Construction Safety Requirements

Abrasive Grinding

All abrasive wheel bench and stand grinders must be provided with safety guards that cover the spindle ends, nut and flange projections, and are strong enough to withstand the effects of a bursting wheel. An adjustable work rest of rigid construction must be used on floor and bench-mounted grinders, with the work rest kept adjusted to a clearance not to exceed 1/8 inch (0.3175 centimeter) between the work rest and the surface of the wheel. All abrasive wheels must be closely inspected and ring-tested before mounting to ensure that they are free from cracks or other defects.

Access to Medical and Exposure Records

Each employer must permit employees, their designated representatives, and OSHA direct access to employer-maintained exposure and medical records. The standard limits access only to those employees who are, have been (including former employees), or will be exposed to toxic substances or harmful physical agents. Each employer must preserve and maintain accurate medical and exposure records for each employee. Exposure records and data analyses based on them are to be kept for 30 years. Medical records are to be kept for at least the duration of employment plus 30 years. Background data for exposure records such as laboratory reports and work sheets need to be kept for only 1 year.

Records of employees who have worked for less than 1 year need not be retained after employment, but the employer must provide these records to the employee upon termination of employment. First-aid records of one-time treatment need not be retained for any specified period.

Accident Recordkeeping and Reporting Requirements

Each employer must maintain, in each location, a log and summary of all recordable injuries and illnesses (resulting in a fatality, hospitalization, lost workdays, medical treatment, job transfer or termination, or loss of consciousness) for that location, and enter each recordable event no later than 6 working days after receiving the information. Where the complete log and summary records are maintained at a place other than the establishment, a copy of the log that reflects the injury and illnesses experience of the establishment must be complete and current to date within 45 calendar days and must be available at the original site. In addition to the log of occupational injuries and illnesses, each employer must have available for inspection at each establishment within 6 working days after notification of a recordable case, a supplementary record for each occupational injury or illness for that establishment.

Each employer must post an annual summary of occupational injuries and illnesses for each establishment, compiled from the collected OSHA 200 Log, which includes the year’s totals, calendar year covered, company name, establishment name and address, certification signature, title, and date. An OSHA 200 Log must be used in presenting the summary. The summary must be posted by February 1 of each year and must remain in place until March 1 of the same year. The log and summary, the supplementary record,

and the annual summary must be retained in each establishment for 5 years following the end of the year to which they relate. Records must be made available, as authorized, upon request.

Within 8 hours after its occurrence, an employment accident that is fatal to one or more employees or that results in the over-night hospitalization of three or more employees must be reported by the employer, either orally or in writing, to the nearest OSHA area director.

Aerial Lifts

Aerial lifts, powered or manual, include, but are not limited to, the following types of vehicle-mounted aerial devices used to elevate personnel to jobsites above ground: extensible boom platforms, articulating boom platforms, and vertical towers.

When operating aerial lifts, employers must ensure employees are:

- Trained and authorized
- Setting brakes and using outriggers
- Not exceeding boom and basket load limits,
- Wearing personal fall protection and attaching the lanyard to the boom or basket, when required
- Not using devices such as ladders, stilts, or step stools to raise the employee above the basket.

In addition, manufacturers or the equivalent must certify, in writing, that any modifications made to aerial lifts are safe by design and for the specific application.

Air Tools

Pneumatic power tools must be secured to the hose in a positive manner to prevent accidental disconnection. Safety clips or retainers must be securely installed and maintained on pneumatic impact tools to prevent attachments from being accidentally expelled. The manufacturer's safe operating pressure for all fittings must not be exceeded. All hoses exceeding 1/2-inch (1.27-centimeter) inside diameter must have a safety device at the source of supply or branch line to reduce pressure in case of hose failure.

Belt Sanding Machines

Belt sanding machines must be provided with guards at each nip point where the sanding belt runs onto a pulley. The unused run of the sanding belt must be guarded against accidental contact.

Compressed Air

Compressed air used for cleaning purposes must be reduced to less than 30 pounds per square inch (psi) and then only with effective chip guarding and personal protective equipment. This requirement does not apply to concrete form, mill scale, and similar cleaning operations.

Compressed Gas Cylinders

Valve protection caps must be in place and secured when compressed gas cylinders are transported, moved, or stored. Cylinder valves must be closed when work is finished and when cylinders are empty or are moved. Compressed gas cylinders must be secured in an upright position at all times, except if necessary for short periods of time when cylinders are actually being hoisted or carried. Cylinders must be kept far enough away from the actual welding or cutting operations so that sparks, hot slag, or flame will not reach them. When this is impractical, fire-resistant shields must be provided. Cylinders must be placed where they cannot become part of an electrical circuit. Oxygen and fuel gas regulators must be in proper working order while in use.

Concrete and Masonry Construction

No construction loads must be placed on a concrete structure or portion of a concrete structure unless the employer 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. No employee must be permitted to work under concrete buckets while buckets are being elevated or lowered into position. To the extent practical, elevated concrete buckets must be routed so that no employee or the fewest number of employees is exposed to the hazards associated with falling concrete buckets.

Formwork must be designed, fabricated, erected, supported, braced, and maintained so that it is capable of supporting—without failure— all vertical and lateral loads that may reasonably be anticipated to be applied to the formwork. Forms and shores (except those used for slabs on grade and slip forms) must not be removed until the employer determines that the concrete has gained sufficient strength to support its weight and superimposed loads. Such determination must be based on compliance with one of the following:

• Plans and specifications stipulate conditions for removal of forms and shores, and such conditions have been followed, or

• Concrete has been properly tested with an appropriate American Society for Testing Materials (ASTM) standard test method designed to indicate the concrete compressive strength, and the test results indicate that the concrete has gained sufficient strength to support its weight and superimposed loads.

A limited access zone must be established whenever a masonry wall is being constructed. The limited access zone must conform to the following:

• The limited access zone must be established prior to the start of construction of the wall.

• The limited access zone must be equal to the height of the wall to be constructed plus 4 feet, and must run the entire length of the wall.

• The limited access zone must be established on the side of the wall that will not have a scaffold.

• The limited access zone must be restricted to entry by employees actively engaged in constructing the wall. No other employees must be permitted to enter the zone.

• The limited access zone must remain in place until the wall is adequately supported to prevent overturning and to prevent collapse. When the height of a wall is more than 8 feet, the limited access zone must remain in place until the requirements of paragraph (b) of OSHA Standard 1926.706(a)(1) thru (5) have been met

All masonry walls more than 8 feet in height must be adequately braced to prevent overturning and to prevent collapse unless the wall is adequately supported so that it will not overturn or collapse. The bracing must remain in place until permanent supporting elements of the structure are in place.

