

SECTION II

JOB SPECIFIC - EQUIPMENT SPECIFIC SAFETY PROCEDURES

Following are general safety procedures that apply to individuals operating the equipment or performing the tasks described.

Clearheart Construction Co., Inc.

SAFETY PROGRAM

REFERENCE & TRAINING MANUAL

SECTION II

JOB SPECIFIC - EQUIPMENT SPECIFIC SAFETY PROCEDURES

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JOB SPECIFIC - EQUIPMENT SPECIFIC SAFETY PROCEDURES

ABRASIVE WHEELS

Abrasive wheels and tools. - 1926.303

An abrasive wheel is defined as a cutting tool consisting of abrasive grains held together by organic (resin, rubber, shellac or similar bonding agent) or inorganic bonds. Hazards that present themselves during abrasive wheel operations include physical contact with the rotating wheel; destruction of the wheel, itself; inhalation of the bonding particles; being struck by flying fragments. All these hazards can be eliminated through adherence to appropriate machine guarding principles, appropriate PPE, and/or respiratory protection.

Immediately before mounting, wheels must be inspected and sounded (ring test) to ensure they have not been damaged. Ensure the spindle speed does not exceed the maximum operating speed noted on the wheel.

Ring Test: Wheel to be tested must be dry and free from sawdust. Wheels should be tapped gently with a light nonmetallic implement, such as the handle of a screwdriver, or a wooden mallet for heavier wheels. If they sound cracked (dead), they may not be used. It should be noted that organic bonded wheels do not emit the same clear metallic ring as do vitrified and silicate wheels. Tap the wheels about 45° each side of the vertical centerline and about one or two inches from the periphery. Rotate the wheel about 45° and repeat the test. A sound, undamaged, wheel will give a clear metallic tone.

Guarding: Abrasive Blades in Portable Circular Saws:

It is important to distinguish between a saw and an abrasive blade because they have different guarding requirements. An abrasive wheel, as defined by CFR §1910.211(b)(14) and American National Standards Institute (ANSI) B7.1-1970, as "a cutting tool consisting of abrasive grains held together by organic or inorganic bonds."

If a wheel is, for example, constructed with bonded, steel fragments arranged in intermittent clusters around the periphery of a steel disc, the steel fragments are too large and sharp to be considered abrasive grains. If these fragments remove material primarily by severing rather than by abrasion, then this would be considered a saw blade and the guarding requirements would be found in 29 CFR 1926.300, General Requirements.

If cutting is done by the abrasive action of the abrasive grains, guarding requirements are found in 29 CFR 1926.303(b), Abrasive Wheels and Tools.

ANSI B7.1 requires the upper half of the abrasive blade be guarded when abrasive wheels are installed on portable power driven circular saws.

AERIAL LIFTS

Aerial lifts. - 1926.453

Aerial lifts include the following types of vehicle-mounted aerial devices to elevate personnel to job-sites above the ground:

- a. extensible boom platforms.
- b. aerial ladders.
- c. articulating boom platforms.
- d. vertical towers.
- e. a combination of any of the above.

Only authorized persons may operate an aerial lift.

Lift controls must be tested each day prior to use to determine they are in a safe working condition.

When working from an aerial lift, you must stand firmly on the floor of the basket or cage and be attached by lanyard and safety harness to the boom or basket. You may not sit or climb on the edge; use planks, ladders, or other devices for a work position; or tie off to any adjacent pole, structure, or other equipment.

Load limits set by the manufacturer must never be exceeded.

The brakes must be set and when outriggers are used, they shall be positioned on pads or a solid surface.

Aerial lifts must not be moved with personnel in the basket unless it is designed for this type of operation. Aerial lifts designed as personnel movers must have controls that are clearly marked as to their use and the lower controls must be able to override the upper controls. Except in an emergency, the lower controls shall not be used unless permission has been granted by the persons in the lift.

Extreme care must be exercised to avoid contact with electrical energy.

COMBUSTIBLE & FLAMMABLE LIQUID HANDLING

Flammable and combustible liquids. - 1926.152

Only approved containers and portable tanks will be used for storage and handling of flammable and combustible liquids. Approved safety cans or Department of Transportation approved containers will be used for handling and use of flammable liquids in quantities of 5 gallons or less.

Note 1: The above does not apply to flammable liquid materials which are highly viscous (extremely hard to pour) which may be used and handled in their original shipping containers.

Note 2: For quantities of one gallon or less, the original container may be used for storage, use and handling.

Flammable or combustible liquids may not be stored in areas used for exits, stairways, or normally used for the safe passage of people.

Inside a facility, no more than 25 gallons of flammable or combustible liquids may be stored in a room outside of an approved storage cabinet.

GASOLINE: General Information

Because most persons use or indirectly handle gasoline on a regular basis -- from filling up automobiles to lawn mowers -- the hazards presented by this product may have become obscure. Just because you are familiar with gasoline, never lose sight of the lethal hazards that it may contain.

Gasoline is a flammable liquid which means it has a flash point of less than 100°F. The actual flash point -- lowest temperature at which a liquid gives off enough vapor to form a flammable mixture with air -- of gasoline is - 45°F. The autoignition temperature -- the temperature at which, with sufficient oxygen, gasoline will ignite on its own and burn -- is 536°F.

Gasoline has a specific gravity -- the weight of the gasoline compared to the weight of an equal volume of water -- of 0.73. Further, gasoline has a negligible solubility in water. Basically, what the above means is that if water is used to extinguish a gasoline fire, it will only spread it because the gasoline will float on the water and continue to give off a vapor and form a flammable mixture with air. Gasoline fires must be fought with an extinguisher that is rated for Class B Fires such as carbon dioxide, dry chemical, or foam. It should be noted that water spray may be used to cool containers that may be exposed to the heat of the fire to prevent an explosion.

Conditions to avoid: heat, flame, & sources of ignition. Materials to avoid: strong oxidizers.

Health hazard information: routes of entry: inhalation, skin, ingestion.

Signs & symptoms of overexposure: headache, nausea, drowsiness, breathlessness, fatigue, convulsions, loss of conscience, dermatitis.

If there is a spill, notify emergency response personnel, evacuate area, remove ignition sources, build a dike to contain flow, do not flush to sewer or open water. Pick up with inert absorbent and place in closed container for disposal.

Gasoline is a carcinogen -- a cancer causing agent.

General rules: Post "No Smoking" signs around gasoline storage and ensure that it is enforced. Use only approved plastic or metal containers for portable gasoline carriers. They must not contain more than 5 gallons.

Double check with local ordinances for storage requirements.

COMBUSTIBLE GAS INDICATORS

The below information is extracted from OSHA Hazard Information Bulletin, dated, January 18, 1990., subject: *The Use of Combination Oxygen and Combustible Gas Detectors*.

In tank removal operations, it is common practice to purge a tank containing flammable vapors with either carbon dioxide or an inert gas, such as nitrogen. When the oxygen content falls to about 10% or below, a false combustible gas indicator reading can occur.

The combination oxygen and combustible gas meter is used to test atmospheres for sufficient oxygen content for life support and/or the presence of combustible gases or vapors posing a potential flammability/explosion hazard. Common examples of locations where this instrument is used include storage tanks, confined spaces, manholes, tank cars, ships and shipyards, tunneling, pumping stations and hazardous waste sites.

The combustible gas indicator is designed to measure combustible gas or vapor content in air. This instrument is capable of detecting the presence of any gas or vapor which, when combined with oxygen in free air, presents a potential hazard due to flammability/explosion. The combustible gas indicator will not indicate the combustible gas content in atmospheres containing less than 10% oxygen.

Each instrument has its own set of operating procedures and instructions, however:

- a. The instrument should not be used where the oxygen concentration exceeds that of fresh air (oxygen enriched atmosphere) when sampling for gases like acetylene and hydrogen.
- b. Certain materials such as silicon, silicates (such as in certain hydraulic fluids) and organic lead (such as in leaded gasoline) will poison the combustible gas sensor thereby giving erroneously low readings.
- c. Combustible gas readings, either negative or greater than 100% LEL, may indicate an explosive concentration of gas beyond the accurate response range of the combustible gas sensor.
- d. Pressurized or low pressure samples will give erroneous oxygen percent readings.
- e. Acid gases, such as carbon dioxide, will shorten the service life of the oxygen sensor.
- f. The instrument will not indicate the presence of combustible airborne mists or dusts such as lubricating oils, coal dust or grain dust.

The safe and effective performance of any oxygen/combustible gas detector requires that the operator know the correct use of the instrument to detect explosive concentrations of combustibles. It is important that the instrument response be appraised in light of the limitations and guidelines given in the instrument manual. The instrument should be operated only after the instructions, labels, cautions and warnings, and any other literature accompanying the instrument are carefully read and understood.

COMPRESSED GAS CYLINDERS

Gas welding and cutting. - 1926.350

Compressed gas cylinders are used on many job sites -- the most common being oxygen and acetylene for welding and propane for heat and forklifts.

Failure to follow basic safety procedures could result in serious injuries such as:

- a. flash burn - due to explosion.
- b. fragment impalement - due to explosion.
- c. compression of the foot - due to mishandling of tanks.
- d. inhalation of hazardous gases - due to leakage.

Basic safety procedures for gas cylinder use:

- a. Cylinders must remain upright and chained to a substantial support or cart when in use.
- b. Wear appropriate personal protective equipment for the job -- such as steel toed shoes, apron, goggles, gloves, helmet, etc..
- c. Read and understand the MSDS for the gas being used and know the location of the MSDS in case of an emergency.
- d. Have appropriate fire extinguisher readily available.
- e. To release the gas, open the cylinder valve slowly -- standing away from the face and back of the gage -- and leave the opening tools in place (on the valve stem) for quick shut-off in the event of an emergency.
- f. Ensure cylinder valves, regulators, couplings, and hoses are free of oil and grease and ensure all connections are tight.
- g. When using oxygen-fuel systems, use flashback arrestors and reverse-flow check valves to prevent flashback.
- h. Keep cylinders away from open flames and sources of heat.
- i. **Cylinders are never allowed in confined spaces.**
- j. Do not alter or attempt to repair safety devices or valves.
- k. Remove the regulators when: a) moving cylinders; b) work is completed, and/or c) cylinders are empty.

CONCRETE AND MASONRY CONSTRUCTION

General requirements - 1926.701

Requirements for equipment and tools. - 1926.702

Requirements for cast-in-place Concrete. - 1926.703

Requirements for precast concrete. - 1926.704

Requirements for lift-slab operations. - 1926.705

Lift Slab Operations - 1926.705 App

Requirements for masonry construction. - 1926.706

Concrete and masonry construction, more so than most trades, are highly skilled activities that require numerous specialized abilities including, but not limited to, an understanding of chemistry, building techniques, specialized tools, and a unique language. The definitions below are extracted from OSHA standards, however they barely scratch the surface. Words and phrases such as: Adiabatic Curing, Hand Float, and Water-Cement Ratio are peculiar to these trades.

DEFINITIONS

Listed below are terms, with accompanying OSHA notes, which must be understood when dealing with concrete and masonry construction:

- Bull float:** a tool used to spread out and smooth concrete.
[Note: Bull float handles that might contact energized electrical conductors must be constructed of nonconductive materials or insulated with a nonconductive sheath.]
- Formwork:** the total system of support for freshly placed or partially cured concrete, including the mold or sheeting (form) that is in contact with the concrete as well as all supporting members including shores, reshores, hardware, braces, and related hardware.
[Note: 1 Formwork must be designed, fabricated, supported, braced and maintained so that it will be capable of supporting without failure all vertical and lateral loads that may reasonably anticipated to be applied to the formwork.]
[Note: 2 Drawings with all revisions for the jack layout, formwork (including shoring equipment), working decks, and scaffolds must be available at the job site.]
- Lift slab:** a method of concrete construction in which floor and roof slabs are cast on or at ground level and, using jacks, lifted into position.
- Limited access zone:** an area alongside a masonry wall, which is under construction, and which is clearly demarcated to limit access by employees.

Precast concrete: concrete members (such as walls, panels, slabs, columns, and beams) which have been formed, cast, and cured prior to final placement in a structure.

Reshoring: the construction operation in which shoring equipment (also called reshores or reshoring equipment) is placed, as the original forms and shores are removed, in order to support partially cured concrete and construction loads.

[Note: 1 All Shoring equipment must be inspected prior to erection to determine that the equipment meets the requirements specified in the formwork drawings.]

[Note: 2 Shoring equipment found to be damaged such that it is not capable of supporting without failure all vertical and lateral loads that may reasonably anticipated to be applied to them must not be used.]

[Note: 3 Erected shoring equipment shall be inspected immediately prior to, during, and immediately after concrete placement.]

[Note: 4 Shoring equipment that is found to be damaged or weakened after erection, such that its strength is reduced to the point where it is not capable of supporting without failure all vertical and lateral loads that may reasonably anticipated to be applied to them will be immediately reinforced.

[Note: 5 The sills for shoring must be sound, rigid, and capable of carrying the maximum intended load.]

[Note: 6 All base plates, shore heads, extension devices, and adjustment screws must be in firm contact, and secured when necessary, with the foundation and the form.]

[Note: 7 Eccentric loads on shore heads and similar members shall be prohibited unless these members have been designed for such loading.]

[Note: 8 Whenever single post shores are used one on top of another (tiered), the below will apply:

- a. The design of the shoring shall be prepared by a qualified designer and the erected shoring shall be inspected by an engineer qualified in structural design.
- b. The single post shores shall be vertically aligned.
- c. The single post shores shall be spliced to prevent misalignment.
- d. The single post shores shall be adequately braced in two mutually perpendicular directions at the splice level. Each tier shall also be diagonally braced in the same two directions.]

[Note: 9 Adjustment of single post shores to raise formwork will not be made after the placement of concrete.

[Note:10 Reshoring shall be erected, as the original forms and shores are removed, whenever the concrete is required to support loads in excess of its capacity.

- Shore: a supporting member that resists a compressive force imposed by a load.
- Tremie: a pipe through which concrete may be deposited under water.
[Note: Sections of tremies and similar concrete conveyances must be secured with wire rope (or equivalent materials) in addition to the regular couplings or connections.]
- Vertical slip forms: forms which are jacked vertically during the placement of concrete.
- Jacking operation: the task of lifting a slab (or group of slabs) vertically from one location to another (e.g., from the casting location to a temporary location, or to its final location in the structure), during the construction of a building/structure where the lift-slab process is being used.

MAJOR HAZARDS

Both concrete and masonry construction require skilled, trained personnel to produce quality work performed in a safe manner. Serious accidents, including wall collapse, can happen in an instant due to premature removal or actual failure of the formwork. Additionally, failure to brace masonry walls, failure to support precast panels, overloading, etc., can cause serious mishaps.

No construction loads will be placed on a concrete structure unless our competent person determines, based on information received from a person who is qualified in structural design, that the structure or portion of the structure is capable of supporting the loads.

Prior to construction of a masonry wall, a limited access zone will be established as follows:

- a. it must be equal to the height of the wall to be constructed plus 4 feet and it must run the entire length of the wall.
- b. on the side of the wall that will be unscaffolded, the limited access zone must be:
 1. restricted to entry only by employees actively engaged in constructing the wall, and,
 2. if the wall is 8 feet or less, the limited access zone will be kept in place until the wall is adequately supported to prevent overturning and collapse, or
 3. if the height of the wall is more than 8 feet and unsupported, the wall must be braced. The bracing must remain in place until permanent supporting elements of the structure are in place.

Concrete and masonry work are performed in such a variety of circumstances and conditions -- under ground, over ground, on sides of structures, on top of structures, inside confined spaces, precast and cast in-place concrete, etc.. Each circumstance presents specific hazards which must be addressed. The competent person on site will point out unusual, specific hazards and means to deal with them.

SAFETY PROCEDURES

The competent person will ensure that all equipment is inspected as required and defective equipment is removed from service.

The competent person will ensure the drawing or plans, with revisions, for all equipment and procedures to be used in concrete or masonry construction are available at the job site.

