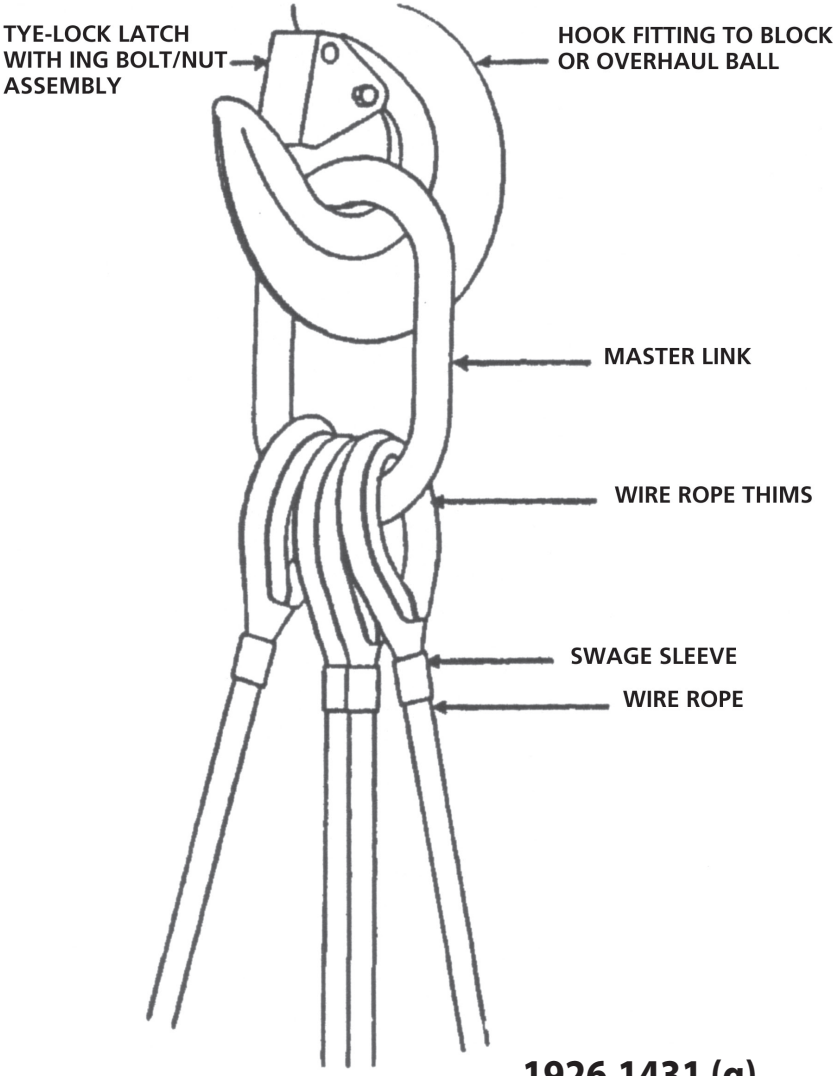
(2) Hooks with self-closing latches or their equivalent must be used.

(3) The materials must be rigged by a **qualified rigger**.