Confined Spaces

All employees required to enter into confined or enclosed spaces must be instructed as to the nature of the hazards involved, the necessary precautions to be taken, and in the use of required protective and emergency equipment. The employer must comply with any specific regulations that apply to work in dangerous or potentially dangerous areas. Confined or enclosed spaces include, but are not limited to, storage tanks, process vessels, bins, boilers, ventilation or exhaust ducts, sewers, underground utility vaults, tunnels, pipelines, and open top spaces more than 4 feet deep (1.2192 meters) such as pits, tubs, vaults, and vessels.

Cranes and Derricks

The employer must comply with the manufacturer's specifications and limitations. Rated load capacities, recommended operating speeds, and special hazard warnings or instructions must be conspicuously posted on all equipment.

Instructions or warnings must be visible from the operator's station. Equipment must be inspected by a competent person before and during use. Any deficiencies corrected before further use.

Accessible areas within the swing radius of the rear of the rotating superstructure must be properly barricaded to prevent employees from being struck or crushed by the crane. Except where electrical distribution and transmission lines have been deenergized and visibly grounded at point of work, or where insulating barriers not a part of or an attachment to the equipment or machinery have been erected to prevent physical contact with the lines, no part of a crane or its load must be operated within 10 feet of a line rated 50 kilovolts (kV) or below; 10 feet plus 0.4 inches for each kV over 50 kV for lines rated over 50 kV, or twice the length of the line insulator, but never less than 10 feet.

An annual inspection of the hoisting machinery must be made by a competent person. Records must be kept of the dates and results of each inspection. All crawler, truck, or

locomotive cranes in use must meet the requirements as prescribed in the ANSI B30.5-1968, *Safety Code for Crawler, Locomotive and Truck Cranes*
The use of a crane or derrick to hoist employees on a personnel platform is prohibited, except when the erection, use, and dismantling of conventional means of reaching the worksite—such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform or scaffold—would be more hazardous or is not possible because of structural design or worksite conditions. Where a decision is reached that this is the case, then OSHA Standard 1926.550(g) must be reviewed and complied with.

Disposal Chutes

Whenever materials are dropped more than 20 feet to any exterior point of a building, an enclosed chute must be used. When debris is dropped through holes in the floor without the use of chutes, the area where the material is dropped must be enclosed with barricades not less than 42 inches high and not less than 6 feet back from the projected edges of the opening above. Warning signs of the hazard of falling material must be posted at each level.

Drinking Water

An adequate supply of potable water must be provided in all places of employment. Portable drinking water containers must be capable of being tightly closed and equipped with a tap. Using a common drinking cup is prohibited. Where single service cups (to be used but once) are supplied, both a sanitary container for unused cups and a receptacle for used cups must be provided.

Electrical Installations

Employers must provide either ground-fault circuit interrupters (GFCIs) or an assured equipment grounding conductor program to protect employees from ground-fault hazards at construction sites. The two options are detailed below.

(1) All 120-volt, single-phase, 15- and 20-ampere receptacles that are not part of the permanent wiring must be protected by GFCIs. Receptacles on smaller generators are exempt under certain conditions.

(2) An assured equipment grounding conductor program covering extension cords, receptacles, and cord- and plug-connected equipment must be implemented. The program must include the following:

- A written description of the program.

- At least one competent person to implement the program..

- Daily visual inspections of extension cords and cord- and plug-connected equipment for defects. Equipment found damaged or defective must not be used until repaired.

• Continuity tests of the equipment grounding conductors or receptacles, extension cords, and cord- and plug-connected equipment. These tests must generally be made every 3 months.

Light bulbs for general illumination must be protected from breakage, and metal shell sockets must be grounded. Temporary lights must not be suspended by their cords, unless they are so designed. Portable lighting used in wet or conducive locations, such as tanks or boilers, must be operated at no more than 12 volts or must be protected by GFCIs.

Extension cords must be of the three-wire type. Extension cords and flexible cords used with temporary and portable lights must be designed for hard or extra hard usage (for example, types S, ST, and SO). Worn or frayed electric cords or cables must not be used. Extension cords must not be fastened with staples, hung from nails, or suspended by wire.

Work spaces, walkways, and similar locations must be kept clear of cords.

Listed, labeled, or certified equipment must be installed and used in accordance with instructions included in the listing, labeling, or certification.

Electrical Work Practices

Employers must not allow employees to work near live parts of electrical circuits, unless the employees are protected by one of the following means:

• Deenergizing and grounding the parts.
• Guarding the part by insulation.
• Any other effective means.

In work areas where the exact location of under-ground electrical power lines is unknown, employees using jack hammers, bars, or other hand tools that may contact the lines must be protected by insulating gloves, aprons, or other protective clothing that will provide equivalent electrical protection.

Barriers or other means of guarding must be used to ensure that workspace for electrical equipment will not be used as a passageway during periods when energized parts of equipment are exposed.

Flexible cords must be connected to devices and fittings so that strain relief is provided which will prevent pull from being directly transmitted to joints or terminal screws.

Equipment or circuits that are deenergized must be rendered inoperative and must have tags attached at all points where the equipment or circuits could be energized.

Excavating and Trenching

The estimated location of utility installations—such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work—must be determined prior to opening an excavation.

Utility companies or owners must be contacted within established or customary local response times, advised of the proposed work, and asked to establish the location of the utility underground installations prior to the start of actual excavation. When utility companies or owners cannot respond to a request to locate underground utility installations within 24 hours (unless a longer period is required by state or local law), or cannot establish the exact location of these installations, the employer may proceed, provided the employer does so with caution, and provided detection equipment or other acceptable means to locate utility installations are used.

When excavation operations approach the estimated location of underground installations, the exact location of the installations must be determined by safe and acceptable means. While the excavation is open, underground installations must be protected, supported, or removed, as necessary, to safeguard employees.

Each employee in an excavation must be protected from cave-ins by an adequate protective system except when:

- Excavations are made entirely in stable rock, or excavations are less than 5 feet in depth and examination of the ground by a competent person provides no indication of a potential cave-in.

- Protective systems must have the capacity to resist, without failure, all loads that are intended or could reasonably be expected to be applied or transmitted to the system.

Employees must be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection must be provided by placing and keeping such materials or equipment at least 2 feet from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.

Daily inspections of excavations, the adjacent areas, and protective systems must be made by a ***competent person*** for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection must be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections must also be made after every rainstorm or other hazard increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated. Where a competent person finds evidence of a situation that could result in a possible cave-in, indications of

failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees must be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

A stairway, ladder, ramp, or other safe means of egress must be located in trench excavations that are 4 feet (1.2192 meters) or more in depth so as to require no more than 25 feet of lateral travel for employees.