For the safety of all employees, the following safety rules are established:

- a. Limited or controlled access zones will be restricted to employees who have actual job responsibilities within the established zones.
- b. Employees will not work under concrete buckets while they are being elevated or lowered into position.
- c. Employees, except those required for the job, are not allowed under precast concrete members while they are being lifted or tilted into position.
- d. Personal protective equipment, determined by the competent person on the job site, will be used without fail. It should be noted that when cement is mixed with water, a highly alkaline solution is produced by the dissolution of calcium, sodium, and potassium hydroxides. Gloves should be worn to protect the skin. Hands should be washed after contact. OSHA requires head and face equipment for employees applying a cement, sand, and water mixture through a pneumatic hose.
- e. Employees will not be allowed to perform maintenance on any equipment where the unexpected activation of that equipment could cause harm without following the procedures in our Control of Hazardous Energy Program.
- f. When fastening other materials to a concrete surface (such as a wooden 2" X 4"), only a fastener of 7/32-inch shank diameter or less will be driven in and it may be no closer than 2 inches from the unsupported edge or corner of the work surface.
- g. Fasteners will not be driven directly into brick or concrete closer than 3" from the unsupported edge of corner unless a special guard, fixture, or jig is used.

NOTE: Exception to the above: Low-velocity tools may drive no closer than 2" from an edge in concrete.

- h. Concrete mixers with one cubic yard or larger loading skips will be equipped with a:
 - a. mechanical device to clear the skip of materials.
 - b. guardrail installed on each side of the skip.

Note: Regardless of the size of the skip, point of operation guarding must be utilized.

REBAR PROTECTION

All protruding reinforcing steel onto and into which employees could fall will be guarded to eliminate the hazard of impalement. Protection from impalement on protruding rebar is primarily a function of fall protection when employees are working above rebar or other impalement hazards.

When working at the same grade as rebar protruding 4 to 6 feet, there is not, for all practical purposes, an impalement hazard. In these instances, acceptable rebar caps are appropriate to prevent cuts, abrasions or other minor injuries.

At grade, the lower the rebar sticks up, the greater the impalement hazard due to tripping. If there is any chance for impalement, acceptable rebar caps are mandatory.

CONCRETE CUTTING

Only trained and authorized personnel will operate concrete tile cutting equipment. The following guidelines will be used during all concrete cutting operations.

- a. follow the manufacturer's recommendations for the safe use of the equipment.
- b. use the correct blade (size, type, speed) for the job, properly tightened. Inspect the blade and all equipment before use.
- c. ensure all safety guards are functioning properly.
- d. never operated a hand held saw above shoulder height.
- e. wear proper safety equipment including eye, hand and skin protection. Depending on the job, respiratory protection or dust masks may be required.
- f. establish a control zone and keep others out who are not directly involved with the work at hand.
- g. ensure there is adequate coolant/water when appropriate.
- h. never operate an internal combustion saw in a confined space.

CRANES AND DERRICKS IN CONSTRUCTION

- 1926.1400 Scope.
- 1926.1401 Definitions.
- 1926.1402 Ground conditions.
- 1926.1403 Assembly/Disassembly – selection of manufacturer or employer procedures.
- 1926.1404 Assembly/Disassembly – general requirements.
- 1926.1405 Disassembly – additional requirements for dismantling of booms and jibs (applies to both the use of manufacturer procedures and employer procedures).
- 1926.1406 Assembly/Disassembly – employer procedures – general requirements.
- 1926.1407 Power line safety (up to 350 kV) – assembly and disassembly.
- 1926.1408 Power line safety (up to 350 kV) – equipment operations.
- 1926.1409 Power line safety (over 350 kV).
- 1926.1410 Power line safety (all voltages) – equipment operations closer than the Table A zone.
- 1926.1411 Power line safety – while traveling.
- 1926.1412 Inspections.
- 1926.1413 Wire rope – inspection.
- 1926.1414 Wire rope – selection and installation criteria.
- 1926.1415 Safety devices.
- 1926.1416 Operational aids.
- 1926.1417 Operation.
- 1926.1418 Authority to stop operation.
- 1926.1419 Signals – general requirements.
- 1926.1420 Signals – radio, telephone or other electronic transmission of signals.
- 1926.1421 Signals – voice signals – additional requirements.
- 1926.1422 Signals – hand signal chart.
- 1926.1423 Fall protection.
- 1926.1424 Work area control.
- 1926.1425 Keeping clear of the load.
- 1926.1426 Free fall and controlled load lowering.
- 1926.1427 Operator qualification and certification.
- 1926.1428 Signal person qualifications.
- 1926.1429 Qualifications of maintenance & repair employees.
- 1926.1430 Training.
- 1926.1431 Hoisting personnel.
- 1926.1432 Multiple-crane/derrick lifts -- supplemental requirements.
- 1926.1433 Design, construction and testing.
- 1926.1434 Equipment modifications.
- 1926.1435 Tower cranes.
- 1926.1436 Derricks.
- 1926.1437 Floating cranes/derricks and land cranes/derricks on barges.
- 1926.1438 Overhead & gantry cranes.
- 1926.1439 Dedicated pile drivers.
- 1926.1440 Sideboom cranes.
- 1926.1441 Equipment with a rated hoisting/lifting capacity of 2,000 pounds or less.
- 1926.1442 Severability.**

Subpart CC, Cranes and Derricks in Construction, applies to power-operated equipment, and their attachments, that can hoist, lower and horizontally move a suspended load.

Exclusions to this standard include, but are not limited to:

1. Power-operated equipment that has been converted or adapted for a non-hoisting/lifting use.
2. Power shovels, excavators, wheel loaders, backhoes, loader backhoes, track loaders.
3. Machinery originally designed as vehicle-mounted aerial devices (for lifting personnel) and self-propelled elevating work platforms.
4. Powered industrial trucks (forklifts), except when configured to hoist and lower (by means of a winch or hook) and horizontally move a suspended load.
5. Articulating/knuckle-boom truck cranes that deliver material to a construction site when used to transfer materials from the truck crane to the ground, without arranging the materials in a particular sequence for hoisting.
6. Articulating/knuckle-boom truck cranes that deliver material to a construction site when the crane is used to transfer building supply sheet goods or building supply packaged materials from the truck crane onto a structure, using a fork/cradle at the end of the boom, but only when the truck crane is equipped with a properly functioning automatic overload prevention device. Such sheet goods or packaged materials include, but are not limited to: sheets of sheet rock, sheets of plywood, bags of cement, sheets or packages of roofing shingles, and rolls of roofing felt.

Note: The above articulating/knuckle-boom crane exclusion does not apply when it is used to 1) hold, support or stabilize the material to facilitate a construction activity, such as holding material in place while it is attached to the structure; 2) when the material being handled is a prefabricated component such as precast concrete members or panels, roof trusses, prefabricated building sections such as, but not limited to: floor panels, wall panels, roof panels, roof structures, or similar items; and, 3) when the material being handled by the crane is a structural steel member (for example, steel joists, beams, columns, steel decking (bundled or unbundled) or a component of a systems-engineered metal building.

Required Actions Prior to Assembly:

Prior to assembly of a crane, care must be taken to ensure ground conditions are appropriate for the crane and other hazards, specifically, electrical hazards, are eliminated.

Ground Conditions

Note: Ground conditions means the ability of the ground to support the equipment (including slope, compaction, and firmness).

The controlling entity must ensure that the equipment is not assembled **or used** unless the 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.

Note: The requirement for the ground to be drained does not apply to marshes/wetlands.

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

Note If there is no controlling entity for the project, the requirements above must be met by the employer that has authority at the site to make or arrange for ground preparations for crane operations.

If the Assembly/Disassembly director **or the operator** determines that ground conditions do not meet the above requirements, that person's employer **must** have a discussion with the controlling entity regarding the ground preparations that are needed so that, with the use of suitable supporting materials/devices (if necessary), the above requirements are met.

Electrical Hazards:

Before assembling or disassembling equipment, the Assembly/Disassembly director must determine if any part of the equipment, load line, or load (including rigging and lifting accessories) could get, in the direction or area of assembly/disassembly, closer than 20 feet to a power line during the assembly/disassembly process.

If so, the A/D director must meet the requirements in Option (1), Option (2), or Option (3), below:

Option (1) Deenergize and ground:

Confirm from the utility owner/operator that the power line has been deenergized and visibly grounded at the worksite.

Option (2) – 20 foot clearance:

Ensure that no part of the equipment, load line or load (including rigging and lifting accessories), gets closer than 20 feet to the power line by implementing the measures found in "preventing encroachment", below.

Option (3) – Table A clearance:

1. Determine the line's voltage and the minimum clearance distance permitted under Table A.

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)

2. Determine if any part of the equipment, load line, or load (including rigging and lifting accessories), could get closer than the minimum clearance distance to the power line permitted under Table A .

If so, the Assembly/Disassembly director must ensure that no part of the equipment, load line, or load (including rigging and lifting accessories), gets closer to the line than the minimum clearance distance.

Note: Voltage information. Where Option (3) of is used, the utility owner/operator of the power lines must provide the requested voltage information within two working days of our request.

Preventing encroachment/electrocution:

Where encroachment precautions are required under Option (2), or Option (3), above, the following requirements must be met:

1. A planning meeting will be conducted with the Assembly/Disassembly director, operator, assembly/disassembly crew and the other workers who will be in the assembly/disassembly area to review the location of the power line(s) and the steps that will be implemented to prevent encroachment/electrocution.
2. If tag lines are used, they must be nonconductive.
3. At least **one** of the following additional measures must be in place. The measure selected from this list must be effective in preventing encroachment.

The additional measures are:

1. Use a dedicated spotter who is in continuous contact with the equipment operator. The dedicated spotter must:
 - a. Be equipped with a visual aid to assist in identifying the minimum clearance distance. Examples of a visual aid include, but are not limited to: a clearly visible line painted on the ground; a clearly visible line of stanchions; a set of clearly visible line-of sight landmarks.
 - b. Be positioned to effectively gauge the clearance distance.
 - c. Where necessary, use equipment that enables the dedicated spotter to communicate directly with the operator.
 - d. Give timely information to the operator so that the required clearance distance can be maintained.
2. A proximity alarm set to give the operator sufficient warning to prevent encroachment.
3. A device that automatically warns the operator when to stop movement, such as a range control warning device. Such a device must be set to give the operator sufficient warning to prevent encroachment.
4. A device that automatically limits range of movement, set to prevent encroachment.
5. An elevated warning line, barricade, or line of signs, in view of the operator, equipped with flags or similar high-visibility markings.

Additional Electrical Safety Measures:

1. Assembly/disassembly below power lines is prohibited. No part of a crane/derrick, load line, or load (including rigging and lifting accessories), whether partially or fully assembled, is allowed below a power line unless the Assembly/Disassembly director has confirmed that the utility owner/ operator has deenergized and (at the worksite) visibly grounded the power line.
2. Assembly/disassembly inside Table A clearance is prohibited. No part of a crane/derrick, load line, or load (including rigging and lifting accessories), whether partially or fully assembled, is allowed closer than the minimum approach distance under Table A to a power line unless the Assembly/Disassembly director has confirmed that the utility owner/operator has deenergized and (at the worksite) visibly grounded the power line.

4. The Assembly/Disassembly director must assume that all power lines are energized unless the utility owner/operator confirms that the power line has been and continues to be deenergized and visibly grounded at the worksite.
5. There must be at least one electrocution hazard warning conspicuously posted in the cab so that it is in view of the operator and (except for overhead gantry and tower cranes) at least two on the outside of the equipment.

Assembly/Disassembly

When assembling or disassembling equipment (or attachments), the Assembly/Disassembly director must comply with all applicable manufacturer prohibitions and will select to use the manufacturer's procedures applicable to the equipment and/or attachments.

Assembly/disassembly must be directed by a person who meets the criteria for both a competent person and a qualified person, or by a competent person who is assisted by one or more qualified persons ("Assembly/Disassembly director").

Where the assembly/disassembly is being performed by only one person, that person must meet the criteria for both a competent person and a qualified person. This person will be considered the Assembly/Disassembly director.

The Assembly/Disassembly director must understand the applicable assembly/disassembly procedures.

The Assembly/Disassembly director must review the applicable assembly/disassembly procedures immediately prior to the commencement of assembly/ disassembly unless the Assembly/Disassembly director understands the procedures and has applied them to the same type and configuration of equipment (including accessories, if any).

Before commencing assembly/disassembly operations, the Assembly/Disassembly director must ensure that the crew members understand all of the following:

1. Their tasks.
2. The hazards associated with their tasks.
3. The hazardous positions/locations that they need to avoid.

Note: If during assembly/disassembly operations, before a crew member takes on a different task, or when adding new personnel during the operations, the Assembly/Disassembly director must complete the above three (3) steps.

Before a crew member goes to a location that is out of view of the operator and is either in, on, or under the equipment, or near the equipment (or load) where the crew member could be injured by movement of the equipment (or load), the crew member must inform the operator that he/she is going to that location.

Where the operator knows that a crew member went to a location noted above, the operator must not move any part of the equipment (or load) until the operator is informed in accordance with a prearranged system of communication that the crew member is in a safe position.

When pins (or similar devices) are being removed, employees must not be under the boom, jib, or other components, except where Addressable/Disassembly director demonstrates that site constraints require one or more employees to be under the boom, jib, or other components when pins (or similar devices) are being removed, the Assembly/Disassembly director must implement procedures that minimize the risk of unintended dangerous movement and minimize the duration and extent of exposure under the boom.

During all phases of assembly/disassembly, rated capacity limits for loads imposed on the equipment, equipment components (including rigging), lifting lugs and equipment accessories, must not be exceeded for the equipment being assembled/disassembled.

The Assembly/Disassembly director supervising the assembly/disassembly operation must address the hazards associated with the operation, which include:

1. Site and ground conditions must be adequate for safe assembly/disassembly operations and to support the equipment during assembly/disassembly.
2. The size, amount, condition and method of stacking the blocking must be sufficient to sustain the loads and maintain stability.
3. When used to support lattice booms or components, blocking must be appropriately placed to:
 - a. Protect the structural integrity of the equipment, and,
 - b. Prevent dangerous movement and collapse.
4. When using an assist crane, the loads that will be imposed on the assist crane at each phase of assembly/disassembly must be verified in accordance with § 1926.1417(o)(3) before assembly/disassembly begins.

5. The point(s) of attachment of rigging to a boom (or boom sections or jib or jib sections) must be suitable for preventing structural damage and facilitating safe handling of these components.
6. The center of gravity of the load must be identified if that is necessary for the method used for maintaining stability.

Note: Where there is insufficient information to accurately identify the center of gravity, measures designed to prevent unintended dangerous movement resulting from an inaccurate identification of the center of gravity must be used.

7. The boom sections, boom suspension systems (such as gantry A-frames and jib struts), and components must be rigged or supported to maintain stability upon the removal of the pins.
8. Suspension ropes and pendants must not be allowed to catch on the boom or jib connection pins or cotter pins (including keepers and locking pins).
9. The potential for unintended movement from inadequately supported counterweights and from hoisting counterweights.
10. Each time reliance is to be placed on the boom hoist brake to prevent boom movement during assembly/disassembly, the brake must be tested prior to such reliance to determine if it is sufficient to prevent boom movement. If it is not sufficient, a boom hoist pawl, other locking device/back-up braking device, or another method of preventing dangerous movement of the boom (such as blocking or using an assist crane) from a boom hoist brake failure must be used.
11. Backward stability before swinging the upperworks, travel, and when attaching or removing equipment components.
12. The effect of wind speed and weather on the equipment.

Additionally, the following must be addressed, if applicable:

1. Manufacturer limitations on the maximum amount of boom supported only by cantilevering must not be exceeded. Where these are unavailable, a registered professional engineer familiar with the type of equipment involved must determine in writing this limitation, which must not be exceeded.
2. The weight of each of the components must be readily available.
3. The selection of components, and configuration of the equipment, that affect the capacity or safe operation of the equipment must be in accordance with:

4. Manufacturer instructions, prohibitions, limitations, and specifications.
 - b. Where these are unavailable, a registered professional engineer familiar with the type of equipment involved must approve, in writing, the selection and configuration of components; or
 - a. Approved modifications that meet the requirements of §1926.1434 (Equipment modifications).
5. Upon completion of assembly, the equipment must be inspected to ensure compliance with the above.

Post-assembly:

Upon completion of assembly, the equipment must be inspected by a qualified person to assure that it is configured in accordance with manufacturer equipment criteria.

Where manufacturer equipment criteria are unavailable, a qualified person must:

- a. Determine if a registered professional engineer (RPE) familiar with the type of equipment involved is needed to develop criteria for the equipment configuration. If an RPE is not needed, the employer must ensure that the criteria are developed by the qualified person. If an RPE is needed, the employer must ensure that they are developed by an RPE.
- b. Determine if the equipment meets the criteria developed in accordance with paragraph a. above.