## Lower load Block Configuration for Rigging as Required by 1926.1431(g)

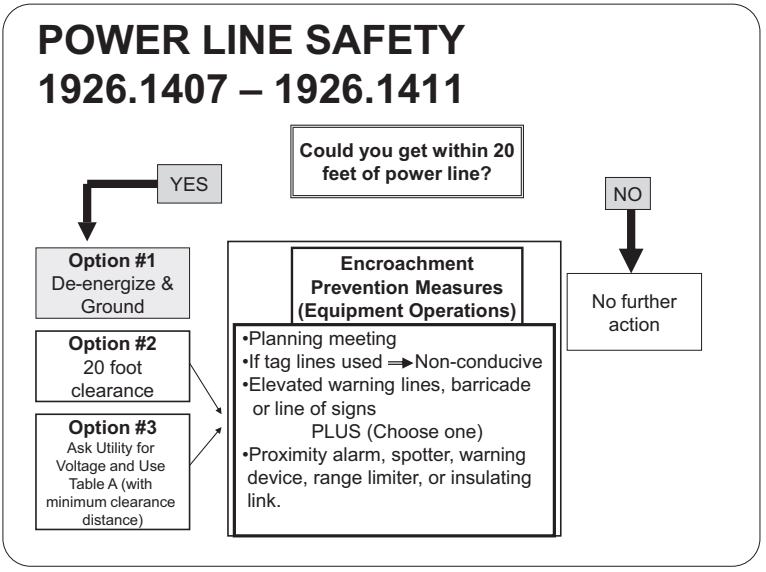


## Wire Rope Assembly Configuration (with Master Link)




**1926.1431 (g)**

# Power Line Safety
# 1926.1407-1926.1411




## Table A – Minimum Clearance Distances

| Voltage (nominal, kV, alternating current) | Minimum clearance distance (feet) |
|---|---|
| Up to 50 | 10 |
| Over 50 to 200 | 15 |
| Over 200 to 350 | 20 |
| Over 350 to 500 | 25 |
| Over 500 to 750 | 35 |
| Over 750 to 1000 | 45 |
| Over 1000 | (as established by the power line owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution) |

## Hoisting and Use of Personnel Baskets

## Crane or Derrick Suspended Platforms

## CFR 1926 Subpart CC

## 1926.1431

### Hoisting Personnel

The use of equipment to hoist employees is prohibited except where the employer demonstrates that the erection, use, and dismantling of conventional means of reaching the work area, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform, or scaffold, would be more hazardous, or is not possible because of the project's structural design or worksite conditions. This paragraph does not apply to work covered by Subpart R (Steel Erection) of this part.

***The personnel platform is not to be used as a convenience***

Once the decision is made to use a personnel platform, follow all criteria set forth in the standard including:

**Equipment set-up** The equipment must be uniformly level, within one percent of level grade, and located on footing that a ***Qualified Person*** has determined to be sufficiently firm and stable. Equipment with outriggers or stabilizers must have them all extended and locked. The amount of extension must be the same for all outriggers and stabilizers and in accordance with manufacturer procedures and load charts.

**Equipment Criteria**

**Capacity** The total load (with the platform loaded, including the hook, load line and rigging) must not exceed 50 % of the rated capacity for the radius and configuration of the equipment, except during proof testing.

**Proper operation required**

Personnel hoisting operations must not begin unless the devices listed in this section are in proper working order. If a device stops working properly during such operations, the operator must safely stop operations. Personnel hoisting operations must not resume until the device is

again working properly. Alternative measures are not permitted. (See 1926.1417 for tag-out and related requirements.)

**Devices**

***Equipment (except for derricks and articulating cranes) with a variable angle boom*** must be equipped with the following:

(A) A boom angle indicator, readily visible to the operator
(B) A boom hoist limiting device

***Equipment with a luffing jib*** must be equipped with:

(A) A jib angle indicator, readily visible to the operator, and
(B) A jib hoist limiting device
***Note:*** Direct attachment of a personnel platform to a luffing jib is prohibited.

***Equipment with telescoping booms*** must be equipped with a device to indicate the boom's extended length clearly to the operator, or must have measuring marks on the boom.

***Anti two-block.*** A device which automatically prevents damage and load line failure from contact between the load block, overhaul ball, or similar component.

***Controlled load lowering.*** The load line hoist drum must have a system, other than the load line hoist brake, which regulates the lowering rate of speed of the hoist mechanism.

**Personnel Platform Criteria**

A ***Qualified Person*** familiar with structural design must design the personnel platform and attachment / suspension system used for hoisting personnel.

The personnel platform shall have an identification plate or other permanent marking which displays the following information:

- manufacturer's name and address
- platform rating in terms of weight and personnel
- platform identification number and date of manufacture

- weight of empty platform and suspension system
- certification of compliance to the design, construction, and testing requirements of ASME B30.23

**Attachment and Rigging**

*Hooks and other detachable devices*

Hooks used in the connection between the hoist line and the personnel platform (including hooks on overhaul assemblies, lower load blocks, bridle legs, or other attachment assemblies or components) must be:

**(A)** Of the type that can be closed and locked, eliminating the throat opening.
**(B)** Closed and locked when attached.

***Most refinery owners require a lift plan along with permission to use a personnel platform.***

**Trial Lift and Inspection**

The ***Competent Person*** (usually the Operating Engineer) must determine that:

(A) Safety devices and operational aides required are activated and functioning properly.
(B) Nothing interferes with the equipment or personnel platform.
(C) The lift will not exceed 50 percent of the equipment's rated capacity at any time during the lift.
(D) The load radius to be used during the lift has been accurately determined.

A trial lift with the unoccupied personnel platform loaded at least to the anticipated lift weight must be made from ground level or any other location where employees will enter the platform, to each location at which the platform is to be hoisted and positioned. A trial lift must be performed each time the crane or derrick is set up.