Explosives and Blasting

Only authorized and qualified persons must be permitted to handle and use explosives. Explosives and related materials must be stored in approved facilities required under the applicable provisions of the Bureau of Alcohol, Tobacco and Firearms regulations contained in 27 CFR part 55, Commerce in Explosives.

Smoking and open flames must not be permitted within 50 feet (15.24 meters) of explosives and detonator storage magazines. Procedures that permit safe and efficient loading must be established before loading is started.

Eye and Face Protection

Eye and face protection must be provided when machines or operations present potential eye or face injury. Eye and face protective equipment must meet the requirements of ANSI Z87.1-1968, *Practice for Occupational and Educational Eye and Face Protection.*

Employees involved in welding operations must be furnished with filter lenses or plates of at least the proper shade number. Employees exposed to laser beams must be furnished suitable laser safety goggles that will protect for the specific wave length of the laser and the optical density adequate for the energy involved.

Fall Protection

Employers are required to assess the workplace to determine if the walking/working surface on which employees are to work have the strength and structural integrity to safely support workers. Employees are not permitted to work on those surfaces until it has been determined that the surfaces have the requisite strength and structural integrity to support the workers.

Where employees are exposed to falling 6 feet or more from an unprotected side or edge, the employer must select a guard-rail system, safety net system, or personal fall arrest system to protect the worker.

A personal fall arrest system consists of an anchorage, connectors, body harness and may include a lanyard, a deceleration device, lifeline or a suitable combination of these. Each employee in a hoist area must be protected from falling 6 feet or more by guardrail systems or personal fall arrest systems. If guardrail systems (or chain gate or guardrail) or portions thereof must be removed to facilitate hoisting operations, as during the landing

of materials, and a worker must lean through the access opening or out over the edge of the access opening to receive or guide equipment and materials, that employee must be protected by a personal fall arrest system.

Personal fall arrest systems, covers, or guardrail systems must be erected around holes (including skylights) that are more than 6 feet above lower levels.

Each employee at the edge of an excavation 6 feet deep or more must be protected from falling by guardrail systems, fences, barricades, or covers. Where walkways are provided to permit employees to cross over excavations, guardrails are required on the walkway if it is 6 feet or more above the excavation.

Each employee using ramps, runways, and other walkways must be protected from falling 6 feet or more by guardrail systems.

Each employee performing overhand bricklaying and related work 6 feet (1.8288 meters) or more above lower levels must be protected by guardrail systems, safety net systems, or personal fall arrest systems, or must work in a controlled access zone.

All employees reaching more than 10 inches below the level of a walking/working surface on which they are working must be protected by a guardrail system, safety net system, or personal fall arrest.

Each employee engaged in roofing activities on low-slope roofs with unprotected sides and edges 6 feet or more above lower levels must be protected from falling by guardrail, safety net, or personal fall arrest systems or a combination of a:

- warning line system and guardrail system,
- warning line system and safety net system,
- warning line system and personal fall arrest system, or
- warning line system and safety monitoring system.

On low-slope roofs 50 feet or less in width, the use of a safety monitoring system without a warning line system is permitted. Each employee on a steep roof with unprotected sides and edges 6 feet (1.8288 meters) or more above lower levels must be protected by guardrail systems with toeboards, safety net systems, or personal fall arrest systems.

Fire Protection

A firefighting program is to be followed throughout all phases of the construction and demolition work involved. It must provide for effective firefighting equipment to be available without delay, and designed to effectively meet all fire hazards as they occur.

Firefighting equipment must be conspicuously located and readily accessible at all times, must be periodically inspected, and be maintained in operating condition.

A fire extinguisher, rated not less than 2A, must be provided for each 3,000 square feet of the protected building area, or major fraction thereof. Travel distance from any point of the protected area to the nearest fire extinguisher must not exceed 100 feet. Acceptable substitutes are a 1/2–inch diameter garden-type hose not to exceed 100 feet and capable of discharging a minimum of 5 gallons per minute, or a 55–gallon drum of water with two fire pails.

One or more fire extinguishers, rated not less than 2A, must be provided on each floor. In multistory buildings, at least one fire extinguisher must be located adjacent to stairway.

The employer must establish an alarm system at the worksite so that employees and the local fire department can be alerted for an emergency.

Flagmen

When signs, signals, and barricades do not provide necessary protection on or adjacent to a highway or street, flagmen or other appropriate traffic controls must be provided. Flagmen must be provided with and must wear a red or orange warning garment while flagging. Warning garments worn at night must be of reflective material.

Flammable and Combustible Liquids

Only approved containers and portable tanks must be used for storing and handling flammable and combustible liquids. No more than 25 gallons of flammable or combustible liquids must be stored in a room outside of an approved storage cabinet. No more than three storage cabinets may be located in a single storage area. Inside storage rooms for flammable and combustible liquids must be of fire-resistive construction, have self-closing fire doors at all openings, 4 inch (10.16 centimeter) sills or depressed floors, a ventilation system that provides at least six air changes within the room per hour, and electrical wiring and equipment approved for Class 1, Division 1 locations. Storage in containers outside buildings must not exceed 1,100 gallons (4,169 liters) in any one pile or area. The storage area must be graded to divert possible spills away from buildings or other exposures, or must be surrounded by a curb or dike. Storage areas must be located at least 20 feet from any building and must be free from weeds, debris, and other combustible materials not necessary to the storage.

Flammable liquids must be kept in closed containers when not actually in use. Conspicuous and legible signs prohibiting smoking must be posted in service and refueling areas.

Gases, Vapors, Fumes, Dusts, and Mists

Exposure to toxic gases, vapors, fumes, dusts, and mists at a concentration above those specified in the *Threshold Limit Values of Airborne Contaminants* for 1970 of the American Conference of Governmental Industrial Hygienists (ACGIH), must be avoided. Administrative or engineering controls must be implemented whenever feasible to comply with TLVs.

When engineering and administrative controls are not feasible to achieve full compliance,

protective equipment or other protective measures must be used to keep the exposure of employees to air contaminants within the limits prescribed. Any equipment and technical measures used for this purpose must first be approved for each particular use by a competent industrial hygienist or other technically qualified person. Whenever respirators are used, their use must comply with OSHA Standard 1926.103.

General Duty Clause

Hazardous conditions or practices not covered in an OSHA standard may be covered under Section 5(a)(1) of the *Occupational Safety and Health Act of 197*0, which states: "Each employer must furnish to each of his 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."

Hand Tools

Employers must not issue or permit the use of unsafe hand tools, including tools that may be furnished by employees or employers. All hand tools must be properly maintained.

Wrenches must not be used when jaws are sprung to the point that slippage occurs. Impact tools must be kept free of mushroomed heads. The wooden handles of tools must be kept free of splinters or cracks and must be kept tight in the tool.