Equipment must not be used until an inspection demonstrates that the equipment is configured in accordance with the applicable criteria.

Note: Reusable shipping pins, straps, links, and similar equipment must be removed. Once they are removed they must either be stowed or otherwise stored so that they do not present a falling object hazard.

Rigging:

In addition to following the requirements in 29 CFR 1926.251 and other requirements in this and other standards applicable to rigging, when rigging is used for assembly/disassembly, the employer must ensure that:

1. The rigging work is done by a qualified rigger.
2. Synthetic slings are protected from: abrasive, sharp or acute edges, and configurations that could cause a reduction of the sling's rated capacity, such as distortion or localized compression. NOTE: Requirements for the protection of wire rope slings are contained in 29 CFR 1926.251(c)(9).
3. When synthetic slings are used, the synthetic sling manufacturer's instructions, limitations, specifications and recommendations must be followed.

Hazard Assessments and Precautions Inside the Work Zone:

Before beginning equipment operations, the qualified person must identify the work zone by either:

1. Demarcating boundaries (such as with flags, or a device such as a range limit device or range control warning device) and prohibiting the operator from operating the equipment past those boundaries, or
2. Defining the work zone as the area 360 degrees around the equipment up to the equipment's maximum working radius.

Determine if any part of the equipment, load line or load (including rigging and lifting accessories), if operated up to the equipment's maximum working radius in the work zone, could get closer than 20 feet to a power line.

If so, the qualified person must meet the requirements in Option (1), Option (2), or Option (3) as follows:

Option (1) Deenergize and ground:

Confirm from the utility owner/operator that the power line has been deenergized and visibly grounded at the worksite.

Option (2) – 20 foot clearance:

Ensure that no part of the equipment, load line or load (including rigging and lifting accessories), gets closer than 20 feet to the power line by implementing the measures found in "preventing encroachment", below.

Option (3) – Table A clearance:

1. Determine the line's voltage and the minimum clearance distance permitted under Table A.

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)

2. Determine if any part of the equipment, load line, or load (including rigging and lifting accessories), could get closer than the minimum clearance distance to the power line permitted under Table A .

If so, the qualified person must ensure that no part of the equipment, load line, or load (including rigging and lifting accessories), gets closer to the line than the minimum clearance distance.

Note: Voltage information. Where Option (3) of is used, the utility owner/operator of the power lines must provide the requested voltage information within two working days of our request.

Preventing encroachment/electrocution:

Where encroachment precautions are required under Option (2), or Option (3), above, the following requirements must be met:

1. A planning meeting will be conducted with the qualified person, operator, and the other workers who will be in the of the equipment or load to review the location of the power line(s) and the steps that will be implemented to prevent encroachment/electrocution.
2. At least **one** of the following additional measures must be implemented:

The additional measures are:

1. A proximity alarm set to give the operator sufficient warning to prevent encroachment.
2. Use a dedicated spotter who is in continuous contact with the equipment operator. The dedicated spotter must:
 - a. Be equipped with a visual aid to assist in identifying the minimum clearance distance. Examples of a visual aid include, but are not limited to: a clearly visible line painted on the ground; a clearly visible line of stanchions; a set of clearly visible line-of sight landmarks.
 - b. Be positioned to effectively gauge the clearance distance.
 - c. Where necessary, use equipment that enables the dedicated spotter to communicate directly with the operator.
 - d. Give timely information to the operator so that the required clearance distance can be maintained.
3. A device that automatically warns the operator when to stop movement, such as a range control warning device. Such a device must be set to give the operator sufficient warning to prevent encroachment.

4. A device that automatically limits range of movement, set to prevent encroachment.
5. An insulating link/device [defined as “an insulating device listed, labeled, or accepted by a Nationally Recognized Testing Laboratory in accordance with 29 CFR 1910.7”] installed at a point between the end of the load line (or below) and the load.

Additional Electrical Safety Measures:

1. No part of the equipment, load line, or load (including rigging and lifting accessories) is allowed below a power line unless the qualified person has confirmed that the utility owner/ operator has deenergized and (at the worksite) visibly grounded the power line.
2. The qualified person must assume that all power lines are energized unless the utility owner/operator confirms that the power line has been and continues to be deenergized and visibly grounded at the worksite.
3. There must be at least one electrocution hazard warning conspicuously posted in the cab so that it is in view of the operator and (except for overhead gantry and tower cranes) at least two on the outside of the equipment.

Inspections:

Note: Any part of a manufacturer’s procedures regarding inspections that relate to safe operation (such as to a safety device or operational aid, critical part of a control system power plant, braking system, load-sustaining structural components, load hook, or in-use operating mechanism) that is more comprehensive or has a more frequent schedule of inspection than the requirements of 1926.1412 must be followed.

Note: All inspection documents must be available, during the applicable document retention period, to all persons who conduct inspections.

Modified Equipment Inspection:

Equipment that has had modifications or additions which affect the safe operation of the equipment (such as modifications or additions involving a safety device or operational aid, critical part of a control system, power plant, braking system, load-sustaining structural components, load hook, or in-use operating mechanism) or capacity must be inspected by a **qualified person** after such modifications/additions have been completed, prior to initial use. The inspection must meet all the requirements of 1926.1412(a).

Repaired/adjusted Equipment Inspection:

Equipment that has had a repair or adjustment that relates to safe operation (such as: a repair or adjustment to a safety device or operator aid, or to a critical part of a control system, power plant, braking system,

load-sustaining structural components, load hook, or in-use operating mechanism), must be inspected by a **qualified person** after such a repair or adjustment has been completed, prior to initial use. The inspection must meet all the requirements of 1926.1412(b).

Post-assembly Inspection:

Upon completion of assembly, the equipment must be inspected by a **qualified person** to assure that it is configured in accordance with manufacturer equipment criteria.

The inspection must meet all the requirements of 1926.1412(c).

Each Shift Inspection:

A **competent person** must begin a visual inspection prior to each shift the equipment will be used, which must be completed before or during that shift. The inspection must consist of observation for apparent deficiencies. Taking apart equipment components and booming down is not required as part of this inspection unless the results of the visual inspection or trial operation indicate that further investigation necessitating taking apart equipment components or booming down is needed. Determinations made in conducting the inspection must be reassessed in light of observations made during operation. Some of the items include control mechanisms, pressurized lines, hooks and latches, wire rope, electrical apparatus, tires (when used), and ground conditions.

The inspection must meet all the requirements of 1926.1412(d).

Daily (each shift) inspections will be documented and include the following: items checked, results of the inspection, and name and signature of the inspection. Documentation of daily (each shift) inspections will be retained for 3 months.

Monthly Inspection:

Per, 1926.1412(e) Each month the equipment is in service it must be inspected by **competent person**. The inspection must meet all the requirements of 1926.1412(d). See “Each Shift” inspection, above.

Note: Documented monthly inspection is not required if the daily (each shift) inspection is documented and records are retained for 3 months.

Annual/Comprehensive Inspection:

1. At least every 12 months the equipment must be inspected by a **qualified person** in accordance with paragraph (d) of this section (each shift) except that the corrective action set forth in paragraphs (f)(4), (f)(5), and (f)(6) of this section must apply in place of the corrective action required by paragraphs (d)(2) and (d)(3) of this

section. The inspection must meet all the requirements of 1926.1412(f).

2. In addition, at least every 12 months, the equipment must be inspected by a qualified person. Disassembly is required, as necessary, to complete the inspection. The inspection must meet all the requirements of 1926.1412(f).

Documentation of Annual/Comprehensive Inspection:

The following information must be documented, maintained, and retained for a minimum of 12 months, by the employer that conducts the inspection:

1. The items checked and the results of the inspection.
2. The name and signature of the person who conducted the inspection and the date.

Severe Service Inspection:

Where the severity of use/conditions is such that there is a reasonable probability of damage or excessive wear (such as loading that may have exceeded rated capacity, shock loading that may have exceeded rated capacity, prolonged exposure to a corrosive atmosphere), the equipment will stop being used and a **qualified** person must inspect it. The inspection must meet all the requirements of 1926.1412(g).

Equipment Not In Regular Use Inspection:

Equipment that has been idle for 3 months or more must be inspected by a qualified person in accordance with the requirements of the Monthly inspection, above.

Wire Rope Inspection:

Wire Rope Shift Inspection:

A competent person must begin a visual inspection prior to each shift the equipment is used, which must be completed before or during that shift. The inspection must consist of observation of wire ropes (running and standing) that are likely to be in use during the shift for apparent deficiencies, including those listed in 1926.1413(a)(2). Untwisting (opening) of wire rope or booming down is not required as part of this inspection.

Daily (each shift) inspections will be documented and include the following: items checked, results of the inspection, and name and signature of the inspection. Documentation of daily (each shift) inspections will be retained for 3 months.

Wire Rope Monthly Inspection:

Each month an inspection must be conducted in accordance shift inspection, above, and 1926.1413(b).

Note: Documented monthly inspection is not required if the daily (each shift) inspection is documented and records are retained for 3 months.

Wire Rope Annual/Comprehensive Inspection:

At least every 12 months, wire ropes in use on equipment must be inspected by a qualified person in accordance with shift inspection, above, and 1926.1413(c).

In addition, at least every 12 months, the wire ropes in use on equipment must be inspected by a qualified person in accordance with 1926.1413(c)

Documentation of Annual/Comprehensive Wire Rope Inspection:

The following information must be documented, maintained, and retained for a minimum of 12 months, by the employer that conducts the inspection:

1. The items checked and the results of the inspection.
2. The name and signature of the person who conducted the inspection and the date.

Safety Devices:

Operations must not begin unless all of the devices listed below are in proper working order. If a device stops working properly during operations, the operator must safely stop operations. If any of the devices listed in this section are not in proper working order, the equipment must be taken out of service and operations must not resume until the device is again working properly.

1. Crane level indicator.
 - a. The equipment must have a crane level indicator that is either built into the equipment or is available on the equipment.
 - b. If a built-in crane level indicator is not working properly, it must be tagged-out or removed. If a removable crane level indicator is not working properly, it must be removed.
 - c. This requirement does not apply to portal cranes, derricks, floating cranes/derricks and land cranes/derricks on barges, pontoons, vessels or other means of flotation.
2. Boom stops, except for derricks and hydraulic booms.
3. Jib stops (if a jib is attached), except for derricks.
4. Equipment with foot pedal brakes must have locks.

5. Hydraulic outrigger jacks and hydraulic stabilizer jacks must have an integral holding device/check valve.
6. Equipment on rails must have rail clamps and rail stops, except for portal cranes.
7. Horn
 - a. The equipment must have a horn that is either built into the equipment or is on the equipment and immediately available to the operator.
 - b. If a built-in horn is not working properly, it must be tagged-out or removed. If a removable horn is not working properly, it must be removed.

Equipment Operations:

Operators must comply with all manufacturer procedures applicable to the operational functions of equipment, including its use with attachments.

Operators must have access to procedures applicable to the operation of the equipment and these items must be readily available in the cab at all times for use by the operator. These items include: rated capacities (load charts), recommended operating speeds, special hazard warnings instructions, and operator's manual.

Note: Where rated capacities are available in the cab only in electronic form: in the event of a failure which makes the rated capacities inaccessible, the operator must immediately cease operations or follow safe shut-down procedures until the rated capacities (in electronic or other form) are available.

The operator must not engage in any practice or activity that diverts his/her attention while actually engaged in operating the equipment, such as the use of cellular phones (other than when used for signal communications).

The operator has the authority **and responsibility** to stop and refuse to handle loads whenever there is a safety concern. A qualified person, at this point, must determine that safety has been assured.

Signals:

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.

Work Control Area:

Swing radius hazards:

The requirements below apply where there are accessible areas in which the equipment's rotating superstructure (whether permanently or temporarily mounted) poses a reasonably foreseeable risk of:

1. Striking and injuring an employee; or
2. Pinching/crushing an employee against another part of the equipment or another object.

To prevent employees from entering these hazard areas, the below procedures will be accomplished:

1. Train each employee assigned to work on or near the equipment ("authorized personnel") in how to recognize struck-by and pinch/crush hazard areas posed by the rotating superstructure.
2. Erect and maintain control lines, warning lines, railings or similar barriers to mark the boundaries of the hazard areas. *Exception:* When the employer can demonstrate that it is neither feasible to erect such barriers on the ground nor on the equipment, the hazard areas must be clearly marked by a combination of warning signs (such as "Danger – Swing/Crush Zone") and high visibility markings on the equipment that identify the hazard areas. In addition, the employer must train each employee to understand what these markings signify.

Protecting employees in the hazard area:

Before an employee goes to a location in the hazard area that is out of view of the operator, the employee (or someone instructed by the employee) must ensure that the operator is informed that he/she is going to that location.

Where the operator knows that an employee went to a location within the swing area radius, the operator must not rotate the superstructure until the operator is informed in accordance with a prearranged system of communication that the employee is in a safe position.

Where any part of a crane/derrick is within the working radius of another crane/derrick, the controlling entity must institute a system to coordinate operations. If there is no controlling entity, the employer (if there is only one employer operating the multiple pieces of equipment), or employers, must institute such a system.

Equipment Modifications:

Modifications or additions which affect the capacity or safe operation of the equipment are prohibited except where below requirements are met.

1. Manufacturer review and approval.
 - a. The manufacturer approves the modifications/additions in writing.
 - b. The load charts, procedures, instruction manuals and instruction plates/tags/decals are modified as necessary to accord with the modification/addition.
 - c. The original safety factor of the equipment is not reduced.
2. *Manufacturer refusal to review request.* The manufacturer is provided a detailed description of the proposed modification/addition, is asked to approve the modification/ addition, but it declines to review the technical merits of the proposal or fails, within 30 days, to acknowledge the request or initiate the review, and all of the following are met:
 - a. A registered professional engineer who is a qualified person with respect to the equipment involved:
 - 1) Approves the modification/addition and specifies the equipment configurations to which that approval applies, and
 - (B) Modifies load charts, procedures, instruction manuals and instruction plates/tags/decals as necessary to accord with the modification/addition.
 - b. The original safety factor of the equipment is not reduced.
3. *Unavailable manufacturer.* The manufacturer is unavailable and the below is met.
 - a. The manufacturer approves the modifications/additions in writing.
 - b. The load charts, procedures, instruction manuals and instruction plates/tags/decals are modified as necessary to accord with the modification/addition.
4. *Manufacturer does not complete the review within 120 days of the request.* The manufacturer is provided a detailed description of the proposed modification/addition, is asked to approve the modification/ addition, agrees to review the technical merits of the proposal, but fails to complete the review of the proposal within 120 days of the date it was provided the detailed description of the proposed modification/addition, and the below is met.
 - a. The manufacturer approves the modifications/additions in writing.

- b. The load charts, procedures, instruction manuals and instruction plates/tags/decals are modified as necessary to accord with the modification/addition.
5. *Multiple manufacturers of equipment designed for use on marine work sites.* The equipment is designed for marine work sites, contains major structural components from more than one manufacturer, and the below is met.
- a. The manufacturer approves the modifications/additions in writing.
 - b. The load charts, procedures, instruction manuals and instruction plates/tags/decals are modified as necessary to accord with the modification/addition.

Modifications or additions which affect the capacity or safe operation of the equipment are prohibited where the manufacturer, after a review of the technical safety merits of the proposed modification/addition, rejects the proposal and explains the reasons for the rejection in a written response.

TRAINING:

Operator Training, Qualification and Certification:

Note: A state or local license is required if:

1. **working within a state or locality that has licensing requirements, and**
2. **the licensing program meets the licensing and certification criteria listed in subpart CC.**
3. **A state or local license is valid for the period of time stipulated by the licensing office, but no longer than 5 years. It is portable only within the jurisdiction of the issuing agency.**

Written tests may be administered in a language understood by the operator candidate. When an operator's testing is based on a language other than English, it must be noted on the certificate.

All costs associated with training will be at no expense to the employee.

During the period November 8, 2010 through November 9, 2014, all operators must be competent to operate the equipment safely and are trained and evaluated on that training before operating the equipment.

As of November 10, 2014, All operators must be certified or qualified.

Accredited Crane Operator Testing Organization

An operator will be deemed qualified to operate a particular piece of equipment if the operator is certified for that type and capacity of equipment or for higher-capacity equipment of that type. If no accredited testing agency offers certification examinations for a particular type and/or capacity of equipment, an operator will be deemed qualified to operate that equipment if the operator has been certified for the type/capacity that is

most similar to that equipment and for which a certification examination is available.