Immediately after the trial lift, the ***Competent Person*** must:

Conduct a visual inspection of the equipment, base support or ground and personnel platform to determine whether the trial lift has exposed any defect or problem or produced any adverse effect.

**Pre-Lift Meeting**

A pre-lift meeting must be held to review the applicable requirements of 1926.1431 and all procedures that will be followed. It must be attended by the equipment operator, signal person (if used for the lift), employees to be hoisted, and the person responsible for the task to be performed. Additional meetings must be held at each new work location and must be repeated for any employees newly assigned to the operation.

Hoisting personnel within 20 feet of a power line that is up to 350kV and hoisting personnel within 50 feet of a power line that is over 350 kV is prohibited, except for work covered by Subpart V of this part (Power Transmission and Distribution)

**Work (Best) Practices**

Tag lines must be used when necessary to control the platform.

Personnel platforms must be used only for employees, their tools, and the materials necessary to do their work.

Materials and tools must be secured to prevent displacement.

Platform occupants must keep all parts of the body inside the platform during raising, lowering, and horizontal movement. This provision does not apply to an occupant of the platform when necessary to position the platform or while performing the duties of a signal person.

Before employees exit or enter a hoisted personnel platform that is not landed, the platform must be secured to the structure where the work is performed, unless the employer can demonstrate that securing to the structure would create a greater hazard.

Except over water, employees occupying the personnel platform must be provided with and use a personal fall arrest system. The system must be attached to a structural member within the personnel platform. When working over or near water, the requirements of 1926.106 apply. The fall arrest system, including the attachment point, must meet the requirements in 1926.502.

Employees being hoisted must remain in direct communication with the signal person (when used) or the operator.

## Environmental Conditions

### *Wind*

When wind speed (sustained or gusts) exceeds 20 mph at the personnel platform, a ***Qualified Person*** must determine if in light of the wind conditions, it is not safe to lift personnel. If it is not, the lifting operation must not begin (or, if already in progress, must be terminated).

### *Other Weather and Environmental Conditions*

A ***Qualified Person*** must determine if, in light of indications of dangerous weather conditions or other impending or existing danger, it is not safe to lift personnel. If it is not, the lifting operation must not begin (or, if already in progress, must be terminated).

# Section 15

# Electrical Safety

## The Hazards

Electrical Shock is usually caused by unintentional contact with energized parts.

Severity of electrical shock is determined by;

- The path of current flow through the body
- Amount of current
- Length of time current flows

**DID YOU KNOW?**
**APPROXIMATELY 350 ELECTRICAL-RELATED FATALITIES OCCUR EACH YEAR.**

## Thresholds of Sensation

- None below: 1 ma or .001 amp
- Let go threshold: 10 ma or .01 amp and greater
- Respiratory Paralysis: 30 ma or .03 amp or greater
- Ventricular Fibrillation: 60 ma or .06 amp or greater

## Ground Fault Circuit Interrupter (GFCI)

Class "A" Device trips from 4 to 6 ma – at 1/40th of a second.

## Arc Flash

- Can be prevented by safe work practices.
- In most cases, Arc Flash is caused by Ground Faults and Short Circuits created by Persons Working on Energized Equipment.
- Temperatures can reach 35,000 degrees F.
- Ambient areas around a person can easily reach 15,000 degrees F.
- The surface of the sun is 9,000 degrees F.
- The severity of an Arc Flash is determined by the amount of available short circuit current and the ability of the over current protective device to quickly clear the fault.

## Arc Blast

- Tremendous heat causes vaporization of conductors resulting in a pressure wave.
- Water vaporized expands 1,670 times its original volume.
- Copper vaporized expands 67,000 times its original volume causing a tremendous explosion.
- Injuries can include concussion, hearing damage and impact caused by flying objects.

## Standards

- OSHA 1926 for the Construction Industry
- OSHA 1910 for the General Industry
- Section 5. (a) of the OSHA act. The General Duty Clause
- NFPA – 70 The National Electrical Code (NEC)
- NFPA 70 Electrical Safety Requirements for Employee Workplaces

## *Hazardous (Classified) Locations OSHA 1926.407*

This section sets forth requirements for electric equipment and wiring in locations that are classified as hazardous, based on the presence of properties of flammable vapors, liquids or gases or combustible dusts or fibers or the likelihood that a flammable or combustible concentration or quantity is present.

Equipment that is safe for the location will be demonstrated by the employer. It will be of a type and design that will provide protection from the hazard arising from the combustibility and flammability of vapors, liquids, gases, dusts, or fibers.