Electric power operated tools must either be approved double-insulated, or be properly grounded.

Hazard Communication

Employers must develop, implement, and maintain at the workplace a written hazard communication program for their workplaces. Employers must inform their employees of the availability of the program, including the required list(s) of hazardous chemicals, and material safety data sheets required.

The employer must ensure that each container of hazardous chemicals in the workplace is labeled, tagged, or marked with the identity of the hazardous chemical(s) contained therein; and must show hazard warnings appropriate for employee protection.

Chemical manufacturers and importers must obtain or develop a material safety data sheet for each hazardous chemical they produce or import. Employers must have a material safety data sheet for each hazardous chemical they use.

Employers must provide employees with information and training on hazardous chemicals in their work area at the time of their initial assignment, and whenever a new hazard is introduced into their work area. Employers must also provide employees with information on any operations in their work area where hazardous chemicals are present, and the location and availability of the written hazard communication program, including the required list(s) of hazardous chemicals, and material safety data sheets. Employers who produce, use, or store hazardous chemicals at multi-employer workplaces must

additionally ensure that their hazard communication program includes the methods the employer will use to provide other employer(s) with a copy of the material safety data sheet for hazardous chemicals other employer(s) employees may be exposed to while working; the methods the employer will use to inform other employer(s) of any precautionary measures for the protection of employees; and the methods the employer will use to inform the other employer(s) of the labeling system used in the workplace.

Hazardous Waste Operations

Employers must develop a written safety and health program for employees involved in hazardous waste operations. At a minimum, the program must include a comprehensive workplan, standard operating procedures, a site specific safety and health plan (which need not repeat the standard operating procedures), the training program, and the medical surveillance program. A site control program also must be developed and must include, at a minimum, a map, work zones, buddy systems, site communications—including alerting means for emergencies—standard operating procedures or safe work practices, and identification of the nearest medical assistance.

Training must be provided for all site employees, their supervisors, and management who are exposed to health or safety hazards.

Head Protection

Head protective equipment (helmets) must be worn in areas where there is a possible danger of head injuries from impact, flying or falling objects, or electrical shock and burns. Helmets for protection against impact and penetration of falling and flying objects must meet the requirements of ANSI Z89.1-1969. Helmets for protection against electrical shock and burns must meet the requirements of ANSI Z89.2-1971.

Hearing Protection

Feasible engineering or administrative controls must be utilized to protect employees against sound levels in excess of those shown in Table D-2 of the OSHA Standard When engineering or administrative controls fail to reduce sound levels within the limits of Table D-2, ear protective devices must be provided and used. In all cases where the sound levels exceed the values shown in Table D-2, a continuing, effective hearing conservation program must be administered. A hearing conservation program in construction should include the following elements:

- monitoring employee noise exposures,
  using engineering, work practice and administrative controls, and personal protective equipment,
- fitting each overexposed employee with appropriate hearing protectors, • training employees in the effects of noise and protection measures,
- explaining procedures for preventing further hearing loss, and
- recordkeeping

Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level. Plain cotton is not an acceptable protective device.

Heating Devices (Temporary)

When heating devices are used, fresh air must be supplied in sufficient quantities to maintain the health and safety of workers. Solid fuel salamanders are prohibited in buildings and on scaffolds.

Hoists, Material, and Personnel

The employer must comply with the manufacturer's specifications and limitations. Rated load capacities, recommended operating speeds, and special hazard warnings or instructions must be posted on cars and platforms.

Hoistway entrances of material hoists must be protected by substantial full width gates or bars. Hoistway doors or gates of personnel hoist must be not less than 6 feet 6 inches high and must be protected with mechanical locks that cannot be operated from the landing side and that are accessible only to persons on the car.

Overhead protective coverings must be provided on the top of the hoist cage or platform.

All material hoists must conform to the requirements of ANSI A10.5-1969, *Safety Requirements for Material Hoists.*

Housekeeping

Form and scrap lumber with protruding nails and all other debris must be kept clear from all work areas. Combustible scrap and debris must be removed at regular intervals.

Containers must be provided for collection and separation of all refuse. Covers must be provided on containers used for flammable or harmful substances.
Wastes must be disposed of at frequent intervals.

Illumination

Construction areas, ramps, runways, corridors, offices, shops, and storage areas must be lighted to not less than the minimum illumination intensities listed in Table D-3 while any work is in progress..

Minimum Illumination Intensities in Footcandles

5 Footcandles -- General construction area lighting.

3 Footcandles --General construction areas, concrete placement, excavation, waste areas, accessways, active storage areas, loading platforms, refueling, and field maintenance areas.

5 Footcandles -- Indoor warehouses, corridors, hallways, and exitways.

5 Footcandles -- Tunnels, shafts, and general under-ground work areas.
(Exception: minimum of 10 footcandles is required at tunnel and shaft heading

during drilling, mucking, and scaling. Bureau of Mines approved cap lights must be acceptable for use in the tunnel heading).

10 Footcandles -- General construction plant and shops (e.g., batch plants, screening plants, mechanical and electrical equipment rooms, carpenters shops, rigging lofts and active store rooms, barracks or living quarters, locker or dressing rooms, mess halls, indoor toilets, and workrooms).

30 Footcandles -- First-aid stations, infirmaries, and offices.

Ladders

Portable and fixed ladders with structural defects— such as broken or missing rungs, cleats or steps, broken or split rails, or corroded components—must be withdrawn from service by immediately tagging “DO NOT USE” or marking in a manner that identifies them as defective, or must be blocked, such as with a plywood attachment that spans several rungs. Repairs must restore ladder to its original design criteria.

Portable non-self-supporting ladders must be placed on a substantial base, have clear access at top and bottom, and be placed at an angle so the horizontal distance from the top support to the foot of the ladder is approximately one-quarter the working length of the ladder. Portable ladders used for access to an upper landing surface must extend a minimum of 3 feet above the landing surface, or where not practical, be provided with grab rails and be secured against movement while in use.

Ladders must have nonconductive siderails if they are used where the worker or the ladder could contact energized electrical conductors or equipment.

Job-made ladders must be constructed for their intended use. Cleats must be uniformly spaced not less than 10 inches apart, nor more than 14 inches apart.

A ladder (or stairway) must be provided at all work points of access where there is a break in elevation of 19 inches r more except if a suitable ramp, runway, embankment, or personnel hoist is provided to give safe access to all elevations.

Wood job-made ladders with spliced side rails must be used at an angle where the horizontal distance is one-eighth the working length of the ladder.
Fixed ladders must be used at a pitch no greater than 90 degrees from the horizontal, measured from the back side of the ladder.

Ladders must be used only on stable and level surfaces unless secured to prevent accidental movement.