The operator's certificate must state the type/capacity of equipment for which the operator is certified.

To achieve the above qualification, the operator must have received certification by an **accredited crane operator testing organization**.

Certification issued by an accredited crane operator testing organization is both portable and valid for 5 years .

Audited Employer Program:

Currently this option will not be used because:

1. It is not portable.
2. It is time and manpower consuming.
3. It requires monitoring and outside approvals.

If this is used in the future, it will be in accordance with 1926.1427(c).

Operator-in-training:

An employee who is not qualified or certified is permitted to operate equipment only as an operator-in-training and only where the below requirements are met:

1. The employer must provide each operator-in-training with sufficient training prior to operating the equipment to enable the operator-in-training to operate the equipment safely under limitations established by this section (including continuous monitoring) and any additional limitations established by the employer.
2. The tasks performed by the operator-in-training while operating the equipment must be within the operator-in-training's ability.
3. While operating the equipment, the operator-in-training must be continuously monitored by an individual ("**operator's trainer**") who meets all of the following requirements:
 - a. The operator's trainer is our employee or agent.
 - b. The operator's trainer is either a certified operator under this section or has passed the written portion of a certification test, and is familiar with the proper use of the equipment's controls.
 - c. While monitoring the operator-in-training, the operator's trainer performs no tasks that detract from the trainer's ability to monitor the operator-in-training.

Signals – radio, telephone or other electronic transmission of signals.

The device(s) used to transmit signals must be tested on site before beginning operations to ensure that the signal transmission is effective, clear, and reliable.

Signal transmission must be through a dedicated channel, except:

1. Multiple cranes/derricks and one or more signal persons may share a dedicated channel for the purpose of coordinating operations.
2. Where a crane is being operated on or adjacent to railroad tracks, and the actions of the crane operator need to be coordinated with the movement of other equipment or trains on the same or adjacent tracks.

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

New signals:

Signals other than hand, voice, or audible signals may be used where it may be demonstrated that:

1. The new signals provide at least equally effective communication as voice audible, or Standard Method hand signals, or
2. The new signals comply with a national consensus standard that provides at least equally effective communication as voice, audible, or Standard Method hand signals.

Voice Signals:

If voice signals are used, prior to beginning operations, the operator, signal person and lift director (if there is one), must contact each other and agree on the voice signals that will be used. Once the voice signals are agreed upon, these workers need not meet again to discuss voice signals unless another worker is added or substituted, there is confusion about the voice signals or a voice signal is to be changed.

Each voice signal must contain the following three elements, given in the following order: function (such as hoist, boom, etc.), direction; distance and/or speed; function stop command.

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

Additional signal information:

1. 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.

2. 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 it is reestablished and a proper signal is given and understood.
3. 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.
4. Only one person may give signals to a crane/derrick at a time, except in circumstances covered by the below:
 - a. Anyone who becomes aware of a safety problem must alert the operator or signal person by giving the stop or emergency stop signal. (NOTE: § 1926.1417(y) requires the operator to obey a stop or emergency stop signal).
5. All directions given to the operator by the signal person must be given from the operator's direction perspective.

Where a signal person(s) is in communication with more than one crane/derrick, a system must be used for identifying the crane/derrick each signal is for, as follows:

1. for each signal, prior to giving the function/direction, the signal person must identify the crane/derrick the signal is for, or
2. must use an equally effective method of identifying which crane/derrick the signal is for.

DEMOLITION

Preparatory operations. - 1926.850

Stairs, passageways, and ladders. - 1926.851

Chutes. - 1926.852

Removal of materials through floor openings. - 1926.853

Removal of walls, masonry sections, and chimneys. - 1926.854

Manual removal of floors. - 1926.855

Removal of walls, floors, and material with equipment. - 1926.856

Storage. - 1926.857

Removal of steel construction. - 1926.858

Mechanical demolition. - 1926.859

Selective demolition by explosives. - 1926.860

Demolition work presents specific hazards that are not normally found on typical job sites. These hazards include, but are not limited to:

- a. the actual collapse of the structure being demolished. Prior to demolition operations, a competent person must determine, and document in writing, the condition of the framing, floors, and walls,

and assess the possibility of an unplanned collapse of any portion of the structure. If appropriate, adjacent structures where employees may be exposed to danger must be checked by a competent person.

1. wall and floors must be braced or shored if employees must work in a structure to be demolished that has been damaged by fire, flood, explosion.
- b. explosion, electrocution, hazardous atmospheres. Prior to demolition work all electric, gas, water, steam, sewer, and other service lines must be shut off, capped, or otherwise controlled, outside the building line before demolition work is started. In each case, any utility company which is involved shall be notified in advance.
 1. additionally, the competent person must determine if hazardous chemicals, gases, explosives, flammable materials, etc. are in pipes, tanks, or other equipment on the property. If apparent or suspected, testing and purging must be performed and the hazard eliminated before demolition is started. It is not uncommon during the demolition of older structures to have potential asbestos and/or lead exposure.

NOTE: If an abatement contractor has abated materials from a building that we are to demolish, we will obtain written certification from the abatement contractor certifying that all the materials in question have been properly removed and appropriate air and/or wipe clearance testing has been completed.

- c. shattered glass.
- d. falling debris.
- e. falling through holes or wall openings.

Specific procedures to eliminate employee hazard exposure during demolition operations are found in the standards immediately following this Section. Areas that are addressed include: stairs, passageways, and ladders; chutes; removal of materials through floor openings; removal of walls, masonry sections, and chimneys; manual removal of floors; removal of walls, floors, and material with equipment; storage of waste material; removal of steel construction; and mechanical demolition.

DISPOSABLE RESPIRATORS

OSHA requires that employees who voluntarily use disposable respirators in situations where respiratory protection is not specifically required by OSHA standard (in atmospheres where exposures are below the permissible exposure limit) essentially for personal comfort or additional, though not required, respiratory protection be informed of 29 CFR 1910.134 Appendix D, printed below.

By insisting that these employees sign the tear-off employee handbook acknowledgement form, you can protect your company from OSHA citation for violating this requirement.

All disposable respirators, such as Moldex, 3M, Wilson, North Safety, etc. must be marked with the manufacturer's name, the part number, the protection provided by the filter, and "NIOSH".

Disposable filters are particulate respirators. They are also known as "air-purifying respirators" because they protect by filtering particles out of the air you breathe.

The below outlines the types of approved disposable respirators and their description.

N95	Filters at least 95% of airborne particles.	Not resistant to oil.
N99	Filters at least 99% of airborne particles.	Not resistant to oil.
N100	Filters at least 99.7% of airborne particles.	Not resistant to oil.
R95	Filters at least 95% of airborne particles.	Somewhat resistant to oil.
P95	Filters at least 95% of airborne particles.	Strongly resistant to oil.
P100	Filters at least 99.7% of airborne particles.	Strongly resistant to oil.

Though disposable filters cannot be fit-tested in the traditional sense, they must be fit-tested in accordance with the manufacturer's instructions.

Under no circumstances may any respirator other than the above disposable respirators be used without compliance with a respiratory protection program.

Standard Number: 1910.134 App D

**Standard Title: (Mandatory) Information for Employees Using
Respirators When not Required Under Standard.**

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the worker. Sometimes, workers may wear respirators to avoid exposures to hazards, even if the amount of hazardous substance does not exceed the limits set by OSHA standards. If your employer provides respirators for your voluntary use, or if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard. You should do the following: 1. Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirators limitations. 2. Choose respirators certified for use to protect against the contaminant of concern. NIOSH, the National Institute for Occupational Safety and Health of the U.S. Department of Health and Human Services, certifies respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how much it will protect you. 3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.

4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.

[63 FR 1152, Jan. 8, 1998; 63 FR 20098, April 23, 1998]

EARTH MOVING EQUIPMENT

Equipment. - 1926.600

All heavy equipment must be inspected prior to use and operated only by authorized personnel.

Bi-directional machines such as front-end loaders and bulldozers will have an audible alarm, distinguishable from the surround noise level which will be used if the operator does not have a clear, unobstructed view or a ground guide indicating that the line of travel is safe.

Scissors points on all front-end loaders which may harm the operator will be guarded as well as all parts exposed to employees such as belts, gears, pulleys, sprockets, spindles, drums, flywheels, chains and other moving parts.

Equipment that is operated from the seated position and has roll over protection will have seat belts and their use is required. If there is no roll over protection, seat belts will not be used.

All trucks into which earth is dumped will have protection for the driver of that vehicle or the driver must exit the vehicle before loading.

Vehicle operators will not operate heavy equipment on any access roadway or grade that is not suitable for the vehicle.

Bulldozer blades, loader buckets, dump bodies and similar equipment will be fully lowered or blocked to prevent movement during maintenance or when not in use.

When equipment is parked, the parking brake will be set. Additionally, on inclines, wheeled vehicles will be chocked. Equipment left unattended at night, adjacent to either a highway or construction area in use, will be clearly visible with reflectors, lights, or illuminated (with reflectors or lights) barricades.

ELECTRICAL WORK - WORKPLACE SAFETY

Applicability. - 1926.402

General requirements. - 1926.403

Wiring design and protection. - 1926.404

Special systems. - 1926.408

General requirements. - 1926.416

Definitions applicable to this subpart. - 1926.449

If one were to wire a facility with 16 gauge aluminum wire, and, a week after the job was completed, the facility burnt to the ground, this would not be an OSHA problem -- it would be a serious, possibly criminal, professional problem. If one were standing in water operating an electrical power tool

connected to a bare spliced extension cord laying in that water, this would be an OSHA problem. These extreme examples are presented to point out that this safety program applies to employee safety while performing work. OSHA standards do not provide any guidance in any profession, they merely provide guidance in doing your professional work safely.

All electrical work will be done according to the latest adopted National Electrical Code as well as established local codes.

ELECTRICAL SAFETY MEASURES

- a. Daily, prior to use, all electrical equipment -- including extension cords -- will be inspected and defective items will be tagged out of service and not used.
- b. With the exception of double insulated tools (with UL approval), all electrical tools and equipment will be grounded.
- c. Tools will not be hoisted by their flexible electrical cords.
- d. Except in an emergency, load rated switches and circuit breakers will be used for the opening and closing of circuits under load conditions as opposed to fuses and splice connections.
- e. While working on electrical equipment, unauthorized persons will be kept clear by barriers or other means of guarding.
- f. Temporary wiring and extension cords will be kept off of walking working surfaces and vehicle traffic areas or covered to prevent tripping and vehicle damage.
 1. Electrical cords will not be suspended with staples, hung from nails, or suspended by wire.
 2. Worn or frayed electric cords or cables will not be used.
- g. Hands will be dry when working on electrical equipment including plugging in extension cords.
- h. Areas in which electrical work is to be done must be adequately illuminated and temporary lighting must:
 1. have guards in place.
 2. not be suspended by its cords unless specifically designed for such installation.
- i. A competent person, before work commences, will inform all employees in the work area of both exposed and concealed electrical hazards. If appropriate, warning tags will be used to prevent accidental contact with electrical energy.

- j. When working around any electrical power circuit, employees will:
 1. **protect themselves by deenergizing the circuit and grounding it or by establishing insulation between themselves and the current.**
 2. ensure that any conductive materials and equipment that are in contact with any part of their body will be handled in a manner that will preclude contact with exposed energized conductors or circuit parts.
 3. use portable ladders that have non-conductive siderails.
 4. remove or insulate conductive articles of jewelry and clothing that might contact exposed energized parts.
- k. All 15, 20, or 30 amp receptacle outlets that are not part of the permanent wiring of the building or structure and that are used by personnel shall have ground-fault circuit interrupter protection for personnel. GFCI pigtailed may be used to meet this requirement if properly sized. Remember, extension cords are considered temporary wiring.
 1. Ground fault circuit interrupters will be tested before use.
- l. Only qualified persons may perform testing work on electric circuits or equipment.
- m. Sufficient access and working space must be maintained about all electric equipment to permit ready and safe operation and maintenance. This space must be kept clear, i.e., it can not be used for storage.
- n. The dimension of the working space in the direction of access to live parts likely to required examination, adjustment, service, or maintenance must not be less that noted below:

Working Clearances

Minimum clear distance for conditions¹

<u>Nominal voltage to ground</u>	<u>(a)</u> <u>Feet²</u>	<u>(b)</u> <u>Feet²</u>	<u>(c)</u> <u>Feet²</u>
0-150	3	3	3
151-600	3	3 ½	4

Footnote¹ Conditions (a), (b), and (c) are as follows:

- {a} Exposed live parts on one side and no live or grounded parts on the other side of the working space, or exposed live parts on both sides effectively guarded by insulating material. Insulated wire or insulated busbars operating at not over 300 volts are not considered live parts.
- {b} Exposed live parts on one side and grounded parts on the other side.
- {c} Exposed live parts on both sides of the workplace [not guarded as provided in Condition (a)] with the operator between.

Minimum Depth of Clear Working Space in Front of Electric Equipment

<u>Nominal voltage to ground</u>	<u>Conditions¹</u>		
	<u>(a)</u> <u>Feet²</u>	<u>(b)</u> <u>Feet²</u>	<u>(c)</u> <u>Feet²</u>
601 to 2,500	3	4	5
2,501 to 9,000	4	5	6
9,001 to 25,000	5	6	9
25,001 to 75 kV	6	8	10
Above 75kV	8	10	12

Footnote¹ Conditions (a), (b), and (c) are as follows:

- {a} Exposed live parts on one side and no live or grounded parts on the other side of the working space, or exposed live parts on both sides effectively guarded by insulating materials. Insulated wire or insulated busbars operating at not over 300 volts are not considered live parts.
- {b} Exposed live parts on one side and grounded parts on the other side. Walls constructed of concrete, brick, or tile are considered to be grounded surfaces.
- {c} Exposed live parts on both sides of the workspace [not guarded as provided in Condition (a)] with the operator between.
 1. The importance of working clearances cannot be overstated. At any time, when working with live electrical systems, there is the possibility of an arcing fault causing an arc flash where the current explosively flows through ionized air at 35,000°F causing incurable burns, hearing loss, collapsed lungs, or even death from the electricity of flying metal shrapnel.
 2. As a contractor working in an area where the possibility of arc flash exists, check to see if an arc flash assessment has been performed on electrical equipment on which you will be working. If it has, follow that specific guidance. If it has not, perform (or have a qualified vendor perform) the arc flash assessment. Refer to NFPA 70E for specific guidance appropriate to the facility's specific electrical equipment.

Note: NFPA 70E is a National Consensus Standard which is incorporated by reference within the OSHA standards; specifically, Appendix A to Subpart S, 29 CFR 1910. Failure to comply with NFPA 70E is citable under the general duty clause.

The above electrical safety measures are not all inclusive, however they cover many normal job site events. A complete list is found in the cited references and they are incorporated into this safety manual. If in doubt about any safety procedure, contact your supervisor or the competent person for clarification.

EXCAVATING, TRENCHING & SHORING

Scope, application, and definitions applicable to this subpart. - 1926.650

Specific Excavation Requirements. - 1926.651

Requirements for protective systems. - 1926.652

Soil Classification - 1926 Subpart P App A

Sloping and Benching - 1926 Subpart P App B

Timber Shoring for Trenches - 1926 Subpart P App C

Aluminum Hydraulic Shoring for Trenches - 1926 Subpart P App D

Alternatives to Timber Shoring - 1926 Subpart P App E

Selection of Protective Systems - 1926 Subpart P App F

Excavating involves any earth removal which creates a cut, cavity, trench, or depression in the earth's surface. A trench is a narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet. If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet or less (measured at the bottom of the excavation), the excavation is also considered to be a trench.

Prior to excavating, obstructions that may create a hazard to employees will be removed or supported and utility companies will be contacted, advised of the proposed work, and asked to establish the location of underground installations.

If the utility company cannot respond to this request within 24 hours and/or the exact location of the underground installations cannot be determined, actual work may begin provided that:

- a. extreme caution is observed.
- b. detection equipment or other acceptable means are used to locate the approximate location of the utility installation.
- c. as the approximate location is approached, the exact location will be determined by safe and acceptable means before proceeding.

In open excavations, underground installations will be protected, supported or removed as necessary to protect employees.

To ensure employee safety, the competent person will ensure that during excavating work in trenches there is:

- a. appropriate access and egress for personnel and/or equipment such as stairs, ramps and ladders so as to require no more than 25 feet of lateral travel for employees in trenches four (4) feet or more deep.
- b. employee protection for head injury. All employees must wear hard hats.