Guidelines for determining the type and design of equipment and installations that will meet this requirement can be found in The National Electrical Code, NFPA 70.

## Product Standards

All electrical conductors and equipment shall be approved.

(Acceptable to the Assistant Secretary of Labor)

Acceptable – Means listed by a National Recognized Testing Laboratory (NRTL)

Ground Fault Circuit Interrupters (GFCI)

Assured equipment Grounding Conductor Program (AEGCP)

- 1926.404 (b) Permits the use of either GFCI or AEGCP
- GFCI is the preferred method of protection to be used to prevent electrical shock

## Guarding Live Parts

Covers must be completely installed on all energized panel boards and any holes in the panel must be properly sealed.

## Safe Work Practices

Working on energized equipment is permitted by NFPA-70E and the OSHA Standards only when a written Safe Work Practice Plan is in place, all employees are properly trained, a hazard risk analysis is performed, and PPE is provided.

Energized work may only be performed when:

- The task is unfeasible to perform de-energized.
- De-energization of the equipment creates a greater hazard.
- Only a qualified person can do work on energized equipment.
- Personal Protective Equipment (PPE) required as outlined on work permit.
- Unqualified persons shall stay at least 10 feet clear of all energized electrical 15 KV or less.

## Extension Cords

- All single phase cords must be the three wire type
- Must be hard or extra hard usage
- Worn or frayed cords shall not be used
- Cords may be repaired with equipment listed for the purpose

## Lockout / Tagout

- Electrical lockout/tagout must include the six steps to de-energize and the four steps to re-energize as described in the prescriptive requirements 1910.333(b).
- Exposure to parts of electrical equipment in a de-energized state requires locks and tags.
- Control circuit devices shall not be used to lockout equipment.
- Section 8 of this training aid contains more detailed information on Lockout / Tagout.

# Section 16

# Job Safety Analysis: A Proactive Accident Prevention Tool

The inspection of the workplace and the assessment of tasks for hazards is crucial to a successful injury prevention program. The Job Safety Analysis (JSA) is a proactive method for reducing injuries in the workplace. There are many ways to deliver the JSA program.

## Purpose

- Review job hazards.
- Discover or recognize job hazards and eliminate, avoid or protect exposure to them.
- Uncover hazards that have been overlooked or developed due to changed conditions prior to work start or resulted in changes in work procedure.

## Intent

- The JSA card is to be filled out daily, prior to start of work and for all new tasks.
- Should work assignments or conditions change, a new JSA should be filed.
- After the responsible worker fills out the card, the information should be verbally reviewed with entire work crew.
- The JSA card is available at the jobsite. JSA cards are audited frequently and should be turned into your contractor safety representative at the end of every shift.

## Job Safety Analysis (JSA) Card, Side A

**HAZARD IDENTIFICATION PROCESS**
**HIP LIST**

- ☐ Are there any ***slipping or tripping*** hazards at the jobsite (spills, ice, hoses, debris, etc.)?
- ☐ Is there a ***fall hazard?*** (Is the job above grade without protective handrails or is a scaffold required/needed?)
- ☐ Are there ***electrical hazards*** present, i.e. overhead lines, sources that cannot be locked out?
- ☐ Is there potential for ***chemical exposure***, i.e. liquids, vapors, dusts, etc? (Can it be mitigated?)
- ☐ Is there a potential for ***thermal burn*** (hot/cold)? Have all precautions been taken to remove the potential, i.e. insulation, steamtraps, etc.?
- ☐ Is there a risk that the atmosphere will reach or exceed ***10% of the LEL*** of any product?
- ☐ Can this task ***conflict with other work or other people in the area***, i.e. welding, x-ray, etc.?
- ☐ Is the ***noise at or above 85 dB?*** Can it be mitigated?
- ☐ Is there potential for a strain type injury, i.e. lifting or moving, excessive force, repetitive motion, vibration, awkward position, etc. (***Ergonomics***)?
- ☐ Are there any ***adverse weather*** conditions, i.e. temperature extremes, winds, precipitation?
- ☐ Are there any ***exposed sharp contact points***?
- ☐ Is ***additional training*** needed to perform task, i.e. asbestos, radiation, technical, etc.?
- ☐ Is there a hazard of a ***plugged drain or bleeder?*** If yes, use a bleeder tap/reamer to clear the plug.
- ☐ Is there ***inadequate clearance*** to perform the task?
- ☐ Is there ***potential for a crushing type incident?***
- ☐ Could this task cause a ***unit upset*** or shutdown?
- ☐ Is ther potential for ***lead exposure***, i.e. grinding power brushing, burning, etc.?
- ☐ Is there any potential for ***exposure to asbestos?***
- ☐ Is the ***lighting inadequate*** to perform duties or tasks?
- ☐ Are any ***additional steps needed*** to do this job safely, i.e. manpower, stress, ergonomics, etc…?
- ☐ Is there **venting** or **draining** that could come in contact with ignition source?
- ☐ Is **Nitrogen exposure** a hazard?