Ladders must not be used on slippery surfaces unless secured or provided with slip-resistant feet to prevent accidental movement. Slip-resistant feet must not be used as a substitute for the care in placing, lashing, or holding a ladder upon a slippery surface.

Employers must provide a training program for each employee using ladders and stairways. The program must enable each employee to recognize hazards related to ladders and stairways and to use proper procedures to minimize these hazards. For example, employers must ensure that each employee is trained by a competent person in the following areas:

- Nature of fall hazards in the work area;
- Correct procedures for erecting, maintaining, and disassembling the fall protection systems to be used;
- Proper construction, use, placement, and care in handling of all stairways and ladders; and
- Maximum intended load-carrying capacities of ladders used.

In addition, retraining must be provided for each employee, as necessary, so that the employee maintains the understanding and knowledge acquired through compliance with OSHA standard 1926.1060

Lasers

Only qualified and trained employees must be assigned to install, adjust, and operate laser equipment. Employees must wear proper (antilaser) eye protection when working in areas where there is a potential exposure to direct or reflected laser light greater than 0.005 watts (5 milliwatts).

Beam shutters or caps must be utilized, or the laser turned off, when laser transmission is not actually required. When the laser is left unattended for a substantial period of time—such as during lunch hour, overnight, or at change of shifts—the laser must be turned off.

Employees must not be exposed to light intensities in excess of the following:

Direct staring—1 microwatt per square centimeter

Incidental observing—1 milliwatt per square centimeter diffused reflected light—2-1/2 watts per square centimeter.

Employees must not be exposed to microwave power densities in excess of 10 milliwatts per square centimeter.

Lead

Each employer who has a workplace or operation covered by this standard must initially determine if any employee may be exposed to lead at or above the action level of 30 micro-grams per cubic meter (30 mg/m^3) of air calculated as an 8-hour time-weighted average.

The employer must assure that no employee is exposed to lead at concentrations greater than 50 micrograms per cubic meter (50 mg/m ^{3}) of air averaged over an 8-hour period (the permissible exposure limit PEL). Whenever there has been a change of equipment, process, control, personnel, or a new task has been initiated that may result in exposure above the PEL, the employer must conduct additional monitoring.

Training must be provided in accordance with the Hazard Communication Standard and additional training must be provided for employees exposed at or above the action level. Prior to the start of the job, each employer must establish and implement a written compliance program.

Where airborne concentrations of lead equal or exceed the action level at any time, an initial medical examination consisting of blood sampling and analysis must be made available for each employee prior to initial assignment to the area.

Lift Slab

Lift-slab operations must be designed and planned by a registered professional engineer who has experience in lift-slab construction. Such plans and designs must be implemented by the employer and must include detailed instructions and sketches indicating the prescribed method of erection. Jacking equipment must be cable of supporting at least two and one-half times the load being lifted during jacking operations. Also, do not overload the jacking equipment. During erection, no employee, except those essential to the jacking operation, must be permitted in the building or structure while jacking operations are taking place unless the building or structure has been reinforced sufficiently to ensure its integrity.

Equipment must be designed and installed to prevent slippage; otherwise, the employer must institute other measures, such as locking or blocking devices, which will provide positive connection between the lifting rods and attachments and will prevent components from disengaging during lifting operations.

Liquefied Petroleum Gas

Each system must have containers, valves, connectors, manifold valve assemblies, and regulators of an approved type. Every container and vaporizer must be provided with one or more approved safety relief valves or devices. Containers must be placed upright on firm foundations or otherwise firmly secured.

Portable heaters must be equipped with an approved automatic device to shut off the flow of gas in the event of flame failure. All cylinders must be equipped with an excess flow valve to minimize the flow of gas in the event the fuel line becomes ruptured.

Storage of liquefied petroleum gas within buildings is prohibited. Storage locations must have at least one approved portable fire extinguisher rated not less than 20-B:C.

Medical Services and First Aid

The employer must ensure the availability of medical personnel for advice and consultation on matters of occupational health. When a medical facility is not reasonably accessible for the treatment of injured employees, a person trained to render first aid must be available at the worksite.

First-aid supplies approved by the consulting physician should be readily available. The telephone numbers of the physicians, hospitals, or ambulances must be conspicuously posted.

Motor Vehicles and Mechanized Equipment

All vehicles in use must be checked at the beginning of each shift to ensure that all parts, equipment, and accessories that affect safe operation are in proper operating condition and free from defects. All defects must be corrected before the vehicle is placed in service.

No employer must use any motor vehicle, earthmoving, or compacting equipment having an obstructed view to the rear unless:

- The vehicle has a reverse signal alarm distinguishable from the surrounding noise level, or

- The vehicle is backed up only when an observer signals that it is safe to do so.

Heavy machinery, equipment, or parts thereof that are suspended or held aloft must be substantially blocked to prevent falling or shifting before employees are permitted to work under or between them.

Personal Protective Equipment

The employer is responsible for requiring the wearing of appropriate personal protective equipment in all operations where there is an exposure to hazardous conditions or where the need is indicated for using such equipment to reduce the hazard to the employees. Employees working over or near water, where the danger of drowning exists, must be provided with U.S. Coast Guard-approved life jackets or buoyant work vests.

Powder-Actuated Tools

Only trained employees must be allowed to operate powder-actuated tools. All powder-actuated tools must be tested daily before use and all defects discovered before or during use must be corrected. Tools must not be loaded until immediately before use. Loaded tools must not be left unattended.

Power Transmission and Distribution

Existing conditions must be determined before starting work, by an inspection or a test. Such conditions must include, but not be limited to, energized lines and equipment, condition of poles, and the location of circuits and equipment including power and communications, cable television, and fire-alarm circuits.

Electric equipment and lines must be considered energized until determined otherwise by testing or until grounding. Operating voltage of equipment and lines must be determined before working on or near energized parts.

Rubber protective equipment must comply with the provisions of the ANSI J6 series, and must be visually inspected before use.

Power Transmission, Mechanical

Belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels, chains, or other reciprocating, rotating, or moving parts of equipment must be guarded if such parts are exposed to contact by employees or otherwise constitute a hazard. Guarding must meet the requirement of ANSI B15.1-1953 (R 1958), *Safety Code for Mechanical Power Transmission Apparatus.*

Process Safety Management

Employers must develop a written plan of action regarding employee participation and consult with employees and their representatives on the conduct and development of process hazards analyses and on the development of the other elements of process safety management.

The employer, when selecting a contractor, must obtain and evaluate information regarding the contract employer's safety performance and programs. The contract employer must assure that each contract employee is trained in the work practices necessary to safely perform his/her job.

The employer must perform a pre-startup safety review for new facilities and for modified facilities when the modification is significant enough to require a change in the process safety information.
The employer must establish and implement written procedures to maintain the on going integrity of process equipment.