- c. no spoil pile or equipment within two (2) feet of the edge of the excavation.
- d. employee protection from vehicular traffic such as barricades, ground guides for operators of equipment with a limited view, away sloping grades, etc..
- e. no exposure to falling loads.
- f. no danger to employees from water accumulation.
- g. no danger from cave-in. Shoring, a structure such as a metal hydraulic, mechanical or timber shoring system that supports the sides of an excavation, will prevent cave-ins.
 - 1. Shoring is not required for trenches less than five (5) feet deep if an examination by a competent person determines the soil has no potential for a cave-in. In this situation, vertical sides are allowed.
 - 2. Once a trench is over 20 feet deep, protective systems, which may include shoring, must be designed by a registered professional engineer.
 - 3. There are other methods of protection from cave-ins such as sloping or benching the adjacent ground according to specific criteria dependent on the soil conditions, weather, and adjacent structures.
 - 4. The total number of cave-in accidents is relatively small, however, the accidents which do occur are generally very serious and are much more likely to be fatal than other types of accidents in the construction industry.
- h. a method to prevent mobile equipment from falling into the excavation such as barricades. Ground guides will be used if the equipment operator does not have a clear view of the edge. If possible, the grade should slope away from the excavation.

If the atmosphere is dangerous or likely to be dangerous, testing will be done as often as needed and emergency rescue equipment -- such as breathing apparatus, safety harness and line, or a basket stretcher -- must be available.

When a hazardous atmosphere does exist, appropriate respiratory protection will be used and a rescue plan developed which includes having an attendant outside the hazardous area with appropriate equipment and training.

PROTECTIVE SYSTEMS

Except when an excavation is made entirely in stable rock or it is less than 5 feet in depth and a competent person finds no indication of potential cave-in, employees in an excavation will be protected from cave-in by

protective systems designed in accordance with paragraphs (b) or (c) of 26 CFR 1926.652.

All employees involved with excavating are to review these standards and understand, in general terms:

- a. The extensive degree of basic data, design, and knowledge that goes into employee protection during excavating projects.
- b. The types of soils and how to identify them on the job site.
- c. The soil condition -- specifically moisture content -- and how that impacts on stability during excavations.
- d. The absolute need for a competent person to be on site at all times during excavating work to visually and manually test soil conditions as work progresses and to maintain a safe site.

DAILY INSPECTIONS

Prior to work and as needed throughout the shift, a competent person will conduct daily inspections of excavations, adjacent areas and protective systems to find evidence of a developing cave-in situation; failure of protective systems; hazardous atmosphere; or other hazardous conditions.

After every rainstorm or event which would affect the safety of employees within an excavation, an inspection will be made by a competent person.

FALL PROTECTION

Walkways must be provided where employees or equipment are required or permitted to cross over excavations. If these walkways are 6 feet or more above a lower level, guardrails must be used. Specific criteria for guardrails is found in 29 CFR 1926.502(b), a copy of which is found in Section III of this safety program behind the Fall Protection tab.

EXTENSION CORDS

Wiring methods, components, and equipment for general use. - 1926.405

General requirements. - 1926.416

Extension cords shall not replace permanent wiring and the following safety precautions will be adhered to:

- a. Inspect the cord for cracks and cuts.
- b. Cord must have a three prong plug for grounding.
- c. Use the shortest continuous length of cord possible. Cords may not be spliced together.
- d. Make certain the cord does not lay in water.
- e. Ensure cord is properly rated for the job.

- f. Secure and route cords out of the traffic flow to prevent tripping.
- g. Defective cords will be tagged and removed from service.
- h. Most importantly, an extension cord used on a job site MUST be used with a ground fault circuit interrupter (GFCI).

GROUND FAULT CIRCUIT INTERRUPTERS

Wiring design and protection. - 1926.404

A ground fault circuit interrupter (GFCI) provides protection for all 120-volt, 15-, 20-, and 30-ampere receptacle outlets that are not a part of the permanent wiring by detecting lost current resulting from a short, overheating, and/or ground fault. It should be noted that an extension cord into which electrical devices are plugged are not part of the permanent wiring; therefore, GFCI's are required.

A GFCI will "trip" when the amount of current amperes going to an electrical device in the hot conductor and the amount of current returning from an electrical device differs by approximately 5 milliamps. The GFCI can interrupt the current within as little as 1/40th of a second.

The current that is missing is being lost through a ground fault, whether it is in the actual grounding, a short in the equipment or electricity going through the employee to the ground.

A GFCI will not protect an employee who comes in contact with two hot wires or a hot wire and a neutral wire. A GFCI will provide protection against fires, overheating, damage to insulation, and, the most common form of electrical shock hazard -- the ground fault. GFCI's must be tested before use.

HEAVY EQUIPMENT AND ELECTRICAL POWER LINES

Cranes and derricks. - 1926.550

Except where electrical distribution and transmissions lines have been deenergized and visibly grounded at point of work or where insulating barriers (not attached to the vehicle) have been erected to prevent physical contact with the lines, the following clearance -- between any part of the vehicle and the line -- will be observed:

<u>Line Rating</u>	<u>Minimum Clearance</u>
50 kV. or below	10 feet
Over 50 kV.	10 feet plus .04 inch for each 1 kV. over 50 kV, or twice the length of the line insulator, but never less than 10 feet.

In transit, equipment clearance must be a minimum of:

<u>Line Rating</u>	<u>Minimum Clearance</u>
50 kV. or below	4 feet
Over 50 kV. to 345 kV.	10 feet
Over 345 kV. to 750 kV.	16 feet

A ground guide will be designated to observe clearance of the equipment and give warning to the equipment operator in situations where it is difficult for the equipment operator to maintain the desired clearances by visual means.

An overhead wire will be considered energized unless the owner of the line or the electrical utility authorities indicate that it is not energized and it has been visibly grounded.

HOISTS

Material hoists, personnel hoists, and elevators. - 1926.552

A hoist is a useful mechanical device which gives one the ability to lift and move heavy objects -- not people. No person is to ride on a hoist. As with all mechanical devices, improper use may lead to injury. You must know what you are doing and you must be careful.

Before use, hoists must be inspected for bent or damaged components. Particular attention should be paid to guarding. Fingers and loose clothing could be snagged in exposed mechanisms. Chains, cables, or rope slings must not be kinked, twisted, or frayed.

Loads must be properly rigged with hooks or slings and they must never exceed the hoist's rated capacity.

Ensure that the area around the hoist is free from debris and, most importantly, people. Do not allow yourself or others to be under a hoisted load.

KETTLE OPERATIONS

Only trained and authorized persons will be involved with kettle operations. All operations will be performed within a control zone that precludes entrance by unauthorized persons.

During kettle operations, employees will wear appropriate PPE including hand protection: gloves; skin protection: long sleeves and long pants; foot protection: steel toed work boots; eye protection: safety goggles; and head protection: hard hat, as necessary.

While our work generally has material within the kettle at 450°F, at no time shall the material within the kettle exceed 500°F.

The kettle lids will not be opened except for loading the kettle with solid roofing material or unless the material in the roofing kettle is less than 150°F.

LIGHTING
Illumination. - 1926.56

A competent person will ensure that all work areas have adequate lighting. Adequate lighting serves a two-fold purpose -- allowing tasks to be more readily performed as well as providing the additional safety factor of being seen by persons not involved with the work -- especially vehicular traffic.

If generators are used for auxiliary lighting, they will be operated and maintained by authorized persons who are competent by training or experience.

LP-GAS STORAGE
Liquefied petroleum gas (LP-Gas). - 1926.153

Liquefied petroleum gas (LP-Gas) is sometimes used on job sites to provide fuel for temporary heating devices.

LP-Gas systems must have containers, valves, connectors, manifold valve assemblies, and regulators of an approved type. All cylinders must be DOT approved.

Rules for inside storage (under construction standards) are simple -- **it is not allowed!**

NOTE: Under industry standards, up to 300 pounds of LP-Gas may be stored, with adherence to specific safety procedures, is allowed

Rules for outside storage require that containers be in a suitable ventilated enclosure or otherwise protected against tampering. At least one approved portable fire extinguisher having a rating of not less than 20-B:C must be readily available.

The distance from buildings or groups of buildings that containers must be stored are as follows:

<u>Quantity of LP-Gas Stored</u>	<u>Distance in Feet</u>
500 lbs or less	0
501 to 6,000 lbs	10
6,001 to 10,000 lbs	20
over 10,000 lbs	25

Storage must not be near building openings or vehicular traffic.

LP-GAS TEMPORARY HEATING

Liquefied petroleum gas (LP-Gas). - 1926.153

When LP-Gas is used for temporary heating on units that provide over 7,500 BTU per hour or use containers greater than 2.5 pounds maximum water capacity [nominal 1 pound LP-Gas capacity], the following will apply:

- a. Container valves, connectors, regulators, manifolds, piping and tubing must not be used as structural supports for the heaters.
- b. The LP-Gas containers and all associated equipment including hoses must be located so as to minimize exposure to high temperatures or physical damage.
- c. The maximum water capacity of individual containers must be 245 pounds [nominal 100 pound LP-Gas capacity].

Heaters that are not integral heater-container units, which connected by hose to the LP-Gas, must be at least 6' from the container. Blower and radiation type heaters must not be directed toward the container or any other unit within 20 feet. Heaters specifically designed for attachment to the container are permitted as long as the heat is not directed to the LP-Gas container.

MACHINE GUARDING

Mechanical power-transmission apparatus. - 1926.307

Most injuries that occur when operating a machine happen at the point of operation -- the point on a machine where the actual work (cutting, bending, spinning) occurs. This is also the point where guards can protect fingers and hands exposed to that danger. Machine guarding also protects employees from other dangers such as flying pieces of metal, sparks, gears, belts, and rotating parts.

The most common types of machines on job sites are power tools which often have guards to prevent injury.

Accident prevention in this area is a function of machine design -- engineering controls -- and operator training. Types of machine guarding are almost as numerous as types of machines -- the most common being a physical barrier to prevent accidental insertion of body parts. Guards are vital for safety reasons and machine guards designed into a machine should never be altered or removed. The speed and tremendous forces involved in modern machines are such that severe injury or even death could occur without warning and without even slowing the machine down.

Training and proper work methods go a long way toward reducing machine accidents. Like all safeguards, there is generally a way to bypass safety features that are engineered into machines. This is sometimes done to

increase speed or just to make one's job easier. This could result in a tragic, avoidable accident. The few seconds saved could cause a lifetime of grief. Do not bypass safety systems.

Operate all machines according to the instructor's manual and follow all safety procedures.

MACHINERY

Spinning, pounding, moving -- gears, pulleys, levers -- electricity, fuel, hydraulics -- action, reaction, force: danger! Machinery takes energy and performs a task or a multitude of tasks. Machinery, from a safety standpoint, is a collection of individual simple machines (pulleys, gears, etc.) combined to work in harmony to accomplish a specific job.

The danger is obvious: the power, speed, movement, and momentum of machinery is not going to be altered by something as insignificant as an employee's finger, hand, or even body.

How does one deal with the dangers of machinery? First, **never** operate any machinery until you have received proper training and you thoroughly understand safety procedures as well as procedures to follow for adjustments, power interruption, jamming, lubrication, and inspection.

Secondly, ensure the guarding systems are in place, functioning properly, and have not been altered or removed.

Thirdly, if a hazard assessment of the machinery operation dictates specific personal protective equipment (PPE), wear it!

Lastly, again from purely a safety standpoint, think of any power operated item with moving parts as machinery. This would include items as diverse as a small electric drill to an 80,000 pound tractor-trailer.

PIPE TIE-INS

Prior to pipe tie-in, the flow of gas, steam, vapor, liquid must be halted. It is absolutely vital to know the ramifications of halting the flow within the pipe particularly in hazardous facilities such as chemical plants, refineries, and other facilities which have a higher degree of hazard than normal work sites. In these types of facilities, **prior** to any blocking of flow through pipes, permission will be obtained from the facility operator. Failure to follow this specific rule could result in a major catastrophe.

Before actual tie-in is attempted, the original pipe that has been taken out of service (by positive means such as valve, block, tag) will be purged of contaminants, and gas tested, if appropriate.

At the completion of the tie-in, the facility operator will be notified **before** flow is restored to the pipe.

It is vital to know the chemical and physical properties of the material within the pipe so an appropriate fire extinguisher can be selected and available. This information will also allow for hazard assessment and PPE selection.

RIGGING FOR MATERIAL HANDLING

Rigging equipment for material handling. – 1926.251

All the applicable provisions of Cranes and Derricks in Construction, pages **16** through **38**, Section II, above, apply to rigging including Rigger Training, Qualification and Certification found on page **36**, above.

Rigger training should incorporate familiarization with rigging, hardware, slings and safety issues associated with rigging, lifting loads and lift planning. Training should include classroom, hands-on training, and exams. Hands-on trainings should include proper inspection, use, selection and maintenance of loose gears (slings, shackles, hooks, etc.).

Additionally, when working within the petrochemical industry, the provisions of API2D 2-3 and API2D 3.14 apply. Specifically, only personnel with training and experience who have completed a rigger training program (including crane operators and inspectors) may attach or detach lifting equipment to loads or lifting loads.

Prior to use on each shift, rigging equipment including slings and all fastenings and attachments will be inspected for damage or defects by a qualified person. Additional inspections will be performed during sling use and where service conditions warrant to ensure that it is safe.

Defective/damaged equipment including slings and rigging will not be used and will be immediately removed from service.

Per 2926.251(a)(3), rigging equipment, when not in use, will be removed from the immediate work area and stored properly so as not to present a hazard to employees.

Under no circumstances may any employee be under a suspended load.

29 CFR 1926.251, Rigging Equipment for Material Handling, contains Tables H-1 to H-20 which indicate rated capacities for various types of slings and grommets, safe working loads for shackles, number and spacing of U-Bolt Wire Rope Clips, and maximum allowable wear at any point of link.

Only alloy steel chain slings may be used for hoisting.

Welded alloy steel chain slings must have permanently affixed durable identification stating size, grade, rated capacity, and sling manufacturer. Of course, hooks, rings, oblong links, pear-shaped links, welded or mechanical coupling links, or other attachments, when used with alloy steel chains, will have a rated capacity at least equal to that of the chain.

Rigging equipment will **not be loaded in excess** of its recommended safe working load and load identification will be attached to the rigging.

Specific requirements for use and inspection of alloy steel chains; wire rope; natural rope and synthetic fiber; synthetic webbing; and shackles are found in the above standards.

Hoisting of personnel: Hoisting of employees using a personnel platform suspended from a crane or derrick is prohibited **except** when conventional means (ladder, aerial lift, personal hoist, etc.) of reaching the worksite is more dangerous.

Personnel platforms must be designed by a qualified engineer or qualified person competent in structural design in accordance with 29 CFR 1926.550 (g)(4).

Rigging of personnel platforms:

- a. When a wire rope bridle is used to connect the personnel platform to the load line, each bridle leg shall be connected to a master link or shackle in such a manner to ensure that the load is evenly divided among the bridle legs.
- b. Latches will be in place on all hooks eliminating the hook throat opening. Per 1926.550(q)(4)(iv)(B), hooks on overhaul ball assemblies, lower load blocks, or other attachment assemblies must be of a type that can be closed and locked, eliminating the hook throat opening. Alternatively, an alloy anchor type shackle with a bolt, nut and retaining pin may be used.
- c. Wire rope, shackles, rings, master links, and other rigging hardware must be capable of supporting, without failure, at least five times the maximum intended load applied or transmitted to that component. Where rotation resistant rope is used, the slings must be capable of supporting without failure at least ten times the maximum intended load.
- d. All eyes in wire rope slings shall be fabricated with thimbles.
- e. Bridles and associated rigging for attaching the personnel platform to the hoist line shall be used only for the platform and the necessary employees, their tools and the materials necessary to do their work and shall not be used for any other purpose when not hoisting personnel.

Personnel platform use:

- a. Except when signaling the crane or derrick operator, employees must keep all parts of their bodies within the platform during raising, lowering and positioning.

- b. Before exiting or entering a personnel platform that is not landed, the platform will be secured to the structure unless this creates an unsafe situation.
- c. Tag lines will be used unless their use creates an unsafe situation.
- e. The crane or derrick operator will remain at the controls at all time the engine is running and/or the platform is occupied.
- f. Hoisting will cease in the event of any impending danger.