**EMPLOYEE NAME**
(EMPLOYEES PLEASE PRINT)

1) _____
2) _____
3) _____
4) _____
5) _____
6) _____
7) _____
8) _____
9) _____
10) _____
11) _____
12) _____
13) _____
14) _____

**THINK SAFETY**
***JOB SAFETY ANALYSIS (JSA)***

JOB NO. _____

Date: _____ Location: _____

Job Leader: _____

_____

Job Description: _____

_____

_____

_____

Types of Permits Needed? _____

_____

_____

_____

See enlarged view of HIP List on page 73

| 1. List Steps Required to Perform This Work | 2. What Are The Potential Hazards With Each Task? | 3. What Will Be Done To Eliminate These Hazards? |
|---|---|---|
| 1. _____ | 1. _____ | 1. _____ |
| 2. _____ | 2. _____ | 2. _____ |
| 3. _____ | 3. _____ | 3. _____ |
| 4. _____ | 4. _____ | 4. _____ |
| 5. _____ | 5. _____ | 5. _____ |
| 6. _____ | 6. _____ | 6. _____ |
| 7. _____ | 7. _____ | 7. _____ |
| 8. _____ | 8. _____ | 8. _____ |
| 9. _____ | 9. _____ | 9. _____ |
| **NOTES** | **Excavation** | **NOTES** |
| _____ | ☐ Inspected by competent person | _____ |
| _____ | ☐ Tag hung | _____ |
| _____ | **Scaffold** | _____ |
| _____ | ☐ Inspected by competent person | _____ |
| _____ | ☐ Tag hung | _____ |
| _____ | **Permit** | _____ |
| | ☐ Job physically shown by | |
| | ☐ Crew reviewed permit | |

## Job Safety Analysis (JSA) Card, Side A, Enlarged HIP List

# HAZARD IDENTIFICATION PROCESS
# HIP LIST

- ❑ Are there any ***slipping or tripping*** hazards at the jobsite (spills, ice, hoses, debris, etc.)?
- ❑ Is there a ***fall hazard***? (Is the job above grade without protective handrails or is a scaffold required/needed?)
- ❑ Are there ***electrical hazards*** present, i.e. overhead lines, sources that cannot be locked out?
- ❑ Is there potential for ***chemical exposure***, i.e. liquids, vapors, dusts, etc? (Can it be mitigated?)
- ❑ Is there a potential for ***thermal burn*** (hot/cold)? Have all precautions been taken to remove the potential, i.e. insulation, steamtraps, etc.?
- ❑ Is there a risk that the atmosphere will reach or exceed ***10% of the LEL*** of any product?
- ❑ Can this task ***conflict with other work or other people in the area***, i.e. welding, x-ray, etc.?
- ❑ Is the ***noise at or above 85 dB***? Can it be mitigated?
- ❑ Is there potential for a strain type injury, i.e. lifting or moving, excessive force, repetitive motion, vibration, awkward position, etc. (***Ergonomics***)?
- ❑ Are there any ***adverse weather*** conditions, i.e. temperature extremes, winds, precipitation?
- ❑ Are there any ***exposed sharp contact points***?
- ❑ Is ***additional training*** needed to perform task, i.e. asbestos, radiation. technical, etc.?
- ❑ Is there a hazard of a ***plugged drain or bleeder***? If yes, use a bleeder tap/reamer to clear the plug.
- ❑ Is there ***inadequate clearance*** to perform the task?
- ❑ Is there ***potential for a crushing type incident***?
- ❑ Could this task cause a ***unit upset*** or shutdown?
- ❑ Is ther potential for ***lead exposure***, i.e. grinding. power brushing, burning, etc.?
- ❑ Is there any potential for ***exposure to asbestos***?
- ❑ Is the ***lighting inadequate*** to perform duties or tasks?
- ❑ Are any ***additional steps needed*** to do this job safely, i.e. manpower, stress, ergonomics, etc ...?
- ❑ Is there **venting or draining** that could come in contact with ignition source?
- ❑ Is **Nitrogen exposure** a hazard?