Program Requirements

The employer must initiate and maintain such programs as may be necessary to provide for frequent and regular inspections of the job site, materials, and equipment by designated competent persons.

The employer should avail himself of the safety and health training programs the Secretary provides. The employer must instruct each employee in the recognition and avoidance of unsafe conditions and in the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury.

The use of any machinery, tool, material, or equipment that is not in compliance with any applicable requirement of OSHA Standards Part 1926 is prohibited.

The employer must permit only those employees qualified by training or experience to operate equipment and machinery.

Radiation, Ionizing

Pertinent provisions of the Nuclear Regulatory Commission (NRC) (10 CFR Part 20) relating to protection against occupational radiation exposure must apply. Any activity that involves the use of radioactive materials or X-rays, whether or not under license from the Atomic Energy Commission, must be performed by competent persons specially trained in the proper and safe operation of such equipment.

Railings

Top edge height of top rails or equivalent guardrail system members must have a vertical height of approximately 42 inches plus or minus 3 inches above the walking/working level.

Guardrail systems must be smooth-surfaced, with a strength to withstand at least 200 pounds, the minimum requirement applied in any outward or downward direction, at any point along the top edge.

A stair railing must be of construction similar to a standard railing with a vertical height of 36 inches from the upper surface of top rail to the surface of tread in line with face of riser at forward edge of tread.

Reinforced Steel

All protruding reinforced steel onto and into which employees could fall must be guarded to eliminate the hazard of impalement**.**

Respiratory Protection

In emergencies, or when feasible engineering or administrative controls are not effective in controlling toxic substances, appropriate respiratory protective equipment must be provided by the employer and must be used.

Respiratory protective devices must be approved by the National Institute for Occupational Safety and Health or acceptable to the U.S. Department of Labor for the specific contaminant to which the employee is exposed.

Respiratory protective devices must be appropriate for the hazardous material involved and the extent and nature of the work requirements and conditions. Employees required to use respiratory protective devices must be thoroughly trained in their use.

Respiratory protective equipment must be inspected regularly and maintained in good condition.

Rollover Protective Structures (ROPS)

Rollover protective structures (ROPS) apply to material handling equipment such as:

All rubber-tired, self-propelled scrapers, rubber-tired frontend loaders, rubber-tired dozers, wheel-type agricultural and industrial tractors, crawler tractors, crawler-type

loaders, and motor graders, with or without attachments, that are used in construction work. This requirement does not apply to sideboom pipelaying tractors.

Safety Nets

Safety nets must be installed as close as practicable under the walking/working surface on which employees are working, but in no case more than 30 feet below such level. When nets are used on bridges, the potential fall area from the walking/working surface to the net must be unobstructed.

Safety nets and their installations must be capable of absorbing an impact force equal to that produced by the drop test.

Saws, Band

All portions of band saw blades must be enclosed or guarded, except for the working portion of the blade between the bottom of the guide rolls and the table. Band saw wheels must be fully encased.

Saws, Portable Circular

Portable, power-driven circular saws must be equipped with guards above and below the base plate or shoe. The lower guard must cover the saw to the depth of the teeth, except for the minimum arc required to allow proper retraction and contact with the work, and must automatically return to the covering position when the blade is removed from the work.

Saws, Radial

Radial saws must have an upper guard that completely encloses the upper half of the saw blade. The sides of the lower exposed portion of the blade must be guarded by a device that will automatically adjust to the thickness of and remain in contact with the material being cut.

Radial saws used for ripping must have non-kickback fingers or dogs. Radial saws must be installed so that the cutting head will return to the starting position when released by the operator.

Saws, Swing or Sliding Cut-Off

All swing or sliding cut-off saws must be provided with a hood that will completely enclose the upper half of the saw. Limit stops must be provided to prevent swing or sliding type cut-off saws from extending beyond the front or back edges of the table.

Each swing or sliding cut-off saw must be provided with an effective device to return the saw automatically to the back of the table when released at any point of its travel. Inverted sawing of sliding cut-off saws must be provided with a hood that will cover the part of the saw that protrudes above the top of the table or material being cut.

Saws, Table

Circular table saws must have a hood over the portion of the saw above the table, so mounted that the hood will automatically adjust itself to the thickness of and remain in contact with the material being cut. Circular table saws must have a spreader aligned with the blade, spaced no more than 1/2 inch behind the largest blade mounted in the saw. This provision does not apply when grooving, dadoing, or rabbiting.

Circular table saws used for ripping must have non-kickback fingers or dogs. Feeder attachments must have the feed rolls or other moving parts covered or guarded so as to protect the operator from hazardous points.

Scaffolds

General Requirements

Scaffold means any temporary elevated plat-form (supported or suspended) and its supporting structure (including points of anchorage) used for supporting employees or materials or both.

Fall protection—such as guardrail and personal fall arrest systems—must be provided for each employee working on a scaffold more than 10 feet above a lower level.

Employers must have a competent person to determine the feasibility and safety of providing fall protection for employees erecting or dismantling supported scaffolds. Each scaffold and scaffold component must support, without failure, its own weight and at least 4 times the maximum intended load applied or transmitted to it. Scaffolds must be designed by a qualified person and constructed and loaded in accordance with such design. Scaffolds and scaffold components must not be loaded in excess of their maximum intended loads or rated capacities, whichever is less.

The scaffold platform must be planked or decked as fully as possible with the space between the platform and uprights not more than 1 inch wide. When side brackets or odd shaped structures result in a wider opening between the platform and the uprights, the space must not exceed 9.5 inches.

The platform must not deflect more than 1/60 of the span when loaded.

The work area for each scaffold platform and the walkway must be at least 18 inches wide. When the work area must be less than 18 inches wide, guardrails and/or personal fall arrest systems must be used.

Access must be provided when the scaffold platforms are more than 2 feet above or below a point of access. Direct access is acceptable when the scaffold is not more than 14 inches horizontally and not more than 24 inches vertically from the other surfaces.

Crossbraces must not be used as a means of access.

A competent person must inspect scaffolds, scaffold components, and ropes on suspended scaffolds before each work shift and after any occurrence that could affect the structural integrity. He or she also must ensure that prompt corrective action is taken.

Stilts may be used on a large area scaffold. (A large area scaffold is a pole, tube and coupler, systems or fabricated frame scaffold erected over substantially the entire work area.) When a guardrail system is used, the guardrail height must be equal to the height of the stilts. Any alterations to the stilts must be approved by the manufacturer.

Bricklaying
Employees doing overhand bricklaying from a
supported scaffold must be protected by a guard-rail or personal fall arrest system on all sides except the side where the work is being done.