SCISSOR-LIFT FALL PROTECTION

What type of fall protection is required for scissor-lifts? This apparently simple question has a relatively simple answer. However, how it is derived is somewhat complicated because OSHA does not have a standard to deal with this issue.

Clearly, there is a hazard -- falling from height -- however, fall protection while using a scissor-lift is not covered in the fall protection, scaffold and ladder fall protection, nor aerial lift fall protection standards.

Section 5(a)(1) of the Occupational Safety and Health Act, commonly referred to as the General Duty Clause is a "catch all clause" which states: "Each employer shall furnish to each of its employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees."

In the absence of a specific standard relating to a safety or health risk, the above is the reference OSHA will cite.

When assessing compliance efforts, OSHA considers the requirements of pertinent national consensus standards. In the case of scissor-lifts, ANSI/SIA A92.6-1990, *Self-propelled Elevated Work Platforms*, and ANSI/SIA A92.3, *Manually Propelled Elevating Aerial Platforms*, are used.

Fall protection is provided by employees maintaining firm footing on the lift and using guardrails. Under no circumstances are employees to place ladders or other items on the lift to extend their reach. Per ANSI/SIA standards, with which OSHA concurs, "Use of planks, ladders, or any other device on the aerial platform for achieving additional height or reach shall be prohibited." Use of these items negates the value of the guardrail system and may possibly exceed the scissor-lift's design limits for stability.

Further, personnel are not to tie off to items adjacent to the lift -- the most obvious reasons are: the anchorage point may not be sufficient and movement of the lift would pull the employee out of and off of the lift.

If, for some reason, guardrails are not being provided for a specific operational reason, then a personal fall protection system may be used which would include an anchorage point, lanyard and safety harness.

However, this option is severely limited because its design would have to be approved by a registered engineer or the scissor-lift manufacturer would have to approve the use of the lift as an anchorage.

Under ideal conditions, rarely found on a construction site, scissor-lifts may be moved with the lift extended. However, should obstacles, debris, drop-offs, holes, depressions, ramps or other hazards be present, the lift must be lowered prior to movement.

Finally, if the employee leaves the safety of the scissor-lift platform while working at height, some sort of approved fall protection system must be employed.

SIGNS & TAGS

Accident prevention signs and tags. - 1926.200

When appropriate, signs and tags will be used to warn of specific hazards. Types of signs are classified according to their use, and their design is regulated by OSHA standard. All personnel will be instructed in the meaning of the various types of signs. Sign usage includes:

- a. Danger Signs (Red, Black & White): indicates immediate danger and denotes that special precautions are necessary.
- b. Caution Signs (Yellow Background): warns of a potential hazard or cautions against an unsafe practice.
- c. Safety Instruction Signs (White Background): used to provide general instructions and suggestions relative to safety measures.

The wording on signs must be positive, clear, concise, and easy to understand or the sign loses its value.

Accident prevention tags are to warn of hazardous or potentially hazardous conditions that are out of the ordinary, unexpected, or not readily apparent. They are not used where signs, guarding or other positive means of protection are used.

All tags must have:

- a. a signal word: "Danger"; "Caution"; "Warning"; BIOHAZARD (or its symbol) and a major message, and
- b. a major message such as: "High Voltage" or "Do not start".
[Major messages indicate the specific hazardous condition.]

The color scheme is basically the same as for signs:

red = danger
yellow = caution
orange = warning
fluorescent orange = biological hazard.

- a. Danger Tags: indicate an immediate hazard that presents a threat of death or serious injury.
- b. Caution Tags: indicate a non-immediate hazard or unsafe practice that presents a lesser threat of injury.
- c. Warning Tags: indicate a hazard between “Danger” and “Caution”.
- d. BIOHAZARD Tags: indicate the actual or potential presence of a biological hazard and identify equipment, rooms, containers, etc., that may be contaminated.

Pay attention to signs and tags and realize that they are in place for only one reason -- your safety.

SLINGS

Rigging equipment for material handling. - 1926.251

A sling is the assembly which connects a load to the material handling equipment. There are many types of slings including, but not limited to:

- a. bridle wire rope sling
- b. cable laid endless sling-mechanical joint sling
- c. cable laid grommet-hand tucked sling
- d. cable laid rope sling-mechanical joint sling
- e. strand laid endless sling-mechanical joint sling
- f. strand laid grommet-hand-tucked sling

Additionally, slings are made of various materials such as alloy steel chain; wire rope; and natural and synthetic fiber rope. Each of these material have their own operating limits which include not only capacity, but temperature, kinks, cuts, and specific conditions.

29 CFR 1926.251, *Rigging Equipment for Material Handling*, gives detailed instructions on the use of each type of sling.

All slings, regardless of type, must be inspected each day before use and all fastenings and attachments must be inspected for damage or defects by a competent person. Depending on work conditions, additional inspections may be required. Damaged or defective slings will be immediately

removed from service. Below are safe operating practices which must be followed:

- a. slings may not be shortened with knots or bolts or other makeshift devices.
- b. sling legs may not be kinked.
- c. slings may not be loaded in excess of their rated capacities.
- d. slings used in a basket hitch must have the load balanced to prevent slippage.
- e. slings must be securely attached to their loads.
- f. slings must be padded or protected from the sharp edges of their loads.
- g. suspended loads must be kept clear of all obstructions.
- h. all employees must be kept clear of loads about to be lifted and of suspended loads.
- i. hands or fingers may not be placed between the sling and its load while the sling is being tightened around the load.
- j. shock loading is prohibited.
- k. a sling may not be pulled from under a load when the load is resting on it.

SOLDERING & BRAZING

Only authorized and trained personnel are permitted to use soldering and brazing equipment. Appropriate PPE, specifically eye protection, must be worn.

An appropriate fire extinguisher will be readily available for immediate use.

Compressed gas cylinders will:

- a. have valve protectors in place when not in use or connected for use.
- b. be legibly marked to identify the gas contained therein.
- c. have the valves closed before the cylinder is moved, when the cylinder is empty, and at the completion of each job.
- d. be stored in areas away from intense heat, electric arcs, and high temperature lines.
- e. be secured (chained in portable dolly), in storage or transportation, from tipping, falling, rolling, and damage from passing or falling objects.
- f. be marked "EMPTY" when appropriate.

- g. be removed from service if the regulators or gauges are defective.
- h. be used only for the purpose for which they are designed --
for example, cylinders will not be used as rollers or supports.
- i. be kept away from stairs.

Regulators and gauges will be inspected daily.

All cylinders, cylinder valves, couplings, regulators, hoses and apparatus will be kept free of oily or greasy substances.

The competent person will ensure that ventilation within a confined space is adequate to negate the possibility of a respiratory or explosion hazard.

A fire watch will be assigned when there is potential a fire might develop. When brazing near a fire hazard and the fire hazard cannot be isolated, shields will be used to confine the heat.

When performing brazing operations capable of producing heat at chemical plants, refineries, or other facilities which have a higher degree of hazard than normal work sites, a hot work permit is generally required.

On the back of the Hot Work Permit is found fire safety instructions which must be read and understood by the persons identified on the permit.

From a safety standpoint, the primary safety hazards associated with soldering and brazing are heat and hazardous fumes.

Soldering and brazing is molecularly bonding components below their melting points. In brazing, a non-ferrous filler material (copper, brass, bronze, and silver alloys) is drawn into closely fitted joints by capillary action and they bond and solidify without melting the components.

In soldering, there may be alloys containing lead, cadmium, beryllium, and zinc. Fumes produced by heating these materials can cause serious health problems.

Other trace metals present in base and filler metals which can give off toxic fumes include arsenic, chromium, bismuth, cobalt, nickel, selenium, thallium, and vanadium.

Soldering and brazing should be conducted in well-ventilated areas assure that hazardous concentrations do not exist. Compounds of these metals may also be present.

Solder alloys melt below 800°F and brazing alloys melt above 800°F.

STAIRS

Stairways. - 1926.1052

Stairways that are not a permanent part of the structure on which construction work is being performed must have landings of at least 30 inches in the direction of travel and extend at least 22 inches in width at every 12 feet or less of vertical rise. Additionally,

- a. riser height and tread depth must be uniform within each flight of stairs.
- b. where doors or gates open directly on a stairway, a platform will be provided, and the swing of the door must not reduce the effective width of the platform to less than 20 inches.
- c. metal pan landings and metal pan treads, when used, must be secured in place before filling with concrete or other material.
- d. all parts of stairways will be free of hazardous projections, such as protruding nails.
- e. slippery conditions on stairways will be eliminated before use.
- f. except during stairway construction:
 1. foot traffic is prohibited on stairways with pan stairs where the treads and/or landings are to be filled at a later date, unless the stairs are temporarily fitted with solid material at least to the top edge of each pan. Temporary treads and landings will be replaced when worn below the level of the top edge of the pan.
 2. foot traffic is prohibited on skeleton metal stairs where permanent treads and/or landings are to be installed at a later date unless the stairs are fitted with secured temporary treads and landings long enough to cover the entire tread and/or landing area.

Treads for temporary service will be made of wood or other solid material and installed the full width and depth of the stair.

Stairways having four or more risers or rising more than 30 inches will be equipped with:

- a. at least one handrail; and
- b. one stairrail system along each unprotected side or edge.

STEEL ERECTION ACTIVITIES

Scope. - 1926.750

Definitions. - 1926.751

Site layout, site-specific erection plan and construction sequence. - 1926.752

Hoisting and rigging. - 1926.753

Structural steel assembly. - 1926.754

Column anchorage. - 1926.755

Beams and columns. - 1926.756

Open web steel joists. - 1926.757

Systems-engineered metal buildings. - 1926.758

Falling object protection. - 1926.759

Fall protection. - 1926.760

Training. - 1926.761

Guidelines for establishing the components of a site-specific erection plan: App A

Illustrations of Bridging Terminus Points: App C

Illustration of the Use of Control Lines to Demarcate Controlled Decking Zones : App D

Training: App E

Perimeter Columns: App F

1926.502 (b)-(e) Fall Protection Systems Criteria and Practices. App G

Double Connections: Illustration of a Clipped End Connection and a Staggered Connection: App H

All affected personnel will have access to the above steel erection standards and be provided training, as appropriate, prior to working in steel erection activities.

Specific hazards that are identified include, but are not limited to: working under loads; hoisting; landing and placing decking; column stability; double connections; loading and placing steel joints; and falls to lower levels.

Additionally, 29 CFR 1926.752, Site layout, site-specific erection plan and construction sequence, require the controlling contractor to provide the steel erector with the following notifications:

- a. Approval to begin steel erection. Before authorizing the commencement of steel erection, the controlling contractor shall ensure that the steel erector is provided with the following written notifications:
 1. The concrete in the footings, piers and walls and the mortar in the masonry piers and walls has attained, on the basis of an appropriate ASTM standard test method of field-cured samples, either 75 percent of the intended minimum compressive design strength or sufficient strength to support the loads imposed during steel erection.
 2. Any repairs, replacements and modifications to the anchor bolts were conducted in accordance with 29 CFR 1926.755(b).

- b. Commencement of steel erection. A steel erection contractor shall not erect steel unless it has received written notification that the concrete in the footings, piers and walls or the mortar in the masonry piers and walls has attained, on the basis of an appropriate ASTM standard test method of field-cured samples, either 75 percent of the intended minimum compressive design strength or sufficient strength to support the loads imposed during steel erection.
- c. Site layout. The controlling contractor shall ensure that the following is provided and maintained:
 - 1. Adequate access roads into and through the site for the safe delivery and movement of derricks, cranes, trucks, other necessary equipment, and the material to be erected and means and methods for pedestrian and vehicular control. Exception: this requirement does not apply to roads outside of the construction site.
 - 2. A firm, properly graded, drained area, readily accessible to the work with adequate space for the safe storage of materials and the safe operation of the erector's equipment.
- d. Pre-planning of overhead hoisting operations. All hoisting operations in steel erection shall be pre-planned to ensure that the requirements of 29 CFR 1926.753(d) are met.
- e. Site-specific erection plan. When we elect, due to conditions specific to a site, to develop alternate means and methods that provide employee protection in accordance with 29 CFR 1926.753(c)(5); .757(a)(4); or .757(e)(4), a site-specific erection plan will be developed by a qualified person and be available at the work site. Guidelines for establishing a site-specific erection plan are contained in Appendix A to subpart R, Steel Erection.

TRAINING

All training required by the steel erection standards will be provided by qualified person(s).

Fall hazard training may be accomplished using our Fall Protection Program with the exception:

- a. each employee engaged in a steel erection activity who is on a walking/working surface with an unprotected side or edge more than 15 feet above a lower level must be protected from fall hazards by guardrail systems, safety net systems, personal fall arrest systems, positioning device systems or fall restraint systems.
- b. perimeter safety cables. On multi-story structures, perimeter safety cables shall be installed at the final interior and exterior perimeters of the floors as soon as the metal decking has been installed.

- c. each connector will:
 1. be protected from fall hazards of **more than two stories or 30 feet above a lower level, whichever is less**;
 2. have completed connector training in accordance with §1926.761.
 3. be provided, at heights over **15 and up to 30 feet above a lower level**, with a personal fall arrest system, positioning device system or fall restraint system and wear the equipment necessary to be able to be tied off.
- d. A controlled decking zone (CDZ) may be established in that area of the structure **over 15 and up to 30 feet above a lower level where metal decking is initially being installed and forms the leading edge of a work area.**
 1. each employee working at the leading edge in a CDZ shall be protected from fall hazards of more than **two stories or 30 feet, whichever is less.**
 2. access to a CDZ shall be limited to only those employees engaged in leading edge work.
 3. the boundaries of a CDZ shall be designated and clearly marked. The CDZ shall not be more than 90 feet wide and 90 feet deep from any leading edge. The CDZ shall be marked by the use of control lines or the equivalent.
 4. each employee working in a CDZ shall have completed CDZ training in accordance with §1926.761.
 5. unsecured decking in a CDZ shall not exceed 3,000 square feet.
 6. safety deck attachments shall be performed in the CDZ from the leading edge back to the control line and shall have at least two attachments for each metal decking panel.
 7. final deck attachments and installation of shear connectors shall not be performed in the CDZ.

Special training programs:

In addition to the above, training will be provided to address the following issues:

1. multiple lift rigging procedure: each employee who performs multiple lift rigging must be provided training in:
 - a) the nature of the hazards associated with multiple lifts; and
 - b) the proper procedures and equipment to perform multiple lifts required by 29 CFR 1926.753(e), printed below:

(e) Multiple lift rigging procedure.

- (1) A multiple lift shall only be performed if the following criteria are met:
 - (i) A multiple lift rigging assembly is used;
 - (ii) A maximum of five members are hoisted per lift;
 - (iii) Only beams and similar structural members are lifted; and
 - (iv) All employees engaged in the multiple lift have been trained in these procedures in accordance with §1926.761(c)(1).
 - (v) No crane is permitted to be used for a multiple lift where such use is contrary to the manufacturer's specifications and limitations.
 - (2) Components of the multiple lift rigging assembly shall be specifically designed and assembled with a maximum capacity for total assembly and for each individual attachment point. This capacity, certified by the manufacturer or a qualified rigger, shall be based on the manufacturer's specifications with a 5 to 1 safety factor for all components.
 - (3) The total load shall not exceed:
 - (i) The rated capacity of the hoisting equipment specified in the hoisting equipment load charts;
 - (ii) The rigging capacity specified in the rigging rating chart.
 - (4) The multiple lift rigging assembly shall be rigged with members:
 - (i) Attached at their center of gravity and maintained reasonably level;
 - (ii) Rigged from top down; and
 - (iii) Rigged at least 7 feet apart.
 - (5) The members on the multiple lift rigging assembly shall be set from the bottom up.
 - (6) Controlled load lowering shall be used whenever the load is over the connectors.
2. connector procedures: each connector must be provided training in the following areas:
- a) the nature of the hazards associated with connecting; and
 - b) the establishment, access, proper connecting techniques and work practices required by 29 CFR 1926.756(c) and 29 CFR 1926.760(b), printed below:

29 CFR 1926.756(c)

- (1) Double connections at columns and/or at beam webs over a column. When two structural members on opposite sides of a column web, or a beam web over a column, are connected sharing common connection holes, at least one bolt with its wrench-tight nut shall remain connected to the first member unless a shop-attached or field-attached seat or equivalent connection device is supplied with the member to secure the first member and prevent the column from being displaced (See Appendix H to this subpart for examples of equivalent connection devices).
- (2) If a seat or equivalent device is used, the seat (or device) shall be designed to support the load during the double connection process. It shall be

adequately bolted or welded to both a supporting member and the first member before the nuts on the shared bolts are removed to make the double connection.