Erectors and Dismantlers
Employers must provide safe means of access for each employee erecting or dismantling supported scaffolds where the provisions of safe access is feasible and does not create a greater hazard. The determination must be made by a competent person based on his or her analysis of the site conditions.

Fall Arrest Systems
Personal fall arrest systems include harnesses, and components of the harness belt, such as Dee-rings, snaphooks, lifelines, and anchorage points. Vertical or horizontal lifelines may be used.

Lifelines must be independent of support lines and suspension ropes and must not be attached to the same anchorage points as the support or suspension ropes,

When working from an aerial lift, the lanyard must be attached to the boom or basket. When lanyards are connected to horizontal lifelines or structural members on single or two point adjustable scaffolds, the scaffold must be equipped with additional independent support lines that are equal in number and strength to the suspension lines and have automatic locking devices.

Guardrails
Guardrails systems must be installed along all open sides and ends of platforms. Guardrails systems must be installed before the scaffold is released for use by employees other than erection/dismantling. Guardrails are not required on the front edge of a platform if the front edge of the platform is less than 14 inches from the face of the work, when plastering and lathing is being done 18 inches or less from the front edge, and when outrigger scaffolds are 3 inches or less from the front edge.

The height of the toprail for scaffolds can be between 38 inches and 45 inches. Midrails must be installed approximately halfway between the toprail and the platform surface.

When screens and mesh are used, they must extend from the top edge of the guardrail system to the scaffold platform and along the entire opening between the supports.

Crossbracing is not acceptable as an entire guardrail system; but crossbracing is acceptable for a toprail when the crossing point of the two braces is between 38 inches and 48 inches above the work platform. Crossbracing is also acceptable for midrails when between 20 inches and 30 inches above the work platform. The end points of the crossbracing must be no more than 48 inches apart vertically.

Planking

Scaffold planking must be capable of supporting, without failure, its own weight and at least 4 times the intended load. Solid sawn wood, fabricated planks, and fabricated platforms may be used as scaffold planks following the manufacturer, a lumber grading association, or an inspection agency's recommendations

Supported Scaffolds

Supported scaffolds are platforms supported by legs, outrigger beams, brackets, poles, uprights, posts, frames, or similar rigid supports. The structural members—poles, legs, posts, frames, and uprights—must be plumb and braced to prevent swaying and displacement. Supported scaffold poles, legs, posts, frames, and uprights must be bear on base plates and mud sills, or other adequate firm foundations.

Supported scaffolds with a height to base width ratio of more than four to one must be restrained from tipping by guying, tying, bracing or equivalent means.

Guys, ties, and braces must be installed according to the scaffold manufacturer's recommendations or at the closest horizontal member to the 4:1 height and be repeated vertically at locations of horizontal members every 20 feet or less thereafter for scaffolds 3 feet wide or less, and every 26 feet or less thereafter for scaffolds greater than 3 feet wide. The top guy, tie or brace of completed scaffolds must be placed no further than the 4:1 height from the top. Such guys, ties and braces must be installed at each end of the scaffold and at horizontal intervals not to exceed 30 feet (measured from one end [not both] towards the other).

Suspension Scaffolds

A suspension scaffold means one or more platforms suspended by ropes or other non-rigid means from an overhead structure. Each employee on a scaffold more than 10 feet above a lower level must be protected by guardrails, a personal fall arrest system, or both. Fall arrest and guardrail systems must be used when working on single and two point adjustable suspension scaffolds and on self-contained adjustable scaffolds that are supported by ropes.

A *competent person* must inspect the ropes for defects prior to each workshift and after every occurrence that affect a rope's integrity, evaluate the direct connections that support the load, and determine if two point and multi-point scaffolds are secured from swaying.

The use of repaired wire rope is prohibited. Drum hoists must contain no less than 4 wraps of the rope at the lowest point. All support devices must rest on surfaces capable of supporting at least 4 times the load imposed on them by the scaffold when operating at the rated load of the hoist (or at least 1.5 times the load imposed on them by the scaffold at the stall capacity of the hoist, whichever is greater). The stall load of any scaffold hoist must not exceed 3 times its rated load. The stall load is the load at which the prime-mover of a power-operated hoist stalls or the power to the prime-mover is automatically disconnected.

When scaffold platforms are more than 24 inches above or below a point of access, ladders, ramps, walkways or similar surfaces must be used. When using direct access, the surface must not be more than 24 inches above the surface or 14 inches horizontally from the surface.

Counterweights, used to balance adjustable suspension scaffolds, must be capable of resisting at least 4 times the tipping moment imposed by the scaffold operating at the rated load of the hoist, or 1.5 (minimum) times the tipping moment imposed by the scaffold operating at the stall load of the hoist, whichever is greater.

Only those items specifically designed as counterweights must be used. Counterweights used for suspended scaffolds must be made of materials that cannot be easily dislocated. Counterweights must be secured by mechanical means to the outrigger beams.

Vertical lifelines must not be fastened to counterweights. Sand, gravel, masonry units, rolls of roofing felt, and other such materials must not be used as counterweights.

A single tie back must be installed perpendicular to the face of the building or structure. Two tie backs installed at opposing angles are required when perpendicular tie back cannot be installed. Tiebacks must be secured to a structurally sound anchorage on the building or structure. Tie backs must not be secured to standpipes, vents, other piping systems, or electrical conduits.

Training

Each employee who performs work on a scaffold must be trained by a person *qualified* to recognize the hazards associated with the type of scaffold used and to understand the procedures to control or minimize those hazards. The training must include such topics as the nature of electrical hazards, fall hazards, falling object hazards, the maintenance and disassemble of the fall protection systems; the use of the scaffolds, handing of materials, and the maximum intended load carrying capacity. Employers who erect, disassemble, move, operate, repair, maintain, or inspect a scaffold must be trained by a *competent perso*n. The training must include such topics as the nature of the hazards, and the correct procedures for erecting, disassembling, moving, operating, repairing, inspecting, and maintaining the type of scaffolds in use. Recommended training includes erection and dismantling planning, personal protective equipment, access, guys and braces, and parts inspection.

Stairs

A stairway or ladder must be provided at all worker points of access where there is a break in elevation of 19 inches or more and no ramp, runway, sloped embankment, or personnel hoist is provided. Except during construction of the actual stairway, skeleton metal frame structures and steps must not be used (where treads and/or landings are to be installed at a later date), unless the stairs are fitted with secured temporary treads and landings.

When there is only one point of access between levels, it must be kept clear to permit free passage by workers. If free passage becomes restricted, a second point of access must be provided and used

When there are more than two points of access between levels, at least one point of access must be kept clear. All stairway and ladder fall protection systems must be provided and installed as required by the stairway and ladder rules *before* employees begin work that requires them to use stairways or ladders and their respective fall protection systems.

Stairways that will not be a permanent part of the structure on which construction work is performed must have landings at least 30 inches deep and 22 inches wide at every 12 feet or less of vertical rise.

Stairways must be installed at least 30 degrees, and no more than 50 degrees, from the horizontal. Where doors or gates open directly onto a stairway, a platform must be provided, and the swing of the door must not reduce the effective width of the platform to less than 20 inches

Except during construction of the actual stairway, stairways with metal pan landings and treads must not be used where the treads and/or landings have not been filled in with concrete or other material, unless the pans of the stairs and/or landings are temporarily filled in with wood or other material. All treads and landings must be replaced when worn below the top edge of the pan.

Stairways having four or more risers, or rising more than 30 inches in height whichever is less, must have at least one handrail. A stairrail also must be installed along each unprotected side or edge. When the top edge of a stairrail system also serves as a handrail, the height of the top edge must not be more than 37 inches nor less than 36 inches from the upper surface of the stairrail to the surface of the tread in line with face of riser at forward edge of tread. Midrails, screens, mesh, intermediate vertical members, or equivalent intermediate structural members must be provided between the top rail and stairway steps of the stairrail system.

Midrails, when used, must be located midway between the top of the stairrail system and the stairway steps. The height of handrails must not be more than 37 inches or less than

30 inches from the upper surface of the handrail to the surface of the tread in line with face of riser at forward edge of tread.

The height of the top edge of a stairrail system used as a handrail must not be more than 37 inches nor less than 36 inches from the upper surface of the stairrail system to the surface of the tread in line with face of riser at forward edge of tread.

Temporary handrails must have a minimum clearance of 3 inches (7.62 centimeters) between the handrail and walls, stairrail systems, and other objects. Unprotected sides and edges of stairway landings must be provided with guardrail systems.

Storage

All materials stored in tiers must be secured to prevent sliding, falling, or collapsing. Aisles and passageways must be kept clear and in good repair. Storage of materials must not obstruct exits. Materials must be stored with due regard to their fire characteristics.

Tire Cages

A safety tire rack, cage, or equivalent protection must be provided and used when inflating, mounting, or dismounting tires installed on split rims, or rims equipped with locking rings or similar devices.

Toeboards

Toeboards, when used to protect workers from falling objects, must be erected along the edge of the overhead walking/working surface. A standard toeboard must be at least 3-1/2 inches in height and may be of any substantial material either solid or open, with openings not to exceed 1 inch in greatest dimension.

Toilets

Toilets must be provided according to the following: 20 or fewer persons—one facility; 20 or more persons—one toilet seat and one urinal per 40 persons; 200 or more persons—one toilet seat and one urinal per 50 workers. This requirement does not apply to mobile crews having transportation readily available to nearby toilet facilities.

Underground Construction

The employer must provide and maintain safe means of access and egress to all workstations. The employer must control access to all openings to prevent unauthorized entry underground.

Unused chutes, manways, or other openings must be tightly covered, bulkheaded, or fenced off, and must be posted with signs indicating “Keep Out” or similar language. Complete or unused sections of the underground facility must be barricaded.

Unless underground facilities are sufficiently completed so that the permanent environmental controls are effective and the remaining construction activity will not cause any environmental hazard or structural failure within the facilities,

the employer must maintain a check-in/check-out procedure that will ensure that aboveground designated personnel can determine an accurate count of the number of persons underground in the event of an emergency.

All employees must be instructed to recognize and avoid hazards associated with underground construction activities. Hazardous classifications are for “potentially gassy” and “gassy” operations. The employer must assign a competent person to perform all air monitoring to determine proper ventilation and quantitative measurements of potentially hazardous gases. Fresh air must be supplied to all underground work areas in sufficient quantities to prevent dangerous or harmful accumulation of dust, fumes, mists, vapors, or gases.

Wall Openings

Each employee working on, at, above, or near wall openings (including those with chutes attached) where the outside bottom edge of the wall opening is 6 feet or more above lower levels and the inside bottom edge of the wall opening is less than 39 inches above the walking/working surface must be protected from falling by the use of a guardrail system, a safety net system, or a personal fall arrest.

When an employee is exposed to falling objects, the employer must ensure that each employee wear a hard hat and erect toeboards, screens, or guardrail systems; or erect a canopy structure and keep potential fall objects far enough from the edge of the higher level; or barricade the area to which objects could fall.

Washing Facilities

The employers must provide adequate washing facilities for employees engaged in operations involving harmful substances. Washing facilities must be near the worksite and must be so equipped as to enable employees to remove all harmful substances.

Welding, Cutting, and Heating

Employers must instruct employees in the safe use of welding equipment. Proper precautions (isolating welding and cutting, removing fire hazards from the vicinity, providing a fire watch) for fire prevention must be taken in areas where welding or other “hot work” is being done. No welding, cutting, or heating must be done where the application of flammable paints, or the presence of other flammable compounds or heavy dust concentrations creates a fire hazard. Arc welding and cutting operations must be shielded by noncombustible or flameproof screens to protect employees and other persons in the vicinity from direct arc rays. When electrode holders are to be left unattended, the electrodes must be removed and the holder must be placed or protected so that they cannot make electrical contact with employees or conducting objects.

All arc welding and cutting cables must be completely insulated and be capable of handling the maximum current requirements for the job. There must be no repairs or splices within 10 feet of the electrode holder, except where splices are insulated equal to the insulation of the cable. Defective cable must be repaired or replaced.

Fuel gas and oxygen hose must be easily distinguishable and must not be interchangeable. Hoses must be inspected at the beginning of each shift and must be repaired or replaced if defective.

General mechanical ventilation, local exhaust ventilation, airline respirators, and other protection must be provided, when welding, cutting or heating:

- Zinc-, lead-, cadmium-, chromium-, mercury-, or materials bearing, based, or coated with beryllium in enclosed spaces;

- Stainless steel with inert-gas equipment;

- In confined spaces; and where an unusual condition can cause an unsafe accumulation of contaminants.

Wire Ropes, Chains, and Ropes

Wire ropes, chains, ropes, and other rigging equipment must be inspected prior to use and as necessary during use to ensure their safety. Defective gear must be removed from service.

Job or shop hooks and links or makeshift fasteners formed from bolts, rods, or other such attachments must not be used.

When U-bolts are used for eye splices, the U-bolt must be applied so that the "U" section is in contact with the dead end of the rope. When U-bolt wire rope clips are used to form eyes, the following table must be used to determine the number and spacing of clips.

Woodworking Machinery

All fixed power-driven woodworking tools must be provided with a disconnect switch that can be either locked or tagged in the off position. All woodworking tools and machinery must meet applicable requirements of ANSI 01.1-1961, Safety *Code for woodworking machinery.*