29 CFR 1926.760(b)

Connectors. Each connector shall:

- (1) Be protected in accordance with paragraph (a)(1) of this section from fall hazards of more than two stories or 30 feet (9.1 m) above a lower level, whichever is less;
- (2) Have completed connector training in accordance with §1926.761; and
- (3) Be provided, at heights over 15 and up to 30 feet above a lower level, with a personal fall arrest system, positioning device system or fall restraint system and wear the equipment necessary to be able to be tied off; or be provided with other means of protection from fall hazards in accordance with paragraph (a)(1) of this section.

3. When controlled decking zone procedures (CDZs) are used, each affected employee will be training in the following areas:
 - a) the nature of the hazards associated with work within a controlled decking zone; and
 - b) the establishment, access, proper installation techniques and work practices required by §1926.760(c) and §1926.754(e), printed below:

29 CFR 1926.760(c):

Controlled Decking Zone (CDZ). A controlled decking zone may be established in that area of the structure over 15 and up to 30 feet above a lower level where metal decking is initially being installed and forms the leading edge of a work area. In each CDZ, the following shall apply:

- (1) Each employee working at the leading edge in a CDZ shall be protected from fall hazards of more than two stories or 30 feet (9.1 m), whichever is less.
- (2) Access to a CDZ shall be limited to only those employees engaged in leading edge work.
- (3) The boundaries of a CDZ shall be designated and clearly marked. The CDZ shall not be more than 90 feet (27.4 m) wide and 90 (27.4 m) feet deep from any leading edge. The CDZ shall be marked by the use of control lines or the equivalent. Examples of acceptable procedures for demarcating CDZ's can be found in Appendix D to this subpart.
- (4) Each employee working in a CDZ shall have completed CDZ training in accordance with §1926.761.
- (5) Unsecured decking in a CDZ shall not exceed 3,000 square feet (914.4 m²).
- (6) Safety deck attachments shall be performed in the CDZ from the leading edge back to the control line and shall have at least two attachments for each metal decking panel.
- (7) Final deck attachments and installation of shear connectors shall not be performed in the CDZ.

29 CFR 1926.754(e):

Metal decking.

- (1) Hoisting, landing and placing of metal decking bundles.
 - (i) Bundle packaging and strapping shall not be used for hoisting unless specifically designed for that purpose.
 - (ii) If loose items such as dunnage, flashing, or other materials are placed on the top of metal decking bundles to be hoisted, such items shall be secured to the bundles.
 - (iii) Bundles of metal decking on joists shall be landed in accordance with §1926.757(e)(4).
 - (iv) Metal decking bundles shall be landed on framing members so that enough support is provided to allow the bundles to be unbanded without dislodging the bundles from the supports.
 - (v) At the end of the shift or when environmental or jobsite conditions require, metal decking shall be secured against displacement.
- (2) Roof and floor holes and openings. Metal decking at roof and floor holes and openings shall be installed as follows:
 - (i) Framed metal deck openings shall have structural members turned down to allow continuous deck installation except where not allowed by structural design constraints or constructibility.
 - (ii) Roof and floor holes and openings shall be decked over. Where large size, configuration or other structural design does not allow openings to be decked over (such as elevator shafts, stair wells, etc.) employees shall be protected in accordance with §1926.760(a)(1).
 - (iii) Metal decking holes and openings shall not be cut until immediately prior to being permanently filled with the equipment or structure needed or intended to fulfill its specific use and which meets the strength requirements of paragraph (e)(3) of this section, or shall be immediately covered.
- (3) Covering roof and floor openings.
 - (i) Covers for roof and floor openings shall be capable of supporting, without failure, twice the weight of the employees, equipment and materials that may be imposed on the cover at any one time.
 - (ii) All covers shall be secured when installed to prevent accidental displacement by the wind, equipment or employees.
 - (iii) All covers shall be painted with high-visibility paint or shall be marked with the word "HOLE" or "COVER" to provide warning of the hazard.
 - (iv) Smoke dome or skylight fixtures that have been installed, are not considered covers for the purpose of this section unless they meet the strength requirements of paragraph (e)(3)(i) of this section.
- (4) Decking gaps around columns. Wire mesh, exterior plywood, or equivalent, shall be installed around columns where planks or metal decking do not fit tightly. The materials used must be of sufficient strength to provide fall protection for personnel and prevent objects from falling through.

- (5) Installation of metal decking.
 - (i) Except as provided in §1926.760(c), metal decking shall be laid tightly and immediately secured upon placement to prevent accidental movement or displacement.
 - (ii) During initial placement, metal decking panels shall be placed to ensure full support by structural members.
- (6) Derrick Floors.
 - (i) A derrick floor shall be fully decked and/or planked and the steel member connections completed to support the intended floor loading.
 - (ii) Temporary loads placed on a derrick floor shall be distributed over the underlying support members so as to prevent local overloading of the deck material.

Note: Per Appendix E to Subpart R -- *Training: Non-mandatory Guidelines for Complying with §1926.761*, the training requirements for steel erection activities will be deemed to have been met if employees have completed a training course on steel erection, including instruction in the provisions of the steel erection standards, a copy of which follows this Section, that has been approved by the U.S. Department of Labor Bureau of Apprenticeship.

WORKING UNDER LOADS

- a. All loads shall be rigged by a qualified rigger
- b. Routes for suspended loads will be pre-planned to ensure that no employee is required to work directly below a suspended load except for those engaged in the initial connection of the steel or those necessary for the hooking or unhooking of the load.
- c. When working under suspended loads:
 - 1. the materials being hoisted must be rigged to prevent unintentional displacement.
 - 2. hooks with self-closing safety latches or their equivalent must be used.

HOISTING

- a. all the provisions of 29 CFR 1926.550, *Cranes and Derricks*, apply to hoisting and rigging **with the exception that cranes or derricks may be used to hoist employees on a personnel platform when performing steel erection activities.**
- b. a pre-shift visual inspection of cranes must be accomplished by a competent person and the competent person must also observe cranes in operation. Remember, a competent person has the authority to stop work if an unsafe work practice is observed. Furthermore, a crane operator has the authority to stop work if an unsafe condition exists.

- c. cranes being used in steel erection activities must be visually inspected prior to each shift by a competent person; the inspection shall include observation for deficiencies during operation. At a minimum this inspection shall include the following:
 1. all control mechanisms for maladjustments.
 2. control and drive mechanism for excessive wear of components and contamination.
 3. crane safety devices.
 4. air, hydraulic, and other pressurized lines and systems for condition.
 5. hooks and latches for deformation, chemical damage, cracks, or wear.
 6. wire rope travel and attachment.
 7. electrical apparatus for malfunctioning, signs of excessive deterioration, dirt, or moisture accumulation.
 8. ground conditions.
 9. leveling.
- d. only a qualified person can inspect the rigging.

TILE CUTTING

Only trained and authorized personnel will operate tile cutting equipment. The following guidelines will be used during all tile cutting operations.

- a. follow the manufacturer's recommendations for the safe use of the equipment.
- b. use the correct blade (size, type, speed) for the job, properly tightened. Inspect the blade and all equipment before use.
- c. ensure all safety guards are functioning properly.
- d. never operated a hand held saw above shoulder height.
- e. wear proper safety equipment including eye, hand and skin protection. Depending on the job, respiratory protection or dust masks may be required.
- f. establish a control zone and keep others out who are not directly involved with the work at hand.
- g. ensure there is adequate coolant/water when appropriate.
- h. never operate an internal combustion saw in a confined space.

TOOLS: HAND

General requirements. - 1926.300

Hand tools. - 1926.301

Hand tools shall be used only for the purpose for which they are designed.

Hand tools will be kept clean and, where appropriate, oiled.

Hand tools which are damaged will not be used.

Hand held cutting tools will be kept sharp and will be sheathed or retracted when not in use.

When using a striking tool such as a hammer or chisel, safety glasses or safety goggles will be used.

Do not force tools.

If you are unfamiliar with the proper procedure for using a tool, ask your Supervisor for instruction.

Power tools may be operated only by those persons who are qualified by training or experience.

Do not alter guards on power tools; wear appropriate PPE.

Electrical tools must be grounded and, in the absence of permanent wiring, a Ground Fault Circuit Interrupter must be used.

Electric tools will not be lifted by their cords and pneumatic tools will not be lifted by their hoses.

TOOLS: PNEUMATIC POWERED

Eye and face protection. - 1926.102

General requirements. - 1926.300

Power-operated hand tools. - 1926.302

Pneumatic powered tools must be safeguarded whenever there are hazardous employee exposures. This is especially important for point of operation guarding.

Three specific hazards associated with pneumatic powered tools which are unique to their use are noise levels, tool retention, and air hose pressure.

Care must be taken to assure that noise levels are within acceptable limits (noise monitoring may be necessary) and, if required, engineering controls and/or ear protection will be employed.

If there is a possibility of tool ejection during use, a tool retainer must be installed.

Safety will dictate that hose and hose connections be designed for the pressure and service to which they are subjected.

Eye protection will be worn when using pneumatic powered tools in accordance with the owner/operator's manual.

Compressed air will not be used for cleaning purposes except where pressure is reduced to less than 30 p.s.i. **and** effective chip guarding is in place **and** appropriate personal protective equipment is being worn. OSHA has determined that effective chip guarding means "any method or equipment which will prevent a chip or particle (of whatever size) from being blown into the eyes or skin of the operator or other workers in the area."

Care must be taken to ensure that employees are not exposed to unsafe levels of respirable dust or crystalline silica.

The PEL for particles not otherwise regulated is 5.0 mg/m³. The PEL for respirable dust containing crystalline silica is determined by the below formula:

PEL = 10 mg/m³ ÷ (%SiO₂+2), where %SiO₂+2 refers to the amount of crystalline silica measured in the sample.

Our operations would not exceed these PEL's and respiratory protection is not required.

TOOLS: POWDER-ACTUATED
Eye and face protection. - 1926.102
General requirements. - 1926.300
Power-operated hand tools. - 1926.302

A powder-actuated fastening tool propels a nail, pin, or fastener through an object to fasten it to another object. These tools, if misused, are extremely dangerous because essentially, they are similar to a pistol or rifle.

The speed of the projectile may range from 300 ft/second to 1290 ft/second.

Only trained and authorized persons may operate a powder actuated tool and, for safety, these tools should be kept secured when not in use.

Prior to use, the tool must be inspected and tested according to the manufacturer's instruction manual which should be kept with the tool.

Defective tools must not be used and they must be taken out of service.

Use of appropriate personal protective equipment - including, at least, eye/face and ear protection -- is required not only for the operator, but also those employees in the vicinity. PPE will be in accordance with the owner/operator's manual.

On the job site, each tool should be accompanied by: 1) its container; 2.) the operator's instruction & service manuals; 3) the tool inspection record; and 4) service tools & accessories.

Tools must not be loaded until just before firing and, under no circumstances, are they to be pointed at any person. Hands must be kept clear of the open barrel end. A powder activated tool must never be left unattended -- loaded or empty -- for safety and security reasons.

Fasteners must not be driven into very hard or brittle materials such as cast iron, glazed tile, surface-hardened steel, glass block, live rock, face brick or hollow tile; easily penetrated materials unless these materials are backed by a substance; nor a damaged area caused by an unsatisfactory fastening. Of course, these tools must never be used in an explosive or flammable atmosphere.

Before fastening questionable material, the operator can determine its suitability by using a fastener as a center punch. If the fastener point does not easily penetrate, is not blunted, and does not fracture the material, initial test fastenings will be made in accordance with the manufacturer's instructions.

The tool must be held perpendicular to the work surface and in the event of a misfire, the operator must hold the tool firmly against the work surface and follow, exactly, the manufacturer's instructions.

Tools must be used with the correct shield, guard, or attachments recommended by the manufacturer.

Because the case and load are color coded, it is imperative that the operator can distinguish the colors of brass and nickel as well as gray, brown, green, yellow and red and purple.

VEHICLES

Only authorized persons may operate a company vehicle. This authorization will not be granted until operating knowledge and ability has been successfully demonstrated to the Safety Director.

Before operation, a safety check will be made ensuring fluid levels are correct, obvious bolts are tight, lights and horn are functioning, tire pressures are correct, fire extinguisher is present and charged, and damage is noted.

Seat belts will be worn and all traffic laws, including speed limits, will be observed. During fueling, vehicles must be turned off and all fluid levels checked.

Before backing up any vehicle, check behind and blow horn for the safety of others.

When hauling a load, the cargo should be strapped or blocked to prevent shift.

VENTILATION
Ventilation. - 1926.57

There may be times in the course of our work such as grinding, cutting, sawing, sanding, etc. that hazardous dusts are released into the atmosphere that exceed the concentrations specified in the “Threshold Limit Values of Airborne Contaminants for 1970” of the American Conference of Governmental Industrial Hygienists, listed below:

MINERAL DUSTS	
Substance	(a)mppcf
SILICA Crystalline Quarts Threshold Limited calculated from the formula Cristobalite.	$(b)(250) \div (\%SiO_2+5)$
Amorphous, including natural diatomaceous earth	
SILICATES (Less than 1% crystalline silica)	
Mica	20
Portland Cement	20
Soapstone	20
Talc (non-abeistiform)	20
Talc (fibrous), use asbestos limit	
GRAPHITE (Natural)	15
INERT OR NUISANCE PARTICULATES Note 1 Covers all organic and inorganic particulates not otherwise regulated. Same as Particulates Not Otherwise Regulated. Note 2 Inert or Nuisance Dusts includes all mineral, inorganic, and organic dusts as indicated by examples in TLV's Appendix D.	50 (or 15 mg/m ³ which-ever is the smaller) of total dust <1% SiO Note 1 See Table above

- a. Millions of particles per cubic foot or air, based on impinger samples counted by lightfield techniques.
- b. The percentage of crystalline silica in the formula is the amount determined from airborne samples, except in those instances in which other methods have been shown to be applicable.

Below the above threshold limits, no action is required, however, employees may wear dust masks for personal comfort.

As always, engineering controls are preferred to personal protective equipment to deal with job site hazards. Therefore, local exhaust ventilation is a preferred method of maintaining atmospheres that have dust levels below the concentrations noted in the Dust Table, above.

Local exhaust ventilation must be designed so that they prevent dispersions of dust in concentrations causing harmful exposure and that dusts are not drawn through the work area of employees.

The dust collected by an exhaust or ventilating system will be discharged to the outside atmosphere.

If concentrations are so great that a dust separator is used, the dust and refuse will be disposed of in such a manner as to not harm employees. The exhaust will still be discharged to the outside atmosphere. Of course, if the above ventilation procedures do not reduce the dust levels to acceptable limits, respirators will be used.

WELDING, CUTTING AND BRAZING

General requirements. – 1910.252

Oxygen-fuel gas welding and cutting. 1910.253

Arc welding and cutting. – 1910.254

Gas welding and cutting. - 1926.350

Arc welding and cutting. - 1926.351

Fire prevention. - 1926.352

Ventilation and protection in welding, cutting, and heating. - 1926.353

Welding, cutting, and heating in way of preservative coatings. - 1926.354

Table Z-1. – Limits for Air Contaminants

Chromium (VI). – 1926-1126

Employees assigned to operate both arc welding and cutting and oxygen-fuel welding and/or brazing equipment, **and their supervisors**, must be properly trained and instructed in the operation of such equipment. Proper PPE will be worn by all welders.

Before welding or cutting, the supervisor or competent person will inspect the area with emphasis on fire prevention and authorize welding or cutting using our Hot Work Permit noting special precautions that must be taken.

An appropriate fire extinguisher and first aid equipment will be readily available for immediate use.

Compressed Gas Cylinders Use:

Compressed gas cylinders are used on many job sites -- the most common being oxygen and acetylene for welding.

Failure to follow basic safety procedures could result in serious injuries such as:

- a. flash burn - due to explosion.
- b. fragment impalement - due to explosion.
- c. compression of the foot - due to mishandling of tanks.
- d. inhalation of hazardous gases - due to leakage.

Basic safety procedures for gas cylinder use:

- a. Cylinders must remain upright and chained to a substantial support or cart when in use.
- b. Wear appropriate personal protective equipment for the job -- such as steel toed shoes, apron, goggles, gloves, helmet, etc..

- c. Read and understand the MSDS for the gas being used and know the location of the MSDS in case of an emergency.
- d. Have appropriate fire extinguisher readily available.
- e. To release the gas, open the cylinder valve slowly -- standing away from the face and back of the gage -- and leave the opening tools in place (on the valve stem) for quick shut-off in the event of an emergency.
- f. Ensure cylinder valves, regulators, couplings, and hoses are free of oil and grease and ensure all connections are tight.
- g. When using oxygen-fuel systems, use flashback arrestors and reverse-flow check valves to prevent flashback.
- h. Keep cylinders away from open flames and sources of heat.
- i. **Cylinders are never allowed in confined spaces.**
 - 1. When welding or cutting in a confined space, the tanks must remain outside the confined space.
 - 2. Appropriate ventilation must be assured, portable equipment must be secured to prevent movement, if appropriate, a rescue plan should be prepared.
 - 3. If the rescue plan involves pulling the person out, attachment of the lifelines should be so the person's body does not jam in the exit and prevent his extraction.
 - 4. If arc welding is suspended for a substantial period of time, the electrodes must be removed to prevent accidental contact and the machine must be disconnected from the power source.
 - 5. If gas cylinder work is suspended, the torch valves must be closed and the fuel-gas and oxygen supply must be positively shut off or disconnected outside the confined space.
 - 6. After welding operations are completed, the welder must mark the hot metal or provide some other means of warning other workers.
- j. Do not alter or attempt to repair safety devices or valves.
- k. Remove the regulators when: a) moving cylinders; b) work is completed, and/or c) cylinders are empty.

Compressed gas cylinders will:

- a. have valve protectors in place when not in use or connected for use.
- b. be legibly marked to identify the gas contained therein.

- c. have the valves closed before the cylinder is moved, when the cylinder is empty, and at the completion of each job.
- d. be stored in areas away from intense heat, electric arcs, and high temperature lines.
- e. be secured upright (chained in portable dolly), in storage or transportation, to prevent tipping, falling, rolling, and damage from passing or falling objects. Oxygen cylinders must be kept 20 feet from any flammable gases or petroleum products.
- f. be marked "EMPTY" when appropriate.
- g. be removed from service if the regulators or gauges are defective.
- h. be used only for the purpose for which they are designed -- for example, cylinders will not be used as rollers or supports.
- i. be kept away from stairs.
- j. Workers in charge of oxygen or fuel-gas supply equipment (including distribution piping systems and generators) must be instructed and judged competent for such work.

Regulators and gauges will be inspected daily.

All cylinders, cylinder valves, couplings, regulators, hoses and apparatus will be kept free of oily or greasy substances.

Operators of welding equipment will report any equipment defect or safety hazards and discontinue use of equipment until its safety has been assured. Repairs will be made only by qualified personnel.

Persons performing arc welding and cutting must be properly instructed and qualified to operate such equipment and, if performing gas shielded arc welding, must be familiar with Recommended Safe Practices for Gas-Shielded Arc Welding, A6.1-1966, American Welding Society, as well as 29 CFR 1910.252.

Electric welders will be inspected daily before use with emphasis on the cables. All splicing of cables must maintain the insulated protection with no exposed metal parts. Cables in need of repair will not be used.

The competent person will ensure that ventilation within a confined space is adequate to negate the possibility of a respiratory or explosion hazard.

A fire watch will be assigned when there is potential a fire might develop. Of course, any person assigned to fire watch must have received training in the specific fire extinguishing equipment being used. When welding, cutting, or brazing an object near a fire hazard that is not readily movable, the fire hazard will be removed. If any fire hazards remain, shields will be used to confine the sparks, heat, and slag. If the provisions of this paragraph cannot be met, welding and/or cutting **may not** take place. In fact, as a company policy, if welding cannot be conducted safely, it may not be conducted.

Fire watchers are required in all locations where other than a minor fire might develop and any of the below conditions exist:

- a. appreciable amounts of combustible materials closer than 35 feet to point of operation.
- b. appreciable combustibles are 35 feet or more away but are easily ignited by sparks.
- c. wall or floor openings within a 35 foot radius expose combustible material in adjacent areas including concealed spaces in walls or floors..
- e. Combustible materials are adjacent to the opposite side of metal partitions, ceilings, or roofs that are likely to be ignited by conduction or radiation.

The fire watch must be maintained at least one half hour after welding or cutting operations have ceased to detect, and extinguish, possible smoldering fires.

When performing operations capable of producing heat at chemical plants, refineries, or other facilities which have a higher degree of hazard than normal work sites, a hot work permit is generally required. Included in these types of operations are burning, cutting, heating, and welding.

With our Hot Work Permit are found fire safety instructions [(29 CFR 1910 252(a)] which must be read and understood by the persons identified on the permit

Welding, cutting, heating of metals of toxic significance (lead, zinc, cadmium, mercury, beryllium, or exotic metals or paints) in enclosed spaces will require either general mechanical ventilation of sufficient capacity and so arranged as to produce the number of air changes necessary to maintain welding fumes and smoke within safe limits **or** local exhaust ventilation consisting of freely movable hoods intended to be placed by the welder or burner as close as practicable to the work. This system shall be of sufficient capacity and so arranged as to remove fumes and smoke at the source and keep the concentration of them in the breathing zone within safe limits.

This would include inert-gas metal-arc welding performed on stainless steel to protect against dangerous concentrations of nitrogen dioxide.

When performing welding operations on stainless steel and there is exposure to airborne chromium (VI) above its action level of 2.5 micrograms per cubic meter of air ($2.5 \mu\text{g}/\text{m}^3$) calculated as an 8-hour time-weighted average (TWA), the provisions of 29 CFR 1926.1126 must be adhered to. The PEL is $5 \mu\text{g}/\text{m}^3$. If air monitoring, as described in 29 CFR 1926.1126 is below $.5 \mu\text{g}/\text{m}^3$, the provisions of this standard do not apply.

IDENTIFICATION OF HAZARDOUS JOB SITE MATERIALS

The presence of asbestos, crystalline silica, and lead is possible on construction job sites. Before work begins, the appropriate PPE and respiratory protection requirements will be discussed with employees.

Because of the chronic (long term) nature of these hazards, detrimental health effects due to exposure would not be immediately noticed.

The competent person on site will prevent exposures to these materials.

Areas that contain the below materials will be cordoned off or protected with appropriate warning signs. Do not enter any restricted area unless dictated by job assignment and only after specific training for dealing with these hazards. The training would include PPE, respiratory protection, work procedures, medical surveillance, containment, hygiene, handling, testing, and labeling.

These materials may be “discovered” as work progresses and employees will be protected from these hazards by:

- a. identification of these items by the competent person.
- b. informing the owner, project designer, or engineer of the hazards.
- c. securing the area in question until testing proves samples to be negative.

Subcontractors who deal with these hazards will have specific programs that address the above issues.

ASBESTOS

Substance Technical Information for Asbestos - Non-Mandatory - 1926.1101 App H

Asbestos can be found in pipe, wall, and boiler insulation; exterior sheeting; and flooring. Friable or crumbling asbestos presents the most hazard as it can float in the air and be inhaled into the respiratory system. Without respiratory protection, the microscopic asbestos fibers can enter the deepest portion of the lung, causing scar tissue to develop and stiffen the lung. The net result is a reduction of gas exchange -- a condition called asbestosis. High levels of exposure to asbestos greatly increase one's chance of lung cancer.

CRYSTALLINE SILICA

Silica, Crystalline (Respirable Size), National Institute of Health

Crystalline Silica can be readily found on many job sites in rocks as well as many concrete and masonry products. Crystalline Silica can be released in the air when employees are performing such tasks as:

- a. chipping, hammering, drilling, crushing, or hauling rock.
- b. abrasive blasting.
- c. sawing, hammering, drilling, or sweeping concrete or masonry.

Unprotected respiratory exposure to crystalline silica may cause a lung disease called silicosis as well as cancer and death.

Occupational silica exposure is completely preventable through employee training, use of a silica substitute, use of engineering controls, improved work practices, and, lastly, use of personal protective equipment.

Employees who are potentially exposed to an environment containing airborne concentrations of silica will receive training prior to working with silica and receive periodic refresher training after work has started.

Silica training will include:

- a. Exposure monitoring for respirable silica.
 1. Full shift personal samples will be taken that are representative of the employees regular, daily exposure to silica. A certified industrial hygienist will use a combination device called a cyclone assembly and a sampling pump to trap tiny respirable silica particles from the air in the work environment.
 2. The cyclone assembly and sampling pump will be placed on an employee who will wear the device throughout the work shift for up to 8 hours.
 3. Sampling requires just a select few employees who are closest to the silica source may be fitted. The industrial hygienist can help you determine what will be most appropriate.
 3. At the end of the sampling period, the hygienist will de-activate the sampling pump and remove the filters to be sent to a certified laboratory for analysis.
 4. Employee exposures to concentrations of silica must be kept below the permissible exposure limits found in 1910.1000 Table Z-3, below:

Standard Number: 1910.1000 TABLE Z-3
TABLE Z-3 Mineral Dusts

Substance	mppcf a	mg/m3
Silica:		
Crystalline		
Quartz (Respirable)	250b	10 mg/m3 e
	%SiO ₂ +5	%SiO ₂ +2
Quartz (Total Dust)	30 mg/m3
		%SiO ₂ +2
Cristobalite: Use ½ the value calculated from the count or mass formulae for quartz.		
Tridymite: Use ½ the value calculated from the formulae for quartz.		
Amorphous, including natural diatomaceous earth	20	80 mg/m3
Substance	mppcf a	mg/m3
		%SiO ₂
Silicates (less than 1% crystalline silica):		
Mica	20	
Soapstone	20	

Substance	mppcf a	mg/m3
Talc (not containing asbestos)	20c	
Talc (containing asbestos) Use asbestos limit		
Tremolite, asbestiform (see 29 CFR 1910.1001)		
Portland cement . . .	50	
Graphite (Natural)	15	
Coal Dust:		
Respirable fraction less than 5% SiO2		2.4 mg/m3 e
Respirable fraction greater than 5% SiO2		10 mg/m3 e
		%SiO2+2
Inert or Nuisance Dust:d		
Respirable fraction	15	5 mg/m3
Total dust	50	15 mg/m3

Note -- Conversion factors - mppcf X 35.3 = million particles per cubic meter = particles per c.c.

a Millions of particles per cubic foot of air, based on impinger samples counted by light-field techniques.

b The percentage of crystalline silica in the formula is the amount determined from airborne samples, except in those instances in which other methods have been shown to be applicable.

c Containing less than 1% quartz; if 1% quartz or more, use quartz limit.

d All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by this limit, which is the same as the Particulates Not Otherwise Regulated (PNOR) limit in Table Z-1.

e Both concentration and percent quartz for the application of this limit are to be determined from the fraction passing a size-selector with the following characteristics:

Aerodynamic diameter (unit density sphere)	Percent passing selector
2	90
2.5	75
3.5	50
5.0	25
10	0

The measurements under this note refer to the use of an AEC (now NRC) instrument. The respirable fraction of coal dust is determined with an MRE; the figure corresponding to that of 2.4 mg/m3 in the table for coal dust is 4.5 mg/m3.

- b. The health hazards associated with respirable silica are silicosis, lung cancer, pulmonary tuberculosis and other airway diseases.

Silicosis is caused by exposure to respirable crystalline silica dust. Crystalline silica is a basic component of soil, sand, granite, and most other types of rock, and it is used as an abrasive blasting agent. Silicosis is a progressive, disabling, and often fatal lung disease. Cigarette smoking adds to the lung damage caused by silica.

Symptoms of silicosis:

Silicosis (especially the acute form) is characterized by shortness of breath, fever, and cyanosis (bluish skin); it may often be misdiagnosed as pulmonary edema (fluid in the lungs), pneumonia, or tuberculosis. Severe mycobacterial or fungal infections often complicate silicosis and may be fatal in many cases

Three types of silicosis:

1. Chronic silicosis: usually occurs after 10 or more years of exposure to crystalline silica at relatively low concentrations
2. Accelerated silicosis: results from exposure to high concentrations of crystalline silica and develops 5 to 10 years after the initial exposure
3. Acute silicosis: occurs where exposure concentrations are the highest and can cause lung cancer.

c. The exposure limits for respirable silica.

See paragraph a.4., above, 1910.1000 Table Z-3.

Permissible Exposure Limit (PEL) = Crystalline Quartz (respirable): 250 mppcf (millions of particles per cubic feet of air)/(%SiO₂ +5); 10 mg/m³/(%SiO₂ + 2); Quartz (total dust): 30 mg/m³/(%SiO₂ + 2); Cristobalite and Tridymite: Use 1/2 the value calculated from the count or mass formula for quartz

e. Acceptable substitutes for silica.

The many types of abrasive materials have varying degrees of health hazards -- silica sand being probably the most hazardous mineral abrasive used.

Whenever possible, its use should be limited and, if possible, a substitute material used. Other types of abrasives include: synthetic or natural mineral grains; metallic shot or hard grit (made of steel or chilled cast iron); and organic abrasives such as ground corncobs and walnut shells. These and other engineering controls such as containment and ventilation are important for employee safety.

f. Engineering controls.

It is important to note that silica is only hazardous in its airborne form. Engineering controls would include local exhaust ventilation and blasting cabinets.

Establishing a clearly identified exposure area.

g. Work practice controls.

Use of water sprays, wet methods for cutting, chipping, drilling, sawing, grinding, etc..

Eating, drinking, or smoking near crystalline silica dust is prohibited.

Employees will wash hands and face before eating, drinking or smoking away from silica exposure area.

h. Personal protective equipment.

The **only health hazard from silica is respiratory** therefore appropriate half-face or full face respiratory will be used.

1. Up to 0.5 milligrams per cubic meter of air (mg/m^3) of airborne exposures to crystalline silica:

Half-facepiece particulate respirators with N95 or better filters

2. Up to 1.25 milligrams per cubic meter of air (mg/m^3) of airborne exposures to crystalline silica:

Any powered, air-purifying respirator with a high-efficiency particulate filter.

Any supplied-air respirator operated in a continuous-flow mode

3. Up to 2.5 milligrams per cubic meter of air (mg/m^3) of airborne exposures to crystalline silica:

Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter

4. Up to 2.5 milligrams per cubic meter of air (mg/m^3) of airborne exposures to crystalline silica:

Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

However, when working with respirable silica, there are many physical hazards and appropriate PPE will be worn to address the hazards presented by the work at hand.

1. Eye protection: Goggles; safety glasses with side shields.
2. Head protection: Hard hat.
3. Hand protection: Gloves.
4. Foot protection: Steel toed work boots.
5. Body protection: Tyvek suits/coveralls.

Following are NIOSH recommendations for reducing crystalline silica exposures.

NIOSH Safety Recommendations:

NIOSH recommends the following measures to reduce crystalline silica exposures in the workplace and prevent silicosis and silicosis-related deaths:

1. Prohibit silica sand (or other substances containing more than 1% crystalline silica) as an abrasive blasting material and substitute less hazardous materials.
2. Conduct air monitoring to measure worker exposures.
3. Use containment methods such as blast-cleaning machines and cabinets to control the hazard and protect adjacent workers from exposure.
4. Practice good personal hygiene to avoid unnecessary exposure to silica dust.
 - a. Wash hands and face before eating.
 - b. No eating, drinking or tobacco products in the blasting area.
 - c. Shower before leaving work site.
 - d. Vehicles parked away from contaminated area.
5. Wear washable or disposable protective clothes at the worksite; shower and change into clean clothes before leaving the worksite to prevent contamination of cars, homes, and other work areas.
6. Use respiratory protection when source controls cannot keep silica exposures below the NIOSH REL.
7. Provide periodic medical examinations for all workers who may be exposed to crystalline silica.
8. Post signs to warn workers about the hazard and to inform them about required protective equipment.
9. Provide workers with training that includes information about health effects, work practices, and protective equipment for crystalline silica.
10. Report all cases of silicosis to the state health department.

LEAD

Substance Data Sheet for Occupational Exposure to Lead - 1926.62 App A

Lead can be found in water pipes, soldering, and paint. Lead is a heavy, toxic metal which can be absorbed into your body by ingestion and/or inhalation. It is a cumulative poison which can stay in your body for decades.

While massive doses of lead can kill in a matter of days, the more likely scenario on a job site is moderate exposure to asbestos or lead which probably would not create any health problems for years -- if at all.

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